2025-2024

Al-Mustaqbal University

College of Enginering and Technologies

Graduation Projects

2024-2025

اشراف

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PART ONE

PROJECTS OF

Department of Mechanical

Power Engineering

Proj.No.1

Optimizing Dynamic Vibration Absorbers for Vibration Control in Cantilever Beams under Harmonic Excitation

Prepared by:

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2- Maytham Kareem Hashem
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Sustainable Development Goals Performed:

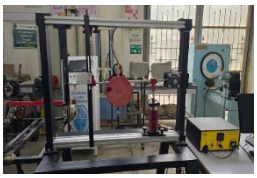
Abstract

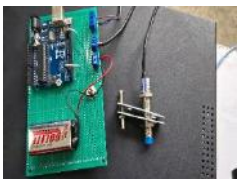
Abstract:

Dynamic Vibration Absorbers are commonly used to reduce vibrations in mechanical systems. This work experimental studies were conducted to analyze the dynamic behavior of a beam with and without dynamic vibration absorber for boundary condition. (pinned-free). The beam is subjected to the dynamic input, and the response of the beam was measured at various locations using accelerometers. The experimental results show that both mass and stiffness have a significant effect on reducing the dynamic response up to 97%. The minimal requirements of the DVA parameters can achieve better reduction in the dynamic response if the DVA is located at the point of maximum displacement

Experimental Part

Experimental : An experimental setup was designed to evaluate the effectiveness of a Dynamic Vibration Absorber (DVA) in reducing vibration and displacement in a beam. The setup includes a beam, a DVA, an excitation source, and a measurement system. Sensors record the beam's response with and without the DVA to analyze its performance. Factors such as attachment location, stiffness, and damping are studied. The setup, developed at Al-Mustaqbal University, aids in optimizing vibration control in various engineering fields.





Results and conclusions

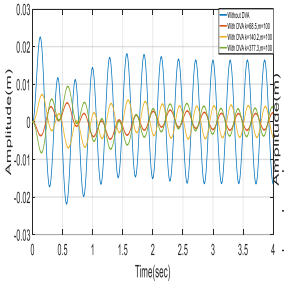


Fig (2) effect of stiffness at beam (t=0.12m of pin free with and without DVA at $\omega = 6.75\pi$. m = 100 gram . k = 68.5 140.2 377.3 N

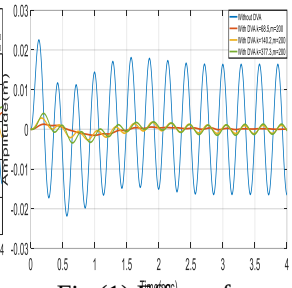


Fig (1) Effect of stiffness at beam (t=0.12m) pin free with and without DVA at $\omega = 6.75\pi$. m =

1.The frequency ranges of the optimal designs increase as the mass ratio increases, and the maximum frequency range of 0.510 to 1.022 is attained at a mass ratio and damping ratio of 0.6 and 0.321,
respectively.

2. Both mass and stiffness have a significant effect on reducing the
dynamic response about 97% for the pinned beam, for example.

3.Minimal requirements of the DVA parameters can achieve better
reduction in the dynamic response if the absorber is located the point of maximum displacement of the beam.

Proj.No.2

Experimental Heat transfer study in cylindrical system of different arrangement immersed in porous media

Prepared by:

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Amen Musa Hassan

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Sustainable Development Goals Performed:

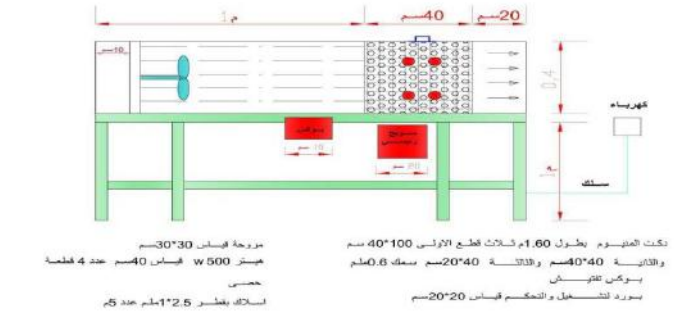
Abstract

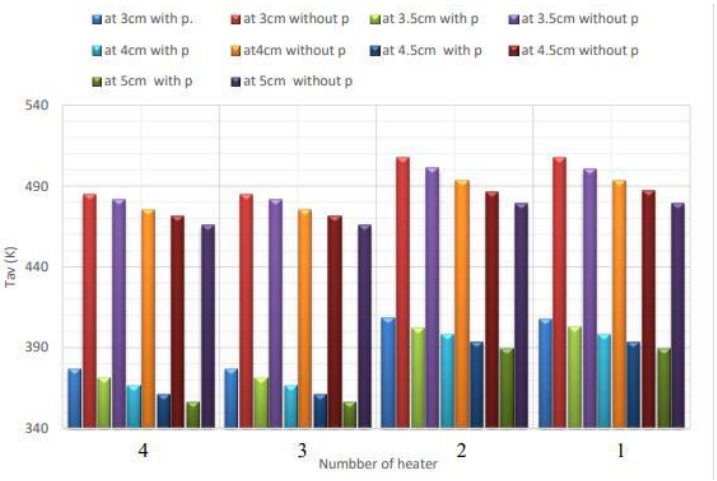
Abstract:

Many applications and industrial processes depend on heat exchangers to contribute to heat transfer. To increase the heat transfer area and obtain a heat exchanger in a smaller size for the same efficiency or the same size with higher efficiency, the porous media is used. Also, the buried pipes underground used to transport steam, oil and other fluids. Heat transfer through them can be enhanced by the type of porous media surrounding these tubes and its configurations. In this investigation used four cylinders with in a square duct once without porous media and other with gravels as porous media at porosity 0.44 with two arrangements of cylinders in-line and staggered.

Experimental Part

The study was carried out using an experimental model consisting of a 40 cm long steel test channel containing thermally insulated heating cylinders. Gravel was used as a porous medium with a porosity of 0.44, and the cylinders were arranged in a linear and zigzag manner to study their effect on heat transfer. The study was carried out using an experimental model consisting of a 40 cm long steel test channel containing thermally insulated heating cylinders. Gravel was used as a porous medium with a porosity of 0.44, and the cylinders were arranged in a linear and zigzag manner to study their effect on heat transfer.





The average temperature of each cylinder in the inline arrangement depends on the location of the cylinder in relation to the air flow. Where the average temperature in the third and fourth cylinders is less by 20 °k than the average temperature in the first and second cylinders, because of the third and fourth cylinders are exposed to air flow directly in contrast to the first and second cylinders, as shown in the figure

.

Proj.No.3

تأثير الظروف الخارجية على أداء نظام تبريد مجمع

Prepared by:

10- عباس رشيد حسن
11- اثير عباس نايف
12- حسين علي محمد
13- ميثم كاظم كريم
14- صادق صالح عودة
15- مصطفى جبار محمد
16- أنور عباس فاضل
17- علي حمزة كاظم
18- يوسف مناف محمد
19- علي طالب عباس

Supervised by:
أ.د.حيدر كريدي راشد

Sustainable Development Goals Performed:

Reducing the electrical energy consumed by the central cooling system of the Energy Research Center building by studying and addressing the impact of external conditions on the performance of this system.

Abstract

In this research, the effect of external conditions on the performance of a combined cooling system applied to the Energy Research Center at Future University was studied. The effect of outside air temperature, the air inlet velocity, solar energy incident on the complex, carbon dioxide content, and outside air humidity were studied to achieve a comfortable condition. To achieve optimal performance, the thermal performance of the system was calculated based on air velocity values, Reynolds number, its relationship with temperature, humidity, and its effect on the flow quality (Laminar) or (Turbulent) to obtain the optimal Coefficient of Performance (COP) for this manifold. The results of the system performance rate showed clear changes in performance rate with changes in the external conditions of this system.

Methodology

Methodology : Heat recovery fans are essentially air-to-air heat exchangers that recover energy from the air escaping a building. They are used to provide fresh ventilation while saving heating and cooling energy. Heat recovery fans are commonly installed in residential and office buildings in many domestic applications, especially during the summer in our country, Iraq. The building's indoor air quality was calculated based on building facility standards to include adequate ventilation systems in public and residential buildings. The complex used at Future University can be seen in the figure (1). Side view of the device as shown in the figure (2)

Figure (1): Future University Energy Research Center.

Results and conclusions

Results and conclusions:

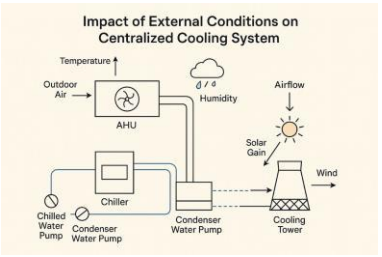


Figure (3): the external conditions that effect on the performance of cooling system.

The outer air velocity ranges from 0.3 m/s to 5.5 m/s and the corresponding Re number ranges from 200 to 2000. the average discrepancy between the predicted Nu number and the experimental values is less than 10% and the average discrepancy between the predicted pressure loss and the experimental values is less than 2%. The good agreement between the predicted and experimental results indicates that the numerical model is reliable to predict heat transfer characteristics and flow structure in compact heat exchangers.

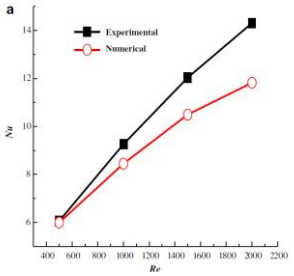


Figure (4): relation between Reynolds number and average Nusselt number

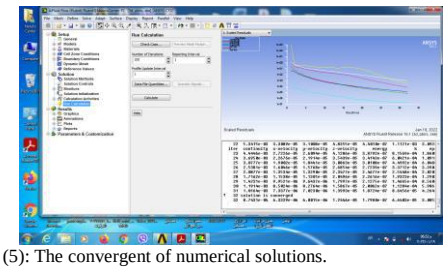


Figure (5): The convergent of numerical solutions.

Proj.No.4

Sunflower-Inspired Solar Panel System with Dual-Axis Sun Tracking and Automated Opening/Closing Mechanism

Prepared by:

20- Mohammed Abbas Jabbar
21- Qasim Jabbar Awad
22- Hassan Abdul Kadhim
23- Ali Faisal Ghazi
24- Ahmed Falah Hassan
25- Akram Majed Mutairi
26- Thamer Ali Abbas
27-
28-

Supervised by:

3- Prof.Dr. Qusay Rasheed
4- M.SC Ali Ajmi Faleh

Sustainable Development Goals Performed:

Abstract

Abstract:

This research presents an innovative approach to improving solar energy efficiency by combining bio-inspired designs with advanced solar tracking technologies. The primary objective of the study is to develop a solar panel system modeled after the sunflower's natural heliotropic behavior, which maximizes sunlight absorption through its ability to track the sun's movement.

The proposed system integrates a dual-axis sun tracking mechanism that ensures the solar panels continuously face the sun throughout the day. This tracking system mimics the movement of sunflower heads, allowing for optimized energy capture during both morning and afternoon hours. The dual-axis tracking provides a greater degree of accuracy in positioning the panels compared to single-axis systems, reducing energy losses caused by misalignment.

In addition to the tracking system, the research incorporates an automated opening and closing mechanism for the solar panels. This mechanism is designed to enhance the system's efficiency by adjusting the angle and orientation of the panels based on environmental conditions such as sunlight intensity and temperature. The automated system ensures that the panels are optimally positioned for maximum energy collection while also minimizing mechanical wear and tear.

Through this bio-inspired design and the implementation of cutting-edge technology, the study aims to significantly enhance solar energy utilization, increase the lifespan of solar panels, and reduce maintenance costs. The results of the system's performance under various environmental conditions will be evaluated, providing insights into its viability for large-scale application in sustainable energy solutions.

Methodology

Methodology

The sunflower-inspired solar panel system is a biomimetic design that enhances solar energy harvesting by mimicking the heliotropic movement of sunflowers. Sunflowers naturally track the sun throughout the day, maximizing light absorption and photosynthesis. Inspired by this principle, the sunflower solar panel system follows the sun's trajectory to optimize energy collection. This is achieved using light sensors (LDRs), servo motors, a motor driver, and an Arduino Nano microcontroller. Additionally, the system incorporates a mechanical folding mechanism that allows the panels to close when sunlight is unavailable, protecting them from environmental hazards such as strong winds and heavy rainfall.

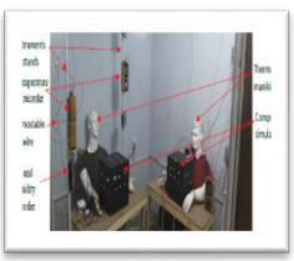
The design consists of three major components:

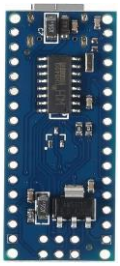
Sun Tracking Mechanism – Ensures continuous alignment of the solar panels with the sun to maximize energy efficiency.

Folding Mechanism – Protects the system by closing the panels when light is insufficient.

Power Generation and Control System – Converts solar energy into electricity while regulating motor movement for tracking and folding.

Each of these components is facilitated by carefully selected hardware elements, which are described in detail below.





Results and conclusions

The home prototype was meticulously crafted using lightweight foam material, ensuring ease of fabrication while maintaining structural integrity. The design process involved precision cutting using a CNC machine, which allowed for high accuracy in shaping the walls, roof, and other architectural elements. The individual foam pieces were assembled using strong adhesive glue, ensuring durability and stability.

To enhance the aesthetic appeal and provide a realistic finish, a color cover was applied to the foam surface, replicating the look of real building materials. The prototype also features LED lights with resistors, which illuminate different sections of the house to simulate real-world electrical applications. These LEDs are controlled via an Arduino Nano, powered by the solar energy harvested by the sunflower-inspired tracking system.

This prototype serves as a functional model to demonstrate the effectiveness of the integrated solar power system in providing energy for household and street lighting applications. The Arduino Nano serves as the central controller, processing data from the sensors and displaying system information. It collects voltage and current measurements, calculates power consumption, and manages battery charging through the 3S balanced charger module, which ensures proper charging and discharging of the 12.6V lithium-ion battery pack, protecting it from overcharging, overcurrent, and short circuits. To monitor power usage, a voltage sensor measures the output voltage from the solar panels and battery pack, while an ACS712 current sensor tracks real-time current drawn by the load. A 20×4 LCD display provides real- time data, including battery voltage, current consumption, and power output, ensuring easy monitoring of system performance. Additionally, a 1S battery level indicator is used for checking the charge level of a single lithium cell, while a 3S battery level indicator displays the charge status of the entire 3-cell battery pack.

The seamless integration of these components results in a fully autonomous solar energy system that efficiently manages power generation, storage, and consumption.

Proj.No.5

Design and implementation of a hybrid wind turbine-solar cell power generation system

Prepared by:

29- Mortada Jassim
30- Mohammed Ali Shaker
31- Saif Majed
32- Hussein Salim
33- Abbas Salim
34- Abdullah Ahmed
35- Mustafa Fadel
36- Abbas Habib
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Supervised by:

Prof. Dr. Qusay Rasheed Al-amir

Sustainable Development Goals Performed: SDG7, SDG9, SDG11, SDG13

Abstract:

This project aims to develop an efficient and sustainable solution for generating electricity from renewable sources by combining wind and solar energy into a single system. The system relies on solar cells to generate electricity during sunny periods, while wind energy is harnessed via wind turbines during windy periods or at night, ensuring continuous power generation throughout the day. The project includes engineering design, simulation, practical implementation, and performance analysis to improve the system's operational efficiency and ensure its stability. This project is a step towards promoting the use of renewable energy and providing practical solutions for generating electricity in environmentally friendly ways.

Methodology

Methodology:

The experimental aspect of the project includes the following components:

1. Three-blade wind turbine system: The type of wind turbine used in this project is a vertical axis wind turbine (VAWT), mounted on a 9-meter-high pole, generating 800 watts at 12 volts (DC).
2.
3. Solar cell system: Two solar cells, each with a capacity of 100 watts and a voltage of 21 volts (DC).

4.Charge controller: Regulates the flow of energy from the turbine and solar cells to the batteries or loads. It protects the system from overcharging or overdischarging.

12-24 DC MPPT for wind

24 DC MPPT for solar

4. Inverter: Converts the direct current (DC) generated by the solar cells and batteries into alternating current (AC) that can be used to power electrical devices.
5. A 42-meter-long DC photovoltaic (DC) flyer (3 meters distributed across the tree's 14 poles, representing the electrical load) of the hybrid system.

Results and conclusions

Results and conclusions:

As shown in the figure, the orange curve has a semi-bell shape, starting at 6 AM and peaking around 1 PM, then gradually declining. As the figure also shows, the blue curve has a sine wave-like oscillation, showing significant output from 9 PM to 5 AM, the peak of wind speed.

In addition to the above, the green curve shows relative stability in generation, with two peaks: one during the day (due to the sun) and the other at night (due to the wind). In other words, the green line represents hybrid energy, which is the sum of the two energy sources and exhibits stability and balance throughout the day.

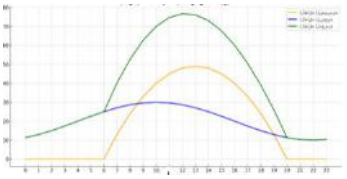


Figure (1): System performance curve

Figure (2): Photograph of the proposed system

Proj.No.6

Mobile Robot Arm Experimental Study

Prepared by:

1-مشتاق طالب عطية **4- أسعد صالح مشعان** **7- جواد كاظم فارس**

2- حسنين جبار علي **5-أمجد صالح مشعان**

3- سلام ياسر كريم **6- حمزة عايد عباده**

Supervised by:

5- Prof. Dr. Essam Zuheir Fadhel

6- Assist. Prof. Dr. Mohammed Ali

Sustainable Development Goals Performed:

Abstract:

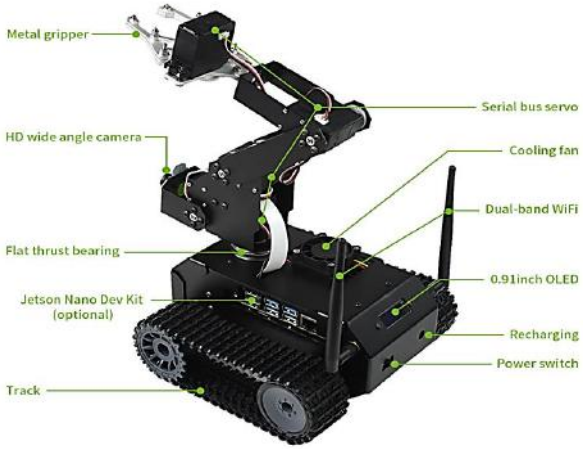
This presentation covered a variety of aspects related to robotics, from its historical development to its modern practical applications, with a particular focus on the JETANK robot. the main points and conclusion can be summarized as, it's clear that robots have become an essential component of our societies. This development contributes to improving productivity, providing innovative solutions in various fields, and addressing future challenges.

Experimental Part

Basic Robot Components

1. Base Frame: A metal tracked structure that supports the rest of the components and provides stability.
2. Jetson Nano Module: To execute programming commands and process images and video.
3. Motors: DC motors to control movement and the robotic arm.
4. Robotic Arm: Consisting of joints to perform grasping and positioning tasks.
5. Camera: To collect data and identify objects.
6. Sensors: Including LiDAR, temperature, and ultraviolet sensors.
7. Battery: A rechargeable power source.
8. Wireless Communication Module: Including Wi-Fi and Bluetooth for remote control.
9. Control Board: Connects all components and executes instructions.

Results and conclusions



1. Structure and Design:

o The robot is equipped with a crawler-mounted base that allows it to move easily in various environments.

o The arm is composed of multiple servo motors, giving it multiple degrees of freedom.

2. Control Systems:

o It contains a controller (usually a Raspberry Pi or Jetson Nano) that supports Wi-Fi connectivity.

o It contains multiple USB ports, indicating the possibility of connecting additional sensors or cameras.

3. Connectivity and Programming:

o It supports wireless connectivity, allowing it to be controlled remotely.

o It is programmable using Python, C++, or the Arduino IDE.

4. Arm Functions:

o The arm is capable of picking up and moving objects, executing precise movements, and performing pre-programmed tasks.

Proj.No.7 **New design of solar water heater storage system equipped with double-walled spherical tank**

Prepared by:

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40- Sajjad Fadhel Hadi
41- Zaid Hussein Abdul Hassan
42- Ali Zuhair Hassan
43- Amin Haitham Abdul Rahim
44- Ali Ahmed Abdul Hassan,
45- Ahmed Hamed Abdul
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Supervised by:

7- Prof. Dr. Qusay Rasheed Al-amir

Sustainable Development Goals Performed:

SDG7, SDG9, SDG11, SDG13

Abstract:

In commercial active solar water heaters, during the convection process, water is continuously circulated between the collector and the tank. The water is heated in the collector and then stored in an insulated tank on the roof. The shape of the collector and tank is an important factor in the development of solar thermal energy storage systems. In this study, the collector and tank were designed as spherical, stable, symmetrical, and capable of tracking the sun regardless of the angle of inclination. Also, in an innovative approach, the solar thermal energy storage tank was designed as a double-walled spherical tank.

Methodology

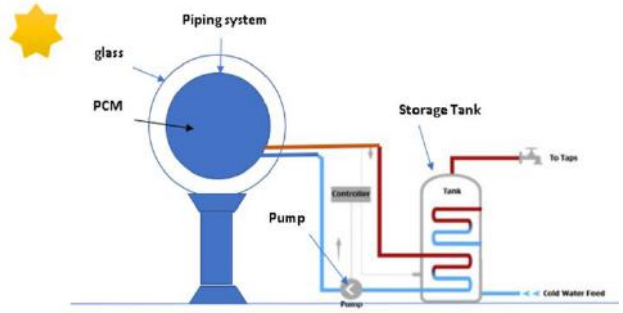
Methodology:

The practical aspect of the project:

The project's experimental device, as shown in Figure (1), can be manufactured in two stages:

The first stage: The water cycle stage, consisting of a tank made of galvanized iron, a 1 cm diameter copper pipe 20 m long, a water pump, a valve to control the amount of water flow, and a flowmeter to measure the volumetric flow rate.

The second stage: The spherical tank with a diameter of 30 cm made of galvanized iron, containing 30 kg of phase-change wax, is manufactured.



Figure(1)represents an illustrative diagram of the testing device.

Results and conclusions

Results and conclusions:

The temperature of the water in the tank is measured by placing thermocouples at different elevations. Water is used as the working fluid in the spherical solar heater at flow rates of 1.25 and 2 liters per minute, circulating between the collector and the tank to harvest energy throughout the day.

The power level and temperature rise to a peak point, then decrease due to the decrease in solar radiation and the rise in water temperature. Unlike conventional insulated heaters, the outer surface of the spherical tank is uninsulated and acts as an active energy absorber. This surface allows the system to operate statically when the flow is separated. The PCM material helps store heat while the sun is on and later turns into an insulator when it freezes, prolonging energy use.

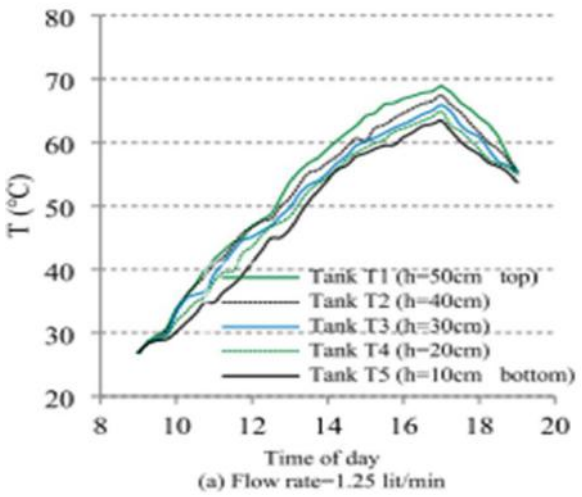


Figure (2): The figure shows the temperature of the spherical tank water at different heights from the tank floor during daily heat load and at different flow rates of circulating water.

Proj.No.8

Using Micro-Technologies to Improve the Efficiency and Sustainability of Electrical Power Systems at the Future Energy Research Center

Prepared by:

47- مسلم عقيل هادي
48- مصطفى عماد عباس
49- عقيل عبد علي
50- حسن مسلم دايخ
51- مؤمل ابراهيم
52-
53- حسن سعدي
54- رائد ماجد نعمة
55-

Supervised by:

8- ا م د ازهر محسن عبد
9- م م اسماء محمد حميد

Sustainable Development Goals Performed:

Abstract:

Smart Building Management System integrates HVAC and power controls to reduce energy use and costs, offering fast, reliable responses via touchscreen and mobile apps for sustainable, renewable energy solutions.

Methodology

Methodology:

The methodology involved developing a Smart Building Management System using a connected touchscreen and mobile application for 24/7 control of lighting, fans, cooling, and temperature. Occupancy sensors automate device operation, reducing energy consumption. Energy usage is monitored across three electrical lines linked to specific loads. The Graview platform enables centralized control for large institutions. The system operates via Wi-Fi locally and supports remote online management for effective, low-cost, and reliable building energy optimization

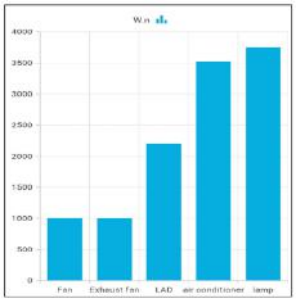
Results and conclusions

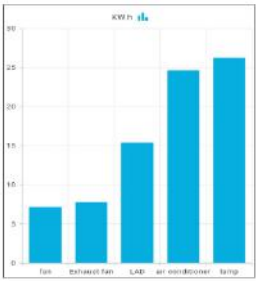
Results and conclusions:

This project successfully achieved full control over lighting and fan systems, including adjustable fan speeds from zero to eight. Control is provided through a connected touchscreen that operates continuously, regardless of internet availability, and a mobile application linked via email. The system automatically turns lighting and fans on or off by detecting occupancy, shutting down devices one and a half minutes after the room is vacated, significantly reducing power consumption. Within the facility, only a Wi-Fi connection is required for control, while remote access and monitoring are possible online, enabling operation and shutdown of devices as well as real-time energy consumption tracking.

For larger facilities such as hospitals, the Graview platform was implemented on computers, allowing device management via email and password. This platform is more suitable for managing extensive electrical networks where mobile apps or touchscreen controls alone are insufficient. Energy consumption is monitored across three distinct electrical lines, each assigned to specific loads: fans on line one, entrance lighting on line two, and laboratory and computer room lighting on line three. Presence sensors control lighting activation to optimize energy use.

Through both the mobile app and computer platform, users can monitor real-time consumption in watts and amperes for each line. Data can be analyzed over daily, weekly, or monthly periods, with graphical charts generated to visualize energy usage patterns clearly. Overall, the system demonstrates effective energy management, enhanced user control, and scalability, proving its suitability for both small and large-scale smart building applications.





Proj.No.9

Design of the air duct network for the cooling system of the complex

Prepared by:

56- Abbas Ali Hussein
57- Mohammed Abbas Hussein
58- Ali Razzaq Jaafar
59- Baqer Talib Kazim
60- Khader Abbas Rashid
61- Hussein Mansour Hassan
62- Marwan Adnan Hamid
63-
64-

Supervised by:

10- M.s.c. Mohsin .O. Naser
11-

Sustainable Development Goals Performed:

Abstract

This research aims to design an effective air duct network for a cooling system in the workshops of the College of Air Conditioning and Refrigeration Technologies. The design of the air duct network is an essential part of the cooling systems, as it ensures the optimal distribution of cooled air and reduces heat loss, which directly affects the efficiency of the system and energy consumption. The study analyzes the factors affecting the selection of the size and design of the air ducts, including the size of the building, the internal distribution, the required ventilation rate, and the surrounding climatic conditions. The results showed that a good design of the air duct network contributes to reducing energy consumption compared to traditional designs, in addition to improving air distribution and reducing noise inside the building. The research includes recommendations for improving future designs to ensure achieving a balance between effective performance and economic cost..

Methodology

Designing the ductwork

Based on the previous data and analysis, engineers begin designing the ductwork network, which includes determining:

• The optimal air path: The most efficient paths for air transfer must be determined, whether horizontal or vertical.

• Components: Choosing the appropriate pipes in terms of size and materials (such as aluminum, stainless steel, or plastic). Figure(3.1)

• Openings and outlets: Determining the location and size of openings and outlets in different rooms to ensure even air distribution.

• Pressure loss calculations: The pressure loss in the network is calculated due to bends, branches, and other components (such as fans and filters).

Results and conclusions

Analysis of Results

The results of the air duct design include improving the even distribution of air, reducing pressure loss, improving energy efficiency, ensuring environmental comfort for users, and controlling noise. The results also ensure ease of maintenance and compliance of the design with approved engineering standards.

Discussion of Results

After evaluating the results based on the specified objectives, if the main objectives such as balanced air distribution, reducing pressure loss, and achieving user comfort are achieved, the project is considered successful. This contributes to improving the efficiency of the system and reducing operational costs, while ensuring a comfortable and healthy environment for users.

Accurately determining the dimensions of the ducts

• Challenge: One of the most difficult challenges is choosing the appropriate dimensions for the air ducts. If the ducts are too small, this may lead to pressure loss and increased energy consumption. However, if they are too large, they may be expensive and not achieve energy efficiency.

• Solution: Flow and pressure calculation equations were used accurately to determine the optimal dimensions based on the size of the rooms, the type of activity in each room, and the ventilation requirements.

Balancing Efficiency and Comfort

• Challenge: It was necessary to balance system efficiency (such as reducing energy consumption) with user comfort (such as ensuring good air distribution and appropriate temperatures).

• Solution: The ideal air distribution points were identified to ensure that each room or area in the building received the appropriate amount of air without affecting environmental comfort.

Proj.No.10 **Improvement of Indirect Evaporative Cooling System**

Prepared by:

65- Hussein Jalal Abbas 66- Haider Batah Ghazi, 67- Hussam Saad Hussein
68- Sajad Abdul-Hamid Rasheed 69- Hussein Ali Jawad 70- Murtadha Nofal Salih
71- Haidera Mohammed 72- 73-

Supervised by:

12- Assist. Prof. Dr. Esam Muhe Mohammed 13-

Sustainable Development Goals Performed:

Abstract

The performance of indirect evaporative cooler (IEC) in the environment of Iraq is assessed experimentally. The wet pad used in indirect evaporative coolers is one of the main parts affecting the output of an evaporative cooler.

In this study, a corrugated cellulose fiber was focused as a wet media for water evaporation and the performance of this pad material was used as a cooling agent. The main design parameters considered are the water flow and the wetted pad in the designing of the cooler. During the testing of the cooler the ambient temperature in the range from 31.9o C to 36.2o C and relative humidity lower than 55% were considered to the ambient air.

The air temperature and relative humidity of the conditioned space were measured and the effectiveness of the cooler was determined. The results obtained show that effectiveness of the IEC system is in range of 81.4–89.1% and measured relative humidity of the conditioned space is in the range of 41-55%.

As an overall the IEC system with pad material of 4 cm thickness showed a comparatively better performance with maximum effectiveness of 89.1%.

Methodology

Manufacturing of the indirect evaporative cooler

The heat exchanger of the IEC system was manufactured by using two concentric ducts manufactured from galvanized iron and having a dimension (150 mm * 200 mm) for the inner and (300 mm * 400 mm) for the outer duct with 3-meter length. A water pump and a fan to push air into the inner duct were used. Three temperature sensors distributed at the beginning and end of the duct to record temperatures. A design of the manufactured IEC system is shown in Fig (1). It can be observed the heat exchanger, a reservoir for water and adapter parts for testing the IEC system. The water distribution was carried out through perforations in the upper part of the device.

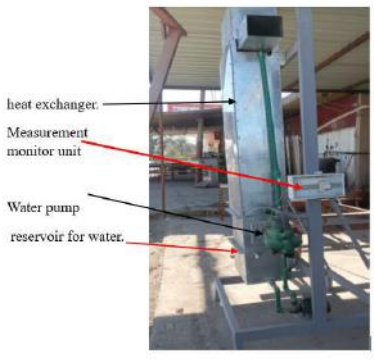


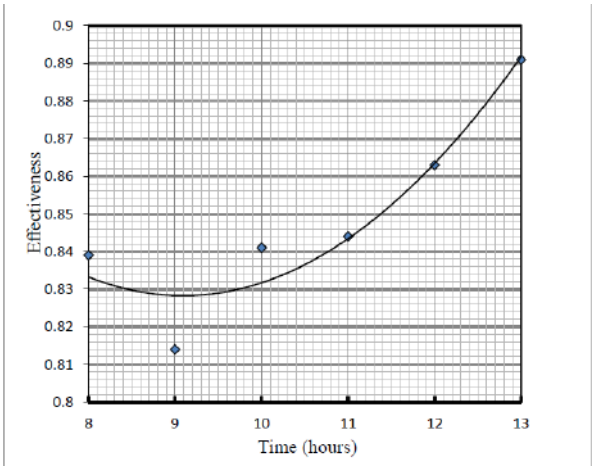
Fig. (1) design of the manufactured IEC system

Results and conclusions

The experimental measurements were recorded for the ambient dry- and wet-bulb temperatures, supply (IEC) temperature, room dry- and wet-bulb temperatures (Room temperature), and room relative humidity (%). The calculated effectiveness from 0.8.00 to 13.00 daily time of test of operation on May and the results obtained are shown in the following table.

From the results obtained it can be seen that the evaporative cooler with pad material of four centimeters layer will give better reasonable performance and maximum effectiveness obtained is 89.1%. So, according to this study, one can conclude that this cooling system can provide better cooling in the summer season.

The variation of effectiveness versus outside input temperature is presented in Fig. (3). From fig. (3) it will be seen that the indirect evaporative cooler (IEC) with pad material of (4cm) layer thickness shows better performance from 31.9 oC to 36.2o C.



Proj.No.11 **Study AIR SYSTEM CONDITIONING**

Prepared by:

74- Ahmed Hussein Sakhil	75- Reda Ali Jawad	76- Mojtaba Tahseen Ali
77- Abbas Alaa Mahdi	78- Mohammed Alaa Kamel	79- Mustafa Mohammed Kazim
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Supervised by:

14- Dr. Abdul Karim Abdul Wahab 15-

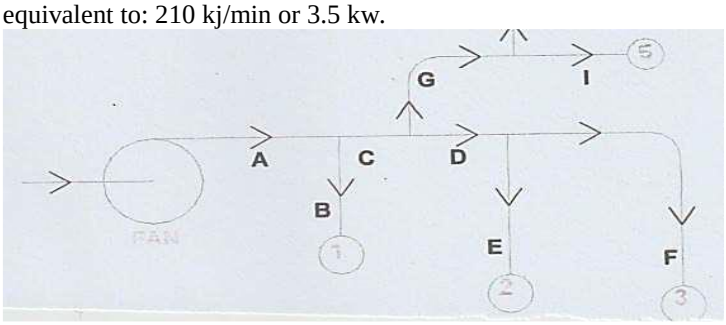
Sustainable Development Goals Performed:

Abstract

Air conditioning systems are essential for maintaining indoor thermal comfort, air quality, and energy efficiency in buildings. The design of these systems involves a multidisciplinary approach that combines mechanical engineering, thermodynamics, architecture, and environmental
science .
The primary design objectives are to maintain optimal temperature, humidity, and air velocity;
To reduce energy consumption through efficient system design and control;
To ensure adequate ventilation and filtration;
To balance initial investment with operating and maintenance costs
To integrate renewable energy sources and environmentally friendly refrigerants.
The project for Fourth Year 2024 / 2025 is study the central air conditioning for the small building. It is describing the requirements methods for calculating the requirements for cooling load and determine the other equipment's which will be used in this project, like, type of compressor, condenser, evaporator, and expansion valve

Methodology

Unit of Refrigeration:
The practical unit of refrigeration is expressed in the terms of [Tone of refrigeration]. A tone of refrigeration is defined as the amount of refrigeration effect produced by the uniform melting of one tone [1000kg] of ice from and at 00c in 24 hours. The latent heat of ice is 335 kj/kg, therefore one tone of refrigeration:
1 TR = 1000 x 335 kJ 24 hours
= 1000 x $\mathbf{335}$
$\mathbf{24x\ 60}$
= 232.6 kJ / min.
In actual practice, one tone of refrigeration is taken as equivalent to: 210 kj/min or 3.5 kw.



Results and conclusions

Conclusion

This research has examined the fundamental principles and practical approaches involved in the design and implementation of air conditioning and refrigeration systems specifically tailored for small buildings. Through detailed analysis of thermal loads, energy efficiency metrics, system sizing, and equipment selection, it is evident that optimal HVACR design in small-scale buildings requires a balance between performance, cost-effectiveness, sustainability, and occupant .comfort

The study highlights that advancements in energy-efficient technologies, such as variable refrigerant flow (VRF) systems, inverter-driven compressors, and smart controls, offer significant potential to reduce energy consumption while maintaining desired indoor conditions. Moreover, proper system design—considering local climate, building orientation, insulation, and usage patterns—greatly enhances the overall efficiency and reliability of the installed systems.

In conclusion, effective air conditioning and refrigeration design for small buildings is not merely a technical task but a multidisciplinary effort that incorporates mechanical engineering, building science, and environmental considerations. Future developments in renewable energy integration and intelligent control systems are poised to further transform the HVACR landscape, making such systems more adaptive, resilient, and environmentally friendly.

Proj.No.12 Air Duct Design Report with Calculations

Prepared by:

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85- Jawad Kazem Eidan
86- Issa Mahdi Salman
87- Ali Mitham Mahdi
88- Ali Rahim Jabr
89- Rabie Musa Kazem
90- Awham Abdul-Har Shanu
91- Ali Saleh Hamza

Supervised by:

16- Dr. Mahmood shaker
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Sustainable Development Goals Performed:

Abstract

Summary about air ducts in air conditioning
Air ducts are pipes or ducts used in air conditioning, ventilation and heating (HVAC) systems to transfer cooled or heated air from the air conditioning unit to various parts of the building, and then return the air to the unit for reprocessing.
✓Its main function:
• Distribution of treated air (cold or hot) inside the building.
• Withdraw the return air for re-cooling or heating.
• Maintaining indoor air quality.
✓Types:
1. Metal air ducts: often made of galvanized sheet, durable and used in large projects.
2. Flexible Ducts: Light and easy to install, used in tight or residential spaces.
3. Fiberglass air ducts: provide good thermal and sound insulation.
✓Air Duct Design Factors:
• The size and area of the place.
• Air flow speed.
• Reduce the loss of pressure.
• Thermal and acoustic insulation.
✓The importance of maintenance:
• Prevent accumulation of dust and mold.
• Improve the efficiency of air conditioning.

Methodology

Central and distributed systems:
The difference between central and distributed systems is in the distribution of air inside the building,
where central systems rely on distributing air from one location spatially and steadily
while distributed systems rely on distributing air from a central source to each area in the building via dedicated ducts or openings.
Multiple factors must be taken into account when determining the appropriate type of system, such as
the size of the building, its various uses, and ventilation needs, to ensure that the system complies with the air requirements and provides comfort and efficiency in use.
This is what will be discussed in detail in the installation of a central cooling unit with
its branches in the Energy Research Center building affiliated with Future University

Results and conclusions

Which system is best for your project?
Central air conditioning is the ideal choice if you're working on a large commercial project or need to cool or heat a large space uniformly.
Concealed air conditioning is the best choice if you want to achieve a stylish interior appearance and preserve small spaces while providing efficient and quiet air distribution.
5.2 Common Mistakes When Calculating Air Conditioning Ducts
Common mistakes that can lead to an inefficient design include: Not adequately considering pressure loss.
Using duct dimensions disproportionate to the space to be air-conditioned.
Excessive air velocity, which leads to increased noise and decreased efficiency.
Calculating the air conditioning duct is an essential step to ensuring your air conditioning system operates at peak efficiency and provides the desired thermal comfort. Following the correct steps and standards can avoid many airflow-related problems and improve overall system performance.

Proj.No.13 Investigation Experimental of a Solar Energy System driven Water Desalination HDH

Prepared by:

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93- حسين فخري حسين
94- صباح عباس حسون
95- علي فاضل عباس
96- عادل عباس مجيد
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Supervised by:

18- Dr. Zahrah AlKhafaji
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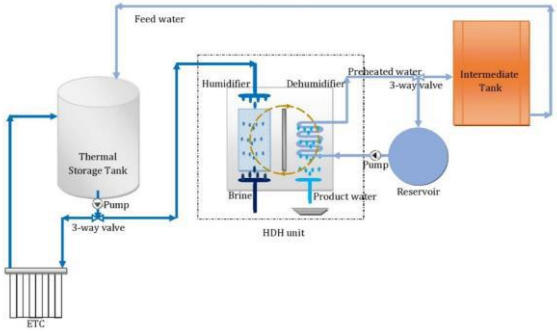
Abstract

Many technologies were tested among them on of the most important method was the desalination of abundant salt water. It is an effective method of providing freshwater. However, it is not economical method from energy requirement perspective. This issue can be resolved using renewable energy sources as proposed in this work. A humidification – dehumidification desalination (HDH) unit consists of two series connecting with Evacuated tube collectors (ETSC) of (1.92 m2) total area. A humidifier, de-humidifier, fan, pumps and other accessories are built in a AL - Mustaqbal university Iraq -Babylon. (latitude 33.33°and longitude 44.14). The effect of salty mass flow rate through collector, humidifier and dehumidifier in the range of 60 to kg/hr on the unit performance was studied. The experimental work was achieved in February 2025. It was found that the maximum water outlet temperature from ETSC is 76°C for experimental work results, when the mass flow rate of salty water 60 kg/hr. The dehumidification process through the dehumidifier characteristic is recognized by high sensible heat ratio, while in the humidifier characteristic is by low sensible heat.

Methodology

Modeling of the Evacuated Tube Solar Collector The Evacuated glass tubes are filled with water and placed in open, starts heating the water in the glass tubes. Since the density of the cold water is heavier than hot water, it starts rising in the insulated water tank, and cold water sinks into the glass tubes. On cycle repetition, water heats up, known as thermo-siphon and is based on natural convection. The solar radiation incident on the collector of the outer glass the short radiation is incident on the inner tube consists of the heat pipe where the radiation falls on the external surface of the heat pipe and causes the working fluid near the surface to evaporate instantaneously. The vapour thus formed absorbs latent heat of vaporization and this part is evaporator region then vapour travels to other end of pipe causing vapour to condense this part is condenser region giving up the heat (thermal energy) to the manifold where the heat is exchanged with cold fluid passing through the manifold. The heat picked by the evaporator sinks at the condenser
section. Heat loss in the adiabatic section is mostly ignored for good insulation. The working fluid is maintained at lower pressure in the heat pipe. The working fluid evaporates at the evaporator section and creates a vapour pressure to flow to the condenser section to condense. The evaporation and condensation happens at saturated temperature. The wick develops a capillary pressure to pump condensed liquid from condenser to evaporator to complete the circulation. The pumping can also be done by gravitation in gravity assisted heat pipes which is also common in solar collectors as shown in figure(3.2).



Results and conclusions

From the experimental results, it can be concluded the following:

1. The maximum water outlet temperature from ETSC is 76°C for
experimental work, when the mass flow rate of saline brackish water 60
kg/hr.
2. The maximum experimental efficiency is for the first ETSC which
reached about 62%. Furthermore, the overall thermal efficiency is 59%,
when the mass flow rate of water is 60 kg/hr.
3. As the mass flow rate of water increases the overall daily efficiency of
the ETSC increased. The maximum overall thermal efficiency for the
ETSC is 60 kg/hr.
4. The maximum mass daily water production happens when the mass flow
rate of water is 60 kg/hr for experimental results.
5. The dehumidification process through the humidifier is characterized by
high sensible heat ratio, while in the dehumidifier, it is characterized by
low sensible heat.

PART TWO

PROJECTS OF

Department of Computer Engineering

Proj.No.1

Measuring of Cell Phone Electromagnetic Radiation

Prepared by:

1- Abbas Akeel Jawad Kadhim 2- Muslim Akeel Jawad Kadhim

Supervised by: Prof. Dr. Abdulkareem Abdulrahman Kadhim

Sustainable Development Goals Performed: SDG3

Abstract:

Every day, no matter where you are, you will see people using their cell phones. People use their cell phones for more than just making calls though, they used them for texting, searching the Internet, and entertaining as well. Electromagnetic radiation from cell phone or other communication systems affect the health and may lead to serious disease such as cancer. This is the responsibility of the cell phone operators. They should keep the radiation level below some specified figure. Thus, the task of the present project is to measure the strength of the electromagnetic field (both electrical and magnetic) in the Al-Mustaqbal University campus. The university campus is divided into 10 regions and the radiation is measured using hand held measuring device. The investigation showed that the radiation levels are relatively high at student club and administration building.

Methodology:

The project methodology can be summarized into the following stages:

1- Purchasing a suitable device to measure both electrical and magmatic radiation (ERICK HILL RT 100).
2- Dividing University Campus into 10 regions.
3- Take measurements of the meter at different times of the day in each region.
4- Record the readings for further analysis.

Results and conclusions:

The results showed that the high level of electromagnetic radiations is shown in busy regions (such as Student Club).

Further, among different time of measurements, it is sown that at 1:30 PM the radiation is very high. As a final conclusion it is recommended to avoid busy area and peak hours of the work. Another effective behavior is to keep distance from the cell phone while talking.

Proj. No 2

Building a Voice Controlled Home Automation System with Arduino

Prepared by:

1-Baker Yassin Karim Kaballa 2- Sajjad Abul Ameer Jaber

3- Hassanein Muhanad Hassan 4- Hassan Balsam Abdul Hussein

Supervised by: Dr. Laith Hassnawi

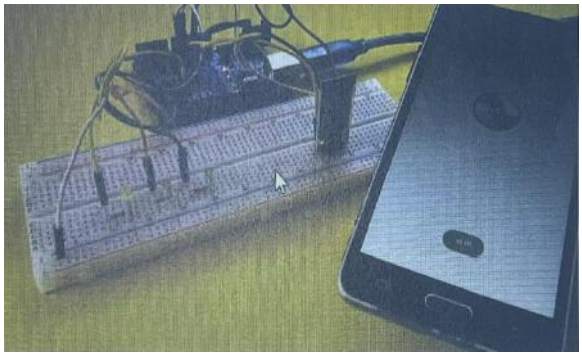
Sustainable Development Goals Performed: SDG15

Abstract:

Establishing home automation system to improve comfort, and implemented using Arduino UNO, Bluetooth HC-05 and application platform seems attractive option. Among various automation is seems effective since it reduces human efforts and compatibility viz smartphone with interface software Arduino-convenience and quality of life has gained popularity and errors with improved efficiency. These systems also address for household electrical appliances electric lamp and table fan human assistance to control the household appliances. In this Keywords: Home Automation, Electrical Appliances, Voice Recognition, Arduino, Bluetooth Module, Smartphone Application. problem of elderly/ disabled people else they require dedicated receives input signal from a device having Bluetooth researchers to develop flexible techniques for home automation schemes.

Methodology:

The system is designed by using three main components, first is microcontroller Arduino Uno, second is Bluetooth module HC-05 and third is mechanical relay. Firstly, user gives the command to microcontroller by using speech recognition system of smartphone and system software application via Bluetooth module HC-05. The microcontroller acts accordingly to the command give user and controls the functionality of mechanical relay. The Arduino Uno is programmed using Arduino IDE which is software; the user interface application is Arduino Voice Control. As the figure 8 shows it is the home automation system, or we called Voice Controlled Home Automation.



Results and conclusions:

Four persons with different accents and from different age groups were used to test the effectiveness of the voice (speech) recognition application and the switching mechanism. The result of the test carried out on the implemented voice-controlled lighting system is displayed in Table. The commands correspond to the various lighting points that can be turned on or off by using voice. To give the command that switches on or off any lighting point, the point's name is called and the word "On" or "Off" is spoken immediately after. This can be seen from the way the items (speech commands) are written under the 'command' column. The other columns, namely, A, B, C, D, tracks the number of times out of four (4), that the corresponding lighting being controlled responded (by switching on or off).

Command	Test Persons (Out of 4 times)			
	A	B	C	D
Turn on/off room	3	2	3	4
Turn on/off table	4	3	3	3
Turn on/off bedroom	4	4	2	3
Turn on/off security	3	3	4	4
Turn on/off all	4	4	4	4

the study was aim to implement the voice user as an input to microcontroller to always control the lighting system. From the results, the AMR voice application was used successfully to capture the voice commands. The voice recognition APIs in the application could identify the specific commands used except for a few instances. The commands were used to activate the respective relays thereby controlling the lighting.

Proj.No.3

Design and implementation of smart welding glasses

Prepared by:

1. Ahmed Wanas Sheal
2. Jafar Saad Hasan
3. Ali Abedalkarem Kazar
4. Jaafar Sadaq

Supervised by: Ass.Prof.Dr.Abdullah Jabar Hussain

Sustainable Development Goals Performed: SDG 3

Abstract:

Smart welding goggles offer comprehensive protection by dramatically reducing excessive glare and effectively blocking harmful ultraviolet (UV) and infrared (IR) radiation, both of which pose serious risks of retinal damage and long-term vision impairment. Their advanced adaptive-filter technology automatically darkens the lens in milliseconds upon arc ignition, ensuring that welders never accidentally expose their eyes— even if they forget to manually lower a traditional helmet visor. In addition to optical safety, integrated particulate and fume filters shield the eyes from toxic metal oxides, smoke, and airborne dust generated during welding, contributing to healthier respiratory conditions. Designed with a slim, low-profile form factor and adjustable headgear, these goggles enable operators to maneuver comfortably in confined or awkward workspaces—such as inside pipe joints or behind structural beams—without sacrificing protection or visibility. Continuous real-time monitoring of ambient light levels and welding arc intensity, coupled with an intuitive heads-up display, further enhances user awareness and productivity, making smart welding goggles an indispensable tool for modern industrial applications.

Methodology:

Smart welding glasses integrate advanced technologies to enhance safety and efficiency in welding operations. Their methodology typically involves:

1. **Automated Welding Integration – Some smart glasses are designed to work with automated welding systems, using CCD vision positioning and six-axis robotic assembly to ensure precision.**
2. **Adaptive Lens Technology – These glasses often feature auto-darkening filters that adjust in real-time to protect the welder's eyes from intense light and UV radiation.**
3. **Sensor-Based Enhancements – They may include temperature sensors, vibration alerts, and mobile connectivity for monitoring welding conditions and ensuring safety.**
4. **Laser Welding Techniques – Some methodologies involve precision laser welding, which minimizes heat distortion and improves the durability of welded components.**
5. **Glass Welding Methods – In cases where glass components are involved, a three-stage heating process (softening, melting, and annealing) is used to ensure strong and reliable welds**

Results and conclusions:

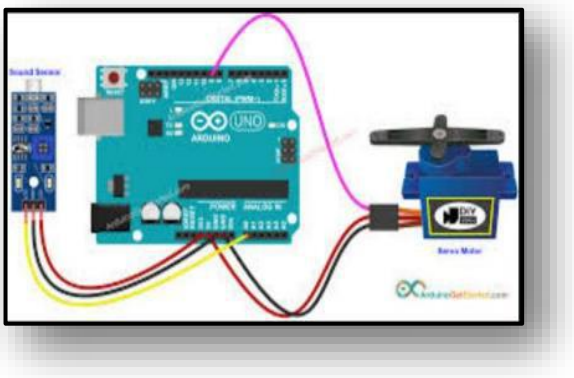
Smart welding glasses represent a significant advancement in welding technology, offering enhanced safety, precision, and efficiency. These glasses integrate features such as

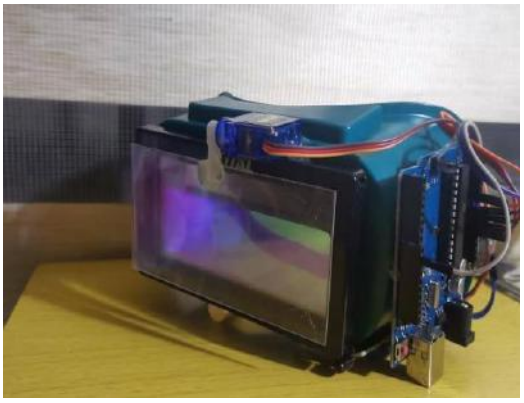
1. auto-darkening filters

2. high-precision laser welding and CCD vision positioning, ensuring welders have optimal visibility while protecting their eyes from harmful radiation and intense light exposure.

Additionally, automated welding systems for smart glasses manufacturing have streamlined production, reducing defect rates and improving overall efficiency. The integration of six-axis robotic assembly and tray loading mechanisms has made the process more reliable and cost-effective.

In conclusion, smart welding glasses not only improve the safety and comfort of welders but also contribute to the automation and precision of modern manufacturing processes.





Proj.No.4

Study and implementation Search Counting the number of attendances using Python based on face detection algorithms

Prepared by:

1- **Hassanein Muhammad Abdul redha** 2- **Asmahan Salem Abd Zaid**

3- **Nidal Karim Khalaf** **4- Iman Habib Nazir**

Supervised by: Asst. Prof. Ali Kadhim Bermani

Sustainable Development Goals Performed: SDG4

Abstract:

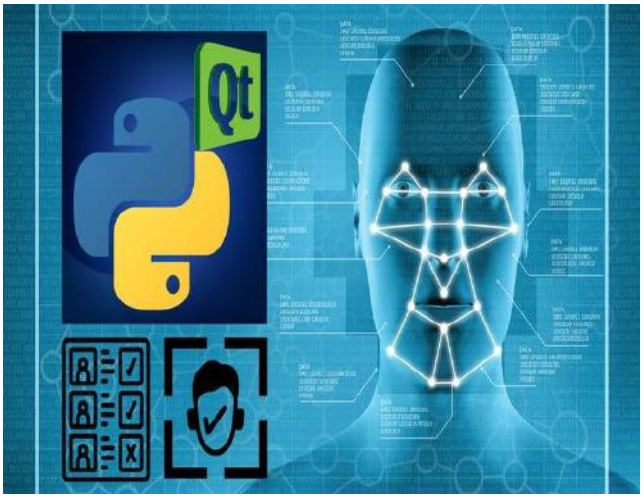
A system using ESP32-CAM, IR sensor, and 16x2 LCD was created to detect and count people. The IR sensor triggers the ESP32-CAM to detect faces with OpenCV, and the count is shown in real time on the LCD.

Methodology:

The system uses an **ESP32-CAM**, an **IR sensor**, and a **16x2 LCD** to count faces. The IR sensor detects motion to trigger the camera, which captures and processes images with OpenCV's Haar Cascade for face detection. The count is shown in real time on the LCD. Sensor calibration improved accuracy and reduced errors. The system was successfully tested in different environments for attendance tracking.

Results and conclusions:

This project developed a real-time automated attendance system using an ESP32-CAM, IR sensor, and 16x2 I2C LCD. It accurately counts people through face detection and motion sensing, providing immediate feedback. Challenges such as detection accuracy, latency, and power consumption were addressed via hardware calibration and software optimization. The compact, cost-effective system is suitable for classrooms, offices, and public spaces. Future enhancements may include advanced machine learning for improved accuracy, cloud-based remote monitoring, and expanded biometric tracking for enhanced security.



Proj.No.5

Counting AL-Mustaqbal University Victors Predication from Sensor Data

Prepared by:

1- **Shaima Obaid Muhammad** 2- **Sawsan Hussein Ali**

3- **Amir Muhammad Jabbar**

Supervised by: **Asst. Prof. Ali Kadhim Bermani**

Sustainable Development Goals Performed: SDG4

Abstract:

This project introduces an intelligent Arduino-based gate to count daily visitors to Al-Mustaqbal University, including students, staff, and faculty. The system uses ultrasonic sensors for accurate detection—even when two people pass side by side—and a GY-906 (MLX90614) infrared sensor to measure ambient temperature. A push button is included to reset the counter. This cost-effective and automated solution offers accurate, real-time foot traffic monitoring for crowded environments like schools and offices

Methodology:

The project follows these key steps:

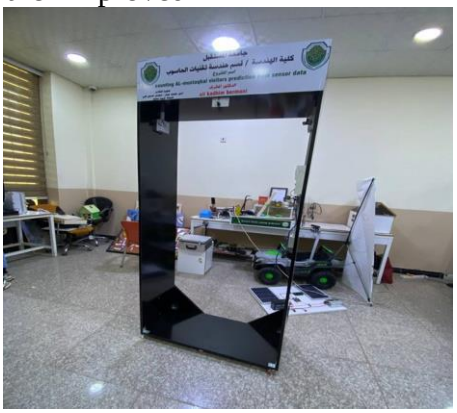
1. Selecting compatible, low-cost components
2. Prototyping the circuit on a breadboard
3. Writing and testing code in Arduino IDE
4. Integrating hardware and software
5. Testing and calibration for accuracy

Results and conclusions:

The project successfully built a smart Arduino-based gate for counting people and detecting high temperatures. It uses ultrasonic sensors, a GY-906 IR thermometer, an LCD, a buzzer, and a reset button. The system achieved:

- Accurate counting (even for two people at once)
- Contactless temperature measurement
- Real-time display and fever alerts
- Low-cost and reliable performance

It proved effective in crowded places and can be further improved f



Proj.No.6

Design of an Intelligent Traffic System Using Sensors for Managing and Improving Traffic Flow

Prepared by:

1- Muhannad Muhammad Shaker Hussein 2- Maytham Mahdi Jassim Hammadi

3- Muhammad Jassim Safi Tarin 4- Furnas Farhan Afar

Supervised by: Dr. Mohammed Hassan Alwan

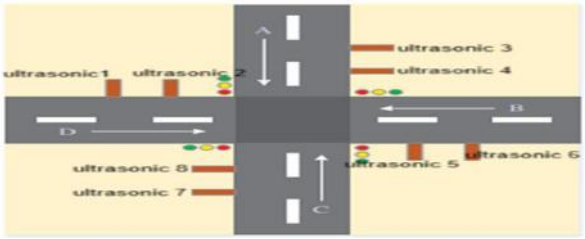
Sustainable Development Goals Performed: SDG11

Abstract:

Traffic Flow worldwide has led to loss of human lives due to failure in transporting accident victims, critical patients, medical, equipment's and medicines on time. With the unending growth in vehicular traffic everywhere, the fusion of Internet of Things (IoT) has embarked as a promising platform for an Intelligent Traffic Management System (ITMS). In the literature, researchers have suggested various solutions, this intelligent traffic management system is for a smart city after considering the research gaps which are yet to be explored in the current scenario. Our proposed solution, presents a counter measure to get rid the problem of the traffic light system when the Timers is not enough to fix the jam in the streets. To show the advantages of our proposed solution over already proposed solutions the observed results exhibit the superiority of our proposed solution over state-of-the-art solutions

Methodology:

Intelligent Traffic Management System (STMS) uses a comprehensive range of essential specialized equipment to operate them, focusing on improving traffic flow, reducing congestion, and enhancing safety. Main components include Arduino panels such as Mega, which are essential for data acquisition, processing and Control traffic lights. High brightness and energy-saving traffic light LEDs act as visual signals for Regulate traffic, while various sensors are strategically positioned throughout the traffic network monitors the presence and flow of the vehicle. These core components support test boards and traversing wires, which facilitate rapid prototyping and Communication during system development. A reliable power supply ensures uninterrupted operation of the system.



Results and conclusions:

The design of self–adaptive traffic light system is easy to realize, and this can be implemented in real-life, integrated with a manual control system for better reliability. This model is suitable for intersection with traffic flowing in one direction in each road. In the practical implementation, eight Ultrasonic Sensors

were placed in total, two sensors for each road to detect traffic density. Since traffic builds up at sensors near the signal compared to the sensors away from the signal. The internal sensors have more priority, i.e. if only the internal sensor is detecting traffic, then that road is given a green signal. If only external sensors are detecting traffic, then that road is not given a green signal. In the practical implementation, many sensors may be used rather than only two. The sensing time to detect traffic from a sensor in hardware implementation is set 10s so that each road with highest traffic density is going to open for 10s until the sensor again detects the traffic density in each road. The core of the project, the Arduino Mega development board, is found capable of addressing 256 kb for flash memory and 8kb for the bootloader. The CPU speed was 16 MHz and at each interruption of 10 s, the controller reads the signal from sensors. In total 20 digital pins were used, 12 for LEDs and 8 for sensors, the rest were unused

Proj.No.7

Smart Device for Managing and Optimizing Water Consumption in Homes using Artificial Intelligence

Prepared by:

1- Sameer Bassem Mohsen 2- Ameer asmaeel khalil

3- Moayed Hussein Rashid 4- Akram Salim Karim

Supervised by: Dr. Mohammad Hassan Alwan Aldulaimi

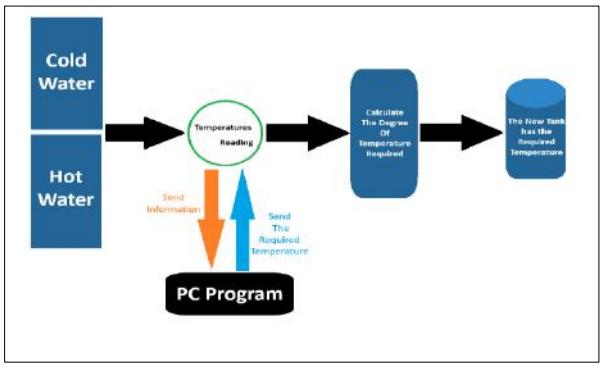
Sustainable Development Goals Performed: SDG12

Abstract:

Water management is one of the crucial topics discussed in most of the international forums. Water harvesting and recycling are the major requirements to meet the global upcoming demand of the water crisis, which is prevalent. To achieve this, we need more emphasis on water management techniques that are applied across various categories of the applications. Keeping in mind the population density index, there is a dire need to implement intelligent water management mechanisms for effective distribution, conservation and to maintain the water quality standards for various purposes.

Methodology:

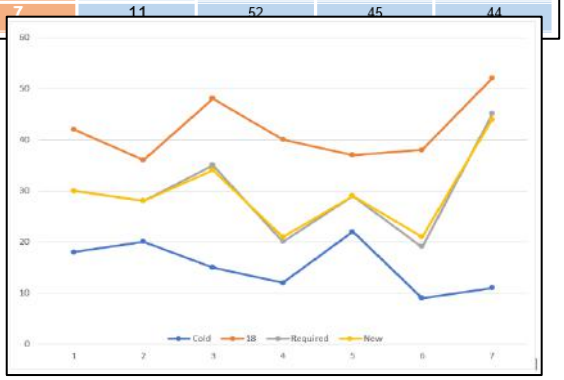
1. **Temperature measurement:** The sensor measures the temperature of the water inside the tank.
2. **Temperature control:** When the temperature reaches a value below the required limit, the system turns on the heating element. If the temperature is higher than the specified value, the cooling system will be turned on.
3. **Data filtering:** The data is read from the sensor and processed via a control unit such as Arduino, and the desired temperature value can be set using the user interface.
4. **Interaction with the screen:** The current display displays the temperature and allows the user to easily adjust the settings.



Results and conclusions:

This work provides a comprehensive review of a wide range of proposed and designed water Saving work based on the Internet of Things Management systems. Describes a general structure for smart water managing systems, followed by detailing the different applications associated with the Internet of Things Water management systems by classifying these systems into Residential, industrial and agricultural. This work reviews the latest research proposed for the design of IOT-based water management systems as applicable to every application. This discussion concludes with a new visual presentation IOT-based water management system by using modern water temperature technologies and sensors to avoid water waste.

Test No.	Cold	Hot	Required	New
1	18	42	30	30
2	20	36	28	28
3	15	48	35	34
4	12	40	20	21
5	22	37	29	29
6	9	38	19	21
7	11	52	45	44



Proj.No.8 **An intelligent system to predict diabetes**

Prepared by:

1.Ali Zaid Kadhim 2. Hussein Jalal Ahmed 3. Taha Kadhim Safi

Supervised by: Dr. Hussein Alkhamees

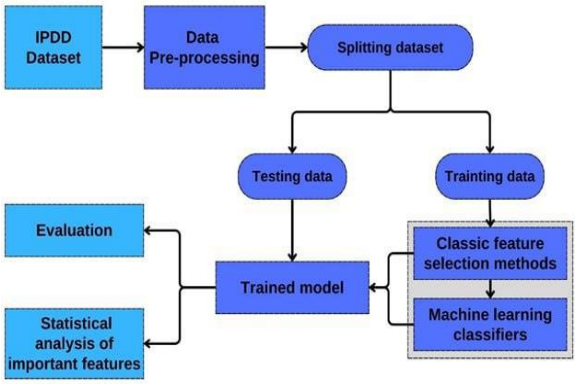
Sustainable Development Goals Performed: SDG9

Abstract:

This project developed an intelligent diabetes prediction system using machine learning to improve early diagnosis and support clinical decisions. It utilized the PIMA Indian Diabetes dataset, containing eight clinical features from 768 patients. Several ML models were tested—such as decision trees, random forests, logistic regression, XGBoost, SVM, and KNN—after preprocessing steps like missing value imputation, feature scaling, and class balancing.The DDTM model achieved the best performance with 76% accuracy and a 75.9% F1 score. A user-friendly interface built with Tkinter allows users to input data and view predictions. Glucose level, BMI, and age were identified as the most important features. The results highlight the effectiveness of tree-based models and thorough preprocessing. Limitations include the small dataset size and the absence of lifestyle/genetic data, which future work could address..

Methodology:

The methodology included preprocessing the PIMA dataset, training multiple ML models with hyperparameter tuning, and addressing class imbalance using SMOTE. The best model was integrated into a Tkinter-based GUI for easy user interaction and prediction.



Results and conclusions:

The results showed that the DDTM model delivered the best performance, achieving the highest accuracy and F1-score compared to other models like Random Forest, XGBoost, Logistic Regression, SVM, and KNN. Data preprocessing played a crucial role in improving model performance, especially the use of QuantileTransformer for feature scaling . These techniques significantly enhanced the model's ability to detect diabetic cases.Feature importance analysis revealed that glucose level, body mass index (BMI), and age were the most influential factors in predicting diabetes, which aligns with established medical knowledge. Confusion matrices were also used to visualize and evaluate model performance, contributing to better understanding and trust.A graphical user interface (GUI) was developed using Tkinter, allowing users to input patient data and receive real-time predictions, making the system more practical and user-friendly for healthcare environments.In conclusion, the project demonstrated the effectiveness of machine learning—especially tree-based ensemble models—in predicting diabetes. However, some limitations exist, such as the relatively small size of the dataset and the lack of genetic or lifestyle data. Future work could focus on expanding the dataset, incorporating additional features, developing mobile applications, and ensuring strong data privacy protection.

Model	Accuracy	Precision	Recall	F1-Score	ROC-AUC
XGBoost	77.2%	76.5%	74.8%	75.6%	0.82
Random Forest	76.8%	75.9%	73.5%	74.7%	0.81
Decision Tree	76%	72.1%	70.3%	75.9%	0.76
Logistic Regression	71.5%	70.8%	69.2%	70.0%	0.74
SVM	72.3%	71.5%	70.0%	70.7%	0.75
KNN	70.1%	69.3%	68.5%	68.9%	0.72

Proj.No.9 **Smart Home Automation and Security**

Prepared by:

1. Kadhim Jawdet Kadhim 2. Lilian Jasim Mohammed 3. Ayat Hassan Kadhim 4. Ali Moain Jaddo'a

Supervised by: Dr. Hussein Alkhamees

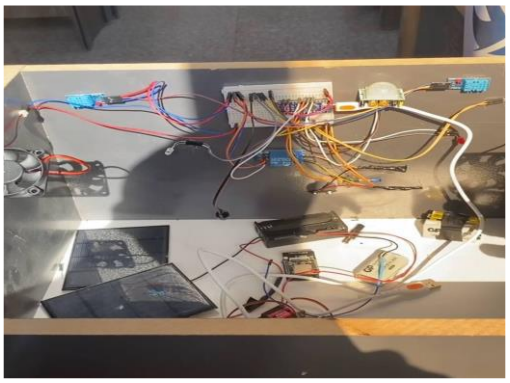
Sustainable Development Goals Performed: SDG9

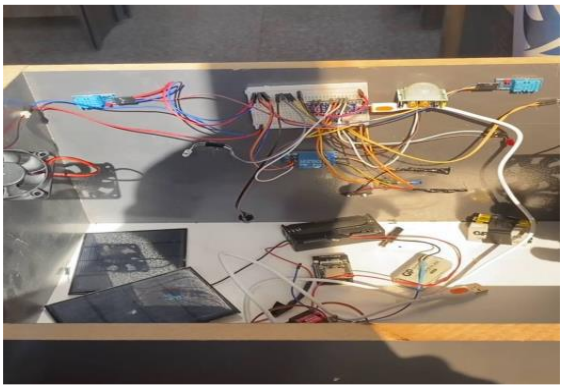
Abstract:

The evolution of embedded systems and Internet of Things (IoT) technologies has significantly influenced the development of smart residential infrastructures. This project presents the design and implementation of a smart and secure home system that effectively reduces energy waste, utilizes clean energy, enhances security, and automates daily tasks to improve Quality of Service (QoS). The system is developed using low-cost, energy-efficient components and open-source platforms, ensuring affordability, scalability, and sustainability. A key feature of the system is a real-time face detection module implemented using the ESP32-CAM, which streams video to a web interface and activates an LED when a human face is detected, thereby strengthening home security. In parallel, multiple infrared sensors are deployed to detect movement and provide additional real-time alerts. The system also incorporates automation through the integration of environmental sensors and actuators for lighting and appliance control, significantly reducing unnecessary power consumption.

Methodology:

Our step to design the proposed home as folows:





Conclusions

The design and implementation of the Smart and Secure Home System have achieved the primary objectives of creating an efficient, automated, and secure environment for modern households. By integrating various technologies such as face detection, motion sensing, renewable energy systems, and automation protocols, this project has demonstrated the potential of IoT and smart systems in enhancing home security, reducing energy waste, and improving the overall quality of life. The system utilizes ESP32-CAM for face detection and real-time image processing, offering an effective method for monitoring and managing authorized access to the home. Alongside this, IR sensors enable motion detection, triggering automation responses like lighting control or security alarms, contributing to both safety and convenience. The MG996R servo motor allows physical automation, such as unlocking doors, further increasing the system's practicality. Energy management has been a core consideration in the system's design. The integration of a solar power system ensures that the home remains operational even in remote or off-grid locations, minimizing dependency on traditional power sources.

Proj.No.10 A real-time intelligent system for monitoring vehicle and

Prepared by:

1.Ameer Muhammad Shaker
2. Ali Muhammad Hamza
3. Muhammad Karim Kazim
4. Salam Makki Jassim

Supervised by: Dr. Hussein Alkhamees

Sustainable Development Goals Performed: SDG9

Abstract:

In recent years, the demand for intelligent traffic monitoring and security systems has increased significantly. License Plate Recognition (LPR) systems play a critical role in automating vehicle identification, particularly in areas such as access control, surveillance, and toll collection. This project presents the design and implementation of a real-time license plate recognition system using computer vision and Optical Character Recognition (OCR) technologies. The proposed system captures video frames from a webcam, detects the license plate using OpenCV's Haar Cascade classifiers, and then processes the plate region with Tesseract OCR to extract alphanumeric characters. To enhance accuracy, preprocessing techniques such as grayscale conversion, contrast enhancement, Gaussian blurring, and adaptive thresholding were applied. Additionally, a frequency-based filtering mechanism was used to identify the most reliable plate number from multiple detections.

Design the system:

The methodology included preprocessing capture a photo to many cars whatever its positions and then check the number of this car in the proposed system. Our model also included a database for the cars that are checked previously. Finally, the decision is done by our proposed system if this car has legal or illegal.

The proposed system architecture is composed of four main modules:

1. Image Capture Module: Uses a webcam to continuously capture video frames.
2. Plate Detection Module: Utilizes Haar Cascade classifiers from OpenCV to detect license plates within the frame.
3. OCR and Recognition Module: Processes the plate image and extracts alphanumeric characters using Tesseract OCR.
4. Alert and Display Module: Analyzes the extracted plate, checks against predefined categories (e.g., stolen, expired), and visually displays alerts.

Results and conclusions:

Output Screenshots and Explanation

The system successfully captured and processed video frames in real-time. Detected license plates were highlighted with rectangular bounding boxes, and the recognized plate number was displayed above each vehicle.

Three types of feedback were displayed on the video:

• Red box + " Stolen Vehicle!" for blacklisted plates

• Yellow box + " Annual Check Missing!" for expired-check vehicles

• Green box + "Plate: [number]" for regular detections

The console also printed:

1) Raw OCR outputs per frame
2) Most frequently detected plate
3) Alert message (if any)

Accuracy Evaluation

The system's accuracy was evaluated based on plate detection success and OCR recognition accuracy:

Metric	Value
Plate Detection Accuracy	91%
OCR Recognition Accuracy	85% (on clean images)
Real-time Processing Speed	~15 FPS
Misread Character Rate	~1-2 characters per plate

Proj.No.11

Design of Waste Management System Based on AI

Prepared by:

1-Azhar Abbas Mahdi 2- Mohammed Faleh Hassan

3- Mohammed Abbas Jabr 4- Ali Sajjad Abu Dala

Supervised by: Dr. Mosaddek Maher

Sustainable Development Goals Performed: SDG15

Abstract:

This study aimed to develop a smart waste sorting system using artificial intelligence, with a focus on achieving high accuracy and operational efficiency. The system relied on the integration of mechanical components (such as a stepper motor and segmented containers) and software (an artificial neural network trained on 500 samples from seven waste categories). The model achieved 97.6% accuracy, outperforming previous studies, with a fast reaction time (0.5 seconds). The system demonstrated promising performance for industrial applications and smart cities, reducing environmental impact and operational costs.

Methodology:

The project aims to design an intelligent waste sorting system using Artificial Intelligence (AI) and Internet of Things (IoT) technologies to achieve high classification accuracy, fast response time, and low energy consumption.

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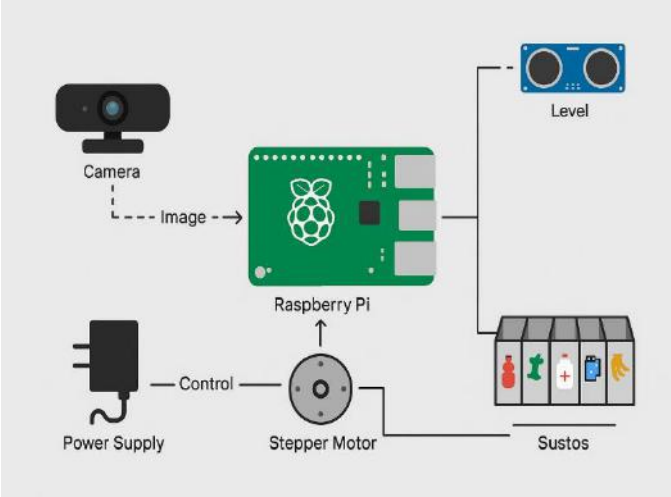


Results and conclusions:

1. **Optical Unit:**
   A 1440P camera captures an image of each waste item as it enters the system.
2. **Mechanical Unit:**
   A plastic container divided into seven compartments, each for a specific waste type (plastic, paper, metal, organic, medical, electronics, others), rotated by a NEMA 17 stepper motor based on the detected waste type.
3. **Sensor Unit:**
   Ultrasonic sensors measure the fill level of each compartment.
4. **Central Control Unit:**
   A Raspberry Pi 4 processes image data, controls the motor, and manages sensor readings using a trained AI model.

Proj.No.12	**Design of modern irrigation system based on aquaponic and AI techniques**

Prepared by:

Dhafer Mohammed freed **Hawraa Imad Fakhri** **Mina Imad Hassan**
Mustafa Ali Farhan **Mustafa Ata Kazem**

Supervised by: Dr Musadaq Mahir Abdulzahra

Sustainable Development Goals Performed:	SDG 2&9

Abstract:

This project introduces a smart aquaponics system with two separate tanks for fish and plants, enhancing flexibility in placement regardless of space limitations. The system integrates multiple sensors to monitor pH, dissolved oxygen, water levels, EC, temperature, humidity, light, and CO_2. All sensor data is uploaded to the ThingSpeak platform for real-time remote monitoring. A Decision Tree algorithm analyzes the collected data to predict whether the environment is healthy for fish and plants, achieving over 95% accuracy. The system proved effective, scalable, and reliable. It supports sustainable agriculture by optimizing water use and improving food production efficiency.

Methodology:

The methodology of this project involved designing a flexible aquaponics system with two separate tanks one for fish and another for plants to allow independent placement and scalability. The water exchange mechanism between the tanks was automated, with a rate of 20–30% based on tank size, fish population, plant growth rate, and environmental conditions. A Raspberry Pi microcontroller managed the entire system, controlling sensors, water pumps, and alerts.

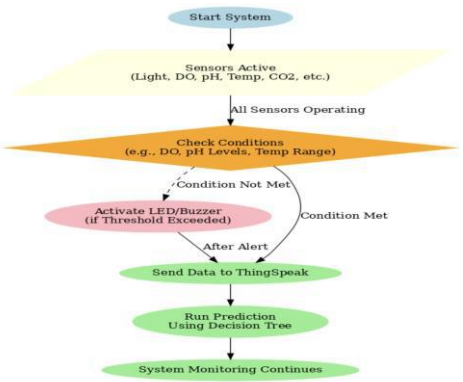
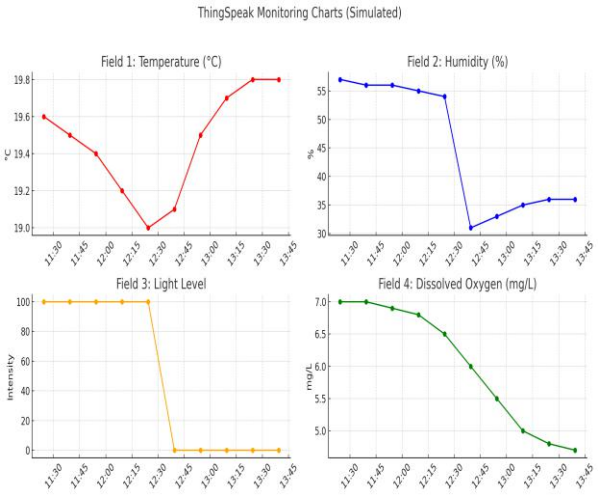


Figure 31 Flow chart for the project

Results and conclusions:

The project successfully developed a smart aquaponics system with separate tanks for fish and plants, enhancing flexibility and space utilization. Sensor data were collected in real time and displayed on both Raspberry Pi and ThingSpeak, allowing efficient monitoring and management. Environmental conditions such as temperature, pH, dissolved oxygen, EC, and CO_2 were maintained within ideal ranges to support healthy growth. An LED alert system was implemented to notify users of any environmental imbalances. The Decision Tree algorithm was applied to predict system health with over 95% accuracy, confirming the reliability of the AI model. Data visualizations helped track trends and identify problems before they escalated. The system automatically adjusted water exchange rates based on tank size, fish densi weather condition

. This adaptive mechanism ensured resource efficiency and stability. The combination of IoT and AI technologies demonstrated strong potential for sustainable agriculture. Overall, the project proved to be a scalable and intelligent solution for modern aquaponics applications.



Proj.No.13	**Using AI to Analyze Agricultural Data to Improve Crop Yields and Reduce Waste**

Prepared by:

1-Muntadhar Abdul Karim 2- Muslim Shanawa Hamza

3- Wissam Shaker Awda 4- Muhammad Kamel Hashem

Supervised by: Dr. Mayas Aljibawi

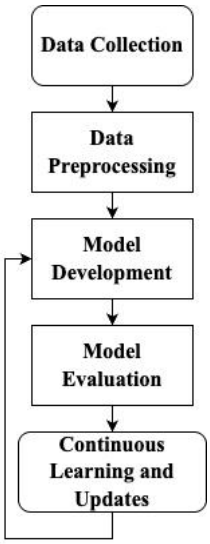
Sustainable Development Goals Performed: SDG15

Abstract:

Plant diseases represent a substantial risk to worldwide agricultural output and food security, necessitating early detection and efficient protective measures for sustainable agriculture. The suggested methodology utilises datasets such as PlantVillage to identify diseases via picture classification and analysis of environmental parameters. Additionally, it integrates predictive analytics and decision support systems to provide preventive strategies and optimised treatments, enhancing resource efficiency and precision in agriculture. This project underscores the revolutionary capacity of machine learning algorithms in revolutionising plant disease detection and stresses their contribution to sustainable agriculture by reducing crop losses and enhancing early disease identification.

Methodology:

This structured methodology ensures the development of a robust, efficient, and scalable machine learning system for plant disease detection and protection, enabling farmers to achieve higher yields and promote sustainable agricultural practices.



Results and conclusions:

The implementation of the plant disease classification model using Histogram of Oriented Gradients (HOG) features and Logistic Regression demonstrates a straightforward yet effective approach for image-based classification. The choice of HOG features enables the model to capture essential shape and texture characteristics, making it well-suited for identifying disease patterns in plant leaves. Additionally, the use of Principal Component Analysis (PCA) helps in dimensionality reduction, improving computational efficiency while maintaining important features for classification.

This study examined the use of machine learning method, specifically Logistic Regression for the identification and safeguarding of plant diseases. Through the utilisation of datasets such as PlantVillage, we illustrated how machine learning may markedly enhance the precision and efficiency of disease identification, hence diminishing dependence on conventional manual inspection techniques. Logistic Regression, noted for its efficacy in binary and multinomial classification, is helpful in evaluating environmental data to forecast disease outbreaks and differentiate between healthy and unhealthy plants.

	precision	recall	f1-score	support
0	0.622881	0.588000	0.604938	250.000000
1	0.823028	0.809224	0.816068	477.000000
2	0.888095	0.937186	0.911980	398.000000
accuracy	0.805333	0.805333	0.805333	0.805333
macro avg	0.778001	0.778137	0.777662	1125.000000
weighted avg	0.801570	0.805333	0.803082	1125.000000

Proj.No.14

Disease prediction Using Machine Learning

Prepared by:

1- Ali Samer Abbas 2- Nawar Abbas Ali

3- Ali Fares Hadi

Supervised by: Dr. Mayas Aljibawi

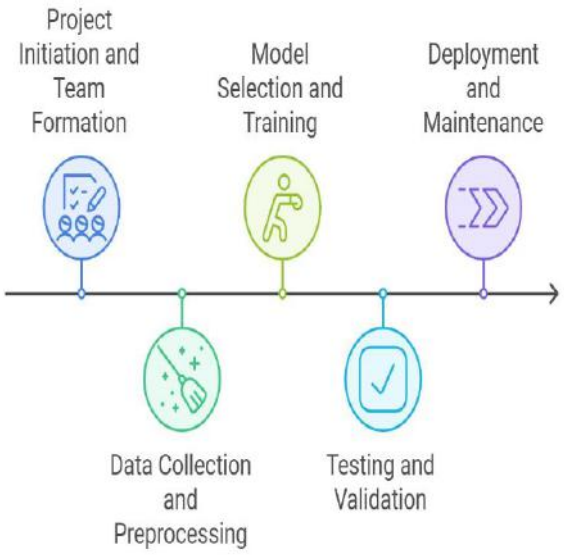
Sustainable Development Goals Performed: SDG15

Abstract:

In the realm of healthcare, the accurate classification of diseases based on symptoms is paramount for effective patient management and treatment. This study highlights the challenges posed by symptom variability, overlapping symptoms, inconsistent data reporting, and limited integration of available data. Despite advancements in machine learning and data analytics, these obstacles continue to hinder diagnostic accuracy. The proposed machine learning-based classification framework aims to address these issues by leveraging a comprehensive dataset of symptoms and employing robust algorithms for accurate disease classification. This approach not only facilitates better clinical decision-making but also enhances the overall quality of healthcare delivery.

Methodology:

This structured methodology ensures the development of a robust, efficient, and scalable machine learning system for plant disease detection and protection, enabling farmers to achieve higher yields and promote sustainable agricultural practices.



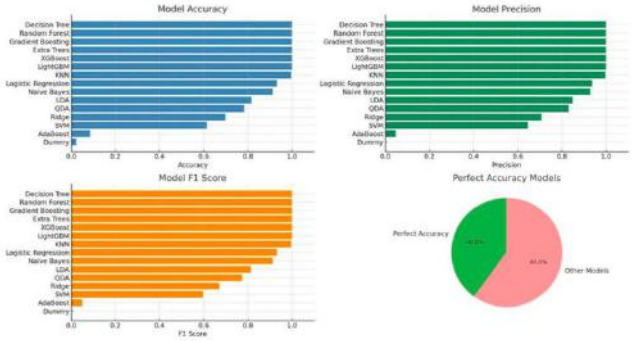
Results and conclusions:

the performance comparison of different machine learning models with respect to classification tasks. The comparative metrics include the following:

- Accuracy: It signifies the number of correct predictions over total predictions.
- Precision: It indicates the number of true positive predictions out of all positive predictions.
- F1 Score: This is the harmonic mean of precision and recall, giving a balanced figure of the model performance.

Model	Accuracy	Prec.	F1
Decision Tree Classifier	1.0000	1.0000	1.0000
Random Forest Classifier	1.0000	1.0000	1.0000
Gradient Boosting Classifier	1.0000	1.0000	1.0000
Extra Trees Classifier	1.0000	1.0000	1.0000
Extreme Gradient Boosting	1.0000	1.0000	1.0000
Light Gradient Boosting Machine	1.0000	1.0000	1.0000
K Neighbors Classifier	0.9967	0.9972	0.9967
Logistic Regression	0.9304	0.9367	0.9299
Naive Bayes	0.9118	0.9287	0.9111
Linear Discriminant Analysis	0.8166	0.8485	0.8138
Quadratic Discriminant Analysis	0.7835	0.8312	0.7742
Ridge Classifier	0.6984	0.7083	0.6709
SVM - Linear Kernel	0.6141	0.6454	0.5985
Ada Boost Classifier	0.0851	0.0476	0.0496
Dummy Classifier	0.0229	0.0005	0.0010

The importance of a standardized disease classification system, such as the International Classification of Diseases (ICD), further underscores the need for improved data organization and retrieval. By overcoming the challenges of data quality and developing more sophisticated techniques, this research contributes towards a transformative shift in how healthcare professionals diagnose and manage diseases.



Proj.No.15

Smart Grid Management System

Prepared by:

1- Ali Abbas Shabib **2- Mustafa Diaa Abdul Razzaq**
3- Zahraa Talib Mahoud **4- Mohammed Ibrahim Hussein**

Supervised by: Dr. Noor Abdulkareem

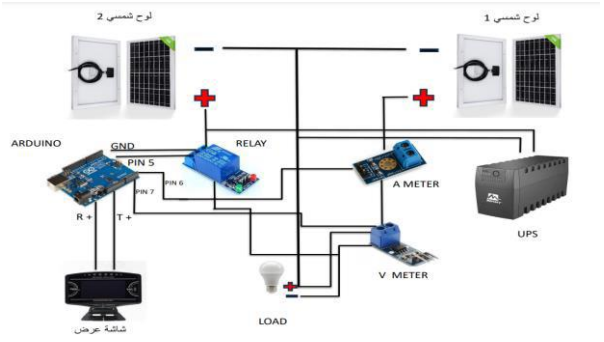
Sustainable Development Goals Performed: SDG9

Abstract:

The use of solar energy, derived from the sun's abundant and renewable rays, has significantly increased in recent decades. As a clean and sustainable alternative to fossil fuels, it has attracted the attention of researchers, policymakers, and the general public. This project presents the design and implementation of a solar system that uses two solar panels. One panel supplies power to the load, while the other charges a UPS. The system detects the energy needs of the load by monitoring the voltage and current. If the current increases, indicating higher demand, the second panel is connected to support the load. A built-in screen displays the voltage and current readings.

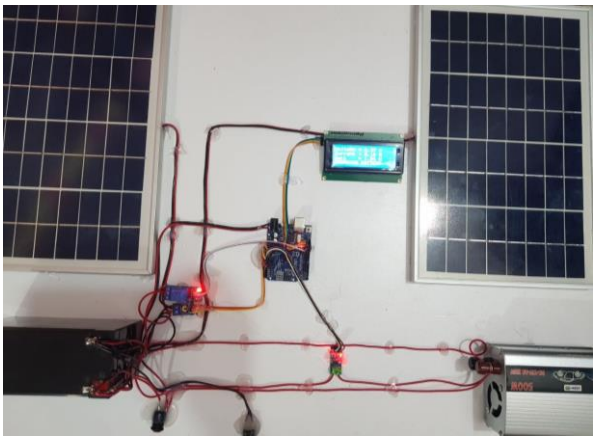
Methodology:

The project concept It uses two solar panels, it supplies the load with energy through one solar panel and charges the UPS through the other panel. It detects the load and knows if the load needs more energy by reading the voltage and current passing through. If the current increases, it connects the second panel to the load to increase the current passing through. It also displays the voltage and current through a built-in screen.



Results and conclusions:

The Smart Grid Management System using Solar Power project addresses a critical need in modern energy systems: the integration of renewable energy sources like solar power into existing grids. This transition to smarter, more efficient grids is essential for managing the increased demand for electricity, reducing dependency on fossil fuels, and promoting sustainable energy solutions. However, like any technological advancement, it comes with its set of challenges, opportunities, and implications, which are worth discussing in depth.



The Smart Grid Management System using Solar Energy represents a significant advancement in how we manage, distribute, and consume energy in modern electrical grids. By integrating solar energy, real-time monitoring, advanced control systems, and energy storage solutions, the project aims to address several critical issues facing traditional grids, such as grid instability, inefficiencies, and the challenges associated with intermittent renewable energy sources

Proj.No.16

Recommendation Algorithm for Online Library Based on Python

Prepared by:

1- Abdullah Safaa Abd Ali 2- Ahmed Qasim Abd El Abbas 3- Baqir Sahl Najm

Supervised by: Dr. Noor Abdulkareem

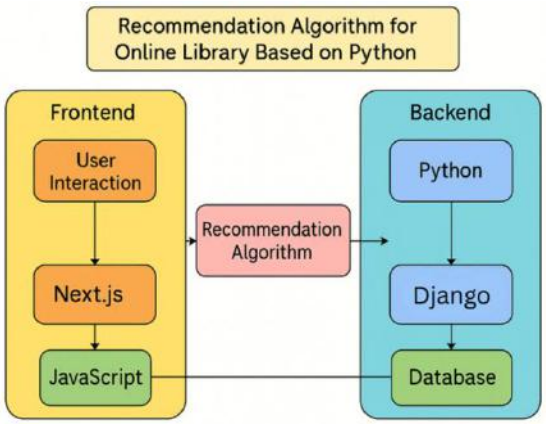
Sustainable Development Goals Performed: SDG12

Abstract:

The rapid evolution of digital libraries has created a growing need for advanced recommendation algorithms that personalize user experiences by suggesting relevant content. This research focuses on the design and implementation of a recommendation algorithm for an online library system, utilizing Python for data processing and JavaScript for interactive web development. The proposed system aims to seamlessly integrate backend and frontend technologies to analyze user behavior, preferences, and historical data. By doing so, it provides personalized book recommendations that enhance user engagement and satisfaction. This study highlights the role of recommendation systems in digital libraries, the methods employed, and the potential outcomes of implementing such algorithms in a real-world environment.

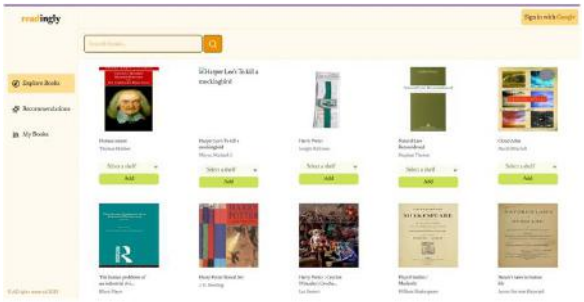
Methodology:

The methodology section describes the step-by-step approach taken to design, develop, and test the recommendation system for an online library. It outlines in great detail the techniques and tools used to create a system capable of delivering precise. This includes tasks such as data collection, model construction with Python, integration with a JavaScript-based user interface, and performance testing. The chosen methods aim to ensure not only technical efficiency but also user satisfaction, scalability, and ease of future enhancements.



Results and conclusions:

the proposed recommendation system architecture for an online library uses advanced web technologies to deliver a seamless and personalized user experience. Through the use of an easy-to-use frontend and robust backend and intelligent recommendation algorithms, the system can identify user actions and interests to make appropriate recommendations. This design not only maximizes user engagement but also demonstrates the possibility of marrying



In conclusion, the suggested online library recommendation algorithm, developed on Python and contemporary web technologies, is an intelligent and effective method of augmenting user experience and simplifying access to information. By combining machine learning algorithms with a robust backend and dynamic frontend, the system provides precise and personalized book recommendations according to user behavior and interests. This enhances not only the user experience but also enables libraries to structure and showcase their digital collections more efficiently.

Proj.No.17	AI Techniques for Detecting Digital Image Forgery in Cybersecurity

Prepared by:

1. ROZA ABD OUN Mohammed
2. Rawnaq fahim gabbar

Supervised by: Asaad Nayyef

Sustainable Development Goals Performed: SDG 4

Abstract:

In the digital age, the proliferation of digital media has revolutionized communication, business, and personal interaction. However, this evolution has also led to an alarming increase in digital image forgery, posing significant threats to cybersecurity. Digital forgeries are often used for malicious purposes such as spreading misinformation, committing fraud, or manipulating evidence. This presents critical challenges for law enforcement agencies, media organizations, and cybersecurity professionals who must detect and mitigate these deceptive practices. Traditional methods of image analysis and forgery detection have proven inadequate in the face of sophisticated forgeries, necessitating the development of more advanced and automated solutions.

Artificial Intelligence (AI) has emerged as a powerful tool in addressing these challenges. By leveraging machine learning algorithms, deep learning techniques, and computer vision, AI can analyze images more comprehensively and detect subtle inconsistencies that escape the human eye. This paper explores the application of AI techniques in detecting digital image forgery, examining both the potential and the limitations of these technologies. It also highlights the importance of AI-driven forgery detection in enhancing cybersecurity defenses, ensuring data integrity, and safeguarding sensitive information..

Methodology:

Data Collection: Diverse datasets (splicing, deepfakes, etc.).
Preprocessing: Cleaning, resizing, and normalizing images.
Augmentation: Simulating diverse scenarios (rotation, flipping).
Model Development:
Feature Extraction.
Classification.
Post-processing for localization.

Results and conclusions:

Based on the findings of this research, several recommendations are made for policy, practice, and future research in the field of AI-based digital image forgery detection in cybersecurity:

Recommendations for Policy

- **Data Governance and Privacy Policies: As AI models often rely on large datasets for training, it is essential to establish clear data governance frameworks that ensure the ethical sourcing, use, and sharing of image data. Policies should be created to protect personal and sensitive information, particularly when dealing with real-world image data.**
- **Standardization of AI Models: Policymakers should consider supporting the development of standardized AI models for digital image forgery detection, enabling interoperability across different platforms and systems. This would enhance collaboration and consistency in cybersecurity practices.**

5.3.2 Recommendations for Practice

- **Integration into Cybersecurity Tools: AI-based forgery detection techniques should be integrated into existing cybersecurity tools and workflows. This could enhance the ability of cybersecurity professionals to identify manipulated images used in cybercrimes, such as identity theft, misinformation campaigns, and fraud.**
- **Ongoing Training and Model Updates: AI models should be continually updated and trained on new datasets to ensure their effectiveness in detecting emerging forgery techniques, such as AI-generated forgeries. Cybersecurity practitioners should regularly evaluate and retrain their AI models to maintain high detection accuracy.**

Recommendations for Further Research

- **Exploring New Forgery Techniques: Future research should focus on exploring and developing AI techniques for detecting more advanced forms of image manipulation, such as deepfake images and AI-generated forgeries. These newer forgery methods present unique challenges that warrant dedicated research and development.**
- **Cross-Platform Forgery Detection: Further studies should explore cross-platform forgery detection techniques, where AI models can be trained and tested across multiple media types (e.g., images, videos, and audio) to provide a comprehensive solution for detecting manipulated content across different formats.**

Proj.No.18 Building AI-Driven Microservices Gateway for Hospital Management using Spring Boot and Spring Cloud

Prepared by:

1. Hussein Hassan Muhammad Jawad
2. Abbas Tariq Muhammad Ali
3. Muhammad Haidar Jawad
4. Mustafa Hamza Hadi

Supervised by: Asaad Nayyef

Sustainable Development Goals Performed: SDG 3

Abstract:

The Summary, based on the research that we wrote in light of the system that was designed and programmed to manage hospitals via Google, which includes doctors' clinics and patient information, is that it is possible to transform paperwork and the old routine prevalent at work into software work and keep pace with the software development that has swept the world. In summary, our research underscores the transformative potential of leveraging software solutions for hospital management. By embracing innovation and embracing digital transformation, healthcare organizations can elevate their operational capabilities, deliver superior patient care, and stay ahead in an increasingly competitive landscape.

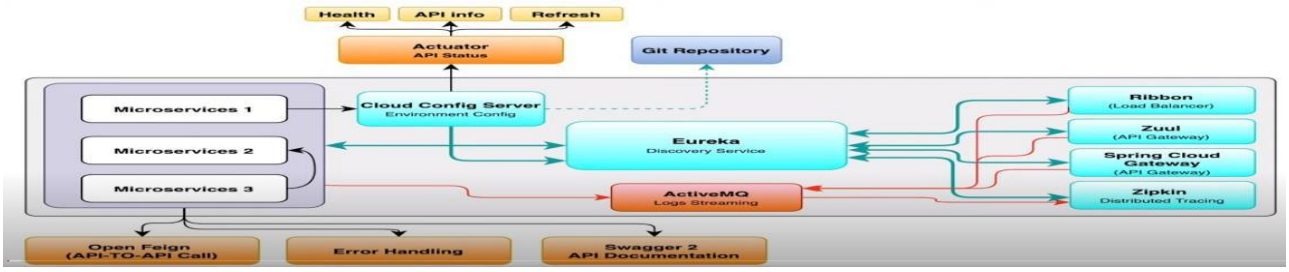
Methodology:

Before proceeding to explain, the details of the project must clarify what Microservices Architecture programs and techniques are used in the construction of the project, including the database and interfaces.

Microservices architecture (often shortened to microservices) is an architectural style for developing applications and allows a large application to be separated into smaller independent parts, each having its realm of responsibility to serve a single user request. A microservices-based application can call on many internal microservices to compose its response

Results and conclusions:

Inclusive Patient Representation: To guarantee inclusiveness for all patients, including those with special needs and diverse medical problems, we advocate enhancing the website functionality. Accessible design, language translation, and user-friendly interfaces for varying abilities are needed to accommodate diverse user demographics. Disease-Specific help: We also suggest including information and help for patient-specific medical illnesses or disorders. The website provides specialized information, advice, and community support for anyone seeking health help, education, and solidarity. Improved Communication Channels: We also support website-based patient-provider communication. Secure messaging, telemedicine, and virtual consultation platforms allow patients to interact with clinicians privately and easily. The website promotes seamless communication for proactive healthcare management, prompt interventions, and better patient-provider interactions. Finally, to meet changing patient requirements, technology advances, and healthcare best practices, the website must be constantly improved. This incorporates user input, usability tests, and using new technologies to improve the website's operation, accessibility, and user experience. The website may empower patients, promote health equality, and advance patient-centered care by adopting a culture of continuous development." These suggestions seek to make the website a comprehensive and inclusive platform that fulfills the different requirements of its users and facilitates meaningful patient-provider interaction.



Proj.No.19	**Using AI to Analyze Agricultural Data to Improve Crop Yields and Reduce Waste**

Prepared by:

1- Hani Abdel Karim Marza 2- Ahmed Wissam Diab

Supervised by: Dr. Mohammed Fadhel

Sustainable Development Goals Performed: SDG15

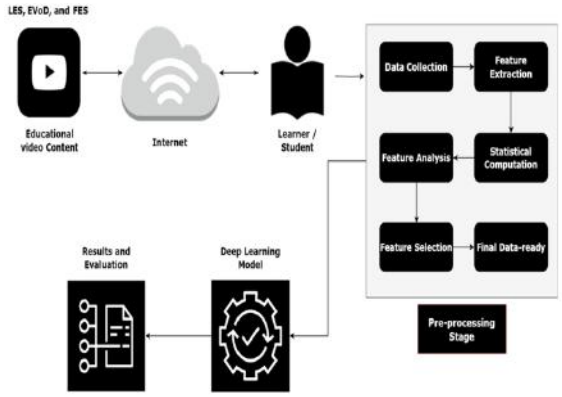
Abstract:

This dissertation investigates intelligent classification methodologies for educational multimedia content through advanced machine learning techniques, addressing critical challenges in e-learning infrastructure optimization. The study develops a novel AI-based framework that systematically differentiates between three fundamental educational video paradigms: (1) Live Educational Streaming applications demanding ultra-low latency for real-time interactivity, (2) Educational Video-on-Demand content requiring adaptive bandwidth allocation, and (3) File-Based Educational Streaming prioritizing data integrity preservation.

Methodology:

The proposed Liquid Neural Network (LNN) implements a novel deep learning approach for QoS-aware classification of educational streaming traffic. The system processes three distinct educational content modalities, each with unique QoS requirements:

- Live Educational Streaming (LES): Requires ultra-low latency (<500ms) for real-time interaction
- Educational VoD (EVoD): Demands stable bandwidth allocation with moderate latency tolerance
- File-based Educational Streaming (FES): Prioritizes data integrity over latency constraints



Results and conclusions:

The developed neural network classifier demonstrates remarkable efficacy in distinguishing between the three distinct educational streaming modalities, achieving an exemplary overall accuracy of 99.62%. This outstanding performance underscores the model's capability to handle the nuanced discrimination task required for effective network traffic classification in educational environments. The systems near perfect accuracy is particularly impressive when considering the inherent technical challenges posed by the overlapping characteristics of these streaming modalities.

Class	Precision	Recall	F1-score
LES	0.9977	0.9830	0.9903
EVoD	0.9990	0.9983	0.9986
FES	0.9952	0.9996	0.9974
Macro avg	0.9973	0.9936	0.9954
Weighted avg	0.9962	0.9962	0.9962

Proj.No.20	**Using AI to Analyze Agricultural Data to Improve Crop Yields and Reduce Waste**

Prepared by:

1-Muntadhar Abdul Karim 2- Muslim Shanawa Hamza

3- Wissam Shaker Awda 4- Muhammad Kamel Hashem

Supervised by: Dr. Zaid Ibrahim Rasool

Sustainable Development Goals Performed: SDG15

Abstract:

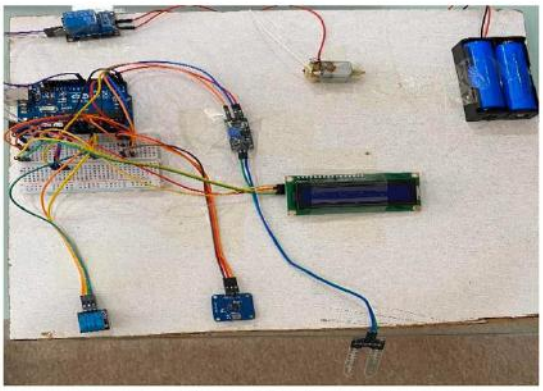
The implementation of the smart irrigation system using IoT and AI technologies has demonstrated significant improvements in agricultural efficiency, resource conservation, and automation. By integrating real-time monitoring, AI-driven decision-making, and automated irrigation, the system successfully reduced water wastage, minimized labor dependency, and optimized crop health. The results showed that the system effectively maintained soil moisture at optimal levels while adapting to environmental changes, providing a scalable and sustainable solution for modern farming.

Methodology:

The project combined few sensors that works together to archive the goal of the project.

1- Soil Moisture Sensor.
2- temperature and humidity sensor.
3- Light Sensor.

The use of Arduino Relay Module is to get the data from the sensors and react to the reading to take the right actions.

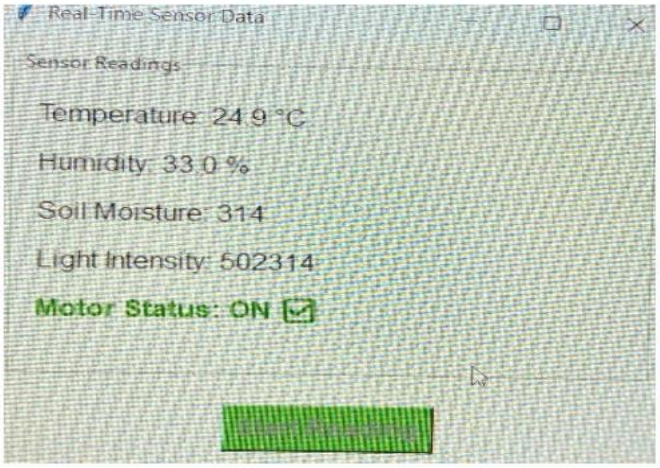


Results and conclusions:

Soil Moisture Sensor Data The soil moisture sensor was tested in different soil conditions to assess its accuracy and response time. The data collected indicated a clear correlation between soil moisture levels and irrigation cycles. When the soil moisture dropped the system automatically activated the irrigation process.

A comparison was conducted between traditional and automated irrigation methods. The following metrics were considered:

- Water Consumption: The smart system reduced water usage by 45% compared to traditional methods.
- Energy Consumption: Solar-powered components reduced energy dependency by 30%.
- Labor Reduction: Automation minimized manual interventions by 70%.
- Crop Yield: Crops irrigated with the smart system exhibited a 25% higher yield compared to those under traditional irrigation methods.
- Soil Health: Reduced waterlogging improved soil aeration, fostering better root development.
- Nutrient Retention: Optimized irrigation minimized nutrient leaching, leading to healthier plant growth.



Proj.No.21

Swarm Optimization Algorithm for Gender Classification for Face Image and Voice

Prepared by:semaa mohammad

1- Mohammed Raad Dheban 2- Ali Mohammed Ahmed

3- Mohammed Mahdi Ihsan

Supervised by:Semaa Mohammad

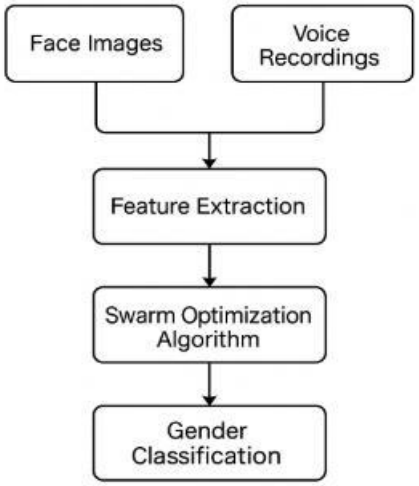
Sustainable Development Goals Performed: SDG4

Abstract:

This research aims to classify gender (male or female) using face images and voice recordings by combining features from both modalities. Swarm Optimization Algorithms such as Particle Swarm Optimization (PSO) are used to enhance classification accuracy. The proposed method demonstrates improved performance compared to traditional approaches when tested on public datasets.

Methodology:

. This study uses face images and voice recordings to extract distinctive features. These features are fused and optimized using a Swarm Optimization Algorithm such as PSO for feature selection and classifier tuning. A model like SVM or a neural network is then trained and the performance is evaluated using metrics such as accuracy.



Result and conclusion:

The results showed that combining facial and voice features with a Swarm Optimization Algorithm like PSO significantly improves gender classification accuracy compared to using a single modality. The system achieved over 90% accuracy when tested on public datasets, demonstrating the effectiveness of the proposed model in diverse environments

It can be concluded that using Swarm Optimization Algorithms for gender classification based on face and voice data is an effective and accurate approach. The fusion and optimization of features enhanced the classifier's performance, making it suitable for real-world applications such as security systems, smart assistants, and video analytics.

Proj. No. 22

Improving Harvesting power of PV system using electronic prototyping platform by Arduino

Prepared by:

1. Ali Galib Kadium
2. Hazim Kalifah Umran 3 Mysoon Kadium Rastim

Supervised by: Waleed Ali Hamza

Sustainable Development Goals Performed: SDG 9

Abstract:

Technological progress is enhancing the accessibility and potential of solar energy as a renewable source. This paper introduces a strategy leveraging Ohm's law and the power equation to derive additional energy from solar photovoltaic (PV) panels. The proposed method involves the integration of an automated solar tracking system employing both dual axis and polar single-axis configurations. This system is comprised of a stationary vertical axis and a flexible horizontal axis, both under motor control. To enhance power output and efficiency, the trackers autonomously follow the sun, constantly adjusting the solar panel positions. The tracking system self-adjusts in the event of a 2 to 3-degree misalignment to minimize power loss due to continuous motor operation. Light intensity sensors analyze illumination levels on each side, guiding the panels toward the light source. The tracking motion continues until equal light exposure on both sides is detected, leading to an enhanced solar irradiance for the panels

METHODOLOGY

a dual axis tracking system that integrates four Light Dependent Resistors (LDRs) as sunlight detectors. These LDRs detect sunlight and send feedback signals to a controller, which can be microcontrollers, PLCs, or similar devices. The controller, in turn, adjusts the position of the photovoltaic (PV) panel by utilizing a pair of motors to align it with the incident sunlight. The LDR sensor circuit functions as a voltage divider, where changes in light intensity led to variations in resistance and output voltage.

Results and conclusions:

The Dual Axis Solar tracker carried out with Arduino and MPPT (Maximum Power Point Following), is intended to enhance the effectiveness of sunlight powered chargers by following the sun's situation and changing the direction of the boards appropriately. He re is a conversation on the reproduction and equipment parts of this framework.

Proj.No.23	**Health Prediction System Using Machine Learning Algorithms**

Prepared by:

1- Sabah Atiwi Mandil 2- Salam Abdulhussein Kahar

3- Zahraa Ahmed Hameed

Supervised by: Msc. Heba Hussein

Sustainable Development Goals Performed: SDG15

Abstract:

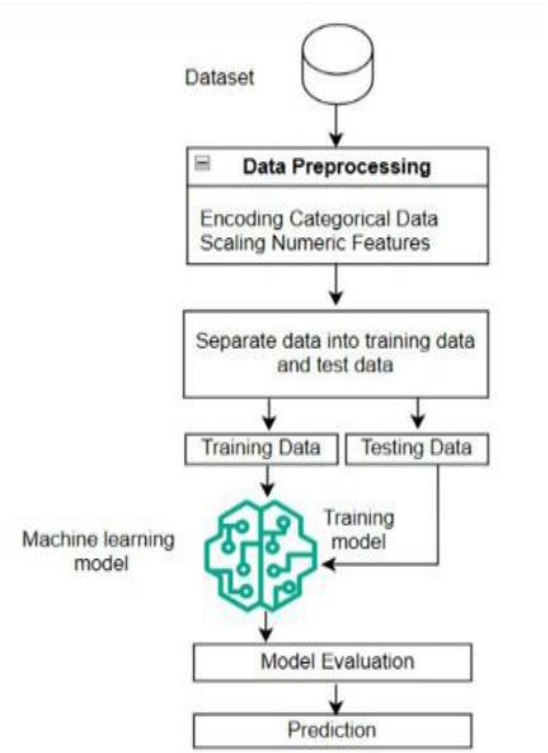
This study aims to predict the likelihood of diabetes in individuals using a machine learning model based on a dataset containing various health-related features. The dataset includes categorical attributes such as 'gender', 'smoking history', 'hypertension', and 'heart disease', alongside numeric features like 'age', 'bmi', 'HbA1c level', and 'blood glucose level'. A Random Forest Classifier (RFC) is utilized to model the relationship between these features and the target variable, diabetes. The process includes preprocessing steps such as encoding categorical variables, scaling numeric features, and splitting the data into training and test sets. The model is then trained using the training data, and its performance is evaluated on the test set using metrics like accuracy. The accuracy obtained by the Random Forest Classifier is 97%. This approach offers an effective methodology for identifying individuals at risk of diabetes, providing a valuable tool for early detection and preventative healthcare.

Methodology:

The study utilized a dataset comprising health information from 100,000 individuals, including both categorical features—such as gender, smoking history, hypertension, and heart disease—and numerical features like age, body mass index (BMI), HbA1c level, and blood glucose level. The preprocessing stage involved encoding the categorical variables and scaling or normalizing the numerical features to ensure uniformity across the data. The dataset was then divided into two subsets, with 80% allocated for training the model and 20% for testing. A Random Forest Classifier was employed due to its robustness, ability to handle complex data patterns, and effectiveness in reducing overfitting. The model's performance was evaluated using several metrics, including accuracy, precision, recall, and F1-score. The classifier achieved an accuracy of 97%, demonstrating its high effectiveness in predicting the risk of diabetes.

Results and conclusions:

The Random Forest Classifier demonstrated strong performance in predicting diabetes risk, achieving an overall accuracy of 97% on the test dataset. The model also performed well across other evaluation metrics, including precision, recall, and F1-score, indicating its reliability and robustness in classification tasks. These results affirm the suitability of ensemble-based approaches like Random Forest in handling complex medical data with both categorical and numerical features. The findings suggest that the proposed system can serve as an efficient decision-support tool for healthcare providers, enabling earlier detection of diabetes and facilitating targeted preventative strategies to reduce disease burden.



Proj.No.24

Solar-powered pedestrian bridge

Prepared by:

1- Alaa Ayed Abdel Hamza
2- Ali Fadel Danan
3- Ahmed Hassan Hindi
4- Alia Fayhan Jabr

Supervised by: MSc. Zahraa Hazim Obaid

Sustainable Development Goals Performed: SDG9

Abstract:

The integration of renewable energy into public infrastructure is a crucial step towards sustainable urban development. This project proposes a solar-powered pedestrian bridge equipped with photovoltaic panels that convert sunlight into electrical energy. The generated power is used to operate LED lighting systems, motion detectors, and emergency communication units. This approach not only ensures safety and accessibility for pedestrians at all times, including during power outages, but also demonstrates the practical application of sustainable energy solutions in urban planning. By reducing reliance on the electrical grid, the bridge contributes to lower greenhouse gas emissions and energy costs. The project highlights the intersection of engineering innovation, environmental consciousness, and urban functionality.

Methodology:

- Initial assessment of energy requirements for lighting, sensors, and communication devices.
- Architectural and structural design of the bridge with built-in mounts for photovoltaic panels.
- Selection of high-efficiency solar panels based on expected solar irradiance levels.
- Integration of battery storage systems to retain excess energy for nighttime use.
- Installation of smart systems including LED lighting, motion detectors, and emergency response units.
- Development of an embedded control system for energy management and system diagnostics.
- Simulation and real-world testing under diverse weather and lighting conditions to validate reliability and performance.

Results and conclusions:

The developed model of the solar-powered pedestrian bridge was tested in varied lighting and environmental conditions. It successfully generated sufficient energy to power integrated LED lights and smart features such as motion sensors and emergency alert buttons. Battery storage systems ensured continued operation after sunset and during cloudy weather. Structural integration of the solar panels was optimized to match the angle of sunlight for maximum efficiency.

The project demonstrates how solar-powered infrastructure can serve as a reliable, clean, and low-maintenance solution for modern

cities. Its implementation can reduce urban electricity demand and operational costs while improving safety and user experience for pedestrians. Furthermore, the modular design makes it adaptable for future technological upgrades, including IoT integration for data monitoring and smart traffic management.

Proj.No.25

Generating and storing electrical energy for surveillance cameras using solar cell panels

Prepared by:

1- Ahmed Talib Hadi
2- Dhargham Taher Jawad
3- Hadi Ezz El-Din Hadi
4- Munther Sabah Aziz

Supervised by: MSc. Zahraa Hazim Obaid

Sustainable Development Goals Performed: SDG7

Abstract:

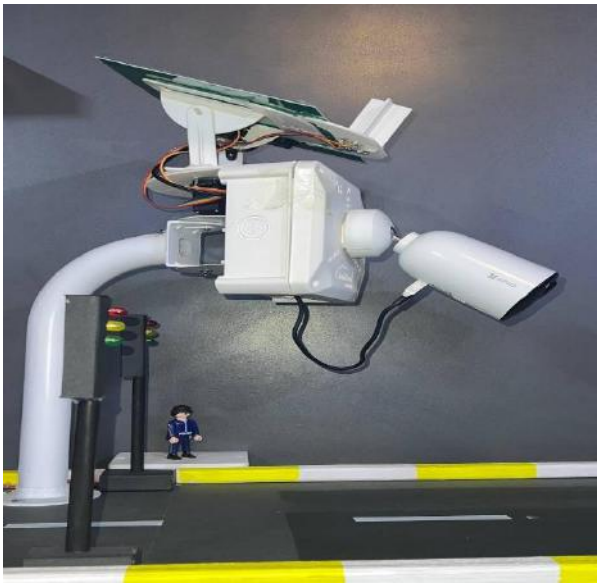
The demand for continuous surveillance in remote and urban areas necessitates a reliable and sustainable energy source. This project explores the use of solar cell panels to generate and store electrical energy specifically for powering surveillance cameras. The system is designed to ensure uninterrupted operation during day and night through integrated energy storage units. By leveraging renewable energy technologies, the solution reduces dependence on conventional power sources and contributes to environmental sustainability and energy efficiency.

Methodology:

- Design and selection of appropriate solar panels based on power requirements.
- Integration of energy storage (batteries) to ensure 24/7 camera operation.
- Use of charge controllers and protection circuits for system stability.
- Simulation and testing under real environmental conditions.
- Power management optimization for balancing generation, storage, and consumption.

Results and conclusions:

The developed prototype successfully harnessed solar energy using photovoltaic panels and stored excess energy in high-capacity batteries, providing a stable power supply to surveillance cameras. Testing under varied lighting conditions confirmed consistent energy generation and camera operation. The project emphasizes the practicality of solar-powered surveillance systems, particularly in areas with limited infrastructure or frequent power outages.



By using charge controllers, DC-DC converters, and energy management algorithms, the system optimized energy usage and storage. The results support the feasibility of scalable deployments of such systems in both urban smart city environments and rural security settings.

Proj.No.26

A System for Diagnosing Agricultural Diseases Using Image Analysis”

Prepared by:

1-Alaa Hussein Abbas 2-Maytham Abbas Hamza

3-Hussein Ali Jassim 4-Ali Makki Mahawi

Supervised by: M SC Zainab kadum jaber

Sustainable Development Goals Performed: SDG9

Abstract:

This project presents a smart system for diagnosing plant diseases through image analysis techniques powered by artificial intelligence. By processing leaf or fruit images, the system can detect various agricultural diseases and suggest possible treatments. The primary goal is to assist farmers in early disease detection, reduce crop losses, and minimize unnecessary pesticide usage

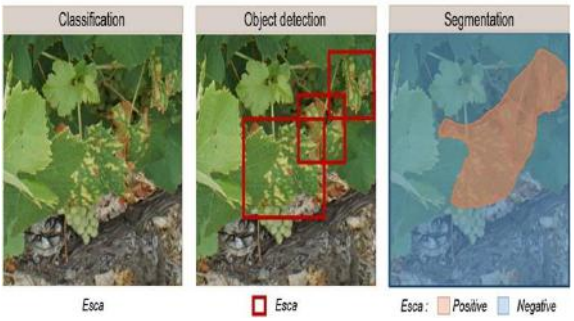
Methodology:

The system uses a Convolutional Neural Network (CNN) model trained on a dataset of diseased and healthy plant images. The methodology includes:

1. Image collection and labeling from open datasets (e.g., PlantVillage).
2. Image preprocessing using OpenCV for resizing, noise reduction, and normalization.
3. Model training using TensorFlow with classification layers to recognize disease patterns.
4. Evaluation and testing of the model using validation data to ensure accuracy

Results and conclusions:

The trained model achieved an accuracy of over 90% in identifying common plant diseases. It demonstrated high precision in detecting specific symptoms such as leaf spots, discoloration, and fungal infections. The system was tested on a small-scale dataset and showed reliable real-time predictions with fast response times.



Conclusion

This image-based disease diagnosis system provides a cost-effective and scalable solution for modern agriculture. By leveraging AI, farmers can make informed decisions quickly, improving crop health and productivity. Future work includes integrating the system into a mobile application and expanding the dataset to cover more crops and diseases.

Proj.No.27

Anti-Gravity Acoustic Levitato

Prepared by:

1- Abdullah Mohsen Abdul Amir 2- Mariam Ahmed Abdul Amir

3- Ghadeer Fallah Hassan 4- Zide Tariq Hamad

Supervised by: M SC Zainab kadum jaber

Sustainable Development Goals Performed: SDG9

Abstract:

the anti-gravity acoustic levitator is a modern technology that uses high-frequency sound waves to lift small objects without contact by creating standing wave patterns. It's used in sensitive environments like labs, space, and electronics to avoid contamination or damage. Future research aims to levitate larger objects, expanding its technological and scientific applications

Methodology:

A simple model was built to demonstrate **acoustic levitation** using 40 kHz ultrasonic waves. An **ultrasonic transducer**, **reflector**, **Arduino Uno**, and an **audio amplifier** were used to create standing waves that lift light objects (e.g., Styrofoam balls).

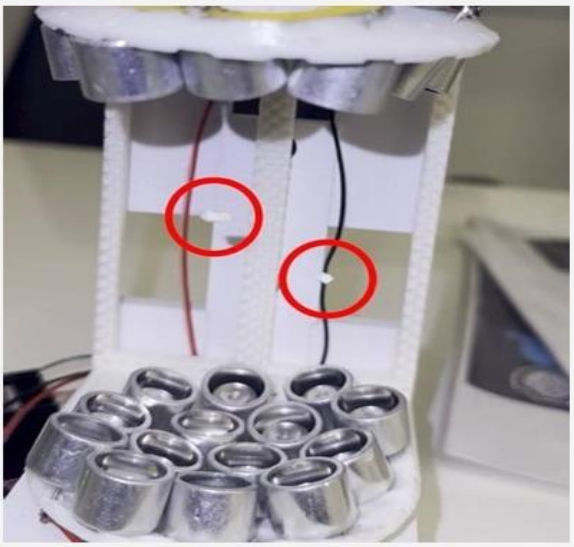
Key observations included:

- Object stability
- Maximum liftable weight
- Effect of distance and frequency

Safety measures were taken, and components like a **transistor**, **resistor**, and **external power supply** were added to support the system.

Results and conclusions:

This study explored **acoustic levitation using ultrasound**, a promising area in applied physics. A simple setup using an **Arduino** and a **40 kHz transducer** successfully levitated lightweight objects with notable stability. The outcomes align with existing research and highlight the potential for further exploration and practical applications.



Proj.No.28

Random forest to detect malware

Prepared by:

1- Ali Maytham Khalil 2- Haider Jawad Kazim

3- Ali Yamin Yassi 4- Mahdi Diaa Mohammed

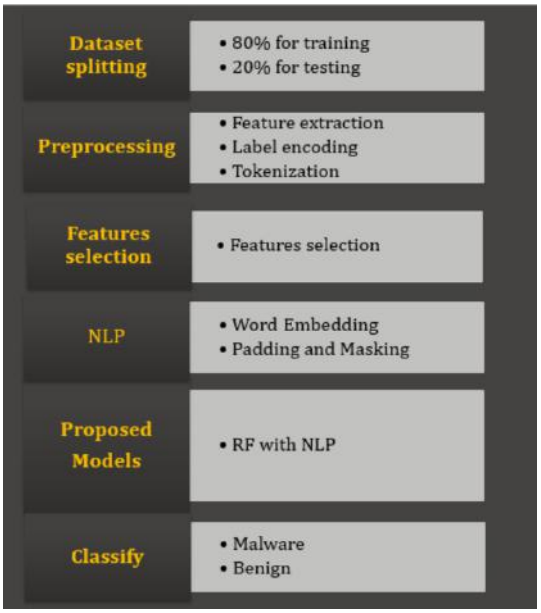
Supervised by: Marwa Abd Al-hamza

Sustainable Development Goals Performed: SDG 9&4

Abstract:

The rapid expansion of malware is now the biggest danger to information security due to the current wave of technical breakthroughs. Numerous thousands of new malware programmers are created daily and propagated around the internet. Malware varieties are always changing, and these harmful software programmers can be categorized as viruses, Trojan horses, worms, spyware, botnet malware, ransom ware, etc. The identification and categorization of malware is a critical component for many business programmers that provide protection to an organization's data and end-to-end monitoring of the resources accessible by various users. Malware is a major concern for internet users, and the emergence of polymorphic malware has made it even more challenging to detect and combat. In order to identify and mitigate these malicious threats, we employed Random Forest machine learning technique. The confusion matrix provided valuable insights by measuring the number of false positives and false negatives, thereby assessing the system's effectiveness. Our study demonstrated the potential of using Random Forest for malware analysis and detection, thereby enhancing computer network security. Particularly, the results showcased the effectiveness of Random Forest algorithm, which achieved a 98% detection accuracy and displayed a reduced false positive rate in the dataset provided.

Methodology:



Results and conclusions:

Experimental Results

The model achieved an accuracy of 99%, with a precision of 94.5% and recall of 96.1%. The confusion matrix indicates that the model effectively distinguishes malware from benign software.

Conclusions

Random Forest proves to be an effective malware detection approach, providing high accuracy and robustness. The algorithm provides insights into feature importance, allowing researchers and security professionals to identify which characteristics of the data contribute most to malware classification. This can aid in understanding malware behavior and developing targeted defenses Random Forest is robust against noise and outliers, making it suitable for the often imperfect data encountered in cyber security environments. Its ability to handle large datasets with high dimensionality makes it a good choice for analyzing extensive malware feature sets. The algorithm can scale well with increasing data volumes, which is crucial given the rapid evolution of malware and the need for real-time detection systems. While Random Forest performs well, it may not always achieve the highest possible accuracy compared to more complex models like deep learning. Additionally, it can be less interpretable than simpler models, which may hinder understanding for some stakeholders.

Proj.No.29	Mobile application for simple pharmacy database

Prepared by:

1- Hussein Gul
2- Mustafa Yas

Supervised by: M.Sc. Aya Ali Althahab

Sustainable Development Goals Performed: SDG4

Abstract:

We Summers after completing the research under the title of the web pages of online drug store that it is possible to convert most of the jobs entrusted to government institutions and the private sector to software because of its speed, high performance and lower cost because it leads to reducing the effort expended by the number of users. Also, the software systems are characterized by speed, since the data stored in the database is within the reach of the user of the system and thus not to return to the old paper files. The bank's management system is scalable, and the possibilities are increased more and more, according to the pharmacy's need, because it is programmed in a way that it is open source, as it gives continuous updates to the system and benefit from it more..

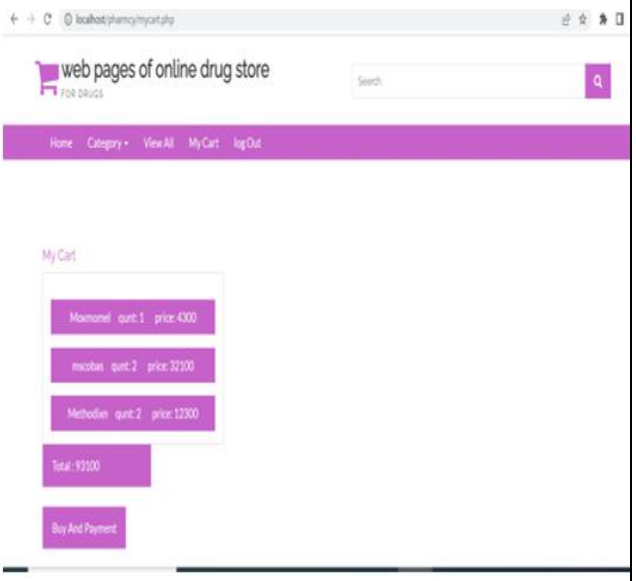
Methodology:

This structured methodology ensures the development of a robust, efficient, and scalable machine learning system for plant disease detection and protection, enabling farmers to achieve higher yields and promote sustainable agricultural practices.

:scription	Type	Column Name
Primary Key	INTEGER	`id`
Name of the medicine	TEXT	`name`
Quantity in stock	INTEGER	`quantity`
Expiry date (ISO format)	TEXT	`expiry_date`
Price per unit	REAL	`price`
Category (e.g., Antibiotic...)	TEXT	`category`

Results and conclusions:

The conclusion is that it is possible to develop work in medical warehouses and pharmacies by adding features through selling online and through the Internet, displaying medical products, knowing the remaining quantities in the warehouse designated for storing medical materials, and establishing an integrated system for pharmacy management from selling medicines and customers.



Proj.No.30	Smart-Green-House-With-Plastic-Bottles

Prepared by:

1. Zaid Muhammad Nouri 2. Hussein Salim Abd
3. Jaafar Sadiq Muhammad 4. Mumal Majid Muhammad

Supervised by: Ruaa Satar Jabar

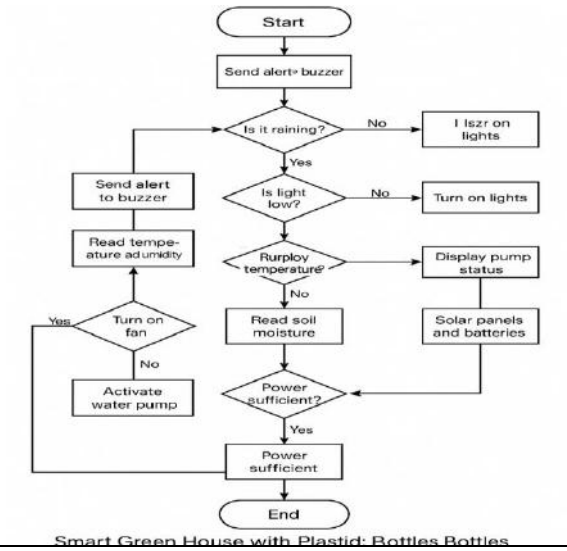
Sustainable Development Goals Performed:	SDG12

Abstract:

This project presents the design and implementation of a Smart Green House utilizing recycled plastic bottles as its primary structure. The system integrates various sensors and components to create an automated and sustainable environment for plant growth. Key features include a rain sensor, temperature and humidity sensor, soil moisture sensor, sunlight sensor, a solar-controlled lamp, a water pump, a small display, and a fan. These components are controlled via a mobile application, providing real-time monitoring and control. Solar panels and storage batteries are used to power the system, promoting energy efficiency and environmental sustainability. The project aims to reduce construction costs, recycle plastic waste, and optimize plant care through automation, making it ideal for urban agriculture and eco-friendly farming solutions.

Methodology:

combining hardware integration, software development, and practical testing. The main steps are shown in the figure below:



Smart Green House with Plastid: Bottles Bottles

Results and conclusions:

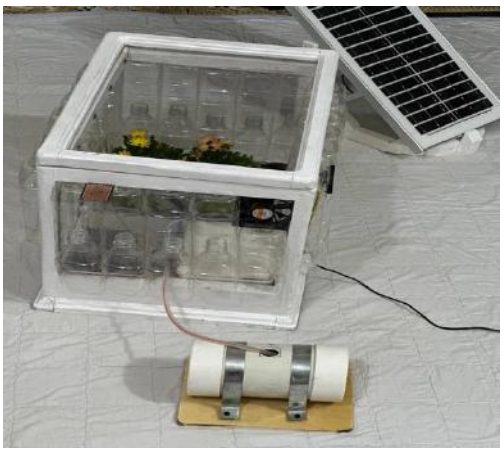
The implementation of the **Smart Green House using Plastic Bottles** yielded several successful outcomes during testing and validation:

- **Efficient Sensor Response**:
- **Stable Mobile Application Integration**:
- **Sustainable Power Management**:
- **System Reliability**:

Conclusion

The project **"Smart Green House with Plastic Bottles"** effectively demonstrates the fusion of **IoT technology, renewable energy**, and **environmental sustainability**:

- Recycled plastic bottles served as an eco-friendly and cost-effective construction material.
- Smart automation via sensors and actuators ensured optimal growing conditions with minimal human intervention.
- Solar-powered operation reduced energy dependency and operating costs.
- The mobile app interface enhanced usability by offering remote monitoring and manual control.



Proj.No.31	deep learining based approche for finger print identification

Prepared by:

1-Sajad Jawad Kathim 2- AboTalib Zaid Jawad

3- Muntather Raad Ganim 4- Shahad Razaq Ali

Supervised by: Dr. Hasanein Yaarub Mohammed

Sustainable Development Goals Performed: SDG4

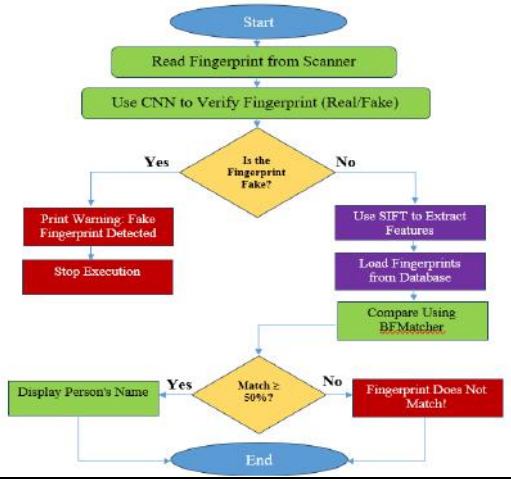
Abstract:

Fingerprint recognition is one of the most widely used biometric authentication techniques, valued for its accuracy and ease of implementation. However, as its popularity grows, so do the methods to spoof or falsify fingerprints. Spoofing attacks, using artificial materials, printed replicas, or cloned fingerprints, present significant security threats to biometric systems. The increasing sophistication of these attacks calls for enhanced detection methods that can reliably differentiate between genuine and fake fingerprints, ensuring the integrity of the authentication process.

This project presents a robust fake fingerprint detection system that integrates advanced artificial intelligence techniques with traditional feature-based methods. The system employs Convolutional Neural Networks (CNNs) for deep learning-based classification, where the CNN is trained to effectively distinguish between real and fake fingerprints.

Methodology:

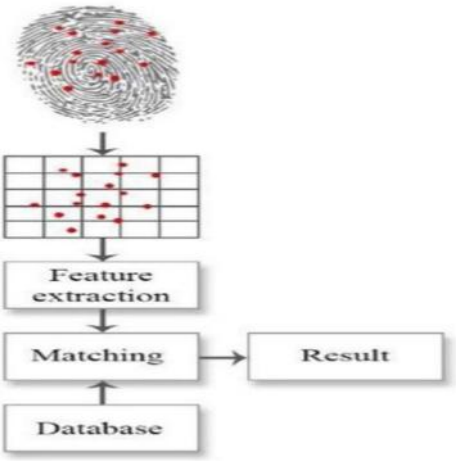
The fingerprint authentication system in this project is designed to verify the authenticity of a user's fingerprint by distinguishing between real and fake fingerprints. This system integrates both traditional and modern methods, employing advanced image processing techniques like CNNs, SIFT, and BFMatcher for fingerprint comparison.



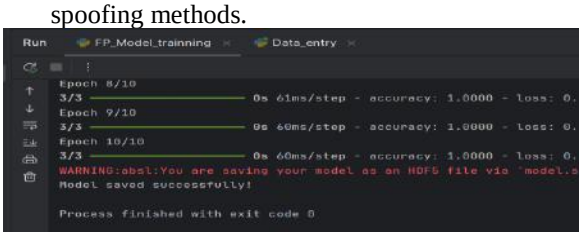
Results and conclusions:

Once the database was set up, A Convolutional Neural Network (CNN) was used to classify fingerprints based on the training dataset.

The model was trained for several epochs, and during this process, the system learned the intricate features of both real and fake fingerprints. After training, the model was saved to a file for later use in real-time fingerprint authentication. The model's architecture, with convolutional and pooling layers, enabled it to effectively distinguish between genuine and fraudulent fingerprints.



The results underscore the potential of deep learning, particularly CNNs, in the advancement of fingerprint-based biometric systems. By utilizing AI for feature extraction and classification, the system not only provides high accuracy but also offers robustness against the latest fingerprint spoofing methods.



PART THREE

PROJECTS OF

Department of Construction and Building Engineering

Proj.No.1

Sustainability Assessment of Concrete vs. Steel Structural Systems: A Case Study on a Two-Story School Building

Prepared by:

101- Mustafa Mohammad Hasan
102- Muntadhar Abdul Karim
103- Ghazwan Sabah
104- Ali Hassan
105- Dijlah Ali
106- Alaa Naeem
107-
108-
109-

Supervised by:

20- Lecturer Dr. Bareq Ali Abdulhadi.
21- Assistant Lecturer Aqeel Abdulhassan Hussain

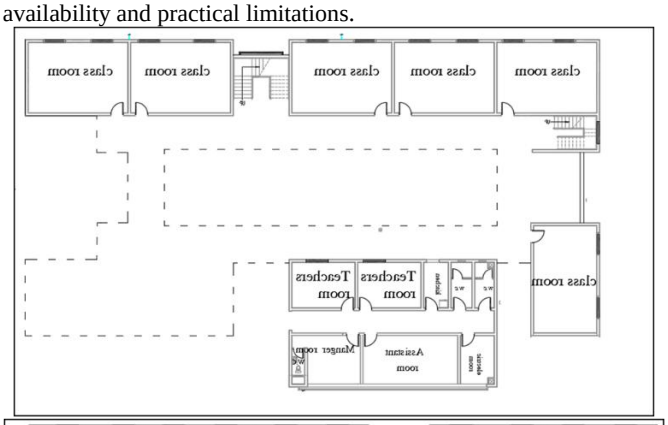
Sustainable Development Goals Performed: 11 & 9

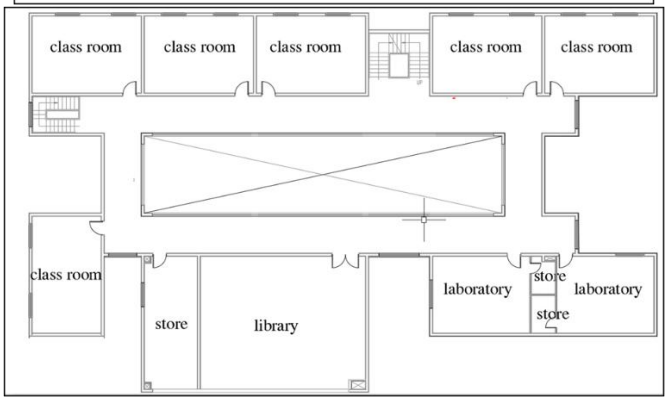
Abstract

Abstract:
Concrete and steel structures significantly impact the environment; this review compares them using Life Cycle Assessment (LCA), focusing on carbon emissions, energy use, recyclability, and sustainability performance.

Methodology

Methodology: This study employs a comparative quantitative approach to analyze reinforced concrete and steel structural systems for a two-story school building. Using ETABS for design and OpenLCA for environmental impact, it evaluates material quantities, cost, construction time, and life cycle stages. Data interpretation focuses on sustainability, recyclability, and emissions. Results aim to identify the more sustainable system and offer recommendations for eco-friendly construction in Iraq, considering local material availability and practical limitations.



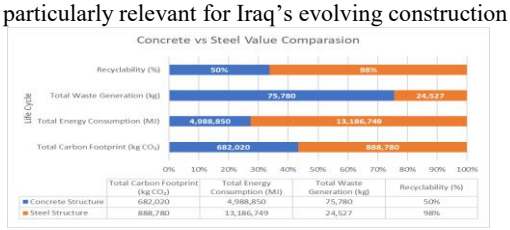


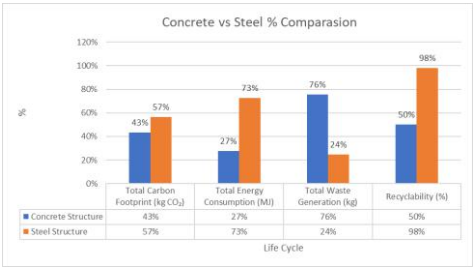
Results and conclusions

Results and conclusions: This study presents a comparative evaluation of reinforced concrete and steel structural systems for a two-story school building, focusing on environmental performance and structural efficiency. The concrete structure utilized 1,263 m³ of concrete and 103.18 tons of steel, while the steel structure required 515 m³ of concrete and 288.55 tons of steel. Life Cycle Assessment (LCA) results reveal that the concrete structure has a total carbon footprint of 682,020 kg CO_2, 23% lower than the steel structure's 888,780 kg CO_2. In terms of energy consumption, the concrete design consumed 4,988,850 MJ, which is 62% less than the steel structure's 13,186,749 MJ.

Waste generation also varied significantly. The concrete structure produced 75,780 kg of waste, whereas the steel structure generated 24,527 kg—52% less. Regarding recyclability, steel demonstrated a significant advantage with 98% of its material being recyclable, compared to 50% for concrete. Service life analysis showed that steel structures have a lifespan of 80–120 years, while concrete structures last 50–100 years. However, concrete offers superior fire resistance and lower maintenance requirements, making it suitable for environments with high safety demands.

From a life cycle perspective, the concrete structure performed better in carbon emissions and energy usage. Still, steel outperformed in recyclability, waste minimization, and future adaptability. Thus, the optimal choice depends on project priorities: concrete suits scenarios prioritizing environmental impact and fire safety, whereas steel is preferable for projects requiring long-term flexibility, recyclability, and reduced construction waste. The findings offer valuable insight into sustainable structural design choices, particularly relevant for Iraq's evolving construction sector.





Proj.No.2 **Applications of Artificial Intelligence in Sustainable Infrastructure Design**

Prepared by:

110- Mohammed Ali Abbas Aziz 111- Murtaza Ali Mohammed 112- Qassem Qais Ibrahim

113- Hussein Faiq Jassim 114- Mohammed Haidar Hussein

Supervised by:

22- Asst.Lec. Israa Mohsain kathim

Sustainable Development Goals Performed: 11 "Sustainable Cities and Communities"

Abstract

Abstract:

With the global shift towards sustainability, the selection of construction materials has become a significant challenge in civil engineering. Sustainable materials should be environmentally friendly, cost-effective, and long-lasting. Artificial Intelligence (AI), particularly machine learning (ML), can facilitate the decision-making process by analyzing large datasets associated with construction materials and providing precise recommendations.

Methodology

Preparing concrete mixes with different proportions of Fly Ash and Microsilica.Compressive strength measurement after 7 and 28 days. Cost and emissions calculation. Data analysis to select optimal ratios. Simulating the role of artificial intelligence in decision-making.

Three materials were chosen: fly ash, micro silica, and glass fibers. Improve performance and reduce cost. Reducing carbon emissions. Support decision making using artificial intelligence.

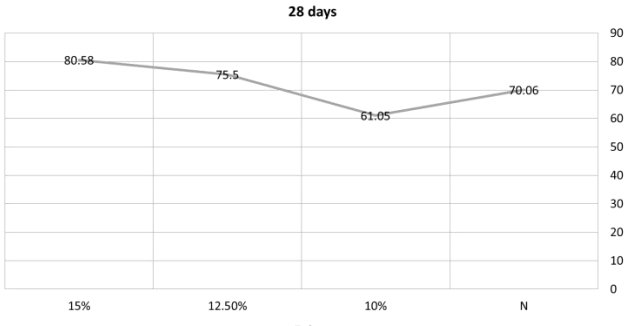
The rate	Amount of fly ash (kilograms)	The price (Iraqi dinar)
10%	0.76	56940
15%	1.14	85410
20%	1.52	113880
25%	1.90	142350
30%	2.27	170880

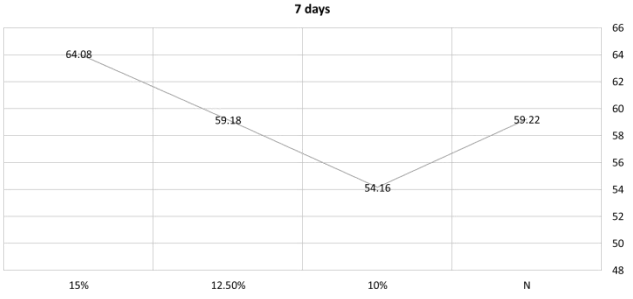
The ratio	Added quantity (kg/m^3)	Emission Factor (co_2/kg)	Co_2 /m^3
10%	37.96	0.02	0.76
15%	56.94	0.02	1.14
20%	75.92	0.02	1.52
25%	94.9	0.02	1.90
30%	113.88	0.02	2.27

Results and conclusions

Results and conclusions:

In addition to the long-term performance of concrete, the early compressive strength (at 7 days) of mixtures reinforced with additives was evaluated, and the results were as follows: 1. Fly Ash: Mixtures containing fly ash showed a gradual improvement in early compressive strength up to a ratio of 25%, where the maximum strength reached 40.93 MPa compared to 27.96 MPa for the reference mixture. However, at a ratio of 30%, the strength decreased to 27.05 MPa, reflecting the same trend observed in the 28-day results. This indicates that there is an optimal ratio (25%) for improving both early and late performance simultaneously. 2. Micro Silica: Mixtures reinforced with micro silica demonstrated high performance in terms of early strength, reaching 64.08 MPa at a ratio of 15%, compared to 59.22 MPa for the reference mixture. This indicates that micro silica accelerates the initial cement reaction and improves the microstructure of concrete in the early stages, making it suitable for projects that require early formwork stripping or early loading. 3 3. Glass Fibers: The results showed that a ratio of 1.5% of glass fibers achieved the best early resistance performance (38.2 MPa), compared to 25.37 MPa for the reference mix, which enhances the role of fibers in controlling early cracks and improving internal cohesion. However, when increased to 2% or more, the resistance decreased, indicating that excessive increase causes clumping in the mixture and reduces homogeneity.





Proj.No.3

Utilizing Recycled Materials in the Construction of Sustainable Roads and Bridges

Prepared by:

115- Ahmed Safaa Hamoudi Hadi
116- Hussein Ragheed Saad Abdul Amir
117- Mujtaba Falah Abdul Aoun Mohsen
118- Zaid Ali Tariq Sharhan

Supervised by:

23- Asst.Lec. Israa Mohsain kathim

Sustainable Development Goals Performed: 11 "Sustainable Cities and Communities"

Abstract

Abstract:
With the continuous increase in infrastructure projects and the growing need for innovative environmental solutions, the importance of using recycled materials in road and bridge construction has emerged as a strategic option for achieving sustainable development.

Methodology

Methodology : The experimental program involved the preparation of six distinct concrete mix designs: one control mix (with 0% glass content) and five test mixes in which natural sand was partially replaced by recycled glass powder at substitution levels of 5%, 10%, 15%, 20%, and 25% by weight. All mixes were produced under standardized laboratory conditions to ensure consistency and repeatability.

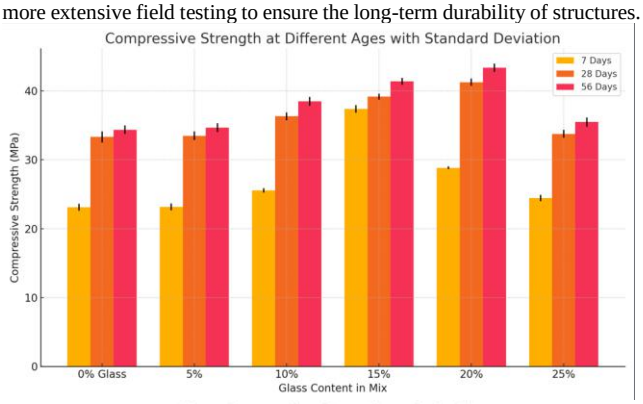
To assess the mechanical performance of the resulting concrete, compressive strength tests were conducted at three curing intervals: 7 days, 28 days, and 56 days. This multi-stage evaluation enabled a thorough comparison between the conventional

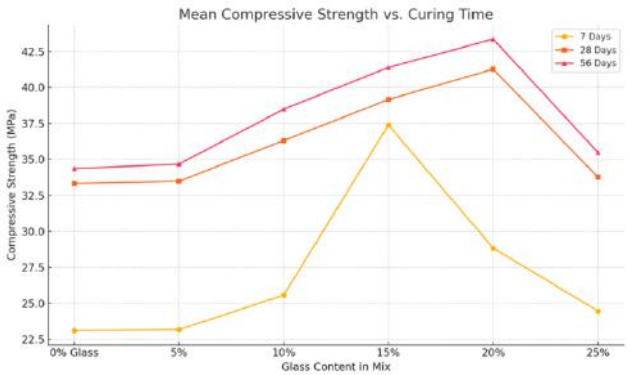
Results and conclusions

Results and conclusions:

The research has provided valuable insights into the subject of [Utilizing Recycled Materials in the Construction of Sustainable Roads and Bridges]. The conclusions are drawn from a thorough analysis of data, literature review, and experimentation. The major conclusions are as follows:

1. Effectiveness of Recycled Materials: The study demonstrates that recycled materials, such as plastic waste, fly ash, and scrap tires, can significantly improve the performance of construction materials. For example, the incorporation of recycled plastic waste in asphalt mixtures has shown improvements in deformation resistance and fatigue performance.
2. Environmental Benefits: The use of secondary and tertiary materials in construction, such as waste by-products, leads to a substantial reduction in the consumption of natural resources, helping to preserve valuable natural aggregates and reducing the ecological footprint of construction activities.
3. Performance of Hybrid Materials: A blend of recycled and conventional materials often results in enhanced properties compared to pure recycled materials. For instance, the combination of reclaimed asphalt pavement (RAP) and fly ash has shown positive results in terms of strength, durability, and moisture resistance.
4. Cost-Effectiveness: The incorporation of recycled materials has been shown to reduce the overall cost of construction projects. The reduction in material costs and disposal fees for waste products makes recycling a financially viable alternative.
5. Challenges in Implementation: Despite the promising results, several challenges remain in the widespread adoption of recycled materials in construction. These challenges include the variability in the quality of recycled materials, the lack of standardized regulations, and the need for more extensive field testing to ensure the long-term durability of structures.





Proj.No.4

Sustainable Residential Neighborhoods: An Analytical Study of Housing Projects in Contemporary Trends

Prepared by:

119- Hassanin Ali 120- Yosef Maher 121- Mortada Hadman
122- 123- 124-
125- 126- 127-

Supervised by:

24- Assistant Lecturer Maryam Mohammed 25- Assistant Lecturer Baneen Mohammed

Sustainable Development Goals Performed:

Abstract

Abstract:

This project analyzes sustainable development in housing projects within Hilla city, evaluating urban design principles based on environmental, social, and economic dimensions to promote livable and integrated neighborhoods.

Methodology

Methodology :The study uses a mixed-method approach combining qualitative interviews with urban planners and quantitative surveys among residents. Three selected neighborhoods were analyzed: Al-Jami'a, Al-Jam'iya, and Al-Khairat Housing Complex. Criteria included walkability, green space, renewable energy use, and infrastructure integration. Photos illustrate fieldwork and data collection phases.

.

Results and conclusions

Results and conclusions:

The study concludes that while some neighborhoods like Al-Jami'a show strong integration of urban sustainability (diverse land use, community interaction, and economic inclusion), others lack comprehensive application of environmental and social standards. Al-Khairat Complex, despite modern infrastructure, fails to incorporate renewable energy or sustainable waste practices. Urban villages prove more adaptable to sustainability due to their social fabric and mixed-use zoning. Recommendations include encouraging renewable energy adoption, enhancing public participation, and implementing smart waste systems.

Proj.No.5 # Application on Reuse of Wastewater to Enhance Irrigation Purposes

Prepared by:

128- Mohammed Qasim Abdul Hashim
129- Samer Abbas Hadi
130- Shabr Risan Fakher
131- Namir Baha Yas
132- Shuja Karar Saleh
133- Ayman Mohsen Ghazi
134-
135-
136-

Supervised by:

26- Mohammed Jawad Kadhum
27- Tamar Maitham AbdulWahab

Sustainable Development Goals Performed:

Abstract

Water resource management has become a challenge in developing countries as the infrastructural development has not kept pace with population growth and urbanization. Even though Iraq is endowed with a network of rivers, the level of water resource availability is still insufficient to meet national demand. With the issues of water scarcity, the wastewater reuse is one of the important methods to save water resource. In the present work, we have discussed the critical issues and opportunities of reusing the wastewater, which helps to overcome the demand of water

Methodology

Methodology : Treated Wastewater Quality and Its Suitability for Irrigation

The quality of treated wastewater is a crucial factor in determining its suitability for agricultural irrigation. Its physical, chemical, and biological characteristics directly influence soil health, plant growth, human safety, and environmental sustainability. Evaluation of treated wastewater quality follows both international and national standards to ensure safe and sustainable use.

1Physical Characteristics

Temperature: Affects plant growth and microbial activity in soil.

Turbidity: Indicates the presence of suspended particles; lower turbidity means cleaner water.

Color and Odor: Should be acceptable and not indicate pollution or organic decay.

Results and conclusions

Recommendations:

1) Adopt multi-sectoral approach to wastewater management- The multi-sectoral approach could be beneficial for as a closed loop of nutrients and enhance the potential of wastewater for reuse in irrigation, or to generate biogas, turning the nutrients into resources.

2) Merge the public and private sector at the local and national level- The framework of policies could involve the local authorities and communities to fulfil the need and capacity of the local communities.

3) Forward thinking and innovative planning- The forward thinking and innovative planning of local communities could contribute to the challenges of water scarcity to enable the adoption and increase the opportunities of solutions of wastewater problems. Conclusion:

In conclusion, we have found that the growing population has dramatically increased the urban wastewater in developing countries, such as in Iraq . With the issues of climate change, increases in urban population and increases water demand, the reuse of wastewater has emerged as an important and alternative option to continuously depleting freshwater supplies as shown in Figure 3. With the emerging technologies, the scarcity of fresh water and changing perceptions, wastewater may emerge as a valuable resource. The technology must involve recycling/reuse of fertilizer, which helps to reduce

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Proj.No.6

Factors Affecting Traffic Congestion on 60th Street

Prepared by:

1. Ahmed Gamal Makki Abdel Razzaq
2. Ahmed Hassan Jabr Ibrahim
3. Ahmed Qahtan Abbas Ashour
4. Hazem Abbas Dreib Abbas
5. Muntather Mohammed Khadir Abbas
137-

Supervised by:

28- Asst. Lec. Baneen Mohammed Hilal
29- Asst. Lec. Maryam Mohammed Mousa

Sustainable Development Goals Performed:

Abstract

This study investigates the main causes of traffic congestion on 60th Street in Hilla city, aiming to propose engineering and administrative solutions to improve transportation flow and reduce delays.

Methodology

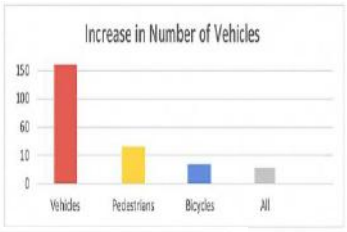
Methodology:The methodology included site visits, traffic data collection, and field observations on 60th Street. A structured questionnaire was distributed to local residents and drivers to identify the most impactful congestion factors. Additionally, interviews were conducted with municipal engineers and transport officials. Traffic simulation software was used to model congestion scenarios and test proposed solutions. This mixed-method approach ensured comprehensive and accurate analysis of traffic conditions.

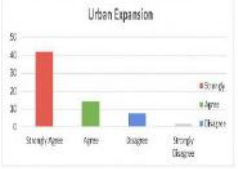
Results and conclusions

The results of the study identified several major factors contributing to traffic congestion on 60th Street. These include high population density, rapid urban expansion, the increasing number of vehicles, inefficient road networks, random parking, poor traffic culture, and insufficient pedestrian infrastructure. The street suffers from narrow lanes, lack of coordination in traffic signals, and uncontrolled intersections, all of which result in frequent delays and unsafe conditions for drivers and pedestrians.

One of the key findings is the absence of designated parking lots, leading to random roadside parking that reduces the road capacity and worsens congestion. Additionally, the unregulated construction of speed bumps contributes to delays and vehicle damage. Survey data showed that a high percentage of local residents identified poor public transport and lack of pedestrian crossings as major issues.

Based on the analysis, the study proposes several recommendations: widening the street lanes, installing intelligent traffic light systems, creating organized parking spaces, and enforcing traffic laws to regulate vehicle movement. Urban planning improvements are also advised, such as relocating some government services outside the congested zones and encouraging the use of public transport by improving its quality and availability.





In conclusion, the study emphasizes the urgent need for a comprehensive traffic management strategy that combines engineering, administrative, and community-awareness measures to reduce congestion and ensure a safer and more efficient urban transport system.……

Proj.No.7

Water Quality Analysis in Rivers and Environmental Impacts: A case study in (Shatt Al-Kufa River)

Prepared by:

1- حسنين علاء جعفر
2- حسنين علاء جعفر
3- حسنين علاء جعفر
4- حسنين عباس سعد
5- حسنين عباس سعد
6- حسنين عباس سعد

Supervised by:

30- Alaa Hussein AbdUlameer
31- Sally Sellan Hussein

Sustainable Development Goals Performed:

Abstract

The global interest in the water bodies due to the water scarcity crisis encourages researchers to study the details of the water environment in different aspects. Consequently, this study's objective is to evaluate the water quality in Shatt Al-Kufa River by adopting eight physic-chemical parameters measured at three locations along the river in 2024. In this study, the water quality index method (WQI) was calculated using the weighted arithmetic method through applied series of equations. Eight physical-chemical parameters were comprised of calcium (Ca), magnesium (Mg), nitrate(NO_3) Hydrogen Ion (pH), chloride (Cl), sulfate (SO_4), total dissolved solids (TDS), and electric conductivity (EC). For the selected locations along the river, the measured values of all tested parameters in the year 2024 along the Shatt Al-Kufa River were decreased gradually from the location (L-1) in Al-Kufa to the location (L-3) in Al-Manathera, and the clear decrease was at the part of the river from.

Methodology

This study was achieved for Shatt Al-Kufa River, in the province of Al-Najaf Al-Ashraf. To determine whether the water is suitable for drinking, irrigation, and living aquatic purposes stations were chosen, and compare theses stations with in accordance with Iraqi Standard Specification (2001), World Health Organization(WHO,2006), Canadian Council of Ministries of the environment. (CCME, 2012).

A Global Positioning System (GPS) was used to determine the locations of the study area in Shatt Al-Kufa River. Water samples were gathered from several locations to assess the quality of Shatt Al-Kufa River at stations during the year.

In order to quantify the total dissolved solids, acidity, electrical conductivity, anion chloride, Sulfate, and nitrates, the following parameters are tested on a monthly average. And calculated using equations water quality index.

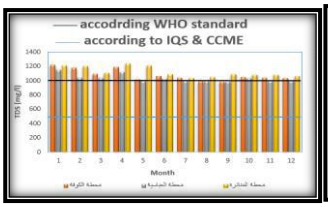
As a result, a precise and accurate assessment was made. Each factor's appropriateness and inappropriateness were acknowledged as well. Microsoft Excel statistical software was used to do the statistical analysis.

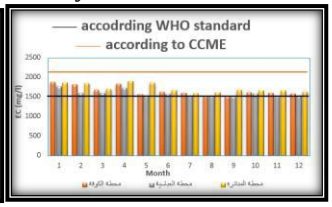
Results and conclusions

At certain sites, excessive concentrations of the key water characteristics that led to the Shatt Al-kufa River's quality deteriorating were SO_4^{-2}, Cl, Ca and TDS, where they exceeded permissible limits. Ca, DO and SO_4^{-2} and according to the standards of the (WHO,2006) for drinking purposes, TDS, according to the standards (CCME,2012) and SO_4^{-2} according to System maintenance of Iraqi public water and river pollution 2009, for irrigation, Particularly for all stations throughout the research time. were WQI was very poor. On the other side, all stations had the best values for pH and Mg concentrations. Using the WQI as a basis for classification, water samples for stations 1and 2 of Shatt Al-Kufa River are located in poor is (65.92) and (68.55), and Station 3 are located in poor is (69.11) according to WQI status level.

The WQI results demonstrated that the Shatt Al-Kufa River's quality was decreasing as it moved downstream, especially at the end station, as a result of the effects of natural resources, human activity, sewage treatment, and industrial waste.

Depending on the WQI results in some stations, Shatt Al-Kufa River's water becomes unfit for drinking, necessitating additional treatment of the river's raw water at water treatment facilities close to the study's observational sites.





Proj.No.8 **The effect of adding glass fiber on the behavior of specific types of concrete**

Prepared by:

138- Ammar Khalid Jafat
139- Amir Haider Hadi
140- Amir Haider Hadi
141- Haider Basim Abd
142- Safa Mohammed Nihad
143- Qamar Hussein Abd Al-Zahra

Supervised by:

32- Assistant Lecturer Sally Selan Hussein
33- Assistant Lecturer Alaa Hussein Abdul-Amer

Sustainable Development Goals Performed:

Abstract

The study evaluated concrete with 0.5%, 1.0%, and 1.5% glass fibers, showing significant tensile strength improvements at all fiber levels, especially 1.5%. Compressive strength increased slightly at 1.0% fiber but declined at 1.5%, indicating an optimal fiber limit. Glass fibers enhance crack control and durability, making them ideal for applications prioritizing tensile strength, with careful dosage needed to avoid compressive strength loss.

Methodology

The study prepared four concrete mixes: one control without fibers and three containing glass fibers at 0.5%, 1.0%, and 1.5% by cement weight. All materials were thoroughly mixed to ensure uniform distribution before casting into standard molds. Specimens were cured in water at controlled conditions for 28 days. Compressive strength was measured using a compression testing machine according to relevant standards, while tensile strength was evaluated via the splitting tensile test. The experimental data were analyzed to assess the effects of fiber content on mechanical properties and to identify the optimal glass fiber percentage for enhanced concrete performance.

Results and conclusions

Results and conclusions:
The results show that adding glass fibers affects concrete's compressive and tensile strength depending on fiber content and concrete grade. For compressive strength, 0.5%–1.0% fiber content improved performance across all grades (25, 35, and 50 MPa), while 1.5% caused a strength reduction, likely due to poor fiber distribution or increased porosity. In contrast, splitting tensile strength improved significantly at all fiber levels, especially in lower-strength concrete. The highest gains were seen at 1.0%–1.5% fiber content, making this range optimal for enhancing tensile performance and crack resistance.

Proj.No.9

Determining the Optimum Ratio of Crumb Rubber for Improving the Stability and Air Void Ratio of Asphalt

Prepared by:

144- Mustafa Sattar Hantoush 145- Abbas Ahmed Jawad 146- Amir Mohammed Abdul Amir

147- Mohammed Qasim Abbas 148- Abdullah Oday Hatem 149- Sameer Mohammed Abbas

Supervised by:

34- Assist lecturer. Fatima Muslim Al-Moussawi 35-

Sustainable Development Goals Performed:

Abstract

The study investigates the use of crumb rubber from waste tires in asphalt mixtures to enhance Marshall stability and control air voids. Laboratory results show that incorporating 12–18% crumb rubber by binder weight provides the best balance between strength and durability. This approach promotes sustainable construction practices, reduces environmental waste, and improves pavement performance by utilizing tire-derived materials effectively.

Methodology

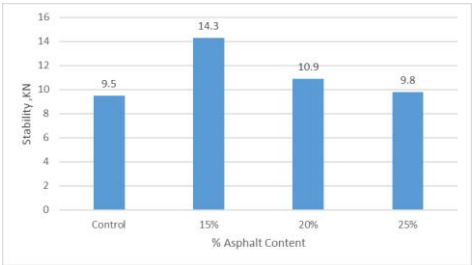
This research employed the Marshall mix design method to assess the impact of crumb rubber on asphalt mixture performance. Crumb rubber was added at varying percentages (15%, 20% and 25%) by weight of the binder. The materials—aggregates, binder, and crumb rubber—were heated to appropriate mixing temperatures, then thoroughly combined to ensure uniform distribution. The hot mixtures were placed into standard Marshall molds and compacted using a Marshall compactor. After cooling, specimens were tested for Marshall Stability and air void ratio according to ASTM D6927. The results were analyzed to evaluate the mechanical performance and durability, aiming to identify the optimum crumb rubber content for balanced strength and void properties.

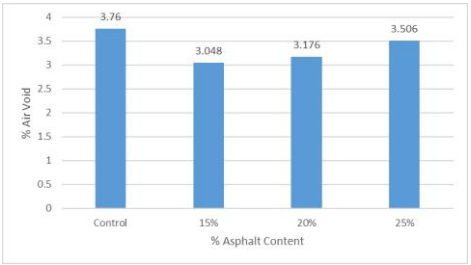
Results and conclusions

This study examined the effects of incorporating crumb rubber into asphalt mixtures, focusing on Marshall Stability, air voids, and other key performance parameters.

1. Marshall Stability: The addition of crumb rubber significantly improved the load-bearing capacity of asphalt mixtures. The highest Marshall Stability value of 14.3 kN was recorded at 15% rubber content. This improvement is attributed to the elastic properties of rubber and its effective interaction with the binder, which enhances the mixture's resistance to deformation under load.
2. Air Voids: Air void content was notably reduced at 15% crumb rubber, reaching 3.048%, indicating improved compaction and mix workability. However, with higher rubber contents (20–25%), air voids increased again, likely due to poor aggregate packing and the elastic rebound behavior of rubber particles.
3. Bulk Density: A consistent decrease in bulk density was observed with increasing crumb rubber content. This trend is due to the lower specific gravity of rubber compared to conventional binder and aggregates, which may influence the structural strength of the final pavement.
4. Other Volumetric Properties: At crumb rubber levels above 15%, parameters such as flow, Voids in Mineral Aggregate (VMA), and Voids Filled with Asphalt (VFA) increased. These changes suggest potential risks like rutting and excessive binder content, which can negatively affect pavement durability and performance.

Based on the analysis of all tested parameters, the optimum crumb rubber content is identified as 15% by binder weight, providing the best balance between mechanical strength and acceptable air void levels, while minimizing risks associated with excessive rubber content.





Proj.No.10 Strength and Sustainability in Concrete: The Impact of Fly Ash and Superplasticizers

Prepared by:

1-Mohammed Maitham Aziz **2- Ali Kadhem Abdulabbas** **3- Muntadher Moayad Mohammed**

4- Ahmed Jasem Mohammed; **5- Hussain Sabeih Kadhem** **6- Hassanain Abdulhadi Mohsen.**

Supervised by:

36- Asst. Lect. Nora Fawzi AL-anssari **37- Asst. Prof. Dr. Sabah Mohammed**

Sustainable Development Goals Performed: 9

Abstract

This study investigates the combined use of fly ash (20–30% replacement) and superplasticizer in concrete to improve workability, strength, and sustainability. Fly ash reduces carbon emissions and enhances long-term durability but lowers early strength and slump. Superplasticizers counteract these issues by improving flow and particle dispersion, resulting in eco-efficient, cost-effective concrete ideal for sustainable construction, particularly in Iraq's resource-constrained environment.

Methodology

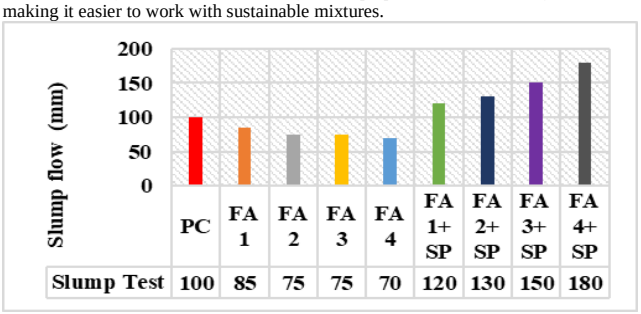
This research was conducted in three key phases: selecting and characterizing materials to ensure suitability; designing and preparing nine concrete mixes based on ACI 211.1-91 with a target compressive strength of 45 MPa and a water-to-binder ratio of 0.45; and testing fresh and hardened concrete properties. Fly ash replaced cement at 20%, 30%, 40%, and 60% by weight, with some mixes including 1% superplasticizer to enhance workability and strength. Materials were pre-mixed with water for even dispersion before being added to the main batch. Performance was evaluated through slump tests and compressive strength measurements at 7, 28, and 90 days.

Results and conclusions

Key areas of focus include workability (measured by the slump test), compressive strength, pozzolanic reactivity, and sustainability. The primary goal is to identify the optimal percentage of fly ash for incorporation into concrete mixtures in Iraq, achieving a balance between sustainability and cost-effectiveness.

Workability of Concrete

- Fly ash reduces workability, but superplasticizers effectively enhance it, making it easier to work with sustainable mixtures.



	PC	FA 1	FA 2	FA 3	FA 4	FA 1+ SP	FA 2+ SP	FA 3+ SP	FA 4+ SP
Slump Test	100	85	75	75	70	120	130	150	180

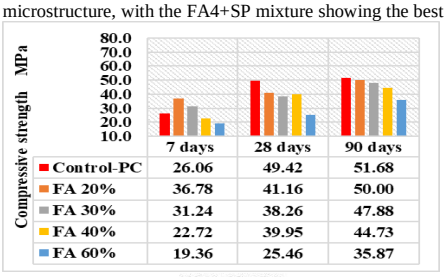
Pozzolanic Activity Index (PAI)

- Fly ash demonstrates good pozzolanic activity, especially up to 40%, but higher percentages (60%) reduce reactivity.

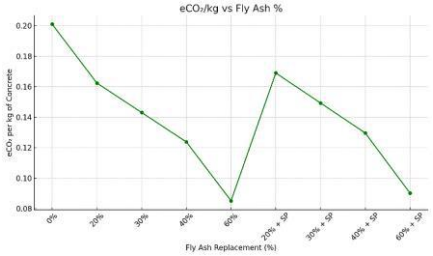
Compressive Strength

- Fly ash mixtures showed increased compressive strength with curing time, with FA4+SP showing the highest compressive strength at 90 days (71.72 MPa).
- Fly ash contributes positively to long-term strength development, with higher fly ash content improving the microstructure. However, excess fly ash (above 40%) may negatively impact early strength due to dilution effects.

- Superplasticizer improves strength by enhancing particle packing and microstructure, with the FA4+SP mixture showing the best results.



	7 days	28 days	90 days
Control-PC	26.06	49.42	51.68
FA 20%	36.78	41.16	50.00
FA 30%	31.24	38.26	47.88
FA 40%	22.72	39.95	44.73
FA 60%	19.36	25.46	35.87



Proj.No.11

Sustainable Concrete using Microsilica

Prepared by:

1- Hassanein Ali Omran Al-Khazraji, 2- Shahdan Nasser Hassan, 3- Maryam Fadel Sawadi
4- Doaa Musa Abdullah

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Sustainable Development Goals Performed: 9

Abstract

The study found that replacing 10–15% of cement with micro silica significantly improves concrete's compressive strength, durability, and resistance to chemicals. The best result was at 15% replacement, achieving 81 MPa at 28 days. Lower or higher ratios showed reduced effectiveness.

Methodology

This research examined the impact of silica fume (5%, 10%, 15% replacement) on concrete's mechanical and durability properties. Mixes used OPC, fine and coarse aggregates, potable water, and superplasticizers. Specimens were cast in standard molds—cylinders for compressive strength and prisms for flexural strength—then compacted using vibration and cured in water at $23 \pm 2°C$. Compressive strength was tested per ASTM C39 at 7, 28, and 56 days, while durability was assessed by chloride ion penetration using the Rapid Chloride Permeability Test (ASTM C1202).

Results and conclusions

Based on the experimental investigation conducted on concrete incorporating silica fume (micro silica), the following key findings were observed:

Optimal Replacement Level:
The optimal percentage of silica fume replacement from cement was found to be in the range of 10% to 15% by weight. Within this range, the bonding strength between the concrete particles significantly increased due to the pozzolanic reaction and filler effect of the fine silica fume particles.

Enhanced Properties:
The improved bonding resulted in enhancements across multiple properties of concrete, including:

- Mechanical properties: Higher compressive, tensile, and flexural strength.
- Physical properties: Reduced porosity and improved density.
- Chemical resistance: Better performance against sulfate attack, chloride ion penetration, and alkali-silica reaction (ASR).

Conclusion
The incorporation of silica fume at a replacement rate of 10–15% significantly improves the overall performance of concrete. It enhances bonding and microstructure, leading to superior strength and durability. This modified concrete is well-suited for use in structurally demanding and chemically aggressive environments. Additionally, the use of silica fume contributes to sustainability by reducing cement consumption and extending the service life of concrete structures, thereby reducing maintenance and repair needs over time.

Proj.No.12

Enhancing the Sustainability of Road Projects Using Innovative Soil Stabilization Solutions

Prepared by:

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152- Ali Raad Hamza
153- Humam Kazem Hadi Marzouk
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Supervised by:

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Sustainable Development Goals Performed: SDGs 9, 11, 12, and 13

Abstract

This study improved Babylon soil using 20% sugarcane ash and 1.5% polyester fibers, enhancing moisture content, compressive strength, and bearing ratio, supporting sustainable, cost-effective infrastructure solutions.

Methodology

Methodology The experimental program consisted of three phases:

1. Modifying natural soil with 20% and 25% sugarcane bagasse ash.
2. Mixing the optimal ash content (20%) with polyester fibers (1% and 1.5%).
3. Combining straw (10%, 20%) and polyester fibers for enhanced performance.

Three standard geotechnical tests were performed:

- Standard Proctor Test
- Unconfined Compression Test
- California Bearing Ratio (CBR) Test

The CRD statistical design and 27 total samples ensured accuracy.

Results and conclusions

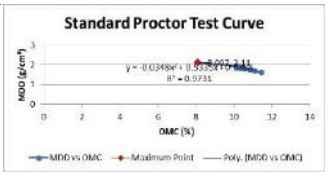
The experimental findings confirmed that the addition of sugarcane bagasse ash and polyester fibers significantly improved the geotechnical properties of Babylon soil.

In the **Standard Proctor Test**, the optimum moisture content (OMC) increased with higher ash and fiber content, reaching its peak at 11.47%. Conversely, the maximum dry density (MDD) slightly decreased due to the lower specific gravity of the additives.

Table (4): Unconfined Compressive Strength (UCS) for Different Soil Mixtures

Average	B2	B1	B0	B/A
0.46	0.597	0.457	0.33	A0
0.95	1.103	0.95	0.797	A1
1.29	1.347	1.303	1.21	A2
0.90	1.02	0.90	0.78	Average
0.0352				LSD0.05

The **Unconfined Compression Test (UCS)** showed a substantial rise in strength. The untreated soil had a UCS of 0.33 MPa, while the mixture with 20% ash and 1.5% polyester reached **1.347 MPa**, indicating a notable improvement in soil cohesion and structure.



In the **CBR test**, bearing capacity improved with each addition. The control sample had a CBR of 1.39%, whereas the optimal mix (A2B2) achieved **3.947%**, demonstrating enhanced resistance to surface loading.

Statistical analysis using the **Completely Randomized Design (CRD)** confirmed that the differences between treatments were statistically significant.

In conclusion, using **20% sugarcane bagasse ash and 1.5% polyester fibers** provides an effective and sustainable solution for improving weak soils. This method not only enhances the mechanical performance of the soil but also supports environmental goals by reusing agricultural and plastic waste. The study contributes to the development of **cost-effective, eco-friendly road infrastructure**, particularly in regions with poor subgrade conditions.

Proj.No.13

Study of the Effect of Recycled Materials on the Properties of Cement Mortar

Prepared by:

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162-	Duaa Ismail Wasme	163-	Mais Odai	164-	
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Supervised by:

42- Asst. Prof. Dr. Mayadah W. Falah

43- Asst. Lect. Nora AL-anssari

Sustainable Development Goals Performed:

Abstract

Abstract: This study investigates the effects of incorporating waste glass powder, ceramic waste, and fly ash as partial replacements for natural fine aggregate in mortar. The aim is to assess the feasibility of using these industrial and post-consumer by-products as sustainable alternatives in construction materials. Mortar specimens were prepared with 10%, 20%,30%,40% and 50% replacement levels for each material, and their performance was compared with a conventional control mix.

Methodology

Methodology : 21 mortar mixes were prepared with a cement-to-sand ratio of 1:3 and a water-to-cement ratio (w/c) of 0.4, to maintain workability. Sand was partially replaced with each material at five levels: 10%, 20%, 30%, 40% and 50% by weight.

All dry components were mixed uniformly.

- Water was added gradually while mixing continued for a total of 5 minutes.
- Mortar was placed in prismatic molds (40×40×160 mm) in two layers, compacted manually.
- Specimens were demolded after 24 hours and cured in water at 23 ± 2°C for 7, and 28 days.

Results and conclusions

Results and conclusions: Compressive Strength

Compressive strength was evaluated at 7 and 28 days. The results showed that:

- Glass Powder: At 10–20% replacement levels, glass powder enhanced compressive strength due to its pozzolanic reactivity and fine particle size, which contributes to pore refinement and improved bonding.
- Fly Ash: Provided a moderate strength gain at later ages due to its latent hydraulic properties. At early ages (7 days), strength was slightly lower than the control mix.
- Ceramic Waste: Generally showed lower strength values compared to the control, likely due to its inert nature and weaker bond with the cement matrix.

- Glass Powder (M1): Exhibited the highest pulse velocity among all mixes, suggesting improved internal structure and compactness due to pozzolanic activity and fine particle packing.
- Fly Ash (M2): Also demonstrated good quality, indicating its positive influence on microstructure, especially at later curing ages.
- Ceramic Waste (M3): Had the lowest UPV, which may be attributed to higher porosity and weak bonding within the matrix, consistent with its lower compressive strength and higher water absorption.
- Control Mix (M0): Provided a baseline with a "Good" quality classification.

These results corroborate previous findings from compressive strength and water absorption tests, showing that waste glass and fly ash enhance mortar quality, while ceramic waste requires optimization for better performance.

Proj.No.14

Investigated the behavior of hollow self-compacted concrete column

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170- Fadhel Abbas Jebur
171- Aqeel Saleh kh.
172- Mohammed Mahdi Abdulsahib
173- Alaa Mohammed Muhi
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Supervised by:

44- Asst. Prof. Dr. Mayadah W. Falah
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Sustainable Development Goals Performed:

Abstract

Abstract: The study aims to focus on the behavior of the reinforced concrete column under static load. In this research, the feasibility of using concrete waste as rubber in preparing new concrete mixes is studied. The waste concrete aggregate is referred to in this study as recycled Rubber. Five mixes are prepared in this study, one control mix with 100% natural rubber and four mixes containing replacement levels of Rubber starting from 5% to 20% by weight of coarse aggregate. The mixes are designed according to the Efnarc code; with a water-cement ratio of 0.47. Fresh concrete mixes regardless of concrete content were tested for their workability to test the effect of Rubber on the fresh state properties of concrete. Hard-state concrete was tested for its compressive strength at the age of 28 days.

In the present research, experimental studies have been devoted to investigating the behavior of self-compacting R/C short Hollow columns. The experimental work consists of the fabrication and testing of five reinforced concrete Hollow columns with a cross-section of **(150 x 150 mm)** and a total length **(450 mm)** which were tested under static load. One of them is a control column and four columns are using Rubber replacement with different percentages (5%, 10%, 15%, and 20%)

Methodology

Methodology : This study included preparation and testing of five columns were made and tested under static load. The cross section for all columns was 150 × 150 mm, and the columns have a total length (L) of 450 mm. Four Ø6 mm deformed bars were provided as longitudinal reinforcement and stirrups reinforcement (Ø4 mm) were provided. Figure (1) illustrates all details of geometry and loading schemes of the tested specimens.

In this study, the experimental program consisting of five samples: one control column without recycle aggregate for comparison with others columns, the four specimens consist with replacement of recycle aggregate, all specimens are Identified in Table (1).

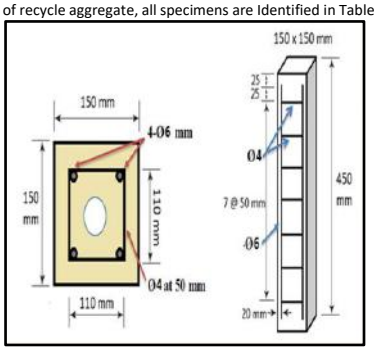


Figure 1: Geometry and Loading Scheme of Tested Specimens

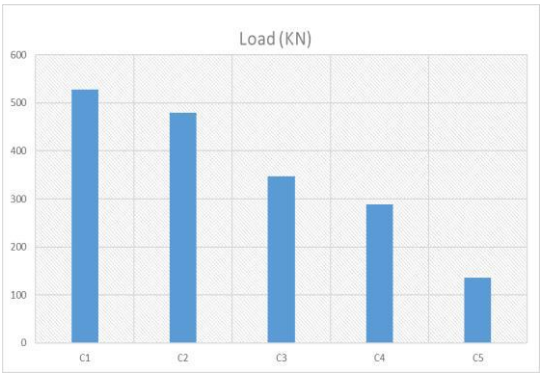
Table (1) Identified of the Specimens

No.	*Sample Name*	*Identification*
1	C1	column without any replacement (Control)
2	C2	Column with replacement (5%) Rubber
3	C3	Column with replacement (10%) Rubber
4	C4	Column with replacement (15%) Rubber
5	C5	Column with replacement (20%) Rubber

Results and conclusions

Results and conclusions: Based on the results obtained from the experimental work for reinforced concrete hollow columns with different percentage of rubber under static loading, the following conclusions can be stated within the scope of this study:

1. It was found that the replacement aggregate by 5% was records the best compressive strength, while replacement of 20% give lowest compressive strength comparison with control sample without replacement of natural coarse aggregates.
2. The first cracks loads were recorded at column C5 at lowest load comparison with control column without replacement.
3. The first cracks loads were recorded at column C2 at largest load comparison with control column without replacement.
4. The ultimate loads have decreased after replacement 5% of rubber by 9% comparison with control column, while replacement 20% of rubber reduced the ultimate load by (74) %.



Proj.No.15

Using recycled materials in the production of environmentally friendly concrete

Prepared by:

177- Ali Ammar Zeyarah 178- Mustafa Sadiq Dishar 179- Ameer Ahmed Saad
180- Haider Maitham Faleh 181- Sajad Daher Horon

Supervised by:
Assis. Lec. Raghda Ali Naser

Sustainable Development Goals Performed: 12

Abstract

Abstract: Recycled brick powder is defined as the result of grinding demolished or unused bricks into fine particles that are classified and tested to determine their suitability for structural applications. This powder has a chemical composition somewhat similar to cementitious materials, making it a suitable candidate for use in concrete mixtures as a partial cement replacement, especially in low substitution ratios such as 10%, 20%, or 30%.

Methodology

Methodology The research follows an experimental methodology, including:

- Preparation of brick powder from red brick waste through grinding and sieving.

- Designing concrete mixes with three cement replacement levels (10%, 20%, 30%), in addition to a reference mix.
- Conducting mechanical tests (compressive, tensile, and flexural strength) and physical tests (density, water absorption).
- Analyzing and comparing results with the conventional mix.

Results and conclusions

Results and conclusions: The experimental results obtained through mechanical and physical tests showed that using recycled clay brick powder as a partial substitute for cement can be feasible within certain limits. The mix with a 10% replacement of cement was able to achieve compressive and tensile strengths very close to the reference mix without replacement, while also providing significant environmental and economic benefits. On the other hand, higher replacement ratios (20%, 30%) led to clear reductions in mechanical properties due to the decreased cement content and limited pozzolanic activity. Effect of Brick Powder Replacement Ratio on Compressive Strength It was found that increasing the replacement ratio of cement with recycled brick powder results in decreased compressive strength, especially beyond the 10% threshold. This decline is attributed to the reduction in effective cement content, which forms the primary binding network in concrete. While the pozzolanic activity of brick powder contributes positively to the chemical reaction, its impact was limited in the early stages, though some improvement in properties was noted over time.

Proj.No.16

Name of Talyze common road problems and develop innovative strategies to improve their quality and performance .he Project

Prepared by:

182- علي سعد	183- كاظم كريم	184- طاهر علي
185- حيدر ضياء	186- علي مرتضى	187-
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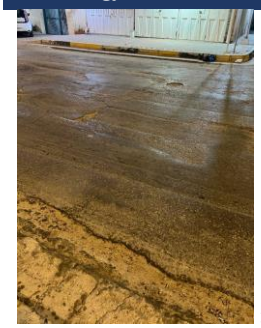
46- م.م حنين فاضل 47-

Sustainable Development Goals Performed:

Abstract

Road networks in many countries face ongoing challenges that negatively impact their efficiency and quality, such as cracks, potholes, surface erosion, and soil subsidence. This research aims to analyze these problems from an engineering and environmental perspective, focusing on influencing factors such as weather conditions, traffic density, and the quality of construction materials. The research also proposes innovative strategies to improve road quality and performance, such as the use of smart condition monitoring technologies and modern materials with higher efficiency and better resistance to environmental conditions. The research concludes by providing practical recommendations that contribute to improving road infrastructure management, reducing maintenance costs, and extending the operational life of road networks. This serves sustainable development and supports decision-making in relevant institutions.

Methodology



:Alligator Cracking (or Fatigue Cracking)
Occurs due to repeated thermal changes combined with a weak foundation.

Thermal Cracking (or Thermal Expansion and Contraction)
Appears as transverse cracks due to temperature changes.Raveling
Loss of cohesion between asphalt particles due to the effects of continuous loads and friction.

Localized depressions or settlements
Localized lowering of the road surface under the influence of high loads.To crack
The appearance of sunken paths in the road surface due to repeated heavy loads

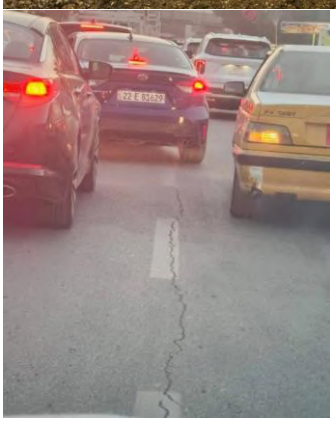
(Longitudinal & Transverse Cracks) 2. Longitudinal and transverse cracks
Result from repeated stresses from traffic and poor structural design

Results and conclusions

A comprehensive analysis was conducted of common road problems, identifying the factors influencing their occurrence, such as environmental factors, traffic, and the quality of materials used in Babil and Karbala Governorates.
The effectiveness of traditional maintenance methods was evaluated and their shortcomings were identified.
Innovative strategies and technologies were proposed to improve the quality of road construction and maintenance, such as the use of modern materials or smart digital solutions.
The economic and environmental impact of proposed technologies to improve road performance was studied……..
…and shrinkage)
causes thermal cracks in the asphalt layer.

The effects of water and rain
Poor drainage leads to water penetration and disintegration of the layers.

High groundwater levels or the presence of clayey soil lead to bulges or subsidence in the pavement layers……..



Proj.No.17

تقييم أداء الخلطة الأسفلتية بإضافة المايكروسيليكا إلى الأسفلت لتحسين الخصائص الميكانيكية للخلطة

Prepared by:

191- عباس فاضل	192- محسن محمد	193- محمد عبد الكريم
194- مرتضى احمد	195-	196-
197-	198-	199-

Supervised by:

48- م.م حنين فاضل 49-

Sustainable Development Goals Performed:

Abstract

Abstract:
Conventional asphalt mixtures are exposed to numerous problems resulting from high traffic loads and climate change, leading to rapid road deterioration. This research investigates the effect of adding microsilica—a nanomaterial with unique properties—to asphalt mixtures to improve their mechanical properties.
A series of laboratory tests were conducted, including stability tests, deformation resistance tests, elasticity tests, and thermal reflection resistance tests. Initial results showed that microsilica contributes to enhancing the mixture's performance in terms of durability, cracking resistance, and compression resistance.
The research recommends adopting optimal ratios of microsilica in the design of modern asphalt mixtures, which will positively impact road life, reduce maintenance costs, and achieve infrastructure sustainability.

Methodology

Results and conclusions

Materials Used:
Bituminous Asphalt: Penetration Grade 60/70 or as locally available.

Aggregates: Coarse and fine, according to local specifications (AASHTO or ASTM).

Microsilica: A fine material rich in silicon dioxide, added in varying proportions (e.g., 4%, 6%, 8%, 10% by weight of bitumen).

3. Mix Preparation:
Asphalt mix design using the Marshall Mix Design method.

Prepare a reference mix (without microsilica).

Prepare modified mixes by adding microsilica in the selected proportions.

Maintain the optimum asphalt ratio for all mixes, or adjust it if necessary based on interaction with microsilica.

4. Laboratory Testing:
A series of mechanical tests will be conducted to evaluate the performance of the mixes, including:

Marshall Stability and Flow Test

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Proj.No.18

Eccentric Retaining Wall Design

Prepared by:

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201- Rulla Mahdi Mohammed
202- Isra Salma
203- Saba Abdul Razzaq
204- Ibrahim Hasan
205- Zainab Sa'ad

Supervised by:
Prof. Dr. Najah M. L. Al- Maimuri

Sustainable Development Goals Performed: **Infrastructures**

Abstract

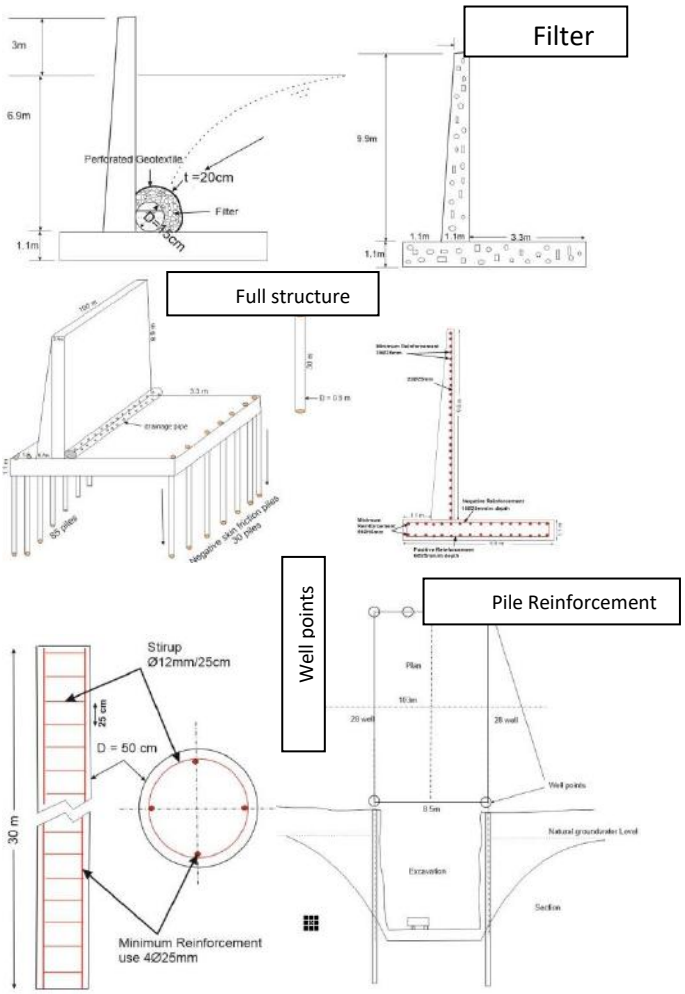
The project involved designing an 11 m high eccentric cantilever retaining wall challenged by groundwater at 6.9 m, compromising stability. To address this, 115 piles and drainage systems were added. The final design achieved safety factors of 3 for overturning and 19.7 for sliding, ensuring full stability.

Methodology

1- Geometrical Design
2- Vertical and horizontal forces calculations using the equation of earth pressure theory.
3- Check design against overturning moments using equilibrium equations.
4- Check design against bearing capacity using Meyerhof's theory.
5- Check against settlement limitations.
6- Design of piles foundation (the structure constitutes positive and negative skin frictions piles.
7- Design of Drainage system by using Manning's Equation.
8- Design of filter using sieve analysis and a standard procedure.
9- Design of well points system required to protect the project from the groundwater threads.

Results and conclusions

Results and conclusions:



Proj.No.19

Using Management Triangle to Measure the Performance of Construction of University New Campus Project

Prepared by:

206- Mohammed Khlaif Flaifel
207- Luqman Abbas Hani
208- Esraa Adel Mahdi
209- Karar Fawzi Hammadi
210- Haider Mohammed Hasan
211-

Supervised by:

50- Aqil Abd al-Hassan
51- Bareq A. Abdulhadi

Sustainable Development Goals Performed:

Abstract

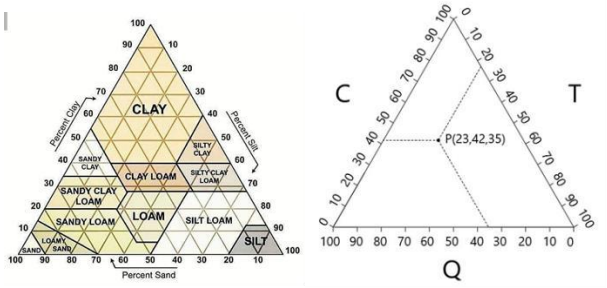
Abstract:
This study introduces a mathematical tool using the management triangle to evaluate project performance based on time, cost, and quality priorities. Applied to ten construction projects in Hilla, Iraq, results show quality as the top priority, followed by time and cost, with an average deviation of 19.7 indicating unbalanced priorities.

Methodology

Methodology The methodology of this research includes two main parts:

Theoretical part: A literature review is conducted to introduce the traditional management triangle, focusing on time, cost, and quality.

Practical part: A field survey is carried out on an actual construction project to measure the three key components—time, cost, and quality—allowing the proposed method to be practically applied and analyzed.



Results and conclusions

Results and conclusions:
Following are the conclusions that can be obtained from this study:

1- The triangle of management can be used to represent numerically the performance of the construction projects. From this representation the priorities of time saving, cost saving and quality satisfaction can be obtained for each project. The deviations from the ideal case (achieving ideal time, cost and quality requirements) can be obtained also.

2- An application is made on ten construction projects executed in Iraq-Hilla . Results showed that quality is the first priority followed by time and the last priority is the cost requirement. The mean value of the deviation in all construction projects is 19.7 which is reflecting the unbalancing in priorities.

Proj.No.20

Assessing the Impact of Recycled Concrete Aggregate on the Mechanical Properties of Hot Mix Asphalt Mixtures

Prepared by:

212-	Yasir Hasan Hendi	213-	Mazin Hatem	214-	Wurood Faris Sattar
215-	Mohammed Hussein	216-	Sajad Dhahir	217-	Ali Khudair
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Supervised by:

52- Senior Lecturer Tameem Mohammed H. 53- Assistant Lecturer Fatima Muslim

Sustainable Development Goals Performed:

Abstract

Recycling concrete waste not only addresses waste disposal challenges but also reduces the need for quarrying virgin aggregates. Incorporating recycled concrete as a hot-mix asphalt (HMA) aggregate presents a cost-effective and environmentally friendly solution, particularly advantageous for the construction of low-volume roads.

Recycled Concrete Aggregate (RCA) differs from natural aggregate due to the presence of residual cement paste and contaminants, which contribute to its low density and high porosity. These characteristics often result in poor engineering properties, which is the primary reason RCA is generally not recommended as an aggregate for Hot Mix Asphalt (HMA).

In this study, the performance of HMA mixtures incorporating RCA was quantitatively evaluated based on volumetric properties. Asphalt mixtures were prepared with four different RCA content levels (0%, 20%, 40%, and 60%) by weight of the total aggregate. The mix design results revealed that RCA is highly absorptive. As the percentage of RCA increased in the mix, the optimum asphalt content also increased linearly, resulting in reduced stability, flow, and density, along with a higher air void content.

Methodology

RCA is major part of industrial waste. In general, after appropriate processing more the major part of materials meets the technical properties for reuse information about RCA to promote its usage as providing confidence in increase a road construction aggregate regarded as an impact. RCA terms of its engineering material with limited economic potential, can be identified as potentially having suitable material characteristics for a surface coarse aggregate and may provide an ideal solution to minimize the problems of raw materials exhaustion while providing other benefits. Since the last decade, Iraq various economic and environmental campaign especially in the construction field. Witnessed wide development industry to reduce costs there is an increasing pressure on the end improve the quality of our environment. The fact is that both of these goals can be achieved at the same time. This project focused on utilization of RCA in hot mix asphalt for surface layer.

For this purpose, the waste concrete was crushed manually and tested to determine their properties, to be used as coarse aggregate in the mixtures through blending with four different percentages of RCA (0%, 20%, 40%, & 60%) then the prepared specimens tested by Marshall test to determine their volumetric properties (Stability, Flow, Air voids, and Bulk sp.gr)

Results and conclusions

- Total air voids content increases by increasing the percent of RCA in the mix, that can be explained through higher absorption of bitumen by RCA particles in comparison with virgin aggregate particles, causing high air content in the mix.
- Stability value decreases by increasing the percent of RAC in the mix, due to low cohesion powers between the particles in the recycled mixtures, as a result of decreasing the free bitumen in the mix by adding RCA.
- Bulk specific gravity decreases by increasing the percent of RAC in the mix, due to increase the air content by increasing the percent of RCA.
- Flow values initially increased at (20% & 40%) of RCA, then it starts to decrease at 60% of RCA and it will continue to decrease by increasing the percent of RCA.

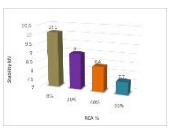
In term of conclusion

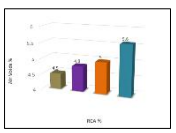
1.Total air voids content increases by increasing the percent of RCA in the mix. At 20% RCA the air voids increased by 6.6%, at 40% RCA air content increased by 11.11%, and at 60% RCA the mentioned value increased by 24.44%.

2.Stability value decreases by increasing the percent of RAC in the mix. At 20% RCA stability value decreased by 10.9%, at 40% RCA stability value decreased by 16.83%, and at 60% RCA the mentioned value decreased by 23.76%. All the values of stability in the recycled mixtures at (20%, 40% & 60%) RCA are within the limits of Iraqi standards (SCRB, R/9 2003).

3. Bulk specific gravity decreases by increasing the percent of RAC in the mix. At 20% RCA density value decreased by 2.6%, at 40% RCA density value decreased by 3.91%, and at 60% RCA the mentioned value decreased by 2.6%.

4. Flow values initially increased by (15.38%) at (20% & 40%) of RCA, respectively. At 60% RCA flow value increased by 7.7%. All the flow values in the recycled mixtures at (20%, 40% & 60%) RCA are within the limits of Iraqi standards (SCRB, R/9 2003).





Proj.No.21

Study of the effect of marble cutting plant waste as an alternative to coarse aggregate on some properties of concrete.

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Prepared by:		
1- Farhan Attia Saguf	2- Ahamd Mohamed Najim	3- Farkad Abass Hamza
4- Azhar Ali Daily	5- Hussain Talib Hussain	6- Aziz Raheem Hadi
7-	8-	9-

Supervised by:	
1- Assist Lect. Merzah K . Imran	2- Assist prof. Dr Omran Issa Mohammd

Sustainable Development Goals Performed:	

Abstract

Abstract:

……..

In This experimental study presents the variation in the strengths (compression and tension) of concrete when replacing aggregates by waste marble from 0% to 80% in steps of 0%, 20%,40%,60% & 80%. They were tested the mix at each of the ages 7, 14, and 28 days . C30 grade of concrete mix design is taken for study.

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Methodology

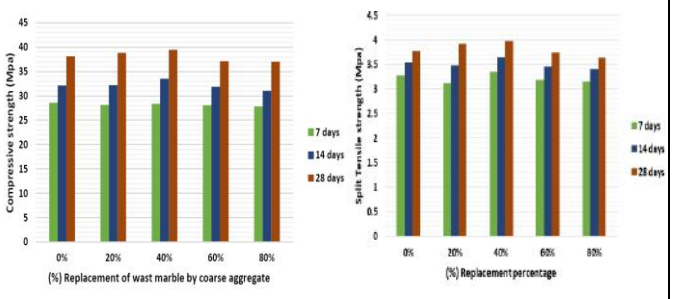
Various materials to be used in this research include Cement,Coarse Aggregate,Waste Marble Aggregate ,Fine Aggregate and Admixture. To investigate the effect of waste marble on concrete, five different specimens were casted , cure and tested at an interval of 7 days, 14 days and 28 days. After the evaluation of their strength the results were compared to control mix concrete A design mix C30 grade was adopted to prepare test samples.

. Experimental variables were: Compressive strength.and Splitting tensile strength.

Results and conclusions

This research is an experimental approach to substitute natural aggregates by the waste marble aggregates; the concern is more scientific than economical and environmental. The results obtained demonstrated the performance of various concrete mixtures which may help to understand the behaviour of these marble aggregates From our project we have obtained the maximum compressive and tensile values for 40% replacement of aggregate with marble. Analysis of these results has revealed that the appropriate incorporation of marble waste aggregates can lead to interesting characteristics in terms of strength, indeed the use of marble aggregates resulted in a considerable increase in the compressive and tensile strength.

It can be concluded that, marble waste as coarse aggregate can be used to improve the mechanical properties of conventional concrete. From the economic and environmental point of view this waste can be successfully used as coarse aggregates in concrete production.The marble waste can be used as alternative aggregates for concrete and for many other purposes such as bricks manufacturing, road construction and landfills.



PART FOUR

PROJECTS OF

Chemical Engineering and Petroleum Industries Department

Converting Food Waste into Energy through Anaerobic Digestion

Proj.No.1

Prepared by:

3.منتظر حيدر علي

Supervised by: Dr. ABBAS JAWAD SULTAN

Sustainable Development Goals Performed: Goal 12: Responsible Consumption and Production

Abstract:

Anaerobic digestion (AD) is a biochemical process that converts organic food waste into biogas and digestate under oxygen-free conditions. This process involves four key stages—hydrolysis, acidogenesis, acetogenesis, and methanogenesis—that break down complex matter into methane (CH_4) and carbon dioxide (CO_2).

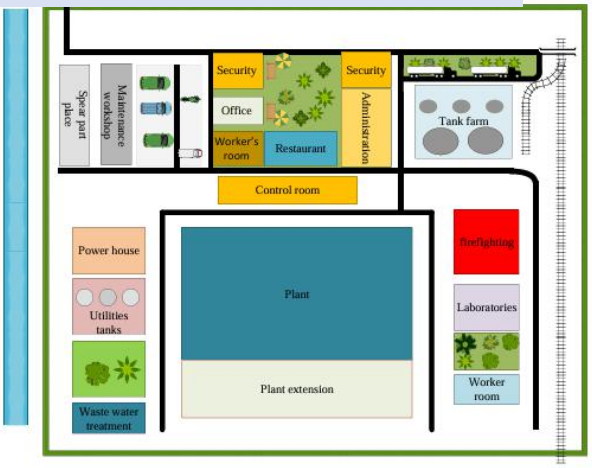
From 1,000 kg of food waste (80% moisture), the process yields approximately 153 m^3 of biogas (60% CH_4 and 40% CO_2), with an energy potential of 920 kWh. It also produces 64 kg of solid digestate and 800 kg of liquid effluent, both useful as biofertilizer.

Biogas yield efficiency depends on factors like waste composition, ~80% VS degradation, temperature, pH, and retention time. This highlights AD as a sustainable, waste-to-energy solution for renewable energy generation and organic waste management.

Methodology:

- This study focuses on biogas production from food waste using a Continuous Stirred Tank Reactor (CSTR). The methodology includes:
- Feedstock Preparation: Food waste (fruits, vegetables, dairy, meat) was collected, sorted to remove non-biodegradable materials, and shredded for better digestion.
- Reactor Operation: The CSTR operated at mesophilic temperature (35–40°C) with continuous stirring to ensure uniform mixing.
- Anaerobic Digestion Stages: The process included hydrolysis, acidogenesis, acetogenesis, and methanogenesis to convert waste into methane and carbon dioxide.
- Process Control: Key parameters such as pH (6.5–7.5), retention time (20–30 days), and carbon-to-nitrogen ratio (20:1–30:1) were monitored and maintained.

Biogas composition (methane and CO_2) was measured, and digestate was analyzed for ilizer



Results

The reactor and heat exchanger were designed based on standard chemical engineering principles, including thermal, mechanical, and economic considerations. Presents the design of a Continuous Stirred Tank Reactor (CSTR) and a Shell and Tube Heat Exchanger. The CSTR has a 0.5 m^3 volume and operates at 1.1 bar, with a 2025 estimated cost of $17,282. The preheater is a horizontal exchanger with counter-current flow, 2 m^2 heat transfer area, and an estimated cost of $105,431. Both designs considered key factors such as dimensions, pressure, heat transfer, and updated cost estimates.

Proj.No.2

Enhancement of Refinery Furnace Efficiency by using Different Design Parameters.

Prepared by:		
1.ياسين خضير عباس	2. كرار اسماعيل عباس	3.منتضر عقيل عبدالرزاق
4. كاظم جاسم ابراهيم		

Supervised by: Dr. Khalid Omran Ali

Sustainable Development Goals Performed:	Goal 7: Affordable and Clean Energy

Abstract: This research explores the enhancement of refinery furnace efficiency through the implementation of various design parameters. Key factors affecting furnace performance, such as combustion efficiency, heat losses, and thermal flow management, were analyzed. A case study on material and energy balance was presented, with calculations estimating operational efficiency and heat loss reduction. Additionally, the environmental impacts of furnace operation, including greenhouse gas emissions, thermal pollution, and waste management, were examined along with mitigation strategies. The study recommends the adoption of heat recovery technologies, low-emission combustion systems, and the integration of clean energy sources to improve furnace efficiency and minimize environmental impact.

Methodology:

This study adopts a combination of theoretical analysis, process simulation, and case study evaluation to assess the impact of different design parameters on furnace efficiency.

1. Literature Review:

- A comprehensive review of past studies related to refinery furnace efficiency, including design advancements, energy-saving techniques, and CFD-based optimization models.

2. Material and Energy Balance Calculations:

- Development of a material balance model
-
- to quantify fuel input and product output.
- Establishment of an energy balance model to determine heat losses and efficiency metrics.

3. Case Study Analysis:

- Selection of an industrial refinery furnace as a reference system.
- Performance assessment based on real operating data and comparison with proposed modifications.

Results:

this established a comprehensive energy balance model for a refinery furnace operating under steady-state conditions. The total energy input from fuel combustion was calculated as 54.35 GJ/h, with 85% of this energy (46.2 GJ/h) effectively utilized in heating crude oil from 150°C to 370°C. The remaining energy was lost through:

Flue gases: 10% (5.43 GJ/h)

Radiation and convection: 5% (2.72 GJ/h)

The energy balance clearly demonstrates the furnace's efficiency and highlights areas for potential improvement. Strategies such as waste heat recovery, air preheating, and enhanced insulation materials can significantly reduce energy losses and enhance thermal efficiency. By addressing these losses, the refinery can optimize fuel consumption, reduce emissions, and lower operational costs.

Proj.No.3

PRODUCTION OF DIMETHYL ETHER (DME) (50,000 TON/YEAR)

Prepared by:	
ناس عبدالحسن عطشان	
عفر علي	

Supervised by: Dr. Abass Jwad Sultan

Sustainable Development Goals Performed: Goal 7: Affordable and Clean Energy

Abstract: Dimethyl ether (DME) is an organic compound with the formula of CH3OCH3 , used primarily as a propellant. It is miscible with most organic solvents and it has a high solubility in water. Recently, the use of DME as a fuel additive for diesel engines has been investigated due to its high volatility (desired for cold starting) and high cetane number. A feasibility study on the production of 99 wt% dimethyl ether (DME) is to be performed. The plant is capable of producing 50,000 tons of DME per year. The goal is to design a grass-roots facility, which safely and efficiently produces DME. The production of DME is via the catalytic dehydration of methanol over an amorphous alumina catalyst treated with 10.2% silica. A methanol conversion of about 80% is achieved in the reactor.

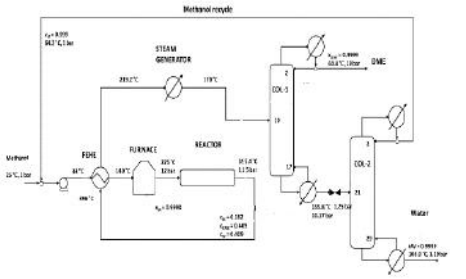
Methodology:

ethodology

In this study, dimethyl ether (DME) is produced via the methanol dehydration method due to its high yield, cost-effectiveness, and ability to produce DME with purity up to 99.99%. The process starts with mixing fresh and recycled methanol, followed by preheating through a feed-effluent heat exchanger (FEHE) and complete vaporization in a furnace. The vapor then enters a fixed-bed gas-phase reactor operating at 250–400 °C and up to 20 bar, where methanol is partially converted to DME and water. The reactor effluent is used to preheat the feed and generate steam for downstream distillation. The hot vapor enters the first distillation column (COL-1) at 10 bar to separate high-purity DME as a top product. The bottom stream (methanol and water) proceeds to the second column (COL-2), where methanol is recovered and recycled, and water is removed as a by-product. The methodology ensures thermal efficiency by heat integration and is illustrated in Figure

Results:

The



material balance for the production of dimethyl ether (DME) was based on a production capacity of 50,000 tons per year and 330 working days, yielding a DME output of approximately 135.87 kmol/hr at 99% purity. The primary reaction converts methanol (MeOH) into DME and water in a 2:1:1 molar ratio, with a methanol conversion of 80%. Accordingly, the fresh MeOH feed to the reactor was 339.67 kmol/hr, resulting in outlet streams of 135.87 kmol/hr of DME, 135.87 kmol/hr of H_2O, and 67.93 kmol/hr of unreacted MeOH. In the first distillation column, DME was separated at 99% purity with 1.37 kmol/hr of MeOH as an impurity in the top stream, while 66.56 kmol/hr of MeOH and 135.87 kmol/hr of water were recovered in the bottom stream. The second column separated 95% of the water (129.08 kmol/hr) as bottom product, while the remaining 6.79 kmol/hr of water and all the MeOH (66.56 kmol/hr) were recycled. This led to a recycle ratio of 19.6%, reducing the required fresh MeOH feed to 273.11 kmol/hr. After mixing with the recycled MeOH, the total feed to the reactor remained at 339.67 kmol/hr. The system was confirmed to be balanced, with all inlet and outlet moles accounted for, ensuring a stable and continuous production process.

Proj.No.4

Production of anti-viral, anti-bacterial and anti-infectious solid surface paints

Prepared by:		
1. امير قحطان	3. سكينة فريد	
2. كرار مكي	4. زيد خالد	

Supervised by: Assistant Professor Dr. Fawzi Abdel Rahman Hamadi Al-Qaessi

Sustainable Development Goals Performed:	Goal 3: Good Health and Well-being

Abstract:

The growing global demand for cleaner and safer environments has led to the advancement of anti-viral, anti-bacterial, and anti-infectious surface paints that actively inhibit the growth and transmission of harmful microorganisms. This research investigates the formulation of these innovative coatings, which utilize modern technologies such as nanoparticles (e.g., silver, copper, titanium dioxide) and photocatalytic agents to create self-sanitizing surfaces with long-lasting antimicrobial properties. These paints are designed not only to be effective against a wide range of pathogens—including SARS-CoV-2, E. coli, and Staphylococcus aureus—but also to minimize cross-contamination risks in healthcare facilities, public spaces, and homes. The study emphasizes the materials and mechanisms that enhance their antimicrobial performance, along with experimental evaluations of their efficiency and safety. With further development, these coatings are expected to play a transformative role in public health by enabling the widespread adoption of smart, self-cleaning, and hygienic surfaces.

Methodology:

This study focuses on developing antiviral and antibacterial surface coatings by formulating paints that combine resins with nanomaterials such as silver nanoparticles, copper oxide, titanium dioxide, and graphene. The production process involves selecting raw materials, mixing them for uniform dispersion, and adjusting properties like viscosity and adhesion. The coatings undergo rigorous laboratory testing to evaluate their antimicrobial effectiveness against bacteria like E. coli and Staphylococcus aureus, as well as viruses such as SARS-CoV-2. Tests also assess physical properties including hardness, chemical resistance, and durability under environmental stresses like humidity and UV exposure. Following successful lab validation, the coatings are produced industrially with strict quality control and safety certifications, then applied in real-world settings such as hospitals and public spaces to reduce microbial contamination and improve hygiene.

Material Balance Results

Unit	Input (Kg/day)	Output (Kg/day)	Notes
Feed Tank (T-101)	7000	5950	60% Alkyd resin (4200 kg) 10% TiO_2 pigment (700 kg) 10% Cobalt Naphthenate (700 kg) 5% Formaldehyde (350 kg)
Weight Tank (WE-101)	5950	5950	Mixture from feed tank
Mixer (M-101)	5950	5950	Continuity maintained
Ball Mill (BM-101)	5950	5950	No loss
Mixer (M-102)	5950 + 1050 (Solvent Toluene) = 7000	7000	Added 15% Toluene (1050 kg)
Hopper (HO-101)	7000	7000	Final product

Proj.No.5 The use of solar energy in heating industrial processes

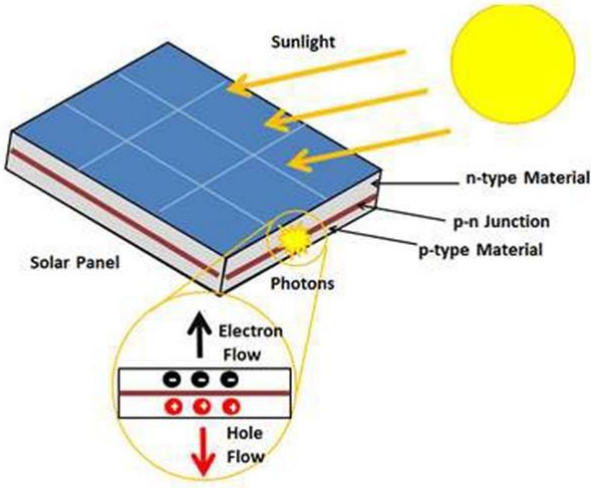
Prepared by:		
1. كرار رزاق	3. محمد حسين	
2. حسين عزيز	4. مرتضى حسين	

Supervised by: Assist .Pro. Dr.Alaa Dhari Jawad

Sustainable Development Goals Performed: Goal 7: Affordable and Clean Energy

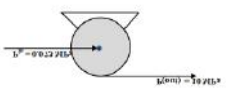
Abstract

The utilization of solar energy for industrial process heating offers a sustainable alternative to fossil fuels, addressing both energy efficiency and carbon emission reduction goals. Industrial processes—especially those requiring low to medium temperature heat (up to 400°C)—present a significant opportunity for solar thermal integration. This research investigates the technical feasibility, performance potential, and economic viability of incorporating solar thermal systems into industrial operations. Technologies such as flat-plate collectors, evacuated tube collectors, and concentrating solar systems (e.g., parabolic troughs and linear Fresnel reflectors) are examined for their capacity to meet varying thermal demands.



Methodology:

This study utilizes a direct solar thermal system based on parabolic trough collectors to heat a heat transfer fluid (HTF) up to 390–400 °C, suitable for industrial applications. A single-tank thermocline thermal energy storage (TES) system with mixed media (rock and sand) is integrated to reduce costs and ensure energy availability during non-solar hours. The TES delivers hot HTF at 275 °C to the power block, enabling the production of superheated steam at 325 °C and 40 bar for electricity generation via a Rankine cycle. This approach offers improved efficiency, cost-effectiveness, and reliable thermal performance for continuous process operation.



Condenser Design

Horizontal centrifugal pump was designed to operate at an outlet pressure of 10 MPa, with an equivalent pipe length of 22 meters and inlet/outlet diameters of 0.016 m and 0.041 m, respectively. The total head was calculated to be 43 meters, and the mechanical design was completed. The updated cost of the pump for the year 2025 is approximately $141. The condenser was designed as a shell-and-tube heat exchanger to condense steam using cooling water, with a heat duty of 2.03 MW and a required heat transfer area of 18.3 m². Cupro-Nickel tubes were selected with an outer diameter of 20 mm and a length of 4 m, totaling 74 tubes. Heat transfer coefficients for both tube and shell sides were calculated, along with the mechanical thickness of the shell and head. The total estimated cost of the condenser in 2025 is approximately $12,162.

Environmental Effect

Solar energy is clean during use but its production involves energy use and hazardous materials. Large plants may affect land, water, and wildlife. Still, it remains a more sustainable alternative to fossil fuel

Proj.No.7

Using Biomembrane Technology to Treat Water Discharged from Electric Power Plant

Prepared by:		
1. احمد محمد عبدالزهرة	3.حسين ايسر	
2. حسين فالح	4.جعفرحسن محمد	

Supervised by: Dr. Mahdi Shenshel Jafar

Sustainable Development Goals Performed:	Goal 6: Clean Water and Sanitation

Abstract: This project examines the use of Biomembrane Technology to treat wastewater from electric power plants, which consume large amounts of water and discharge pollutants like chemicals, heavy metals, and organic materials. These pose serious environmental and health risks, making treatment essential for sustainability. The study reviews physical, chemical, and biological treatment methods. While physical and chemical methods are partially effective, Biomembrane Technology, especially Membrane Bioreactors (MBRs), stands out for combining biological degradation with filtration, achieving high efficiency and water reuse potential. The project covers pollutants, treatment technologies, mass and energy balances, equipment design, environmental impacts, and plant layout. It supports SDG 6 (Clean Water and Sanitation) by promoting sustainable, low-energy, and efficient wastewater solutions.

Methodology:

The design methodology for the submerged Membrane Bioreactor (MBR) system involved calculating the required membrane area based on the target flowrate and net flux, including a safety factor to account for fouling and aging. Commercial membrane modules were selected and configured for submersion in the bioreactor's aerobic zone, ensuring proper aeration and scouring to maintain membrane permeability. The aeration system was designed separately for biological treatment and membrane cleaning, calculating the necessary airflows and blower power requirements.

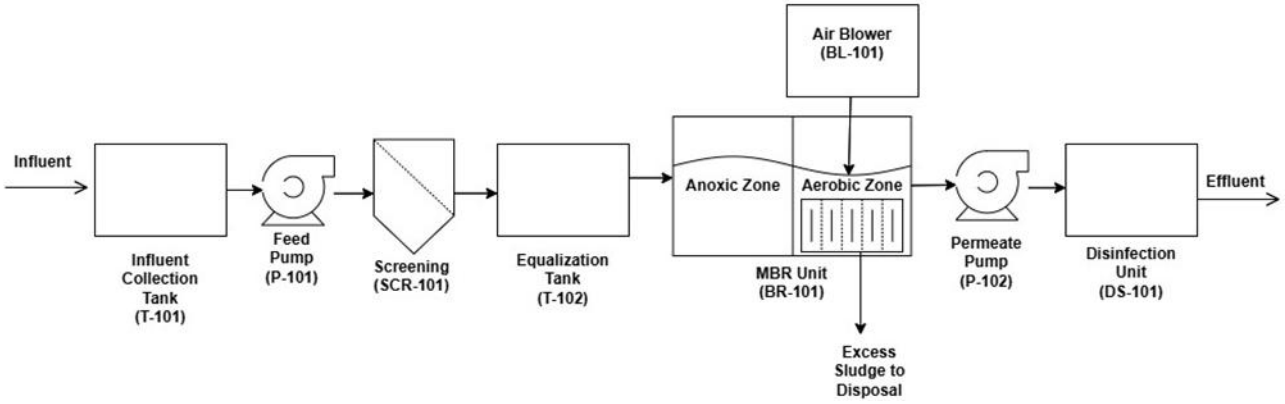
A variable-speed blower was specified to deliver sufficient air at the required pressure, integrated with a PLC control system for monitoring and optimization through dissolved oxygen feedback. This systematic approach ensured an efficient, scalable, and operable MBR design.

Equipment Design

The submerged MBR system treats 1 m^3/h with a membrane area of 60 m^2 using three modules, operating 20 hours/day at ≤0.5 bar TMP. Aeration includes 5.35 m^3/h for biological treatment and 15 m^3/h for membrane cleaning, supplied by a 25 m^3/h blower with 0.6 kW power, controlled via PLC with oxygen sensor feedback, using fine and coarse bubble diffusers for efficient operation.

Results and conclusion:

The wastewater treatment system is based on an MBR unit with a capacity of 1000 L/h, comprising initial pretreatment that removes about 5% of total suspended solids (TSS), followed by biological treatment which reduces 91% of BOD_5 and 75% of ammonia, producing around 0.77 kg of sludge daily. The treated water then passes through membrane filtration removing 95% of remaining BOD_5, 98% of TSS, and 50% of ammonia, followed by a disinfection stage that achieves 99.9% microbial inactivation with additional BOD_5 reduction. Influent pollutant concentrations start around 200 mg/L TSS, 85 mg/L BOD_5, and 8 mg/L ammonia, and are reduced to less than 4 mg/L TSS and below 1 mg/L BOD_5 and ammonia in the treated effluent, ensuring high-quality water that meets environmental standards.



Proj.No.8

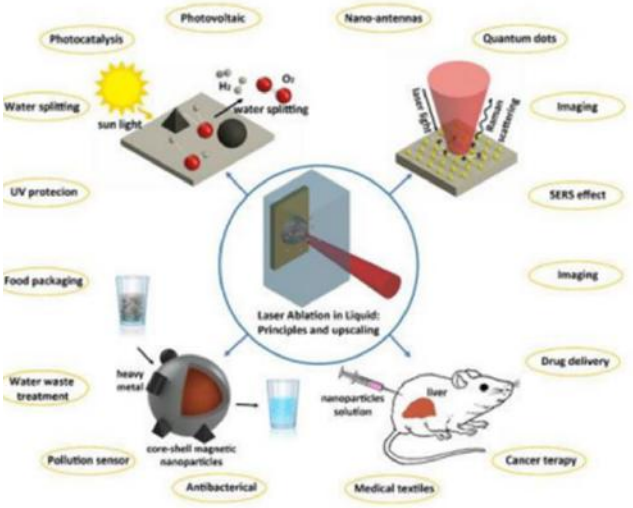
Oxide Nanoparticle Synthesis Using Pulse Laser Ablation And Optical Physicochemical Analysis

Prepared by:		
1. حيدر جواد كاظم	2.علي عباس جابر	3. عبدالله داخل عبود
Supervised by:Nooruldeen Saad Abis		

Sustainable Development Goals Performed:	Goal 9: Industry, Innovation, and Infrastructure

Abstract :

This research focuses on synthesizing oxide nanoparticles (NPs) using the Pulse Laser Ablation in Liquid (PLAL) method, a clean and versatile technique. It examines how process parameters affect NP formation and analyzes their structural, optical, and chemical properties, emphasizing quantum effects and surface defects. Mass and energy balances were performed to evaluate process efficiency, and a site selection strategy was proposed for scaling up production. The study advances sustainable, precise synthesis of oxide NPs for applications in biomedicine, photonics, and energy.

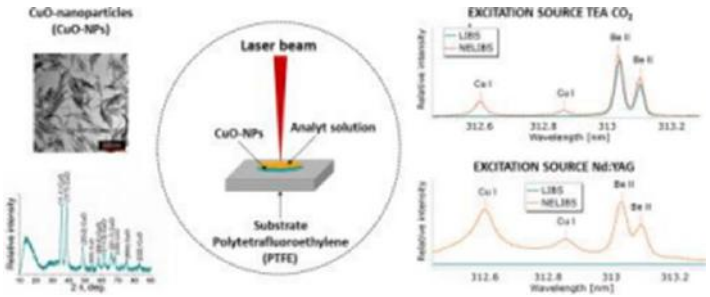


Methodology :

Nanoparticles of metal and metal oxides were synthesized using the Pulsed Laser Ablation in Liquid (PLAL) technique, where a solid target immersed in deionized water or aqueous solution was irradiated by a pulsed Nd:YAG laser (wavelengths 1064 nm and 355 nm, pulse duration 3-6 ns, repetition rate 10 Hz). The target was rotated to ensure uniform ablation, producing plasma that cools to form nanoparticles suspended in the liquid. Laser parameters such as pulse energy, wavelength, and number of pulses were adjusted to control nanoparticle size and yield, with size monitored by spectroscopic analysis of atomic emission lines. The produced nanoparticles were collected on substrates for characterization by Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM) to examine morphology and size. Additionally, optical emission spectroscopy, laser-induced fluorescence, and laser-induced breakdown spectroscopy were used to analyze plasma properties and elemental composition. This PLAL method enables chemical-free, controlled synthesis of pure metal and metal oxide nanoparticles with tailored size and structure.

Results and conclusions :

The material and energy balances for pulsed laser ablation of a zinc target in water were analyzed, showing that 0.15 g of zinc was ablated in 30 minutes, producing a nanoparticle concentration of 3 g/L. The total laser energy input was 1800 J, corresponding to an energy consumption of 12,000 J per gram of nanoparticles produced. Laser-to-plasma conversion efficiency ranged from 20–30%, with 50–60% energy lost due to heat and scattering, resulting in about 540 J of effective energy for nanoparticle generation. Theoretical models, including the Bernoulli equation, accurately predicted water jet velocities, and higher laser pulse energies increased plume thickness and length. Although PLAL is more energy-intensive than conventional chemical synthesis, it produces high-purity nanoparticles without chemical reagents and offers potential efficiency improvements through advanced laser parameters and heat recycling techniques.



Proj.No.9

Removal of Heavy Metals from Industrial Wastewater in Petroleum Refinery

Prepared by:		
1. زينب حيدر محمد	2. فرح زيد سامي	3.ابراهيم صلاح علي

Supervised by: Dr. Abbas Khaleel Ibrahim Al-Gburi

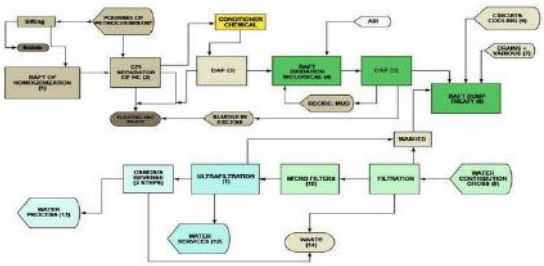
Sustainable Development Goals Performed:	SDG 14: Life Below Water

Abstract:

The treatment of heavy metals in petroleum refinery wastewater (PRWW) is vital due to the toxic and persistent nature of metals like arsenic, cadmium, and lead. Traditional methods are often costly and environmentally damaging, leading to a shift toward more sustainable techniques. This study reviews key treatment methods such as chemical precipitation, adsorption, membrane filtration, and bioremediation, highlighting their effectiveness and environmental impact. It emphasizes the development of cost-effective, eco-friendly solutions to help refineries meet regulations and minimize their ecological footprint.

Methodology:

The methodology of this study involves a comparative analysis of treatment technologies used to remove heavy metals from petroleum refinery wastewater (PRWW). A systematic literature review was conducted to identify common contaminants and evaluate the performance of methods such as chemical precipitation, membrane filtration, coagulation–flocculation, and air flotation. Each method was assessed based on removal efficiency, operational cost, sludge generation, and environmental impact. Particular focus was given to chemical and membrane-based techniques due to their widespread use and potential for sustainability. The study also considered the feasibility of applying these methods at industrial scale, aiming to support cleaner production and compliance with environmental regulations.



Results and conclusions

The primary wastewater stream generated from the oil refinery is characterized by a high content of organic and inorganic pollutants. The average flow rate of this stream was recorded as 10.68 m^3/h. The Total Suspended Solids (TSS) concentration was found to be 55.2 mg/L, while the Total Dissolved Solids (TDS) reached a significantly higher value of 4800 mg/L. The Chemical Oxygen Demand (COD) of the stream was measured at 452 mg/L, indicating the presence of oxidizable organic compounds. Furthermore, the Biological Oxygen Demand (BOD_5) was determined to be 145 mg/L, suggesting a considerable amount of biodegradable organic matter. The Oil and Grease (O&G) content in the wastewater was found to be 14.6 mg/L, reflecting the nature of the stream as a byproduct of petroleum processing activities.

Proj.No.10

Recycling of polymer product for Sustainability of raw material

Prepared by:		
1. قاسم عباس حسن	2. سجاد محمد زويد	3.مصطفى قاسم علي

Supervised by: Dr. Anwar Qasim Saeid

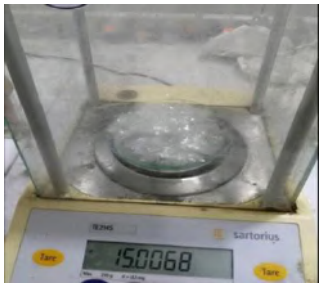
Sustainable Development Goals Performed:	Goal 13: Climate Action

Abstract:

Waste LDPE samples were degraded between 475–600°C using thermal and catalytic pyrolysis with silica-alumina catalyst.The Liquid product yield increased with temperature up to 550°C for both methods, with catalytic pyrolysis reducing the reaction time. Different catalyst ratios (4:1 and 8:1) were tested, where the 4:1 ratio gave higher yields while the 8:1 ratio caused a decrease. FT-IR analysis confirmed the presence of various functional groups in the liquid products, consistent with GC-MS results. The maximum product yield was achieved at 550°C using the 4:1 catalyst ratio.

Methodology:

In the practical part of this project, waste low-density polyethylene (LDPE) bottles were collected, cleaned, dried, and shredded into small pieces. Six 15 g samples were pyrolyzed at varying temperatures ranging from 450 °C to 600 °C using a controlled oven. During pyrolysis, the plastic decomposed into liquid, solid, and gaseous products, which were then separated and weighed using a sensitive balance. Mass and heat balances were calculated based on the material outputs and energy inputs, and the results showed that increasing temperature favored higher liquid yield with reduced solid residue. Physical property comparisons between LDPE and the resulting liquid fuel were conducted. Additionally, a continuous pyrolysis reactor was designed, including reactor volume estimation and heat transfer analysis. The design extended to a jacketed vessel, where internal and external heat transfer coefficients, as well as the overall heat transfer coefficient, were calculated using thermodynamic and fluid mechanics equations. Results were validated using mass and heat balance diagrams to confirm the efficiency of the system.



Results and Conclusions:

The reactor cost, with a volume of 0.5464 m^3 and dimensions of 0.8861 m in diameter and length, was calculated considering material and pressure factors, resulting in an adjusted cost of approximately $900.67 in 2017. The results showed that the pyrolysis of LDPE requires a long time to complete below 500°C, with liquid product yield increasing as temperature rises, reaching a maximum at 550°C. Catalytic pyrolysis enhanced the product yield, with the highest yield obtained at a 4:1 catalyst-to-LDPE ratio using silica-alumina catalyst at 550°C. The pyrolysis products mainly consist of alkanes, alkenes, aldehydes, ketones, and carboxylic acid functional groups. For future work, it is suggested to produce fuel oil from LDPE or polypropylene water bottles using vacuum pressure in the same process, convert gaseous and vapor products into light fuel fractions via catalytic processes, use fractional distillation to separate these fractions, and explore fuel oil production from rubber and resin wastes.

This study evaluates the environmental benefits of recycling one tonne of plastic waste in the EU compared to incineration and landfilling. It includes all stages from collection to recycling and credits the savings from replacing virgin materials and conventional energy. Different polymers have specific recycling rates and disposal mixes

PART FIVE

PROJECTS OF

Department of Biomedical Sciences

Proj.No.1 **Detection of Liver Fibrosis Based on Deep Learning Techniques**

Prepared by:

10- شمس الدين نصير عبد الجبار 11- احمد جواد عبد الحسن 12- علي رياض سعدون

13- محمد فريد علي نوري 14- نبأ موفق جبار 15- عباس ساطع محمد

Supervised by:

3- م.م زينب ستار جبار 4-

Sustainable Development Goals Performed:

Abstract

Abstract: This study presents an AI-based LRCN model using US/SWE images for liver fibrosis classification, achieving 98.18% accuracy and demonstrating strong potential for improving non-invasive clinical diagnostics.

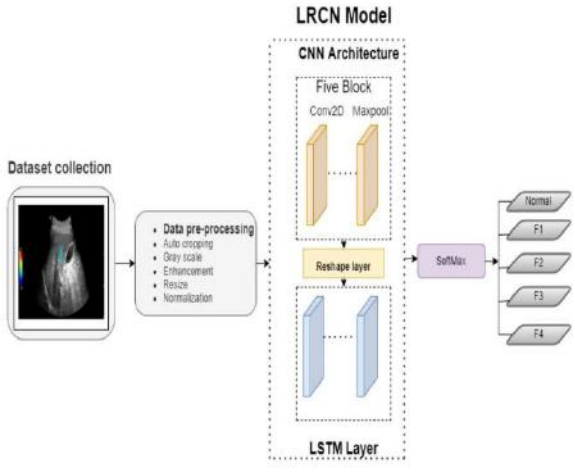
Methodology

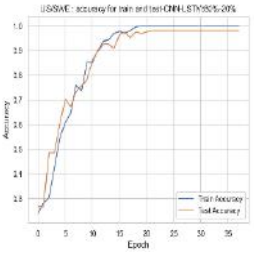
Methodology: This study developed a multi-class LRCN model to classify liver fibrosis stages (F0–F4) using US/SWE images. The model combines CNN for spatial feature extraction and LSTM for temporal analysis. It includes pre-processing steps, feature extraction through five Conv blocks, and classification via fully connected and LSTM layers. Trained with Adam optimizer and early stopping, the model showed improved accuracy, especially during testing, using both 80%-20% and 90%-10% train-test splits.

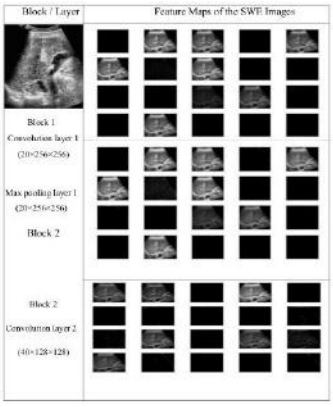
Results and conclusions

Results and conclusions: This study presents an AI system for classifying liver fibrosis stages (F1–F4 and normal) using Ultrasound Shear Wave Elastography (US/SWE) images. A hybrid Long-Term Recurrent Convolutional Network (LRCN), combining CNN and LSTM, was used to enhance accuracy by capturing both spatial and temporal features. Using 835 images with an 80/20 train-test split, preprocessing steps like auto-cropping, grayscale conversion, resizing, and CLAHE improved image clarity. While the CNN alone extracted spatial features well, the LRCN achieved higher accuracy and lower loss, confirmed by ROC and AUC metrics.

Implemented in Python with TensorFlow/Keras on an NVIDIA RTX4090, the system handled data scarcity in early/severe fibrosis stages effectively. Overall, the LRCN model outperformed CNN, showing strong potential for improving non-invasive liver fibrosis diagnosis in clinical settings.







Proj.No.2

Developing A Device To Treat Muscle Laziness Using EMG Signals

Prepared by:

16- Fatimah Ayad Abdulmohsen. 17- Zahraa Ahmed Mohsen Kamel. 18- Morsalin Saad Shakir.
19- Noor AlHussein Arkan Ali. 20- Abdullah AlKarrar Mohammed.

Supervised by:

5- Asst. Lect. Hiba Diaa Abdulameer.

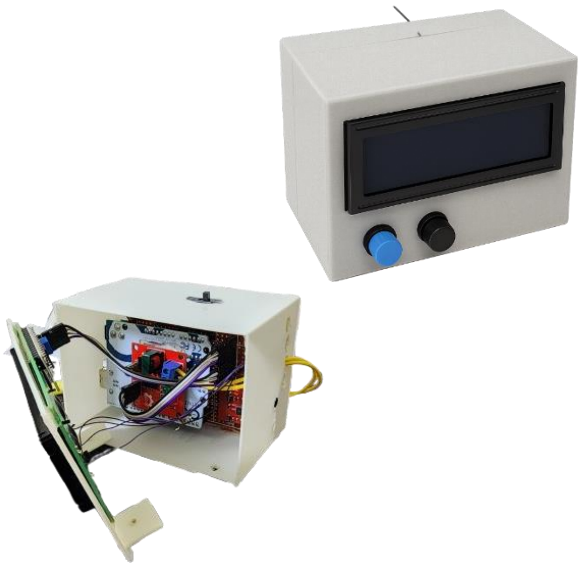
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

Abstract: A portable EMG-based device detects abnormal muscle signals and provides multi-level stimulation, aiding rehabilitation in stroke, sarcopenia, and nerve injuries, with confirmed effectiveness across three clinical cases.

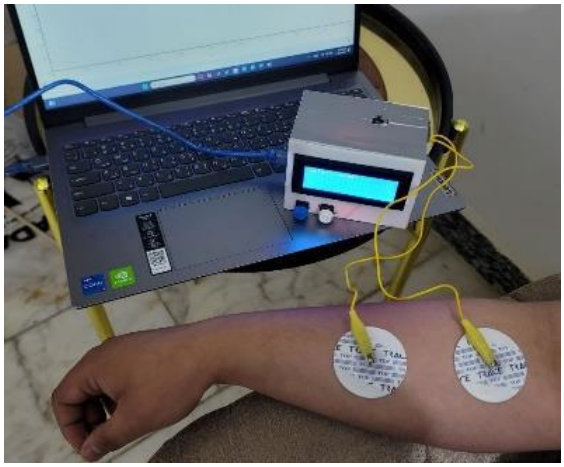
Methodology

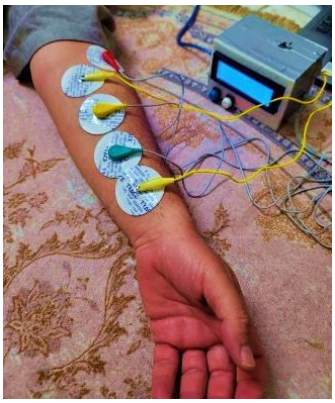
Methodology: The EMG-based stimulation device is built using Arduino Uno, an EMG sensor module, LCD display, stimulation unit, and safety circuits. It monitors surface EMG signals and delivers targeted electrical pulses to stimulate inactive muscles. The system operates in Manual or Auto Mode, with stimulation triggered either by the user or automatically based on threshold detection. A custom board manages power regulation and intensity control. The compact casing supports safe, portable, and low-cost rehabilitation use.



Results and conclusions

Results and conclusions: An EMG-based muscle stimulation device was tested in three cases—stroke, sarcopenia, and ulnar nerve injury—over 8 weeks. All patients showed improved EMG amplitude and muscle function. Gains ranged from 54% to 137%, with restored grip or movement. Therapy was safe, fatigue-managed, and well-tolerated. The device proved adaptable, effective across conditions, and promising for low-resource rehabilitation, highlighting its potential as an affordable alternative to conventional therapy.





Proj.No.3 Design of an Arduino-Based Smart Glove for Sign Language Translation

Prepared by:

21- Modaffar Naseer Shehab. 22- Hussein Rassool Abbas. 23- Noor AbdulKareem Ameen.
24- Nirjaes Abbas Abtaan. 25- Shawok Kamil Dawood.

Supervised by:

6- Asst.Lect. Hiba Diaa Alrubaie.

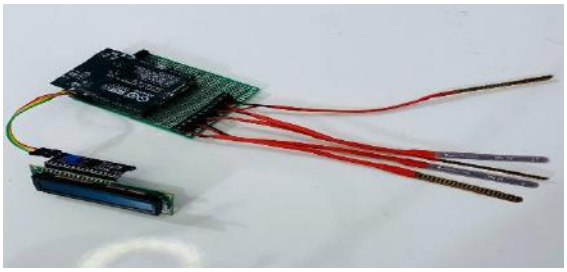
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

Abstract:
This project presents a smart glove that translates American Sign Language into speech and vice versa using flex sensors and an ESP32 microcontroller, enhancing communication for the deaf and mute community.

Methodology

This project developed a smart glove system to translate sign language into text using flex sensors, an MPU6050 motion sensor, and an Arduino Uno Wi-Fi board. The glove includes an LCD display, audio module, and custom 3D-printed casing. It captures hand gestures, processes them, and outputs real-time translations. Designed for comfort and accuracy, the glove was tested on users with communication impairments across various environments to evaluate performance and usability.



Results and conclusions

Results and conclusions: four real-world case studies evaluating a smart glove system for individuals with hearing and/or speech impairments. The glove uses flex sensors and motion detection to translate sign language into speech or text.

Case 1: A 35-year-old man with acquired hearing and speech loss used the glove at work. It achieved 100% accuracy in translating common gestures, improving communication and confidence despite a limited vocabulary.

Case 2: A 22-year-old woman with congenital deafness used the glove in a semi-supervised setting. It translated daily and emergency gestures in under 1 second, enhancing her independence.

Case 3: A 10-year-old girl used it in a mainstream school to engage socially and academically, including asking questions and requesting meals.

Case 4: A 42-year-old mute man with a finger amputation used adapted gestures, which the glove still recognized accurately, showing adaptability to physical impairments.

The glove proved reliable, fast, and user-friendly across varied settings—work, home, and school. Despite its limited vocabulary, it demonstrated strong potential as an inclusive communication aid for users of different ages and abilities.

Proj.No.4 Diagnostic tests for brain tumor using machine learning.

Prepared by:

26- Ali Hadi Salah
27- Zainab Hassan Eidan
28- Duaa Rady Ismail
29- Hawra Kareem Nemeh
30- Wed Ibrahim Gharib

Supervised by:

Dr. Haider Jabbar Abdul Nassar

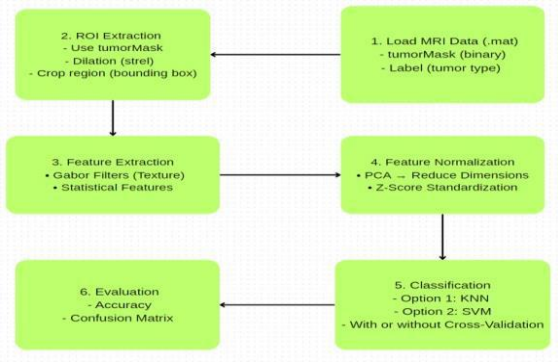
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

Abstract:
This study uses machine learning to classify brain tumors from 3,064 MRI images into Meningioma, Glioma, and Pituitary types. Features were extracted using Gabor filters and statistical measures. SVM and KNN classifiers were tested, showing effective and accurate tumor classification. The results support the use of computer-aided diagnosis systems to improve speed and accuracy in brain tumor detection.

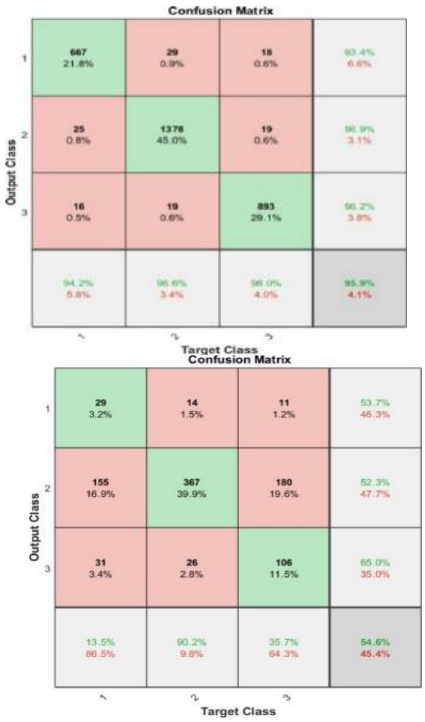
Methodology

Methodology: A machine learning system was developed to classify glioma, meningioma, and pituitary brain tumors from MRI images. It uses statistical and texture features with SVM and KNN classifiers, trained and tested on labeled data. Performance metrics guide a comparison to identify the better model, aiming to assist radiologists in early, accurate diagnosis.



Results and conclusions

Results and conclusions:
Results from the machine learning models for brain tumor classification show that both SVM and KNN were trained and evaluated on the dataset. The SVM achieved 89% accuracy, while KNN outperformed it with 95%. Confusion matrices and performance plots supported these findings. Overall, MATLAB simulations demonstrate that traditional machine learning methods effectively classify brain tumors from MRI images.



Proj.No.5 EMG arm orthosis for assistance and rehabilitation

Prepared by:

31- Ali Aqeel Hadi. 32- Ghadeer Murtadha Ali 33- Hawraa Qasim Farhan
34- Mustafa Abdul-kareem Abbas 35- Teeba Abdul-Ameer Jaafer

Supervised by:

7- Dr. Ameen M. Al-Juboori SDG-3

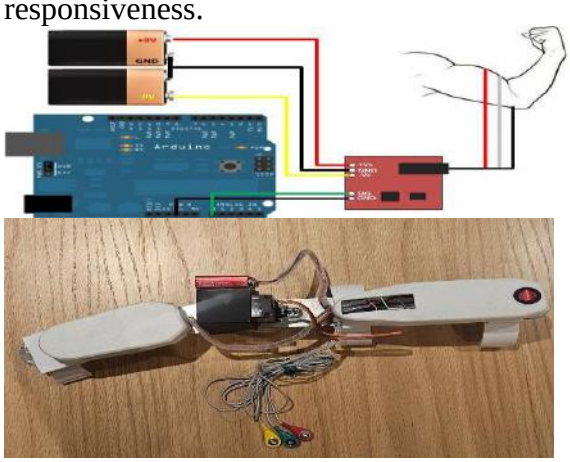
Sustainable Development Goals Performed:

Abstract

Abstract:
This project designs a lightweight orthotic arm controlled by EMG signals to help individuals with muscles weakness regain partial movement of the elbow and arm for improved independence in daily activities.

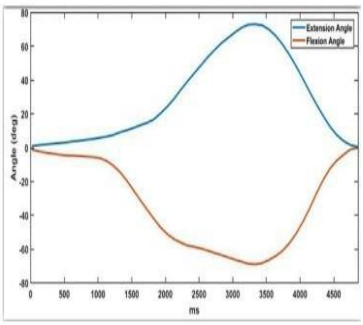
Methodology

Methodology:
The exoskeleton was designed, assembled, and tested through a structured methodology. Initially, the mechanical design was modeled using CAD software, followed by fabrication with stainless steel. The control system was developed using Arduino and programmed to track elbow motion using EMG and gyroscope sensors. The device was tested in flexion and extension modes on normal subjects to evaluate range of motion and system responsiveness.



Results and conclusions

Results and conclusions:
In recent years, the number of individuals suffering from physical impairments due to strokes, spinal cord injuries (SCI), or motor neuron disorders has increased significantly. These conditions often result in the loss of functional movement, particularly in the upper limb. Rehabilitation therapies supported by advanced assistive technologies have been proven to enhance patient recovery. In this context, a flexible, lightweight, and wearable exoskeleton was developed to provide both assistive and rehabilitative functions, primarily targeting elbow joint movements. The device utilizes surface electromyography (EMG) signals for control and includes a low-noise actuation mechanism, making it suitable for home- based use. Designed using 316 medical-grade stainless steel, the orthotic arm ensures a high safety factor, excellent corrosion resistance, and
a relatively low production cost.



Proj.No.6 Investigation of Bioactivity Properties of Bioactive Glass-Ceramics for Bone Regeneration

Prepared by:

36- Mohammed murtadha enad
37- Zainab najah mohammed
38- Ali jassim hanidi
39- Haider arkan khalifa
40- Hajar Hussein abdul rahman

Supervised by:

Dr.Amir N.Saud

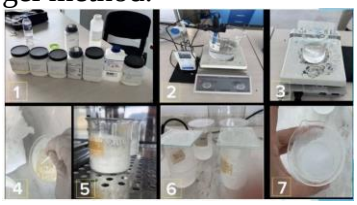
Sustainable Development Goals Performed: SDG-3

Abstract

Manganese-doped bioactive glass scaffolds enhanced hydroxyapatite formation, antibacterial activity, degradation rate, and pH response, demonstrating promising potential for advanced bone tissue engineering applications.

Methodology

This study synthesized 45S5 bioactive glass ceramics doped with Mn and La_2O_3 using the sol-gel method.

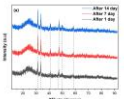


Samples were shaped, sintered, and immersed in simulated body fluid (SBF) to assess bioactivity. Characterization included XRD, SEM, FTIR, DTA, and antibacterial testing.

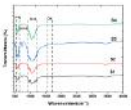
Hydroxyapatite formation, structural morphology, and biodegradability were evaluated over 1, 7, and 14 days to determine the material's potential for bone regeneration applications.

Results and conclusions

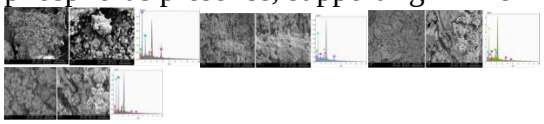
XRD revealed crystalline phases like sodium calcium silicate. After immersion in SBF, hydroxyapatite (HA) peaks appeared and increased over time, showing good bioactivity, especially in Mn-doped samples.



FTIR confirmed silicate and phosphate bonds. Manganese disrupted the silicate network and enhanced phosphate formation. After SBF immersion, stronger P–O peaks indicated HA layer growth.



SEM/EDS showed a uniform HA layer on Mn-doped samples, while undoped glass had scattered HA particles. EDS confirmed calcium and phosphorus presence, supporting HA formation



In conclusion, manganese addition enhanced the material's thermal and structural properties and promoted better HA formation, making it a strong candidate for bone regeneration applications.

Proj.No.7 Manufacturing a rehabilitation chair for people with disabilities

Prepared by:

41- Abdullah Ali Khalaf Hashem
42- Abdullah Abdulkarim Mahdi Kazem
3- Ali Laith Fadhel Abdulhussein
43- Ahmed Al-Ameen Arkan Ali Munji
44- Mohammed Raad Hashem Obais

Supervised by:

Dr. Mohammed Hamza Daham

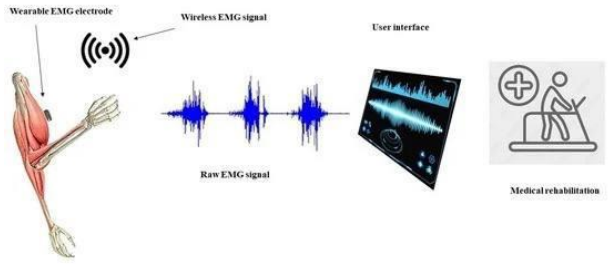
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

This project developed a low-cost rehabilitation chair for people with disabilities, especially amputees. It features a treadmill for walking exercises, a seat for rest, and integrated EMG sensors to monitor lower limb muscle activity in real time. Data is sent via Bluetooth to a mobile app for visualization and analysis. The chair is foldable, adjustable, and designed for easy use and transport, offering a multifunctional solution to support physical therapy and enhance mobility.

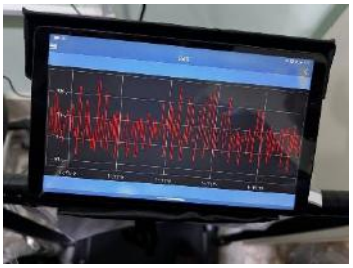
Methodology

The project followed key stages: the rehabilitation chair was built using iron, motors, supports, and hydraulics for stability. A motorized treadmill with adjustable speed was controlled wirelessly. EMG sensors on the lower limbs captured muscle signals, which were processed by an Arduino and sent via Bluetooth (HC-05) to a custom mobile app. Developed using MIT App Inventor, the app displayed real-time graphs, stored data, and provided audio feedback on muscle improvement. Device setup photos are included below.



Results and conclusions

The rehabilitation chair was successfully developed with a treadmill, foldable seat, EMG sensors, and a Bluetooth-connected mobile app. Testing confirmed its effectiveness in tracking muscle activity and providing real-time feedback, leading to improved balance, gait, and mobility in amputees. Users reported greater confidence and motivation. The project highlights the value of EMG integration in personalizing therapy and monitoring progress. Future work will focus on enhancing the app and applying machine learning for automated analysis.



	A	B	C	D	E
1	رقم القمة	زمن التقريبي	سعة تقريبية	شكل القمة	التفسير
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3	2	1:17:08	عالية ٩٠µV	حادة ومركزة	نشاط عضلي قوي
4	3	1:17:12	متوسطة	مزدوجة	استمرار التقلص
5	4	1:17:16	منخفضة	مشتتة	ارتخاء نسبي
6	5	1:17:20	عالية جدًا ١٠٠µV	طويلة	ذروة التقلص عضا
7	6	1:17:25	متوسطة	منتظمة	نشاط مستمر
8	7	1:17:30	منخفضة	قصيرة	بداية استرخاء عضا

Proj.No.8

Mathematical Modeling of Open-Loop Pancreas System

Prepared by:

45- Esraa Hadi Ali. 46- Tiba Hadi Idan 47- Mohammed Hassan hadi
48- Zainab Ali Jabr. 49- Manar Abdulameer Saheb

Supervised by:

8- Dr. Mujtaba A. Flayyih

Sustainable Development Goals Performed: SDG-3, SDG-4

Abstract

Abstract:
This study simulates an open-loop artificial pancreas using the Bergman Model to evaluate glucose-insulin dynamics in healthy and diabetic individuals under fasting and meal intake conditions.

Methodology

Methodology:
We developed a nonlinear glucose-insulin model using Bergman's equations and simulated it in MATLAB/Simulink. The model included different meal inputs (Gaussian, Step, Pulse) and was tested under fasting and fed conditions. The numerical solution used the Runge-Kutta 4th order method. Results were evaluated using parameters like peak amplitude, area under the curve, and return time.

Results and conclusions

Results and conclusions:
This project evaluates an open-loop artificial pancreas using the Bergman Minimal Model through simulations of healthy and diabetic individuals under fasting, pulse, step, and Gaussian meal inputs. Healthy subjects showed quick insulin responses and glucose regulation, while diabetics exhibited weak or no insulin activity, leading to dangerous glucose spikes and slow recovery. Gaussian meals produced smooth hormonal changes in healthy cases, but step meals caused severe hyperglycemia in diabetics. Metrics like peak value, AUC, and return time highlighted the system's failure in diabetic control, underscoring the necessity for closed-loop feedback designs. This study offers a useful simulation framework for advancing biomedical control systems.

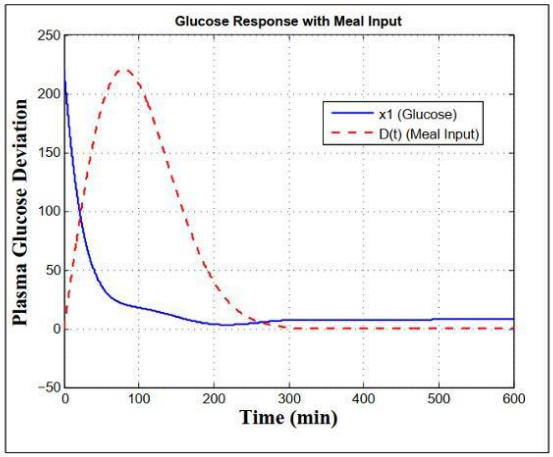


Figure 3.8: Glucose response with Gaussian meals inputs for healthy person.

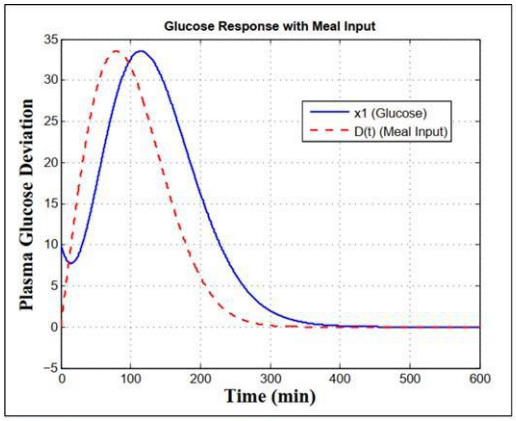


Figure 3.20: Glucose response with Gaussian meals inputs for diabetic patient.

Proj.No.9

Medical monitoring and tracking system for Alzheimer disease based on IoT

Prepared by:

50- احمد فاضل عبد الحسين
51- فاطمة ثامر هادي
52- زهراء احمد محسن شاكر
53- حوراء مهند رضا
54- فاطمة عباس فاضل

Supervised by:

م.م. زينب ستار

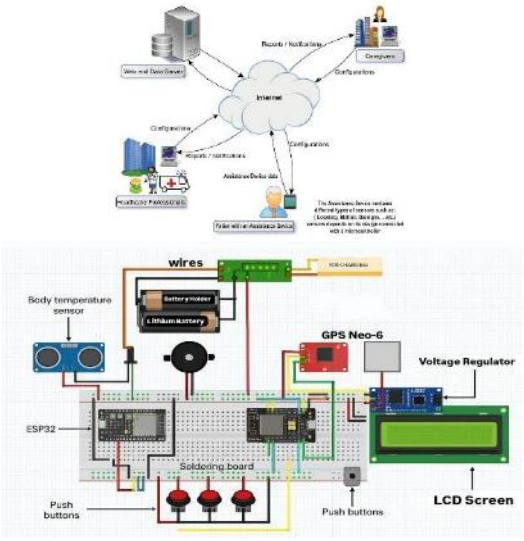
Sustainable Development Goals Performed: SDG-3, SDG-9

Abstract

Abstract: This project presents an IoT-based monitoring system for Alzheimer's patients, enhancing safety and caregiver support. It tracks vital signs (heart rate, temperature, oxygen) and real-time location via GPS, sending alerts through a mobile app or web interface during emergencies or when the patient exits a safe zone.

Methodology

Methodology: The system uses an ESP32 microcontroller with sensors for temperature, motion, and oxygen levels, a Neo-6M GPS module for tracking, and components like lithium batteries, an LCD display, buzzer, and voltage regulator housed in a plastic case. Sensor data is transmitted via Wi-Fi to the Blynk platform, displayed in a mobile app, and triggers audio alerts and instant messages during health emergencies or location deviations.



Results and conclusions

Results and conclusions: This IoT-based system provides an effective solution for monitoring Alzheimer's patients by continuously tracking vital signs such as heart rate, SpO_2, and body temperature, and accurately displaying the patient's real-time location through the Blynk app. It issues instant audio-visual alerts during medical emergencies or if the patient strays from a predefined safe zone. The integration of ESP32, biosensors, GPS, and the Blynk platform ensures reliable data flow, system responsiveness, and seamless communication between hardware and software. This smart system enhances patient safety, reduces caregiver burden, and represents an innovative model in telehealth. It also offers potential for future development by integrating AI technologies, additional medical devices, and more interactive user interfaces.

.

Proj.No.10 Design Orthosis for Correction or Assist Scoliosis Defect

Prepared by:

55- Narges Nasser Kadhim. 56- Taif Baher Mahdi. 57- Mariam Hadi Abd Al-Ameer
58- Noor Mohammed Khudair. 59- Ali Mousa Obayes

Supervised by:

9- Dr. Ali K. Kareem.

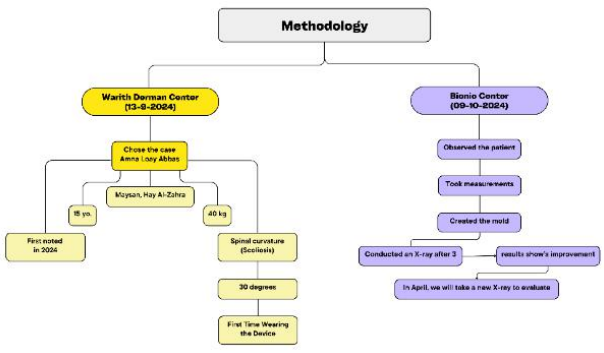
Sustainable Development Goals Performed: SDG-9, SDG-4

Abstract

Abstract:
This project focuses on designing and evaluating a custom orthosis for scoliosis management. Built using patient-specific measurements and materials like Gypsona, plastic, and metal, the device was assessed through X-rays post-fitting. Initial results show notable spinal curvature reduction, indicating improved alignment and comfort.

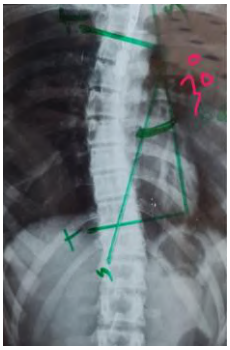
Methodology

Methodology:
The patient assessment was conducted at the Bionic Center on 09-12-2024, involving necessary measurements and immediate mold fabrication. Materials such as Gypsona, gypsum, plastic tubes, metal bars, Surfoum, a suction unit, clamps, and an oven were used during the process. The orthosis was fabricated and fitted on the same day, followed by scheduling the first X-ray. A three-month follow-up X-ray indicated improvement, with a second evaluation planned for six months later.



Results and conclusions

Results and conclusions:
A personalized orthotic brace significantly reduced a 15-year-old patient's spinal curvature from 30° to 6° within three months. Designed using lightweight materials like Gypsona and plastic, the brace offered comfort, better alignment, and improved compliance. Aesthetic and patient-specific adjustments enhanced adherence, especially important for adolescents. Radiographic evaluation confirmed the effectiveness, supporting its role in non-surgical scoliosis management. Continued follow-up will assess long-term stability of the correction.



Proj.No.11

Preparing vegetable biomaterials and studying its impact on human health

Prepared by:

60- Ahmed Imad Waheed
61- Mohammad al-Baqir Muqdad Abdul Sattar
62- Mohammed Ahmed Ali
63- Jaafar Miri Abdul Zaid
64- Ghaith Hatem Rahim

Supervised by:

10- Dr. Mohammed Hamza Daham

Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

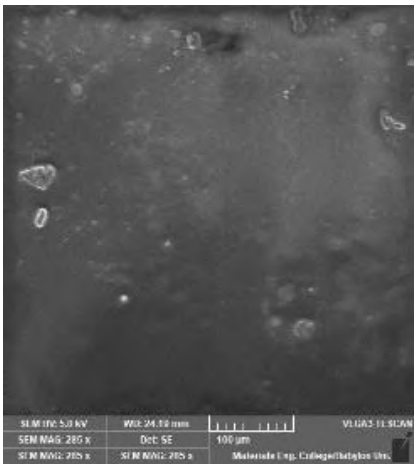
Abstract:
The abstract is that the dye we came with represents a simple component, partially from natural, sustainable resources. This pigment can increase the shelf life and weathering resistance, and prevent face discoloration problems that ordinary glass faces.

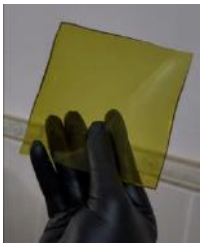
Methodology

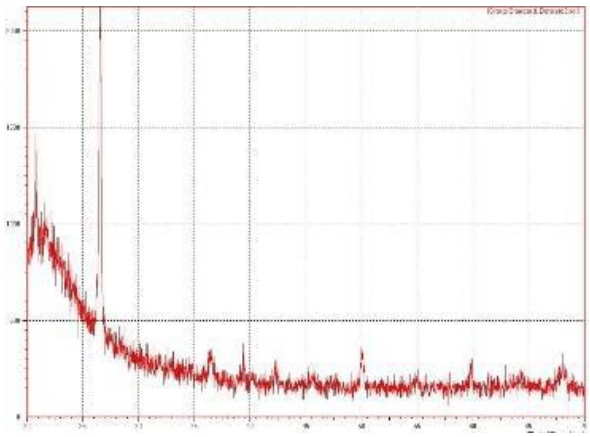
Methodology: We abstract the chlorophyll from spinach with pure alcohol, then mix the low viscosity epoxy resin in a ratio of 1:2. Then we add 1.5 grams of nano-silica to enhance the physical properties of the pigment and test the mechanical, topography, and optical properties in XRD and SEM tests, along with other tests.

Results and conclusions

Results and conclusions:
In conclusion, exchanging the ordinary lime glass and treating lime glass that faces issues like discolouration, heat shock, and weathering exchange takes its toll in when replaced with ordinary glass covered with semi-natural Pigment
From naturally occurring chlorophyll based on low viscosity epoxy resin with nano silica Which replaces the complex lime glass, which is a wide variety of compounds. In addition to its simplicity, the pigment we came with has better optical, physical, and mechanical properties that reinforce the properties of glass.







Proj.No.12

Quantifying Cognitive Performance in Athletes: A Hybrid System Approach Using FNIRS Technology and Electrodermal activity (EDA) meter.

Prepared by:

65- Ayam Muhammad Jassim. 66- Haider Bahjat Malik. 67- Mustafa Maher Kamel.
68- Noor Thaher Abd Al-Kazem. 69- Zainab Ahmed Fadel.

Supervised by:

11- Mr. Mahir Rhaman Al-Hajaj.

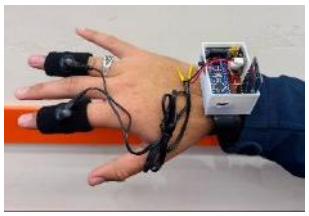
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

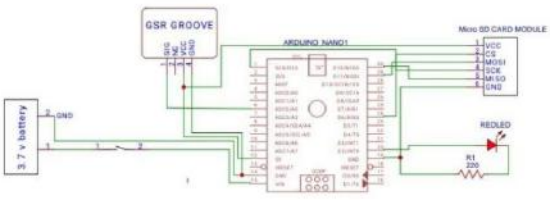
Abstract: This research uses fNIRS and EDA technologies to measure athletes' cognitive and physiological performance, comparing their data to evaluate effectiveness. Results support deeper insights for optimizing training strategies.

Methodology

Methodology: a custom-built device with an Arduino Nano R3 microcontroller and EDA sensors, and the Mendi headset employing fNIRS technology. The wearable Arduino-based system records and stores electrodermal activity (EDA) to assess physiological responses. The Mendi headset non-invasively measures brain oxygenation and activity via fNIRS, providing real-time neurofeedback through a smartphone app. Together, these systems allow comparative analysis of physiological and neurological responses during athletic performance.



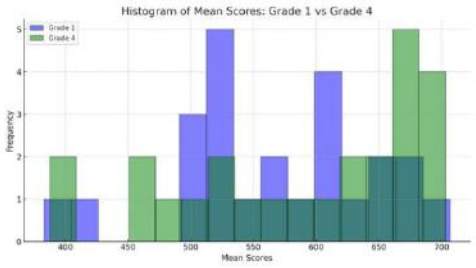
fNIRS headband and EDA device.



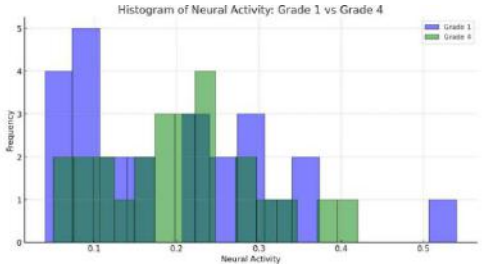
The schematic of the EDA circuit.

Results and conclusions

Results and conclusions: The hybrid fNIRS-EDA system accurately measured athlete cognitive performance in a field environment, demonstrating its ability to track brain activity and physiological stress responses. Combined data revealed a strong correlation between mental and physical states. Statistical analysis of fNIRS data showed a significant difference between Grade 1 and Grade 4 students. While visually distinct, observed performance differences in EDA data were not statistically significant, suggesting natural variation. Further research with larger samples is recommended.



The histogram of the EDA data.



The histogram of the fNIRS data.

Proj.No.13 Skin Conductance Patterns and Their Association with Concentration Levels in 100-Meter Running Trials

Prepared by:

70- Jihan Khaled Kazim. 71- Mortada Jawad Karim. 72- Rokaya Jalil Muslil.
73- Tabark Haidar Naji. 74- Zainab Fadel Obaid.

Supervised by:

12- Mr. Mahir Rhaman Al-Hajaj.

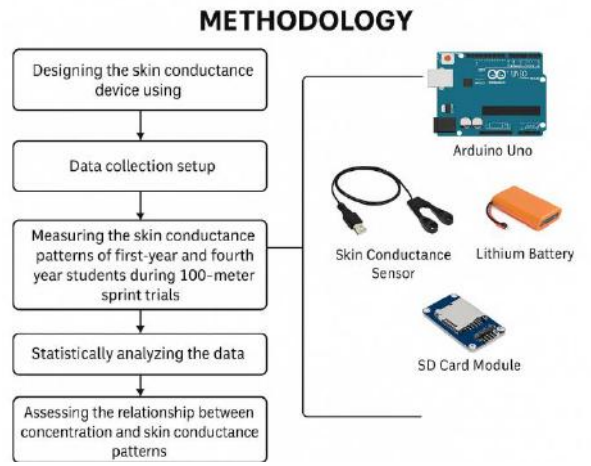
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

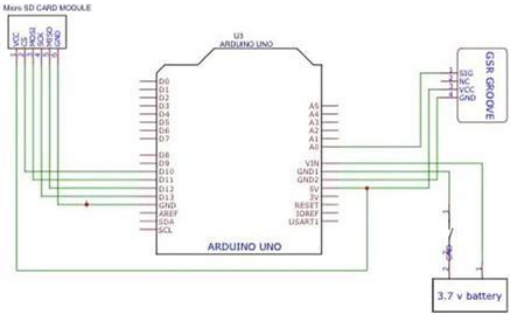
Abstract: This study examines the link between skin conductance and concentration during 100-meter sprints in first- and fourth-year students, revealing significant physiological and performance differences influenced by experience level.

Methodology

Methodology: The methodology involves designing a skin conductance device using Arduino Uno, a sensor, lithium battery, and SD card module to analyze concentration patterns during sprints.



Designated methodology for measuring skin conductance patterns during 100-meter sprints.

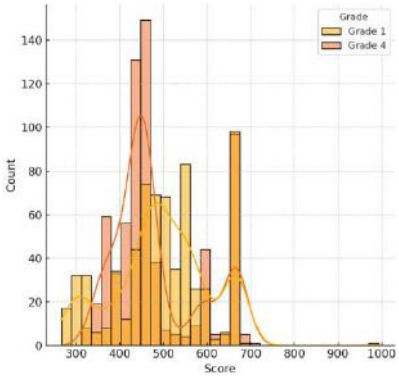


The schematic of the circuit connections.

Results and conclusions

The wearable prototype.

Results and conclusions: Statistical analysis revealed significant performance differences between first- and fourth-grade students. Mann-Whitney U ($U=267440.0$, $p=3.14\times10^{-8}$) and Kolmogorov-Smirnov ($p=1.56\times10^{-29}$) tests confirmed distinct score distributions, with greater variability observed in fourth graders. The findings indicate notable developmental and educational differences between grades. Variations in performance likely reflect age, learning environments, and teaching methods. Further research with larger samples is needed to explore contributing factors such as study habits and socio-economic status.



The histogram shows the distribution of scores for both grades, including the Kernel Density Estimate (KDE) for a smoother curve.

Proj.No.14

Prepared by:

75- Mohammed Thaer Obied. 76- Hassan Abbas Khalil 77- Maream Basil Saad
78- Furqan Emad Razaaq 79- Ola Ahmed Gawad

Supervised by:

Dr. Alaa Mohammed Hussein 13-

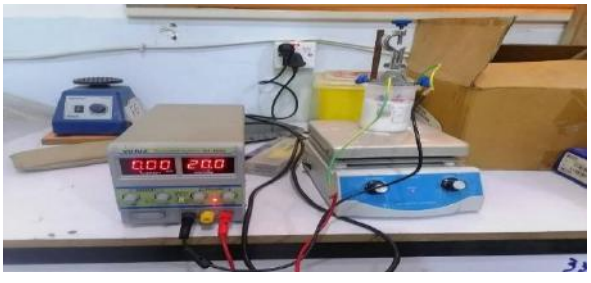
Sustainable Development Goals Performed: SDG-3, SDG-4

Abstract

Abstract: In this study, ZnO nanoparticle coatings were applied to AZ31 magnesium alloy using electrophoretic deposition (EPD) to improve surface hardness and antibacterial properties. Coatings were deposited from a 50 g/L ethanol-based suspension at 20 V for 1, 2, and 4 minutes. The sample coated for 4 minutes showed surface characteristics close to natural bone, with a contact angle of 5.4°, indicating hydrophobicity. Overall, EPD proved effective for creating biocompatible coatings with enhanced mechanical and antibacterial performance.

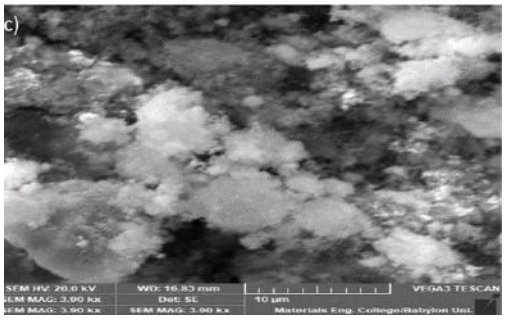
Methodology

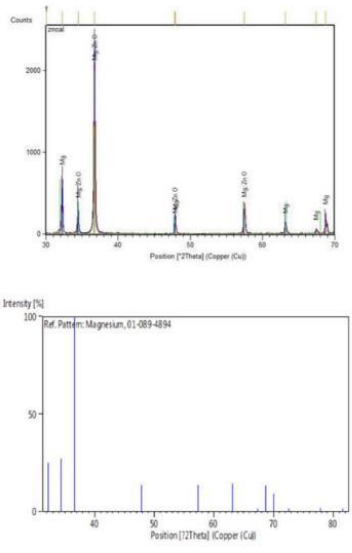
Methodology: In this process, magnesium alloy served as the cathode and counter electrode, both placed 15 mm apart in a ZnO suspension. A custom holder-maintained electrode spacing and eased sample handling. Electrophoretic deposition (EPD) was conducted in a glass beaker with magnetic stirring to ensure particle dispersion. A DC power supply provided adjustable voltage (0–60 V), with optimal deposition at 20 V for 2, 4, and 6 minutes using a 1 g/L ZnO-ethanol suspension. pH was monitored using a PH-100 meter. ZnO was ultrasonically dispersed before coating. After deposition, samples were air-dried for 24 hours at room temperature.



Results and conclusions

Results and conclusions: This study demonstrated the successful deposition of ZnO biocoatings on magnesium alloy via electrophoretic deposition (EPD) for biomedical use. Under optimal conditions (20 V, 4 min), the coatings were uniform, crack-free, and 10–17 µm thick. They improved surface hardness, adhesion, and antibacterial properties while reducing the release of toxic ions, especially at lower pH. These enhancements support the potential of ZnO-coated magnesium implants in biomedical applications.





Proj.No.15

The Structure and Properties behavior of antibacterial Composite Biocoatings onto Ti-6Al-4V Surface by Electrophoretic Deposition.

Prepared by:

80- Hasanain Hayder Jawad
81- Noor ALeslam Maher
82- Shams Ahmed Salim
83- Tabarek Salam Dakhil
84- Zainab Mohammed Ahmed
85- Zainab Mohammed Mahdi

Supervised by:

Dr. Alaa Mohammed Hussein Wais

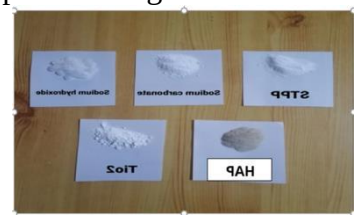
Sustainable Development Goals Performed: SDG-3, SDG-4

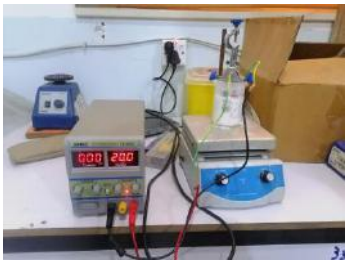
Abstract

Ti-6Al-4V was coated with HAP and TiO via EPD to enhance hardness, biocompatibility, and antibacterial properties. Results showed improved surface characteristics suitable for biomedical implant applications.

Methodology

The EPD process used Ti-6Al-4V as both substrate and counter electrode, placed 15 mm apart in a suspension. A custom holder ensured constant distance and easy sample handling. The suspension contained TiO_2, HAP, and ethanol, stirred magnetically for uniformity. Deposition was done at 20V for 2, 4, and 6 minutes. After coating, samples were air-dried for 24 hours. TiO_2 was initially dispersed using an ultrasonic bath for better mixing.





Results and conclusions

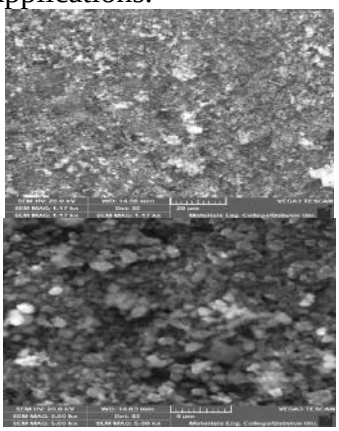
Results and conclusions: This study successfully deposited TiO_2 and TiO_2/HAP coatings on Ti-6Al-4V alloy using electrophoretic deposition (EPD) to improve biomedical properties.

Results showed the coatings were uniform and crack-free at 20 V for 4 minutes, enhancing surface morphology and hardness. The presence of TiO_2 and HAP increased microhardness, improving wear resistance and durability.

The coatings demonstrated strong adhesion to the substrate, reducing the risk of implant loosening. They also acted as a protective barrier, limiting the release of harmful metal ions, with ion release increasing at lower pH levels.

Antibacterial properties were improved, helping to reduce infection risk in implants. The average thickness of the TiO_2/HAP coating was about 18 µm, ensuring effective layer formation.

Overall, TiO_2 and TiO_2/HAP coatings via EPD enhance biocompatibility, surface hardness, adhesion, and antibacterial performance of Ti-6Al-4V implants, making them promising for biomedical applications.



Proj.No.16 Bone Cement Enhanced with Bioactive Glass

Prepared by:

86- Hassan Ayed Mohammed. 87- Mohammaed Rashad Ali 88- Noor Alhuda Hussam Taimol
89- Safa Habib Abdullah 90- Fatima ali Muhsin

Supervised by:

Dr. Amir N. Saud

Sustainable Development Goals Performed: SDG-3, SDG-9

Abstract

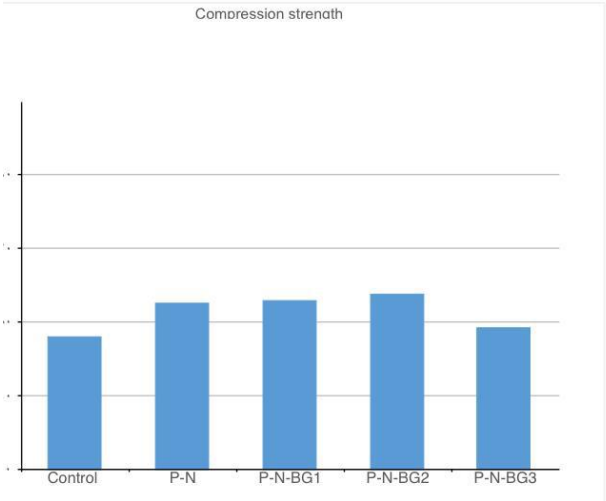
Abstract:
Bone cement is a critical material in orthopedic surgeries for implant fixation.
This project investigates the enhancement of bone cement by incorporating bioactive glass (BG) to improve mechanical properties and bioactivity.
Tests were conducted on different formulations to assess compressive strength and structure integrity.

Methodology

Methodology:
The experimental methodology included preparation of standard PMMA bone cement, followed by incorporation of different percentages of bioactive glass (BG1, BG2, BG3).
Mixtures were poured into silicone molds and allowed to cure. Samples were later subjected to mechanical and structural testing.

Results and conclusions

Results and conclusions:
The incorporation of bioactive glass showed a noticeable effect on compressive strength.
Formulations P-N-BG1 and P-N-BG2 showed improvement compared to control samples. However, higher concentrations (BG3) reduced strength slightly.
The bar chart below illustrates the compressive strength values across samples.



Proj.No.17 DESIGN AND IMPLEMENTATION OF A PROTECTION SYSTEM FOR LINAC SYSTEM.

Prepared by:

1- Saif Haider Aziz
2- Sajjad Najm Abd Al-Zahra
3-Ali Ahmed Kamel
4-Hassan Ali Abdullah
5-Ali Karim Kazem

Supervised by:

Prof. Dr. Ibrahim A. Murdas

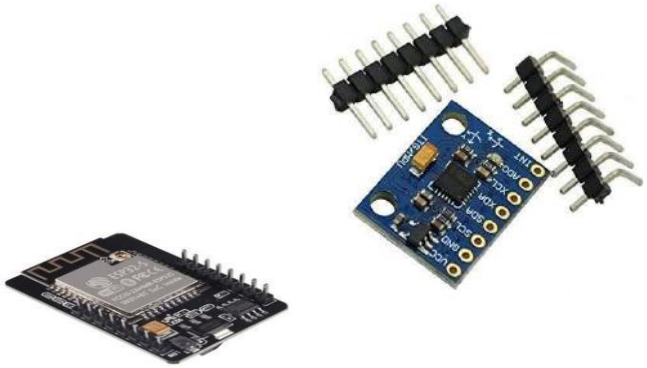
Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

Abstract:This project developed an intelligent system to monitor patient movement and breathing during radiotherapy using a Linear Accelerator (LINAC). The system aims to enhance treatment accuracy and patient safety by detecting and minimizing unwanted motion during radiation sessions.

Methodology

The project employed precise, compact electronic components chosen for medical-grade sensitivity and programmability. Key elements included an ESP32 microcontroller for control and Wi-Fi connectivity, pressure and motion sensors to monitor breathing and movement, and visual/audible alert devices (LCD display, RGB LEDs, buzzer). A 3D-printed enclosure housed the system, designed for easy mounting near the patient. Wiring and assembly were completed using standard tools to ensure reliable integration.



Results and conclusions

Results and conclusions:
The project developed a smart system to monitor patient breathing and movement during radiotherapy with a LINAC machine. Using a belt equipped with a pressure sensor, MPU6050 motion sensor, and ESP32 controller, the system detects sudden movements and responds by triggering sound and light alerts, stopping the device to protect healthy tissue. An LCD displays patient and breathing status, while a mobile app sends real-time alerts to medical staff. This innovative system enhances radiotherapy accuracy and patient safety by reducing risks from patient motion.

Proj.No.18 Design and implementation of anti-sleep and health monitoring system for drivers to avoid accidents

Prepared by:

91- Elaf Baseem Mahdi **2-Ahmed Jalil Shabib** **3- Amir Abbas Mohsen**

4- Mohammed Aziz Abbas **5- Ali Abdel Nasser Saleh**

Supervised by:

Asst. Lec. Zainab Sattar Jabbar

Sustainable Development Goals Performed: SDG-9, SDG-3

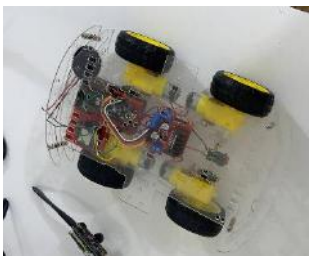
Abstract

Abstract:

This study proposes a low-cost IoT-based drowsiness detection system integrating smart glasses (blink sensor, Arduino Nano), audible and haptic alerts, vehicle receiver via nRF24L01+, achieving 85% accuracy and <1-second response.

Methodology

System design begins by selecting a compact infrared-based eye-blink sensor for real-time eyelid movement data. Software development involves programming the Arduino Nano for signal acquisition, robust drowsiness detection via blink duration analysis, and alerting. Upon detecting drowsiness, the controller activates the vibration motor and buzzer to issue immediate haptic and audible warnings to the driver. The system achieves sub-second response with low power consumption, making it suitable for vehicular deployment.



Results and conclusions

The IoT-based anti-sleep system uses smart glasses with an infrared blink sensor and Arduino Nano to detect drowsiness by monitoring eyelid closure. Prolonged blinks (>3 seconds) trigger buzzer, vibration, and a wireless command to slow and stop the vehicle. It achieved 85% accuracy with fast response (<1s) and reliable performance day and night. Tested over five days, the system was stable, low-power, and easy to install using common components. Future upgrades aim to integrate AI, biometric sensors, and smart vehicle features for improved safety and personalized monitoring.

Proj.No.19 DESIGN AND IMPLEMENTATION OF IR LASER SYSTEM FOR BONE FRACTION DETECTION

Prepared by:

92- Mahmoud Yhya Abed
93- Mustafa Yahya Ali
94- Marwan Basem Ghanem
95- Ahmed Saleh Mahdi
96- Haider Mohammed Kazim

Supervised by:

Prof. Dr. Ibrahim A. Murdas

Sustainable Development Goals Performed: SDG-9, SDG-3

Abstract

The project presents a non-invasive system for detecting bone fractures using infrared (IR) light, relying on 32 photodetectors and emitters to analyze changes in light transmission through tissue. The system was tested on industrial models and detected fractures as small as 1 mm with high accuracy, demonstrating its potential as a portable and safe tool for detecting fractures without radiation.

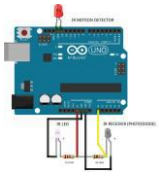
Methodology

The system comprises a linear array of 32 IR emitters (820 nm) paired with 32 matching IR photodiode detectors, mounted on opposite sides of the scanning region (e.g. a limb).

IR emitters

IR Detectors

Emitters are driven sequentially, and detectors measure transmitted or scattered light as voltage variations.

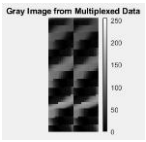


IR Emitter and IR receiver circuit

A microcontroller network coordinates timing, data acquisition, and USB streaming to a host PC, where a MATLAB application reconstructs a 2D intensity map and applies feature-extraction algorithms to localize potential fractures.

Results and conclusions

An infrared bone fracture detection system was developed using 32 emitters and detectors, along with signal processing circuits and microcontrollers. Tests confirmed that the emitters and detectors operated accurately and that data was transmitted to the computer seamlessly. The system was able to detect gaps ≥2 mm in synthetic materials, but struggled with gaps smaller than 1 mm.



Heat maps (in MATLAB) clearly demonstrated fracture areas, but the system faced challenges such as sensitivity to ambient light and difficulty penetrating more than 25 mm of tissue. Further improvement is needed for clinical use.

This project designed a non-invasive IR laser system to detect bone fractures using 32 IR emitters (820 nm) and detectors in a parallel array. The system measures transmitted IR light through tissue and bone, with data processed via microcontrollers and MATLAB to generate 2D intensity maps highlighting fracture regions. The approach offers a potential alternative to traditional imaging methods like X-rays.

Proj.No.20 Design of upper Limb arm bond with EMG and Robot

Prepared by:

97- Mostafa Mohmead. 98- Mohmead abdulkareem. 99- Yassir Khudier.
100- Kefaa Sattar. 101- Zahraa Abdullah.

Supervised by:

Dr. Ali K. Kareem

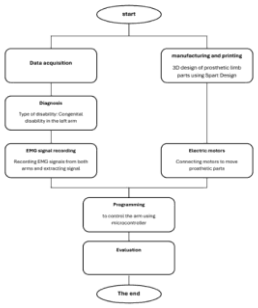
Sustainable Development Goals Performed: SDG-9, SDG-3

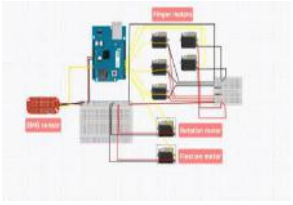
Abstract

This research focuses on the design and development of an upper limb prosthetic controlled by electromyographic (EMG) , who suffers from a congenital disability in his left hand. The project was implemented using biomedical engineering techniques, where EMG signals were recorded and analyzed through an Arduino microcontroller to control the movement of the prosthetic limb.

Methodology

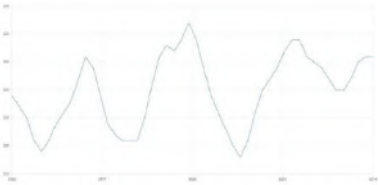
This project focuses on designing, developing, and testing an upper limb prosthetic controlled by EMG signals.
EMG data from surface electrodes on specific muscles guide the design, which is modeled for functionality and fabricated using 3D printing. The prosthesis is then evaluated for accuracy,
responsiveness, and usability, ensuring effective interaction between the user's neuromuscular system and the device.



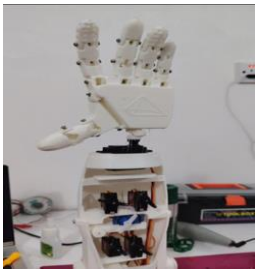


Results and conclusions

Results:
Healthy arm: 100–350 µV (rest), 750–980 µV (contraction).
Amputated arm: 50–300 µV (rest), 700–980 µV (contraction)



conclusions : The integration of EMG signals with robotic arm control represents a key advancement in assistive technology, enabling real-time translation of muscle activity into robotic movement. This provides natural, intuitive control for individuals with upper limb impairments. Operating at low voltages, the system ensures safety and reliability. It shows strong potential in prosthetics and rehabilitation, with future development expected to enhance precision, adaptability, and comfort. Incorporating machine learning could further improve signal interpretation and allow complex, multi-joint movement. Overall, EMG-based robotic arms offer promising solutions for restoring mobility and independence for people with disabilities advancing personalized and responsive assistive devices.



PART SIX

PROJECTS OF

Department of Medical Devices Engineering

Proj.No.1

Alarm system for ALzheimer's patient based on WiFi technology

نظام انذار لمرضى الزهايمر يعتمد على تقنيةWIFI

Prepared by:

102- Zahraa Abd Al-Hussain Takleef
103- Hawra fouzi hadi
104- Mohammed Raed Hashem
105- Youssef Sabah Hassouni
106- Mohammed Nazim Shaker Jadoua
107- Ameer Kareem Badr
108- Mohammed Baqer Hamid
109-
110-

Supervised by:

14- Bayan Mahdi Al-Sabbar
15-

Sustainable Development Goals Performed:

Abstract

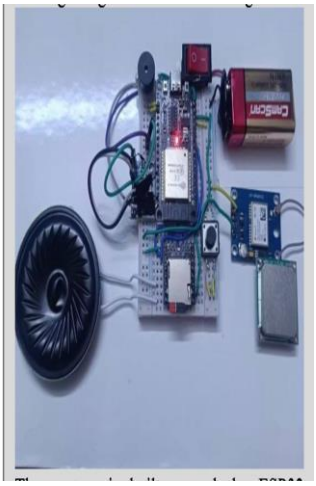
Abstract:

This research introduces a WiFi-based alarm system for Alzheimer's patients, integrating GPS, ESP32, and Telegram alerts to ensure real-time monitoring, accurate tracking, and rapid emergency response for caregivers.

Methodology

Methodology :

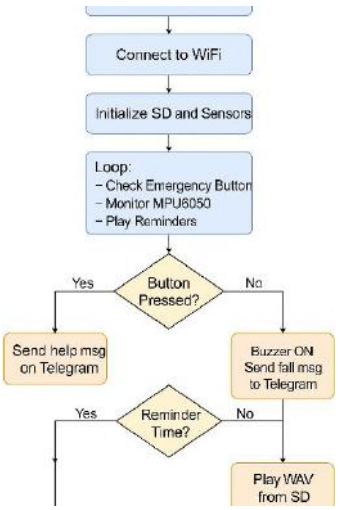
The system operates by first connecting the ESP32 to WiFi, initializing the SD card and sensors, and starting audio reminder timers. In a continuous loop, it checks reminder timers, monitors the fall detection sensor, and triggers a buzzer and Telegram alert if a fall occurs. It also monitors an emergency button, sending location-based alerts when pressed. Audio playback is maintained using audio.loop(), ensuring real-time monitoring and immediate feedback.



Results and conclusions

Results and conclusions:

The developed alarm system, built with an ESP32 microcontroller and various sensors, was successfully tested for fall detection, emergency alerts, and medication reminders. The MPU6050 accurately detected falls, triggering a buzzer and instant Telegram alerts with location data. An emergency button sent alerts immediately upon pressing, while the MP3 player reliably delivered scheduled audio reminders. WiFi connectivity and Telegram integration were stable, ensuring real-time communication. The system functioned reliably even under overlapping events, proving its multitasking capability. This low-cost IoT solution enhances safety for Alzheimer's patients, offering both automated and manual alerts, and supports caregivers through timely, remote notifications.



Proj.No.2

Smart Drug Injection System by Using Arduino

أنظمة حقن الأدوية الذكية بإستخدام الأردوينيو

Prepared by:

111- Alaa Samer Ghazi
112- Ali Saad Hadi
113- Ahmed Abdu Alsada Hadi
114- Mortaza Mohammed Kazim
115- Ghaith Jabber Ali
116- Taiba Mohammed Hamid
117- Mohammed Khalid Turki

Supervised by:

16- MSC. Elaf Hussian

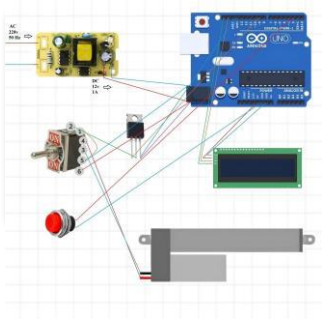
Sustainable Development Goals Performed: **Goal 3: Good Health and Well-being**

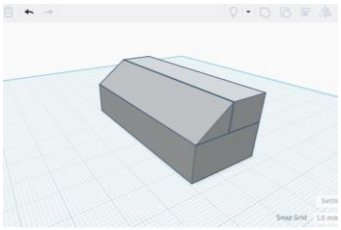
Abstract

An automatic anesthesia injector system using Arduino delivers precise doses based on patient health conditions, minimizing human error, ensuring safety, and improving efficiency during surgeries and critical treatments.

Methodology

The Smart Drug Injection System uses an Arduino microcontroller to automate drug delivery with high precision. Sensors monitor patient vitals like heart rate and temperature. Based on programmed thresholds, the Arduino controls a motor via an L298N driver to inject the correct drug dosage. An LCD displays real-time data. This system minimizes human error, ensures accurate dosing, and enhances safety and efficiency in medical treatments, especially during anesthesia or critical care.





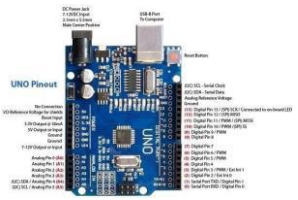
Results and conclusions

Results:

The development of smart drug injection systems using Arduino has been explored in various studies aiming to enhance medication delivery through automation and real-time monitoring. These systems typically integrate sensors, Arduino microcontrollers, and actuators to deliver precise drug dosages based on patient conditions.

One common implementation is a "smart syringe pump" designed for controlled dosing, often used in telemedicine and critical care. It utilizes DC motors, vital sensors (e.g., heartbeat, temperature, respiration), and a real-time clock (RTC) to ensure accurate injection timing.

Another example involves multiple automated injections, using Arduino Uno, relay modules, water pumps, and load cell amplifiers for fluid control, plus internet connectivity for remote access. These systems reduce human error, ensure consistency in treatment, and enhance patient safety, making them valuable tools for modern healthcare, especially in critical and remote settings.



Conclusion:

Arduino-based smart drug injection systems represent a significant advancement in medical technology, offering automated and precise control over medication delivery. Research shows that such systems increase accuracy, reduce human error, and improve patient safety.

Key features include real-time monitoring, customizable injection schedules, and wireless communication, enabling remote control and supervision in both hospital and home care. Flow and temperature sensors ensure safe dosage, while real-time clocks support scheduled delivery.

Their low cost, small size, and flexibility make them ideal for use in telemedicine and resource-limited environments. Arduino's adaptability also allows easy integration of additional features or sensors.

These systems are suitable for both routine drug administration and critical applications like anesthesia or pain management. As the need for efficient healthcare grows, smart injection systems offer a promising solution to deliver reliable, automated medical treatment in diverse clinical environments.

Proj.No.3

Third Eye for the Blind

العين الثالثه للمكفوفين

Prepared by:

3- **Abbas Ali Mihoul**
4- **Hussein Riad Hussein**
5- **Farah Mohammed Jawad**
6- **Umm Al Banin Ali Hamza**
7- **Auras Salam Ali**
8- **Zainab Majeed Hussein**

Supervised by:

1- **Dr. Zeyad Taha Yaseen**
2-

Sustainable Development Goals Performed: Goal 10: Reduce Inequality Within and Among Countries

Abstract

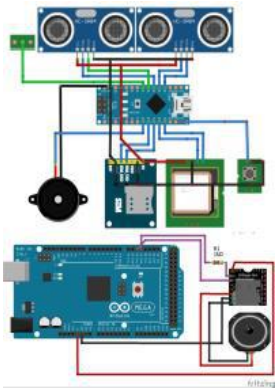
Abstract:
The Third Eye for the Blind is an innovative device that helps the visually impaired detect upper-level obstacles using sensors, GPS, GSM, and audio alerts, enhancing their safety, independence, and navigation experience.

Methodology

Methodology:
This project followed a structured methodology that involved hardware and software integration.

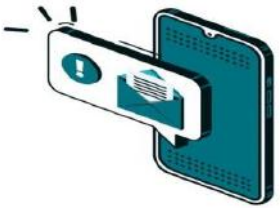
The system was designed using Arduino boards, ultrasonic sensors, GSM/GPS modules, and MP3 players. The methodology began with component selection, followed by circuit design and code implementation.

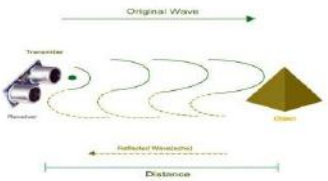
The prototype was tested in various real-life scenarios to ensure accurate obstacle detection and emergency location alerts, prioritizing usability, safety, and cost-efficiency for visually impaired individuals.



Results and conclusions

Results and conclusions :
The implementation of the "Third Eye for the Blind" project resulted in the successful creation of a smart wearable assistive device tailored for visually impaired individuals. The system effectively detects obstacles at three distance levels (1.5m, 1m, 0.5m) and responds with accurate pre-recorded audio alerts. Field testing demonstrated the device's capability to help users navigate safely in both indoor and outdoor environments. When obstacles were encountered, the ultrasonic sensor reliably measured the distance, triggering the Arduino to play specific voice alerts through the MP3 module. Additionally, the SOS emergency feature functioned as intended; upon pressing the button, the GPS module retrieved the user's coordinates and sent a distress SMS using the GSM module.





These results confirmed that the device can significantly increase the safety and independence of visually impaired users, especially in unfamiliar areas. The system operated reliably in various environmental conditions and required minimal training for use, fulfilling the project's goal of affordability and ease of use.

In conclusion, the "Third Eye for the Blind" project proves that low-cost, open-source technologies like Arduino can be effectively used to develop assistive tools for the visually impaired. This prototype lays a solid foundation for future enhancements such as integration with voice assistants, solar power, facial recognition, and mobile applications. With further improvements and extended testing, this innovation has the potential to become a practical solution for improving the quality of life for blind individuals.

Proj.No.4 DESIGN AND IMPLEMENTATION OF PATIENT MONITOR

Prepared by:

118-	مرتضى عباس عيدان	119-	ضرغام جميل رحمان	120-	علي غالب عبد العظيم
121-	امير مازن ابراهيم	122-	ايات امير عباس	123-	الاء محي كصب
124-	كرار حيدر محمود	125-		126-	

Supervised by:

17- **DR. Tarik Raoof Al_Khateeb** 18-

Sustainable Development Goals Performed:

Abstract

Abstract:
This system enables real-time, non-invasive vital sign monitoring with personalized feedback via a smart application, enhancing health management, early detection, and remote support for individuals and healthcare professionals.

Methodology

Methodology: The patient monitoring system was developed using an ESP32 microcontroller integrated with ECG, GSR, and DHT11 sensors. The system collects real-time data on heart activity,

stress levels, temperature, and humidity. Sensor data is processed and displayed on a 4x20 LCD screen, while also being transmitted wirelessly via Wi-Fi or Bluetooth for remote monitoring. Custom firmware and threshold-based algorithms enable data analysis, alerts, and secure communication.

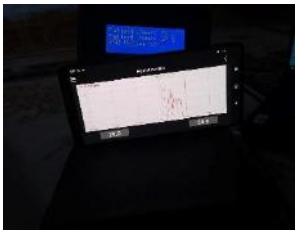
Results and conclusions

Results and conclusions:

The patient monitoring system effectively measures and displays key physiological signals—ECG and GSR—in real time. The ECG signal reflects the heart's electrical activity, while the GSR signal indicates emotional or stress responses through changes in skin conductance. Both signals are clearly visualized on a user-friendly interface, allowing healthcare professionals to monitor patients accurately and respond promptly when needed.

In addition, the system captures temperature (29°C) and humidity (20%), offering a comprehensive view of the patient's condition and environment. The integration with mobile devices supports remote monitoring, making the system valuable in telemedicine and home care settings.

The design uses low-cost, non-invasive sensors, ensuring accessibility and affordability. Data is transmitted securely, maintaining patient privacy and reliability. Overall, the system enhances continuous health monitoring, early detection of abnormalities, and timely intervention—making it a practical and efficient tool for improving healthcare delivery and patient outcomes.



Proj.No.5

Smart prescription drug alert system

Prepared by:

127- Hussein Hamid Jabbar	128- mortada Ayad Abd Almunim	129- Maryam Ahmed Faisal
130- Taqwa Abdulla Hassen	131- Huda Abd Alkadhim	132- Tadin Ryan Dayim
133- Rokua Mohammed Ali	134-	135-

Supervised by:

19- Dr. Zahraa hashim kareem 20-

Sustainable Development Goals Performed:

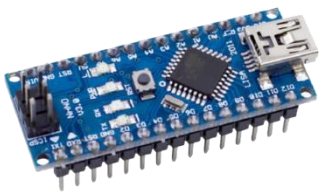
Abstract

Abstract:

Our system is simple, cost-effective, and uses smart alerts to ensure medication adherence. It's easy to use, locally sourced, and more efficient than traditional complex systems.

Methodology

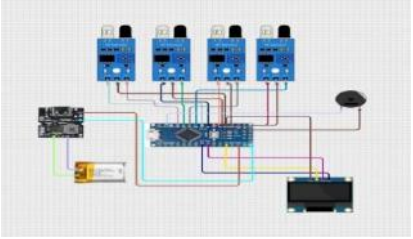
Methodology : A smart prescription drug alert system was developed to improve medication adherence, especially for epilepsy patients. The system utilized locally available components and smart alert technology to deliver timely reminders. A group of patients tested the system over a set period, and their adherence rates were monitored and compared to previous behavior. User feedback was collected to assess usability, efficiency, and impact on caregiver burden, helping evaluate the system's effectiveness and practical application in healthcare settings.



Results and conclusions

Results and conclusions:

The smart prescription drug alert system has shown strong effectiveness in improving medication adherence, particularly among patients with epilepsy. By providing timely and clear reminders, it helps patients consistently take their medications, leading to improved health and treatment outcomes. Unlike traditional systems that can be expensive, complicated, and difficult to manage, this system is simple, cost-effective, and easy to maintain. It also reduces the burden on caregivers and promotes patient independence. With its components readily available in local markets, the system is well-suited for use in various healthcare environments. Overall, it offers a practical, efficient, and scalable solution to medication management.



Proj.No.6

Patient monitoring system using IOT

نظام مراقبة المريض باستخدام إنترنت الأشياء

Prepared by:

136- Ahmed Kareem Mousa
137- Ali Adnan Ameen
138- Haider Ihsan Adnan
139- Ali Qahtan Hadi
140- Fatima Mohammed Radhi
141- Maysaa Mohsen Abdel
142- Arshad Gaith Abdulabbas

Supervised by:

21- Dr. Hasen Hamad Ali

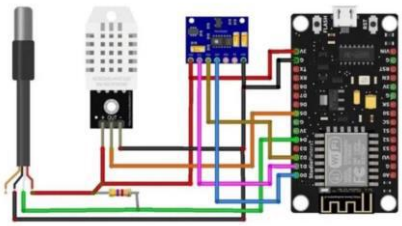
Sustainable Development Goals Performed:

Abstract

Abstract: This research aims to design and implement a patient monitoring system using Internet of Things (IoT) technology. The system utilizes a Node MCU ESP8266 development board along with various sensors, including a DHT22 digital temperature and humidity sensor, a waterproof temperature sensor (DS18B20), and a pulse oximeter sensor (MAX30100).

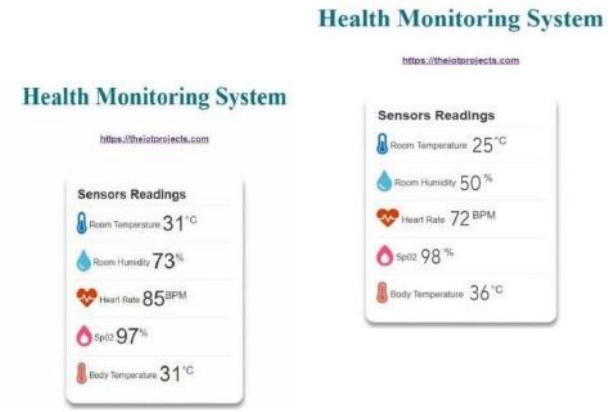
Methodology

Methodology : In this project, an IoT-based patient monitoring system was designed and implemented to address the limitations of traditional methods. The system utilizes a NodeMCU ESP8266 board and sensors such as the DHT22 for temperature and humidity, the DS18B20 for temperature measurement, and the MAX30100 for heart rate and oxygen saturation. Data is transmitted wirelessly to a web-based interface, enabling real-time monitoring from anywhere.



Results and conclusions

Results and conclusions: Once the code is uploaded to your NodeMCU ESP8266 board, you can open the serial monitor to see the program into action. The NodeMCU ESP8266 will connect to your Wi-Fi Network. Once connected, it will display the ESP8266 IP Address. Now, copy the ESP8266 IP Address and paste it on your Web Browser. It will display the room temperature, room humidity, Heart Rate, Blood Oxygen Level, and body temperature, etc., as shown in the images below. Similarly, you can monitor your patient's health from any device that features browsing capability. The below image is the view of the Patient Health Status on Android Smartphone. You simply need to copy the IP Address and paste it on the browser of any device.



Proj.No.7

Multifunctional electrical lab kit with non-fixed appliances

مجموعة مختبر كهربائي متعدد الوظائف مع أجهزة غير ثابتة

Prepared by:

143- Haider Karrar Hussein Ali
144- Mahdi Dawood Neamah
145- Naba Hussein kadhum Mahdi
146- Zahraa Omran Aliwi
147- Ammar Hamid Abdel Majeed
148- Hussein salam Kamel Mohammed
149- Muhammad Aqeel Abbas Safuk
150-
151-

Supervised by:

22- Dr. Osamah Jaber Ghayyib
23-

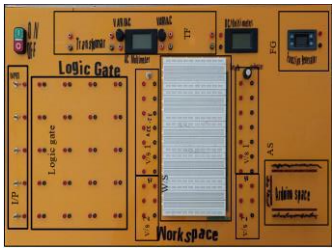
Sustainable Development Goals Performed: The ninth goal of sustainable development Industry

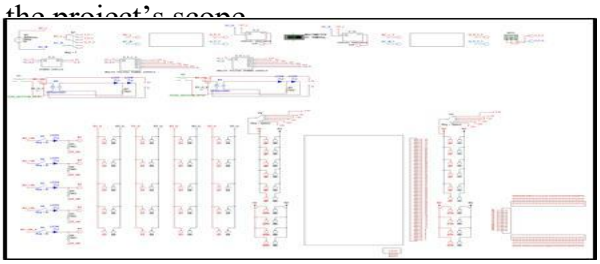
Abstract

Abstract:
The project develops low-cost, high-performance lab panels to enhance hands-on engineering education, using affordable local materials, easy maintenance, and transparent design, supporting Sustainable Development Goal 9 for sustainable education.

Methodology

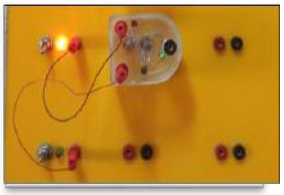
Methodology:
This study employed a qualitative approach, using interviews and questionnaires to gather data from participants. The target population included users and stakeholders of the system under development. Data was analyzed to understand user needs, system requirements, and technical feasibility. A prototype was then developed based on the findings. The process ensured that the solution met user expectations and addressed practical implementation challenges within the project's scope.





Results and conclusions

Results and conclusions: The multifunctional electrical lab kit project achieved notable results by overcoming the limitations of traditional lab equipment. It introduced a cost-effective, transparent, and modular training board designed for various electrical and electronic experiments. The board supports hands-on learning with components such as logic gates (AND, OR, NOT), microcontrollers like Arduino, power supplies, and frequency generators. Its modular design with removable parts allows students to perform real-time experiments, troubleshoot circuits, and visualize logical operations through LEDs. The transparent acrylic structure enables visual inspection of internal wiring, enhancing conceptual understanding. Integrated tools such as breadboards, multimeters, and banana connectors improve usability and flexibility. The inclusion of safety features like relays and halogen lamps helps protect users from electrical hazards during experiments. This project successfully meets its educational and economic goals by providing an accessible and practical solution for institutions with limited resources. It promotes student engagement, creativity, and technical skill development while contributing to quality education and innovation—supporting Sustainable Development Goal 9. Future enhancements may involve integrating more digital modules (e.g., flip-flops, counters, decoders), creating guided experiments, and testing improved materials for durability. Overall, the kit provides an efficient and innovative platform for learning, making engineering education more interactive and inclusive.



Proj.No.8	Detection and Analysis of Heart Rate Variability (HRV) from ECG Signals using MATLAB	

Prepared by:		
1- Hassan Moayed Taleb	2- Hussein Abdul Abbas	3- Hassan Diaa Jawad
4- Ayoub Taher Abdul Zahra	5- Murtada Mohsen Kazem	6- Benin Qasim Majid
7-	8-	9-

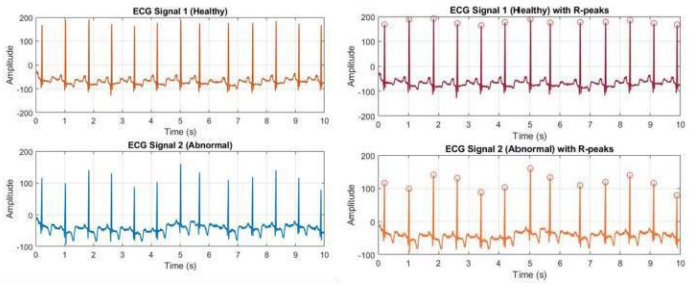
Supervised by:	
1- **MSC. Huda Asaad Abd Al-Ameer**	2-

Abstract

Abstract:
This project analyzes Heart Rate Variability (HRV) from ECG signals using MATLAB to assess autonomic nervous system balance. Key steps include signal filtering, R-peak detection, and RR interval extraction. Time-domain, frequency-domain, and nonlinear methods were applied. Results showed clear differences between healthy and abnormal signals, with lower HRV linked to cardiac issues. The study highlights HRV as a valuable non-invasive diagnostic tool and suggests future integration with AI and wearable technologies.

Methodology

ECG signals were obtained from public databases or real- time devices and sampled at appropriate rates. Signals were preprocessed using filters (e.g., Butterworth, FIR) to remove noise and artifacts. R-peaks were detected using the Pan- Tompkins algorithm. RR intervals were calculated, and HRV features were extracted using three approaches: time- domain (e.g., SDNN, RMSSD), frequency-domain (using FFT), and nonlinear methods (e.g., entropy, Poincaré plot). All analyses and visualizations were performed using MATLAB.



Results and conclusions

Results and conclusions:

The analysis revealed clear differences in HRV features between healthy and abnormal ECG signals. Healthy signals showed regular RR intervals and balanced spectral energy, indicating proper autonomic regulation. In contrast, abnormal signals displayed irregular RR intervals, reduced SDNN and RMSSD values, and lower spectral power, especially in high-frequency bands—signs of impaired autonomic function. These findings confirm HRV's effectiveness in detecting cardiac abnormalities and support its clinical value in early diagnosis and risk assessment.

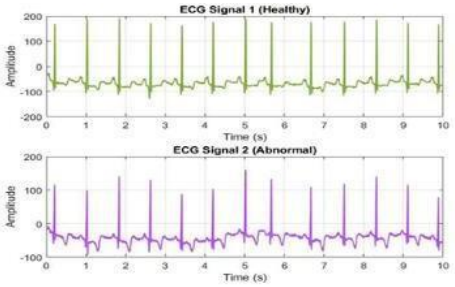
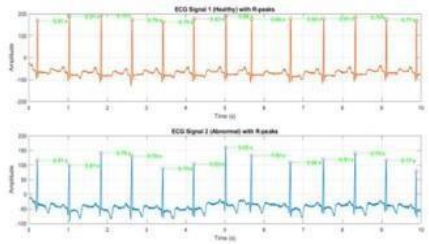


Fig (4-5) Comparison between a Normal and an Abnormal ECG Signal



Proj.No.9	Wearable Spine Stress Monitoring System	

Prepared by:		
1- Mohamed Mrzh Ibrahim	2- Zahraa Salah Abbas	3- Ahmed Faleh Hashem
4- Muntadhar Ali Ismail	5- Amir Fares Wathiq	6- Zahraa Ali Hameed
7- Fatima Nameer Abbas	8-	9-

Supervised by:	
1- **Dr. Osama Jaber Ghaib**	2-

Sustainable Development Goals Performed:	**The third goal Good Health and Well-being.**

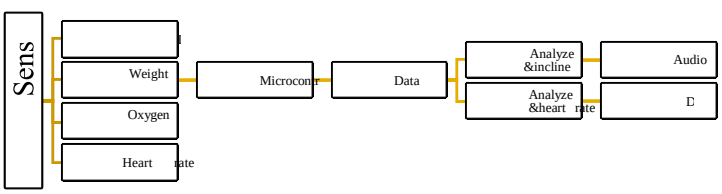
Abstract

Abstract:

This project introduces a wearable spinal monitoring system using sensors and Arduino technology to track posture and detect strain. It offers real-time alerts and displays vital signs like heart rate and oxygen levels. Designed for use in daily life, therapy, and sports, the device aims to prevent injuries and enhance overall well-being through smart, user-friendly technology.

Methodology

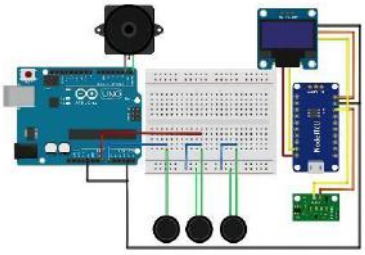
An Arduino board is used with three pressure sensitive sensors (FSRs) connected to a voltage divider system using fixed resistors (usually 10 kΩ) with one end of each FSR connected to 5V and the other end to ground. The analog signal is extracted from the point of intersection of the sensor with the resistor to feed an analog input (such as A0, A1 or A2) on the Arduino; the pressure change causes the measured voltage value to change, which is converted to a digital value using the analog Read function, allowing algorithms to be programmed to determine the limits of normal pressure versus excessive pressure that may indicate an incorrect position affecting the spine. An audible alarm device (bell or speaker) is connected to one of the digital ports with the possibility of adding a transistor or resistor to control the current, to issue an immediate alert when the readings exceed the specified limit after performing an accurate calibration.



Results and conclusions

Results and conclusions:

The test was conducted on many people of different ages (ages ranged from 15 to 80 years) and it was confirmed that the device, in terms of operation, works with high efficiency, high accuracy, and has an appropriate processing and response time. As for the design, the design was comfortable, light, and suitable for all categories. The 10-25 age group shows nearly 100% acceptance, while the 50-80 group declines due to comfort concerns. Older users need more support, highlighting the importance of enhancing user experience to boost acceptance across all ages.



Proj.No.10

Shaking and Weight Device of the Blood Bag

Prepared by:

152- Ammar Alaa Hadi Abdul	153- Ali Essam Salem Yassin	154- Hassan Abdul Ali Nayef
155- Sajjad Star Saheb Kazem	156- Murtaja Salah Abdul Saadoun	157- Karrar Ali Hussein Salem
158- Ibrahim Qasim Tayeh	159-	160-

Supervised by:

24- **Prof.Dr. Bayan Mahdi Sabbar** 25-

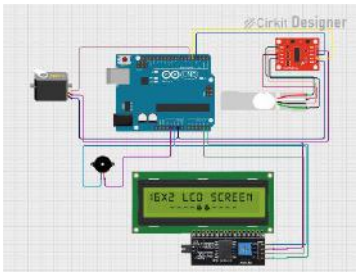
Sustainable Development Goals Performed:

Abstract

Abstract:
This project aims to design and implement an automated Shaking and Weight Device for blood bags to improve the accuracy and efficiency of blood collection in medical settings. It uses a load cell with an HX711 amplifier for real-time weight monitoring and an MG996R servo motor for gentle periodic shaking. The system is controlled by an Arduino UNO and includes a 16×2 LCD and buzzer for alerts. Testing showed the device can reduce clotting and enhance transfusion safety, highlighting the value of low-cost automation in healthcare.

Methodology

The blood bag weighing and shaking device was tested under controlled conditions to ensure reliable performance. The load cell with HX711 amplifier was calibrated using standard weights, confirming accurate measurements across typical blood volumes. The servo motor provided gentle, consistent agitation for proper anticoagulant mixing without stressing the sample. The 16×2 LCD and buzzer effectively delivered real-time feedback and alerts. Overall, the system proved accurate, safe, and efficient for medical use.



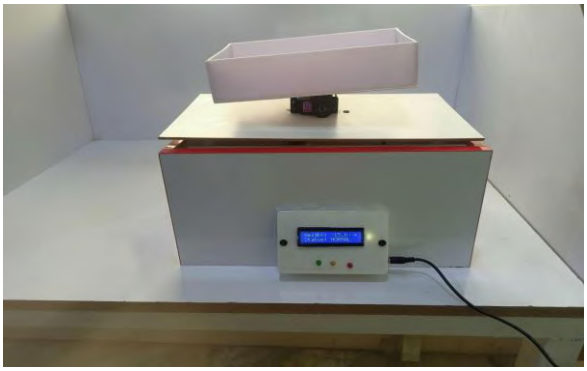
Results and conclusions

Results and conclusions:

The device demonstrated the following outcomes during testing:

- Weight Measurement: Achieved ±10 mL accuracy in volume measurement, validating the 1.06 g/mL blood density conversion factor.
- Agitation Efficiency: The servomotor maintained consistent shaking intervals (every 60 seconds) with adjustable amplitude, ensuring thorough anticoagulant mixing.
- User Interface Reliability: The LCD displayed real-time weight data, while the buzzer triggered alerts at 90% and 100% of the target volume (450 mL).

Furthermore, the performance of the user interface comprising a 16×2 LCD and an auditory buzzer was examined.



Proj.No.11

نظارات ذكية للأشخاص ذوي الإعاقة البصرية مزودة بنظام تنبيه للعوائق

Smart Glasses for the Visually impaired with Obstacle Alert System

Prepared by:

161- Zainab Ali Obaid 162- Fatima Fadhil Ali 163- Aya Hatim Lafta

164- Rawan Basim Rahi 165- Sajad Muslim Jassim 166- Hussein Alaa Hussein

Supervised by:

26- M.Sc Ali Kareem 27-

Sustainable Development Goals Performed: Goal 10 : Reducing unnecessary demand

Abstract

Smart Glasses help visually impaired individuals detect obstacles using sensors and audio alerts, improving their independence and mobility. The system offers a practical solution to reduce movement difficulties.

Methodology

Methodology

The project was developed using Arduino Uno, ultrasonic sensors, a buzzer, and a rechargeable power supply. The ultrasonic sensors were mounted on the smart glasses and walking stick to detect nearby obstacles. These sensors continuously measure the distance between the user and any object in front of them.

The Arduino Uno receives the sensor data and processes it using a custom program written in the Arduino IDE. Once an object is detected within a specific range (less than 1 meter), the system activates the buzzer to alert the user with an audible signal.

The components were first assembled and tested on a breadboard to ensure functionality. After that, the circuit was carefully soldered and integrated onto the glasses and stick. The final setup was tested in different environments, including indoors with controlled lighting and outdoors with natural conditions, to evaluate the system's reliability and accuracy.

Adjustments were made to the sensitivity of the sensors and the response timing of the buzzer to ensure quick and accurate alerts. The system was designed to be lightweight, portable, and affordable, making it suitable for daily use by visually impaired individuals.

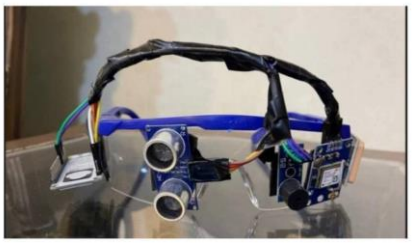
Fig (2-4): Ultrasonic

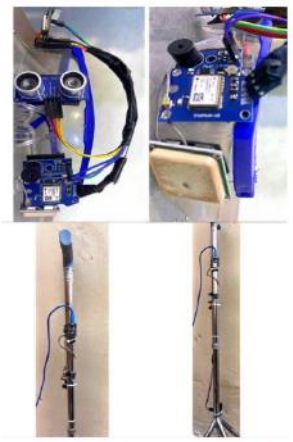
Fig (2-1): ARDUINO

Results and conclusions

Results and conclusions:

The smart glasses were tested in various environments to measure the accuracy of the obstacle detection The smart glasses were tested in various environments to measure the accuracy of the obstacle detection system. In indoor settings with clear lighting and minimal noise, the ultrasonic sensors successfully detected obstacles with an accuracy rate of 92% within a 1- meter range. In outdoor environments, the accuracy slightly decreased to 85%, mainly due to environmental interference such as wind, uneven surfaces, and background noise. These results indicate that the system is generally reliable in detecting common obstacles within a safe walking distance, offering effective support for visually impaired users.





Proj.No.12

Implementation of vein finder

جهاز كاشف الأوردة

Prepared by:

167-	Ali Ibrahim Kazim	168-	Hussain Khalid Mahdi	169-	Mohammed Haider Mohi
170-	Sajjad Abbas Kazim	171-	Mustafa Firas Mussa	172-	Mohammed Hamid Aziz
173-	Ghofran Qasim Abdullah	174-		175-	

Supervised by:

28- M.S.C Ali Kareem 29-

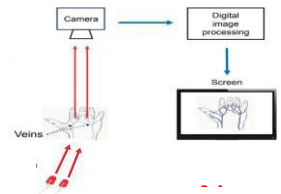
Sustainable Development Goals Performed:

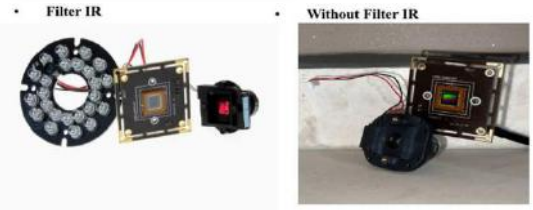
Abstract

Vein detection for venipuncture and biometrics is one of the most researched biomedical techniques. Problems faced in accessing veins by physicians and nurses to administer intravenous drugs make non-invasive vein detection the need of the hour

Methodology

Vein Viewers use infrared light to detect hemoglobin and capture the vascular pattern beneath the skin. The captured image is then processed and projected onto the patient's skin, enabling medical practitioners to visualize the veins clearly and make informed decisions.



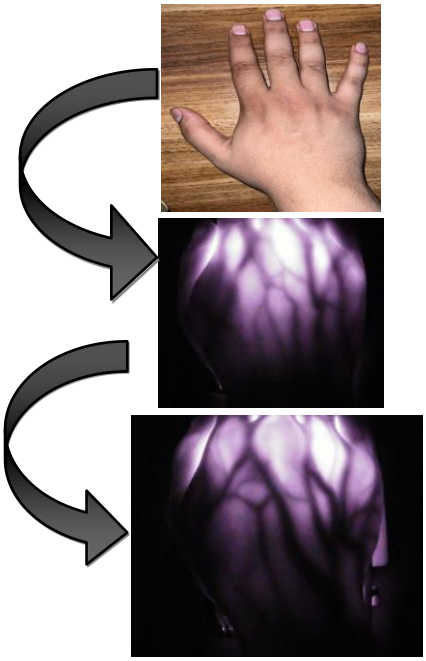


Results and conclusions

•The project was tested on a person suffering from blurred palm veins due to an increase in body fat

•His vein cannot be located but with vein finder wegot the location of the vein and could easily draw blood from his palm

•A clear, high-resolution imaging was obtained through which the location of the vein could determine and take laboratory blood tests without problems



Proj.No.13

Smart Control of Wheelchair Using Voice Commands

التحكم الذكي بالكرسي المتحرك باستخدام الأوامر الصوتية

Prepared by:

176- Mohammed Anwer Moner | **177- Ali Jaafar Mohammed** | **178- Hussein Ali Jawad**

179- Hussein Majid Kadhim | **180- Abbas Karim Abd Karim** | **181- Murtada Qasim Karim**

182- Ahmed Rami Abd Al-Razaq | 183- | 184-

Supervised by:

30- Prof. Hasan Hamad Ali | 31-

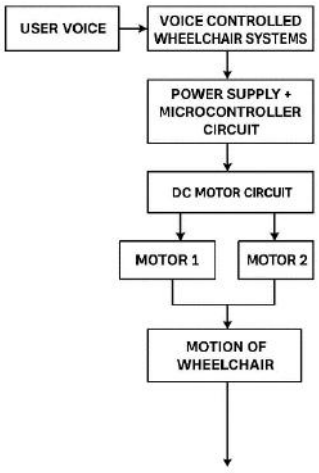
Sustainable Development Goals Performed:

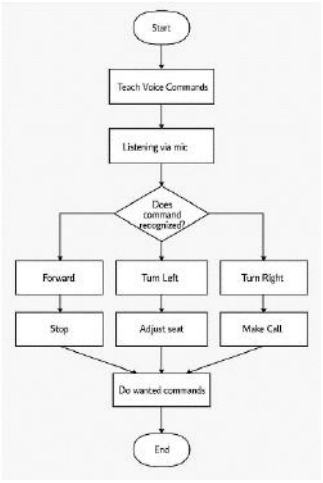
Abstract

This research presents a smart wheelchair using voice and gesture control with Arduino and AI, enhancing mobility and independence for individuals with physical disabilities through accessible, hands-free navigation

Methodology

This system consists of two parts: one for driving the wheelchair and another for control and tracking. It uses a voice recognition module where users pre-record commands like “forward,” “backward,” “left,” “right,” and “stop” to control movement. The wheelchair responds to these voice inputs, allowing individuals with disabilities to navigate independently and easily manage direction and motion using simple spoken commands





Results and conclusions

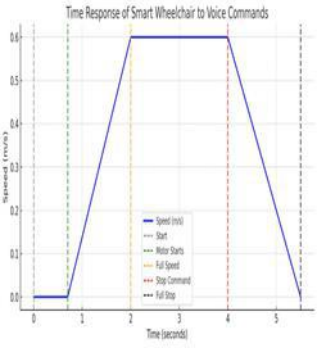
The Results

Full control of movement (forward, backward, right, left, stop). Immediate response to commands via the mobile app Accuracy of sensor readings (such as the distance sensor for obstacle avoidance) Battery efficiency and lifespan during continuous use The system's ability to stop in an emergency Obstacle avoidance using sensors Ease of use via the mobile app User satisfaction with the speed of response and accuracy

Conclusions

The smart voice-controlled wheelchair represents a breakthrough in assistive technology, empowering individuals with disabilities to navigate independently. By integrating artificial intelligence and microcontroller-based systems, this project offers a practical and efficient solution for enhancing mobility and autonomy. This project depicts a "speech-controlled Wheel chair"

Distance (m)	Duration (s)	Phase	Command
0.39	1.3	Acceleration	Forward
0.46	2.0	Constant Speed	Forward
0.46	1.5	Deceleration	Forward
2.03	5.5	Total	Forward
0.30	1.0	Pre-Turn Slowdown	Turn Right/Left
0.45	1.0	Turning	Turn Right/Left
0.45	1.5	Post-Turn Acceleration	Turn Right/Left
1.20	3.7	Total	Reverse
0.30	1.0	Acceleration	Reverse
1.40	5.7	Constant Speed	Reverse



Proj.No.14

Smart Control of Wheelchair Using Voice Commands

التحكم الذكي بالكرسي المتحرك باستخدام الأوامر الصوتية

Prepared by:

185-	**Mohammed Anwer Moner**	**186-**	**Ali Jaafar Mohammed**	**187-**	**Hussein Ali Jawad**
188-	**Hussein Majid Kadhim**	**189-**	**Abbas Karim Abd Karim**	**190-**	**Murtada Qasim Karim**
191-	**Ahmed Rami Abd Al-Razaq**	192-		193-	

Supervised by:

32- Prof. Hasan Hamad Ali 33-

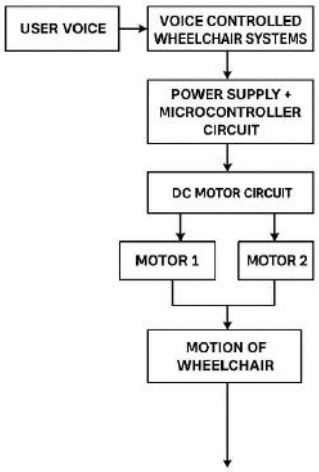
Sustainable Development Goals Performed:

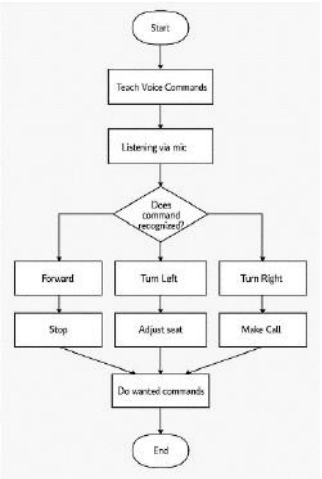
Abstract

This research presents a smart wheelchair using voice and gesture control with Arduino and AI, enhancing mobility and independence for individuals with physical disabilities through accessible, hands-free navigation

Methodology

This system consists of two parts: one for driving the wheelchair and another for control and tracking. It uses a voice recognition module where users pre-record commands like “forward,” “backward,” “left,” “right,” and “stop” to control movement. The wheelchair responds to these voice inputs, allowing individuals with disabilities to navigate independently and easily manage direction and motion using simple spoken commands





Results and conclusions

The Results
Full control of movement (forward, backward, right, left, stop). Immediate response to commands via the mobile app Accuracy of sensor readings (such as the distance sensor for obstacle
avoidance) Battery efficiency and lifespan during continuous use The system's ability to stop in an emergency Obstacle avoidance using sensors Ease of use via the mobile app User satisfaction with the speed of response and accuracy
Conclusions
The smart voice-controlled wheelchair represents a breakthrough in
assistive technology, empowering individuals with disabilities to navigate
independently. By integrating artificial intelligence and microcontroller-based
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mobility and autonomy. This project depicts a "speech-controlled Wheel chair"

Distance (m)	Duration (s)	Phase	Command
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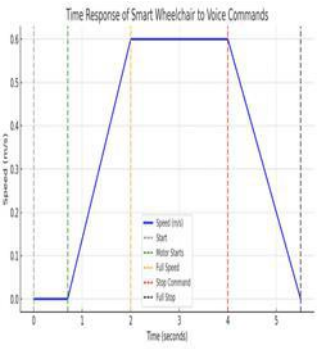
0.30	1.0	Acceleration	Reverse
1.40	5.7	Constant Speed	Reverse



Proj.No.15

INTELLIGENT SUPPORT ASSISTANT FOR INDIVIDUALS WITH MUSCULAR WEAKNESS

Prepared by:

194-	مرتضى سلمان خضير	195-	حسين علي راضي	196-	هيثم محسن
197-	منتظر حسين كاظم	198-	علي عباس	199-	حسين كامل
200-	حسين خيري	201-		202-	

Supervised by:

34- MSC. Elaf Hussein Hadi 35-

Sustainable Development Goals Performed:

Abstract

Abstract:

This device empowers individuals with muscular weakness by using AI and ergonomic design to assist with daily tasks, enhance independence, ensure safety, and promote ease of use and confidence.

Methodology

Methodology: The project employed a hands-on engineering approach to design and build a lifting assistive device. Using Arduino controllers, servo motors, and sensors, the system was prototyped to support loads up to 15 kg. Components such as load sensors and emergency stop features were integrated for safety. The device was tested through staged lifting tasks to evaluate functionality, stability, accuracy, and user-friendliness in real-world conditions.

Results and conclusions

Results and conclusions:

The “Helping Hand for Lifting” device achieved its primary goal of providing an assistive lifting solution, capable of lifting loads up to 15 kilograms with precision and safety. Testing confirmed its effective performance, with servo motors and sensors enabling stable, smooth lifting operations. The ergonomic design, combined with safety features like calibrated sensors and emergency stop functions, ensured user safety and comfort. Lightweight materials and cost-effective components made the device portable and affordable, while user feedback highlighted its intuitive interface and ease of use. Additionally, the device improved productivity in environments requiring frequent lifting and showed potential to reduce physical strain and musculoskeletal injuries.

Proj.No.16	Design A Smart Waste Disposal System in Hospitals	

Prepared by:		
1- Ahmad Nieamah malik	2- Mohammed Amer Mohammed	3- Mohamed Ali Jassim
4- Hassan Majed Mohammed	5- Nayzak Kazem Abbas	6- Mohammed Saeid Ali
7- Tabark Azhar Khalkhal	8-	9-

Supervised by:	
1- **Dr. Osama Jaber Ghaib**	2-

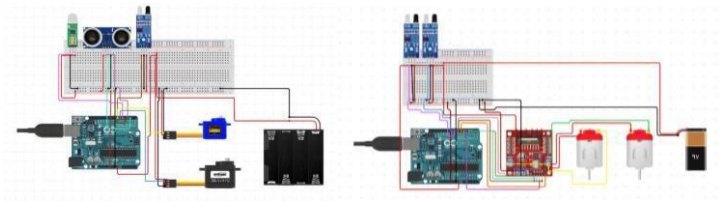
Sustainable Development Goals Performed:	**The third goal Good Health and Well-being.**

Abstract

Abstract:
This project aims to enhance hospital waste management by developing an intelligent disposal system using Arduino UNO, integrated with sensors (infrared, PIR, ultrasonic), servo and DC motors, UV sterilization, and a robotic transporter. The system automates waste handling, monitors bin levels, detects hazardous materials, and ensures sterilization, providing real-time alerts. It offers a cost- effective, hygienic, and sustainable solution that reduces human contact, meets international standards, and supports infection control, staff safety, and environmental protection in modern healthcare facilities.

Methodology

The system starts with a PIR sensor detecting motion, triggering a servo motor to open the first door for touchless waste disposal. An IR sensor then confirms waste presence, prompting a second servo motor to open the second door, allowing waste to drop into the main container. A UV unit sterilizes the waste afterward. An ultrasonic sensor monitors waste levels to prevent overflow. For transport, a robot guided by IR line sensors follows a marked path, controlled by an L298N motor driver and Arduino Uno, enabling smooth, automated movement to the disposal area.



Results and conclusions

Results and conclusions:

The simulation confirmed the smart waste disposal system's effectiveness, with all sensors and actuators functioning properly and in sync. The robot accurately followed its path and adjusted movements using IR sensors and motor control, while UV sterilization activated on time to support infection control. These results demonstrate the system's potential for hospital use, offering safer, more efficient, and environmentally responsible medical waste management. The intelligent medical waste disposal system aims to improve the handling of solid and liquid waste in hospitals. Key features include:

1. Waste sterilization
2. Fill-level monitoring
3. Real-time container status updates
4. Reminders for emptying containers
5. Detection of unusual waste such as sharps or hazardous liquids

Proj.No.17

IoT Based Interactive Blind-Person Stick Using Microcontroller

Prepared by:

203- Mohammed Abdul-Abbas khalif
204- Hussein Muntaser Hafidh
205- Abdullah Adel Rebeh
206- Mahdi Ihsan Ali
207- Ali Haider Abd Zaid
208- Noor Ali Hussein
209- Zainab Mahdi Hassan

Supervised by:

Assist.Prof.Dr. Saad Mutashar Abbas

Sustainable Development Goals Performed:

Abstract

Abstract: This study presents the design and implementation of smart blind stick using a Arduino. The proposed stick have an ultrasonic sensor that detects obstacles within a certain range and alerts the user through a buzzer and vibration motor. The stick also have a Arduino that processes the sensor data and controls the buzzer and vibration motor. The stick are powered by a rechargeable battery and can be charged through a USB port.

Methodology

Methodology

Design and Components

The smart blind stick was designed using a combination of hardware and software components to ensure efficient obstacle detection and user alert mechanisms

Circuit Design and Assembly

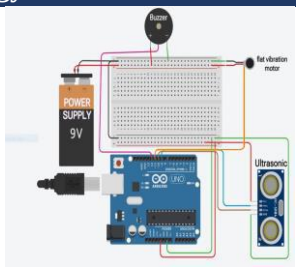


Fig-1 Schematic Diagram

The Schematic diagram for the circuit is shown in Fig,-1

The circuit for the smart blind stick was designed to integrate the Arduino microcontroller with the ultrasonic sensor, buzzer, and vibration motor. The components were connected as follows:

- The ultrasonic sensor was connected to the Arduino's digital pins for sending and receiving signals.
- The buzzer and vibration motor were connected to the Arduino's output pins to receive signals that trigger the alerts.

The components were assembled on a breadboard for initial testing and then transferred to a more permanent prototyping board for durability.

Testing and Validation

The smart blind stick was tested in various scenarios to evaluate its effectiveness:

Indoor Testing: The stick was tested in a controlled indoor environment with common obstacles like

Fig-2

Results and conclusions

Results and conclusions: the design and implementation of smart blind stick using a Arduino provide a low-cost and effective solution for blind or visually impaired individuals to navigate their surroundings safely. The proposed system is easy to use and portable, and it can detect

Fig-3 The Stick

obstacles within a certain range and alert the user through a buzzer and vibration motor.The results of the study demonstrate the effectiveness of the proposed system in various scenarios, such as indoor and outdoor environments. The system can provide blind or visually impaired individuals with greater confidence and safety when navigating their surroundings. The use of a Arduino makes the smart stick highly customizable and scalable. Overall, the design and implementation of smart blind stick using the Arduino hold great promise for improving the quality of life of blind or visually impaired individuals. The system can be a cost-effective and portable solution that enables individuals to navigate their surroundings with greater independence and confidence

Proj.No.18

Design and implementation of smart lot device for child safety based on Arduino

Prepared by:

210-	Dhu al-Fiqar Ahmed Adel	211-	Wessal Yasser Jiyad	212-	Hasan Dhahir habib shalan
213-	Zahraa Mitham Mohammed	214-	Zahraa Mitham Mohammed	215-	Zahraa Samir Salem
216-	Kawthar Hussein Abdul	217-		218-	

Supervised by:

36- **Prof.Dr. Alaa Hussein Ali** 37-

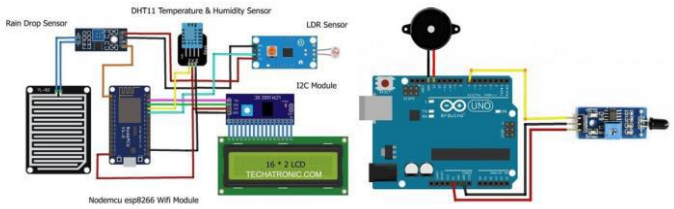
Sustainable Development Goals Performed:

Abstract

Abstract:
This study presents the design and implementation of a smart child protection device based on IoT and Arduino technologies to monitor children's health and surrounding environment in real time. The system includes sensors such as DHT11 for temperature and humidity, motion, heart rate, rain, and fire sensors to detect risks like falling, suffocation, or exposure to unsafe conditions. Data is processed by an Arduino microcontroller and transmitted via NodeMCU over Wi-Fi to a mobile app, providing instant alerts to parents. The project combines engineering design and programming with a focus on cost-effectiveness, efficiency, and ease of use. It also discusses challenges faced, results achieved, and future improvements to extend its application to elderly and patient care.

Methodology

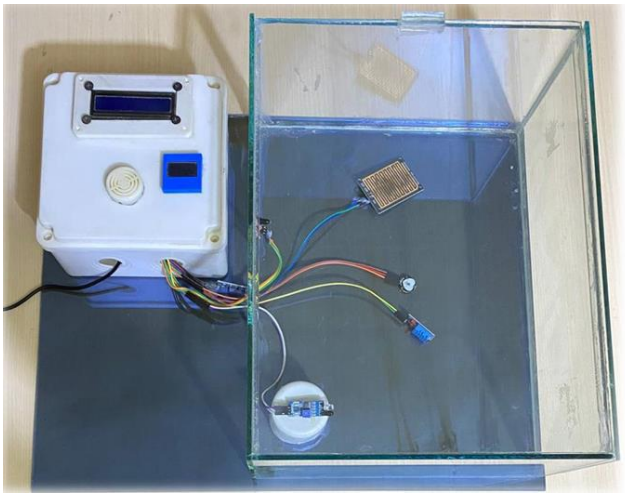
The child safety device uses multiple sensors—heart rate, IR motion, water, and flame—connected to an Arduino for real-time monitoring. NodeMCU transmits alerts via Wi-Fi to a mobile app, while LCD and OLED screens display status. A buzzer signals dangers, and all components are enclosed and tested for reliable performance, offering a smart IoT-based solution for child protection.



Results and conclusions

Results and conclusions:

The research has led to the design and implementation of a smart device based on Internet of Things (IoT) technologies and various sensors to protect children from potential risks, such as falling, suffocation, or high temperatures. The device collects environmental and health data in real time using multiple sensors, such as temperature, humidity, motion, and toxic gas sensors, then processes them via the Arduino platform and sends instant alerts to parents via a mobile application connected to a Wi-Fi network using NodeMCU. The device is characterized by its low cost and high efficiency, with the possibility of developing it in the future to include additional features such as integration with smart home systems, improving sensor accuracy, and using renewable energy sources to ensure its sustainability.



Proj.No.19

Design and Implementation of Device to Transfer any Movement Made by a Paralyzed Patient into Voice Commands

Prepared by:

219-	Ibrahim Hussein	220-	Hiba Raheem	221-	Zainab Mohamed
222-	Hassan Salah	223-	Ameer Shahid	224-	Marwa Mohamed
225-	Mouda Dakhel	226-		227-	

Supervised by:

38- Dr. Maiser Mundhir 39-

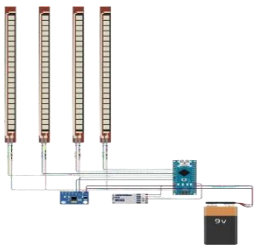
Sustainable Development Goals Performed:

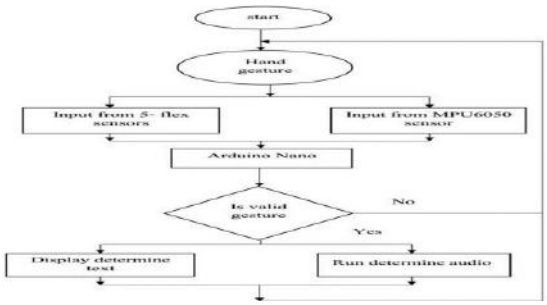
Abstract

Abstract: People With Disability (Deaf And Dumb) Using Sign Language As A Language Of Expression, By Using Sign Language Which Depend On Hand Gesture And Movement, Using Smart Glove To Enable Communication Between People And People With Disability

Methodology

Methodology : This project employs an applied methodology to design, implement, and evaluate a Smart Air Quality Monitoring System using Internet of Things (IoT) technology. The methodology integrates both hardware and software components to enable real-time air quality assessment through sensor data collection, wireless transmission, and remote access via mobile or web platforms





Results and conclusions

Results and conclusions: Disable people using sign language (gesture) to communicate with others, but normal person cannot understand what disable people try to say by their sign language and needed to translation to be understood and to communicate with them, to make a communication bridge glove was designed for deaf and dumb people. The glove is capable of translating their sign language gestures into so, that communication is not limited between disable people only they can communicate with normal people, and make their future better.

Future Work:

To improve system performance in future development, some suggestion below:

- Using two glove and connected them wirelessly in order to increase the number of gestures.
- Make glove depend also on motion of hand in order to increase number of gesture and at sometimes gets precisely some gesture

Proj.No.20

Enhanced pH Meter for Medical Fluid Analysis

مقياس الأس الهيدروجيني المحسن لتحليل السوائل الطبية

Prepared by:

228- Mohammed Kazim Abd Farhan
229- Hussein Hadi Kamil
230- Fatima Rahim Eubayd
231- Tabarak Kazim Hashim
232- Noor Jafar Kassar
233- Saja Saleh Fahim
234-
235-
236-

Supervised by:

40- M.Sc. Huda Wasfi Hassoon
41-

Sustainable Development Goals Performed: 3

Abstract

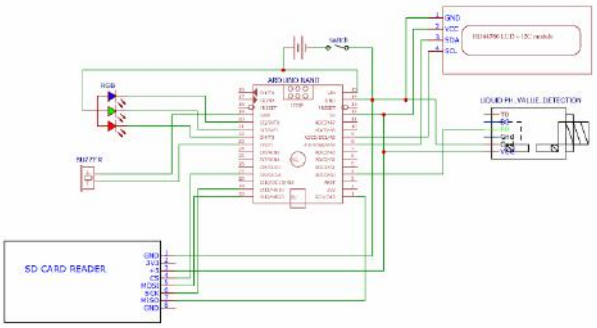
Abstract: This project presents a low-cost, portable, and accurate Arduino-based pH meter designed for medical fluid analysis, offering real-time alerts, data logging, and visual indicators for clinical efficiency.

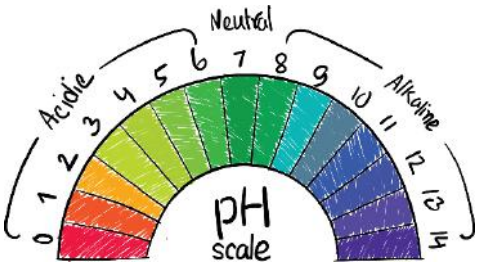
Methodology

Methodology: The enhanced pH meter was developed using an Arduino Nano microcontroller integrated with a liquid pH sensor, LCD I2C display, RGB LED, buzzer, and SD card module. The device was calibrated with standard buffer solutions and tested on various fluids including blood, urine, water, and chlorine. Data were processed, displayed, and logged automatically. System wiring ensured stable operation, and the device was evaluated for accuracy, usability, and portability.

Results and conclusions

Results and conclusions: The developed pH meter was tested across various samples—blood, urine, water, and cleaning solutions. Results demonstrated accurate and consistent pH readings. Blood measured at pH 6.369 indicated acidity, though it raised concerns regarding classification thresholds that may need refinement for clinical accuracy. Urine showed a pH of 3.83, correctly reflecting a highly acidic condition, demonstrating the device's sensitivity. The chlorine solution, measured at pH 12.20, confirmed the system's ability to handle strong alkalinity, which is essential for industrial or sterilization use. Water recorded a slightly alkaline value of 7.933, suggesting minimal deviation or presence of dissolved minerals.





The device successfully logged all data onto an SD card and provided real-time feedback through color-coded LEDs and buzzer alerts, enhancing usability in time-sensitive environments. The system's ability to provide immediate visual and auditory alerts, in addition to precise data logging, improved both accuracy and efficiency. The conclusion confirmed that the Arduino-based pH meter achieved its objectives as a reliable, low-cost, and portable solution suitable for various medical and research applications.

Proj.No.21

Design of medical program for drug analysis benefits and risks

تصميم برنامج طبي لتحليل الأدوية والفوائد والمخاطر

Prepared by:

237- Abdullah Ahmed Ali 238- Mujtaba Ahmed Adnan 3-Rola Sarmad Abdel Wahab
5-Maryam Mohamed Hassan **5**-Dhamyaa Jassim Hammadi 6- Sahib Shakir Sahib
7- Muqtada Bassem Hassoun

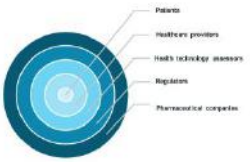
Supervised by: MSc. Ali kareem Obaid

Sustainable Development Goals Performed: 3rd Good Health

Abstract

This project aims to develop medical software that evaluates new drug benefits and risks, helping physicians make accurate decisions using reliable, personalized patient data and clear, essential drug information.

Methodology



The methodology involved designing and developing a user-friendly medical software using structured programming techniques. A database of medications was integrated to provide real-time analysis. The system allows users to input drug details and patient data, which are then processed to assess benefits and risks. The software generates a comprehensive report to support clinical decisions, ensuring accuracy, reliability, and personalized healthcare recommendations.

Results and conclusions

In this project, a specialized medical software application has been developed to evaluate pharmaceutical drugs in terms of their benefits and risks. The primary objective is to support healthcare professionals, particularly physicians and nurses, in making informed clinical decisions by providing them with reliable, clear, and accessible information about medications. The need for such a tool arises from the challenges clinicians face when dealing with newly introduced drugs. Often, they must rely on information provided by pharmaceutical representatives or complex and lengthy documents issued by regulatory authorities. This can lead to delays in understanding a medication's true value and possible effects.The software is designed with an intuitive and interactive interface that displays essential drug information in a structured and user-friendly format. It allows users to quickly assess the therapeutic advantages and potential risks associated with each drug, including comparisons of different active ingredients. The system also facilitates the input of patient-specific data—such as age, health status, and dosage—to provide a personalized evaluation for each case, thus enhancing the accuracy of treatment decisions.

Proj.No.22

Smart Ventilaitor

Prepared by:

239-	كاظم كريم جحيل	240-	زينب نجيب جادر	241-	ميثم ياسر موسئ
242-	مصطفئ رزاق تركي	243-	كرار كريم دحام	244-	مومل فواز محي
245-	كرار حاتم مطشر	246-		247-	

Supervised by:

42- **M.s:Alaa Khalid Abd AL-Ridha** 43-

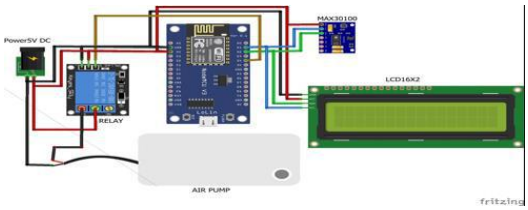
Sustainable Development Goals Performed:

Abstract

Abstract:
The IoT-based ventilator aims to provide continuous breathing to a patient whose lung capacity has decreased to the point where it is not possible to inhale and exhale on their own. The IoT-based ventilator is a low-cost, effective, and easy-to-make alternative to existing nasal respirators.

Methodology

The smart ventilator system integrates sensors, controllers, and Internet of Things (IoT) technology to monitor and support patients' respiratory functions. Here's how it works: Patient Monitoring• When the patient places their finger on the MAX30100 sensor, the device begins reading:• Blood oxygen level (SpO• Heart rate (BPM)• These readings are transmitted to the ESP8266 NodeMCU, which processes the data. Data Display and Transfer• Processed readings are displayed on an I2C LCD screen, allowing real-time viewing of the patient's vital signs.• Simultaneously, the data is sent via Wi-Fi to the physician's phone or computer using the RemotXY mobile app, enabling remote monitoring. Oxygen Delivery Control: If the system detects that the blood oxygen saturation (SpO2) level is below a certain threshold, the NodeMCU activates a 5V relay module, which in turn: Turns on the air pump, supplying the patient with oxygen. Once the oxygen level returns to normal, the system can automatically:Turn off the air pump to save energy and avoid hyperoxia. Remote Access:The physician or healthcare provider can: Monitor the patient's vital signs in real time. Manually turn the air pump on/off from the RemotXY app if necessary.Receive alerts if any vital signs exceed a safe range. Power Management: The device can be operated on battery power, allowing patients freedom of movement while being monitored.This feature is particularly useful during power outages or in areas without a stable power source.



Results and conclusions

Results and conclusions:
The project was successfully completed. When the thumb or any left finger is placed on the oxygen sensor, the sensor will send a signal that reads the oxygen in the blood and sends it to the controller, which in turn sends these readings to the screen in the project and also sends them to the mobile via the Wi-Fi in the controller. The project was placed in a suitable box with a good appearance, with an air pump that is controlled by the mobile to turn it on and off. This pump represents a virtual device that sends oxygen.

Conclusions:
It provides a good ventilation system for patients who have lost the ability to breathe.
Improving the efficiency of the respiratory system, and increasing the speed of response in emergency situations, as the reading reaches the emergency unit via Wi-Fi.
Provides an easy-to-use system suitable fordifferent environments.
This project provides flexibility of use, as theventilator and patient monitoring system can be used together or separately according to the patient's requirements.
It contains rechargeable batteries, which allows movement anywhere there is no electricity.

Proj.No.23

DESIGN AND IMPLEMENTATION OF A SMART MULTI-SCAN MEDICAL DEVICE

Prepared by:

248- علي تحسين ربيع
249- علي عبيس محمد
250- يسر ماهر موسى
251- عباس ستار عليوي
252- ابرار براء إبراهيم
253- اماني جاسم محمد
254- حيدر مقصد عمران
255-
256-

Supervised by:

44- **Dr . Rami Qays Malik**
45-

Sustainable Development Goals Performed:

Abstract

Abstract:
This advanced, non-contact health monitoring system enhances remote care by tracking vital signs in real time, offering personalized insights, improving early detection, and promoting proactive, patient-centered healthcare management.

Methodology

Methodology: The device was developed using an Arduino Nano microcontroller integrated with ECG, pulse oximeter, and non-contact temperature sensors. Sensor data were acquired and processed in real-time using custom firmware and displayed through a computer application with a user-friendly interface. AI-based algorithms analyzed the health data to detect anomalies. Simulations were conducted to test accuracy and performance, with results validated through comparison to standard physiological ranges.

Results and conclusions

Results and conclusions:

The developed multi-scan medical device has demonstrated effective and accurate performance in monitoring essential vital signs, supporting its suitability for both clinical and home care settings. During testing, the device reliably measured heart rates within the normal range of 60 to 100 beats per minute, accurately capturing variations during different activity levels such as resting and walking. Oxygen saturation levels were consistently detected between 95% and 100%, confirming the device's ability to identify early signs of respiratory issues. Additionally, the non-contact temperature sensor provided precise readings between 36.5°C and 37.5°C, with fast response times ideal for clinical use.

The ECG module recorded clear and distinguishable waveforms, including P, QRS, and T waves, enabling effective heart rhythm analysis. Simulated arrhythmias were correctly detected by the AI algorithm, validating the system's diagnostic capabilities.

Proj.No.24	Design and implementation of vital signs monitor using Arduino	

Prepared by:		
1- Saif Habib Karim	2- Mustafa Latif Fakhry	3- Ahmed Bader Katham
4- Hassanein Mahdi Attia	5- Ashraf Hussein Ali	6- Mohammed Asaad Yadam
7- Aysir Ahmed Awad	8-	9-

Supervised by:	
1- Dr. Adnan Hussein Ali	2-

Sustainable Development Goals Performed:	

Abstract

Abstract:

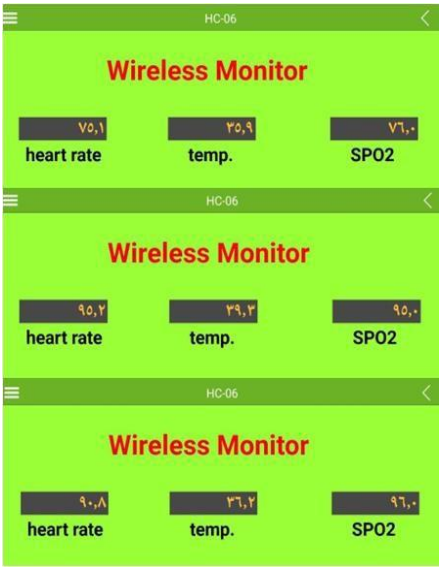
This project involves designing a portable vital signs monitoring device using Arduino Nano to measure heart rate, SpO2, and body temperature. It uses the MAX30100 sensor and an NTC thermistor, with data sent via HC-06 Bluetooth to a smartphone through the RemoteXY app. Powered by lithium batteries, the device is low-cost and compact. Tests showed good accuracy, with one SpO2 reading indicating a need for better calibration. The system is suitable for basic health monitoring in remote or home settings.

Methodology

The bio-system is built inside a dedicated protective box (Caja De Conexiones) to ensure safety and proper organization. It operates using two 18650 lithium batteries connected in series, supplying power through a BMS protection circuit that controls voltage and current. This power is then routed through a push button switch to the Arduino Nano, which acts as the main controller of the system. The MAX30100 sensor is connected via I2C ports to measure heart rate and blood oxygen saturation (SpO2), while an NTC thermistor connected to an analog input reads body temperature. The HC-06 Bluetooth module sends the collected data wirelessly to a smartphone, where it is displayed in real time using the RemoteXY application. A distribution board is used to simplify connections between components without permanent soldering, allowing for future modifications. The system is recharged using a 12V adapter through a DC jack, with the BMS ensuring safe and regulated battery charging.

Results and conclusions

Three practical tests were performed on different individuals to evaluate the device's accuracy in measuring heart rate, blood oxygen (SpO2), and body temperature using the RemoteXY app via Bluetooth. The first reading showed normal heart rate (75.1 bpm) and temperature (36.9°C), but low SpO2 (76%) likely due to misalignment or weak signal. The second reading indicated fever with a high temperature (39.3°C) and increased heart rate (95.2 bpm), while SpO2 remained normal at 95%. The third reading showed all values within normal ranges—heart rate (90.8 bpm), temperature (36.2°C), and SpO2 (96%)—demonstrating the device's reliability when properly used.ط



Proj.No.25	Design and implementation of vital signs monitor using Arduino	

Prepared by:		
1- Saif Habib Karim	2- Mustafa Latif Fakhry	3- Ahmed Bader Katham
4- Hassanein Mahdi Attia	5- Ashraf Hussein Ali	6- Mohammed Asaad Yadam
7- Aysir Ahmed Awad	8-	9-

	Supervised by:
1- Dr. Adnan Hussein Ali	2-

Sustainable Development Goals Performed:	

Abstract

Abstract:
This project involves designing a portable vital signs monitoring device using Arduino Nano to measure heart rate, SpO2, and body temperature. It uses the MAX30100 sensor and an NTC thermistor, with data sent via HC-06 Bluetooth to a smartphone through the RemoteXY app. Powered by lithium batteries, the device is low-cost and compact. Tests showed good accuracy, with one SpO2 reading indicating a need for better calibration. The system is suitable for basic health monitoring in remote or home settings.

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The bio-system is built inside a dedicated protective box (Caja De Conexiones) to ensure safety and proper organization. It operates using two 18650 lithium batteries connected in series, supplying power through a BMS protection circuit that controls voltage and current. This power is then routed through a push button switch to the Arduino Nano, which acts as the main controller of the system. The MAX30100 sensor is connected via I2C ports to measure heart rate and blood oxygen saturation (SpO2), while an NTC thermistor connected to an analog input reads body temperature. The HC-06 Bluetooth module sends the collected data wirelessly to a smartphone, where it is displayed in real time using the RemoteXY application. A distribution board is used to simplify connections between components without permanent soldering, allowing for future modifications. The system is recharged using a 12V adapter through a DC jack, with the BMS ensuring safe and regulated battery charging.

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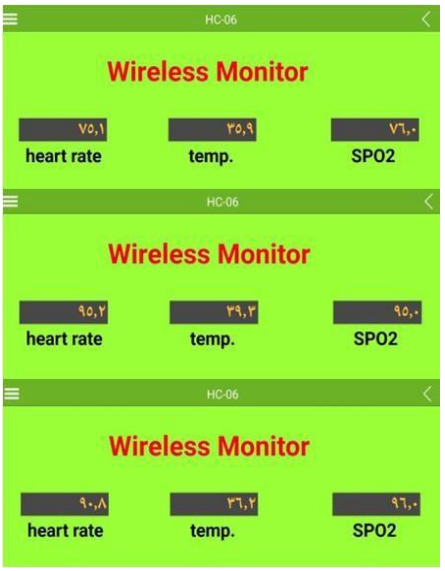


Proj.No.26

Design and implementation of smart monitoring and Alarm system for patient

Prepared by:

257- Ameer Haidar Khammat 258- Atyaf Imad Alawi Nasser 259- Sarah Ameen Mohammed
260- Tayba Ali Hadi Wanas 261- Hussein Nahidh Hatif Tarad 262- Mohammed Bukhait Shaddad
263- Ali Kazem Waisi Ghadab 264- 265-

Supervised by:

46- **Dr. Maysar Munther Adnan Al-Amiri** 47-

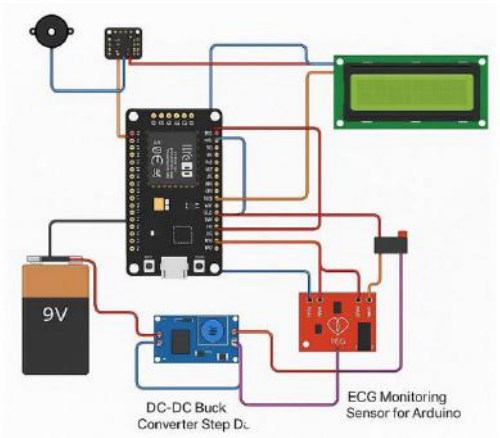
Sustainable Development Goals Performed:

Abstract

Abstract:
This project is a simple Arduino-based health monitoring system that measures heart rate, blood oxygen level, and body temperature using MAX30100 and DHT11 sensors. Results are shown on an LCD, with a buzzer alert. Though it lacks IoT features, it offers potential for personal health tracking and future upgrades.

Methodology

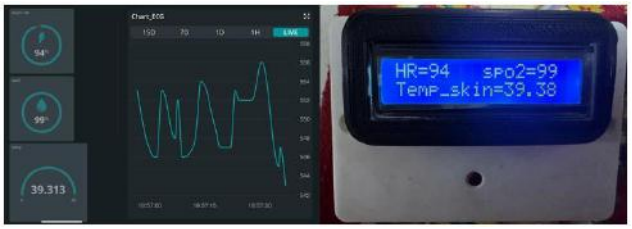
The project uses the ESP8266 module for collecting, analyzing, and transmitting patient vital signs, powered by a rechargeable battery regulated via a DC-DC buck converter. It integrates the MAX30100 sensor (heart rate and SpO_2) and an ECG sensor, both connected to the ESP8266. Data is displayed on a 16x2 LCD, and a buzzer alerts in case of abnormal readings. The system supports real-time remote monitoring through Wi-Fi and includes a power switch for control. This setup ensures efficient, smart health monitoring.

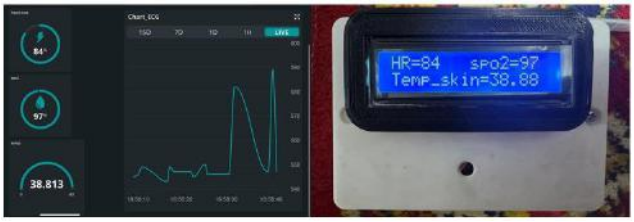


Results and conclusions

Results and conclusions:

Two biometric readings were taken and displayed in real time via the IoT Remote app. The first reading showed HR: 94 bpm, SpO_2: 99%, and skin temperature: 39.31°C, indicating good health with slightly elevated temperature. The second reading showed HR: 84 bpm, SpO_2: 97%, and temperature: 38.81°C, all within normal limits. The results confirm the device's accuracy and effectiveness in continuous remote monitoring.





Proj.No.27

Crying Baby Detector

Prepared by:

266- Ali Kifah Hussein Wahid
267- Ali khalid Faleh Jabr
268- Moammel Jasim Mohammed
269- Zaid Ahmed shaker
270- Abdullah Mohammed Jawad
271- Hussein Ahmed Fadil Earis
272-
273-
274-

Supervised by:

48- **Dr. Zeyad Taha Yaseen**
49-

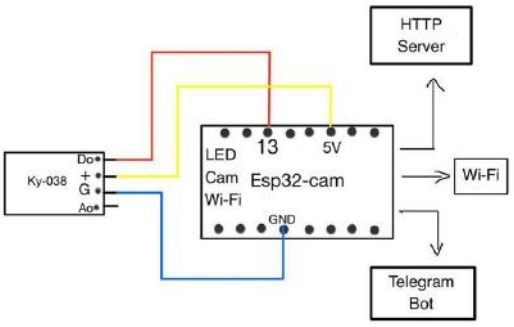
Sustainable Development Goals Performed:

Abstract

Abstract:
The Baby Cry Detector is a smart system that uses the KY-038 sound sensor and ESP32-CAM to detect a baby's cry and instantly send alerts with live video via the Telegram app. It enhances infant monitoring through cost-effective, easy-to-use IoT technology, helping parents respond quickly and reducing stress.

Methodology

The research methodology follows a structured sequence to develop an effective Baby Cry Detector system. It begins with analyzing system requirements, designing the circuit with ESP32-CAM and KY-038, and developing software to handle detection, camera operation, and Telegram alerts. After coding, the system is tested and evaluated for accuracy and reliability. Once powered on, the device initializes components, connects to Wi-Fi, activates the camera and streaming server, sends a welcome message via Telegram, and enters a loop to monitor sound and send alerts ensuring full functionality from startup.



Results and conclusions

Results and conclusions:

The experiments showed that the system effectively meets its main objectives. It accurately detects a baby's cry using the KY-038 sound sensor and sends instant alerts via the Telegram app, along with a live video stream through the ESP32-CAM with good quality and low latency. The built-in LED serves as a visual indicator, confirming sound detection and system status. A 10-second delay mechanism was implemented to reduce repeated alerts without affecting response time. Despite its overall strong performance, some challenges were observed, such as occasional false alarms due to environmental noise and reduced stream stability when the Wi-Fi signal is weak. Adjusting sensor sensitivity and considering environmental conditions are recommended to improve accuracy.

Proj.No.28

Trainer Board For Medical Device Experiments with Arduino sensors

Prepared by:

275- Ameer Awaed Kazim
276- Zaynab Eabd Alamir Lizam
277- Salah Al-Deen Ali Abood
278- Zainab Fadil Abdul Zahra
279- Ahmed Abd AL-Kareem Nasser
280- Zaid Tariq Najee abboud
281- Ali Jalil Hadi Radi
282-
283-

Supervised by:

50- Dr. Rami Qays
51-

Sustainable Development Goals Performed:

Abstract

Abstract:

This project presents a training platform using Arduino technology to simulate vital biomedical sensor functions, allowing students to interact with real-time data, alerts, and wireless communication.

Methodology

Methodology :

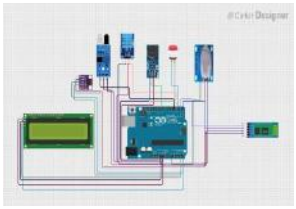
The system is divided into two main units:

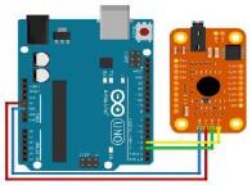
Arduino Uno Unit:

Receives input from a Voice Recognition Module V3 or IR Remote, and sends digital signals to control the activation of sensors and relays via pins

Arduino Mega Unit:

Processes data from sensors once activated. It reads sensor values and displays them on the LCD screen, plays audio alerts via DFPlayer Mini, and activates relays or buzzer in response to abnormal readings. The Bluetooth module transmits sensor data to external devices. All components are powered by an integrated supply system including an AC generator and a full-wave rectifier





Results and conclusions

Results and conclusions:

The system performed reliably in controlling and monitoring biomedical sensors through coordinated operation between Arduino Uno and Mega.

MAX30100 delivered accurate heart rate and SpO_2 readings indoors; DHT11 measured temperature and humidity within expected ranges; and MQ-2 effectively detected gas concentrations.

Audio and visual alerts (via DFPlayer and LCD) responded promptly to abnormal values.

Bluetooth transmission was stable, allowing real-time data sharing.

The power system ensured uninterrupted operation.

Overall, the trainer board proved to be an effective, interactive platform for educational use in medical device simulation.

Proj. No.29 Design and implementation of Li_Fi system to transport patient voice inside MRI room.

Prepared by:

284- غفران قاسم خساره
285- بركات علي حسين
286- حسين عامر كاظم
287- ذوالفقار محمد عوده
288- نور الهدى حميد محسن
289- ياسمين قاسم جابر
290- مصطفى حسين جميل
291-
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Supervised by:

52- Dr.Rami Qais Malik
53-

Sustainable Development Goals Performed:

Abstract

Li-Fi uses light to transmit audio from an MRI room to the outside, using laser light instead of LEDs for better strength and precision. It's safe, hack-resistant, and can transmit up to 500 meters. A strong and secure alternative to Wi-Fi, especially in sensitive environments.

Methodology

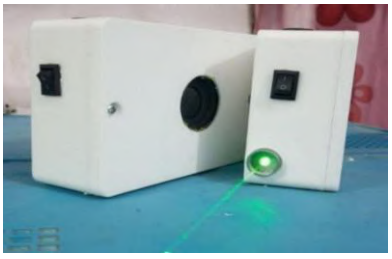
Laser light is used as the source for datatransmission. The laser beam is directed at a solar panel, which converts the light signals into electrical signals that are then translated into sound. The effective transmission distance was tested and found to be up to 500 meters before signal fading

Results and conclusions

Results and conclusions:

The system successfully transmitted clear audio using laser light over a distance of 500 meters. Laser light proved significantly more effective than LED in terms of performance and signal clarity. The system operated safely in MRI environments without electromagnetic interference. Data remained secure and unhackable, ensuring high levels of privacy and reliability.

This project successfully demonstrates the use of Li-Fi technology for safe and efficient audio transmission inside MRI rooms. The system proved to be lowcost, secure, and free from electromagnetic interference. Li-Fi offers a promising alternative to traditional wireless systems, especially in sensitive medical environments



Proj.No.30	Design of Alcohol Detector by Using Arduino	

Prepared by:		
1- Shams Ibrahim Mohammed	2- Aws Hussein Joudah	3- Taif Mohanad Jawad
4- Baraa Kazem Kareem	5- Ali Adel Abbas	6- Fadel Abbas Talib
7- Ghaith Sadiq Abdul Zahra	8-	9-

Supervised by:	
1- **Prof.Dr. Bayan Mahdi Sabbar**	2-

Sustainable Development Goals Performed:	

Abstract

Abstract:

This project presents the design and implementation of an alcohol detection system using Arduino. The device utilizes an MQ-3 sensor to measure alcohol concentration in the air and triggers alerts when the detected levels exceed a predefined threshold. The system is designed in applications for driver alcohol testing, workplace safety, and public environments to enhance safety and prevent alcohol-related incidents. The project aims to create an affordable, efficient, and reliable solution with potential for future enhancements, such as wireless connectivity and improved sensor accuracy.

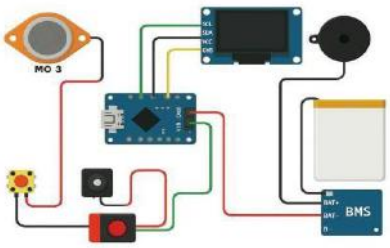
Methodology

The interfacing methodology relies on using the Arduino Nano board as a central controller. The gas sensor (MO3) is connected to one of the analog inputs to read the captured air values, while the OLED display is connected via I2C using the SDA and SCL ports to display the read data. A buzzer is connected to one of the digital outputs to sound an alarm when certain conditions are met, and a push button is used to activate specific functions when pressed and connected to one of the digital inputs. The system is powered by a lithium polymer battery connected to a battery management module (BMS), which regulates charging and discharging and protects the circuit. All components are connected to the Arduino Nano in a manner that ensures safe operation and data integrity between the sensors, processing unit, and display.

Results and conclusions

Results and conclusions:

The results of the project "Design of Alcohol Detector Using Arduino" demonstrate the device's efficiency in detecting alcohol concentration in the air using the MQ-3 sensor, providing accurate and real-time measurements. The system successfully delivers immediate visual or audible alerts when alcohol levels exceed the predefined threshold, enhancing its effectiveness in various settings. It is a cost-effective and user-friendly solution compared to other systems, with potential for future improvements, such as wireless connectivity and enhanced sensor accuracy. The device's practical applications include driver alcohol testing, workplace safety, and public monitoring, displaying its versatility and contribution to public safety.



Proj.No.31

Design and implementation of an arrhythmia detector using Arduino.

Prepared by:

293- Emad Qassim Khasara. 294- Hussein Ali Rahman. 295- Mojtaba Ayed Hadi.

296- Hussein Mustafa Saleh. 297- Ahmed Hekmat. 298- Dhulfikar Ali Abdul-Kadhim.

299- Abbas Abdul Hussein. 300- 301-

Supervised by:

54- MSc:Zahraa Issa 55-

Sustainable Development Goals Performed:

Abstract

Abstract:

This project presents the design and implementation of a portable, real-time arrhythmia detection system using Arduino and ESP32 microcontrollers. Recognizing the growing need for easy cardiovascular monitoring, the system continuously measures heart rate, blood oxygen saturation (SpO_2), body temperature.

Methodology

Methodology :This device was developed using an Arduino Mecha 256 microcontroller integrated with a cloud platform for Internet of Things (IoT) and a sensor that detects arrhythmia using the earlobe and finger. The sensor data was then acquired, processed, and displayed through a computer application with an easy-to-use interface. The algorithms in the programming code analyzed health data to detect arrhythmia. Simulations were conducted to test accuracy and performance, and the results were validated by comparison with standard physiological ranges.

Results and conclusions

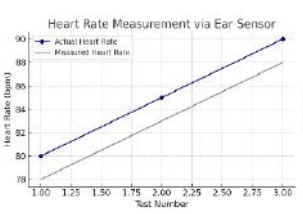
Results:The medical device was tested. The performance of each component of the project was evaluated, including sensor accuracy, response speed, alarm system effectiveness, cloud data storage efficiency, and power consumption. Additionally, system stability and load distribution between the Arduino Mega and ESP32 controllers were analyzed.

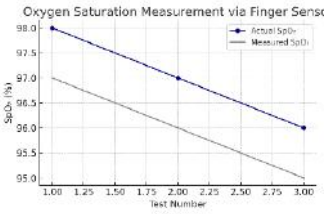
1-Heart rate measurement via an ear sensor The ear-mounted heart rate sensor connected to the ESP32 controller was tested. The results showed good accuracy, with an average deviation of ±3 bpm.

2-When measuring heart rate and oxygen saturation using a fingertip sensor (MAX30100) connected to an Arduino Mega board, the results were as follows:

· Oxygen saturation (SpO_2) readings showed an accuracy of ±2% compared to a certified medical device.

3-A temperature sensor connected to the ESP32 controller was tested to measure body temperature. The results showed high reading accuracy, with a deviation of no more than 0.3°C compared to a standard thermometer.





Proj.No.32	Design of Alcohol Detector by Using Arduino	

Prepared by:		
1- Shams Ibrahim Mohammed	2- Aws Hussein Joudah	3- Taif Mohanad Jawad
4- Baraa Kazem Kareem	5- Ali Adel Abbas	6- Fadel Abbas Talib
7- Ghaith Sadiq Abdul Zahra	8-	9-

Supervised by:	
1- **Prof.Dr. Bayan Mahdi Sabbar**	2-

Sustainable Development Goals Performed:

Abstract

Abstract:

This project presents the design and implementation of an alcohol detection system using Arduino. The device utilizes an MQ-3 sensor to measure alcohol concentration in the air and triggers alerts when the detected levels exceed a predefined threshold. The system is designed in applications for driver alcohol testing, workplace safety, and public environments to enhance safety and prevent alcohol-related incidents. The project aims to create an affordable, efficient, and reliable solution with potential for future enhancements, such as wireless connectivity and improved sensor accuracy.

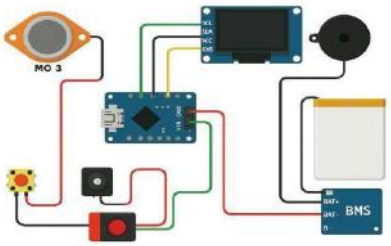
Methodology

The interfacing methodology relies on using the Arduino Nano board as a central controller. The gas sensor (MO3) is connected to one of the analog inputs to read the captured air values, while the OLED display is connected via I2C using the SDA and SCL ports to display the read data. A buzzer is connected to one of the digital outputs to sound an alarm when certain conditions are met, and a push button is used to activate specific functions when pressed and connected to one of the digital inputs. The system is powered by a lithium polymer battery connected to a battery management module (BMS), which regulates charging and discharging and protects the circuit. All components are connected to the Arduino Nano in a manner that ensures safe operation and data integrity between the sensors, processing unit, and display.

Results and conclusions

Results and conclusions:

he results of the project "Design of Alcohol Detector Using Arduino" demonstrate the device's efficiency in detecting alcohol concentration in the air using the MQ-3 sensor, providing accurate and real-time measurements. The system successfully delivers immediate visual or audible alerts when alcohol levels exceed the predefined threshold, enhancing its effectiveness in various settings. It is a cost-effective and user-friendly solution compared to other systems, with potential for future improvements, such as wireless connectivity and enhanced sensor accuracy. The device's practical applications include driver alcohol testing, workplace safety, and public monitoring, displaying its versatility and contribution to public safety.



Proj.No.33 Building and designing a robot arm using the Arduino system

Prepared by:

-302 كرار حيدر حسين جمعه	**-303 محمد رحيم حمادي**	**-304 عباس منذر نعمه**
-305 مرتضى عايد عبد الامير	**-306 زينب علي رزج**	**-307 زهراء يوسف خليل**
-308 علي محسن جاسم	-309	-310

Supervised by:

56- أ.م. د. سعد مطشر عباس	-57

Sustainable Development Goals Performed: **Goal 9: Industry, Innovation and Infrastructure**

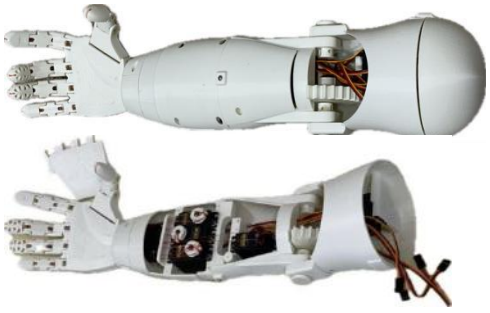
Abstract

Abstract:

This project aims to design and implement a myoelectric prosthetic arm using the Arduino system and 3D printing technology. The arm is controlled by detecting muscle contractions, allowing the user to move it naturally. The design is low-cost compared to commercial prosthetic limbs and serves as a research model that contributes to the development of technological solutions in prosthetics and enhances the understanding of muscle-controlled robotic systems.

Methodology

The prosthetic arm was designed using SolidWorks and manufactured with a 3D printer. A tendon-driven mechanism controlled by servo motors was used to move the fingers. Muscle signals were captured using EMG sensors and processed by an Arduino Uno, which sent control signals to the motors. Basic software logic allowed muscle flexing to trigger hand movements, making the system functional and low-cost as a research prototype.

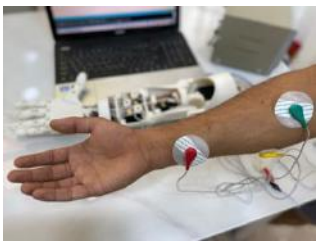


Results and conclusions

The 3D-printed robotic arm was successfully tested and operated using EMG signals. The thumb, index, and middle fingers moved independently, while the ring and pinky moved together. The arm weighed around 950 grams and had over 3 hours of battery life. Although the system worked well for basic control, grip strength was weak, and there were some signal noise issues affecting stability.

conclusions:

The prototype proved effective as a research model, showing the potential of low-cost, EMG-controlled prosthetics. However, it is not yet suitable for real-world use due to limited strength and mechanical durability, especially in the wrist. Further improvements in signal processing and structural design are needed to make it more practical and reliable.



Proj.No.34

Low-Cost Mechanical Ventilator Using Arduino Technology

جهاز تنفس ميكانيكي منخفض التكلفة باستخدام تقنية أردوينو

Prepared by:

311- Mohammed Mansour Aziz
312- Mortada Ahmed Amori
313- Sajad Farhan Kazem Mohammed
314- Ali Abdel Hussein Habeb
315- Ali Kadhim Jasim
316- Sajjad Yunus Sachet
317-
318-
319-

Supervised by:

58- M.Sc. Huda Wasfi Hassoon
59-

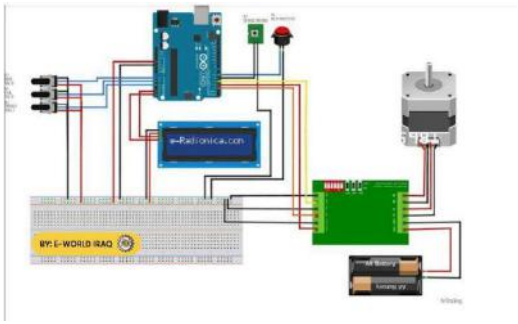
Sustainable Development Goals Performed: **3**

Abstract

Abstract: This project develops a low-cost mechanical ventilator using Arduino, integrating vital sign monitoring and automated airflow to support breathing in emergencies and low-resource settings with reliable, portable, and effective performance.

Methodology

Methodology: The ventilator system was built using an Arduino Uno as the central controller, connected to sensors (MAX30100 for SpO_2 and heart rate, DHT11 for temperature/humidity), a servo motor to automate an Ambu bag, and an LCD for display. The components were assembled in a 3D-printed frame. Battery backup was included for power continuity. The system was tested on individuals aged 10 to 50 to monitor real-time health data and deliver controlled ventilation.



Results and conclusions

Results and conclusions: The ventilator was tested on four participants aged 10 to 50 years. The system successfully monitored vital signs including oxygen saturation (SpO_2), heart rate, temperature, and humidity. All SpO_2 readings were within the healthy range (96–99%), indicating that the ventilator maintained effective oxygenation without the need for external oxygen sources. Heart rates varied appropriately based on age and activity level, and temperature/humidity readings were consistent with environmental conditions. The servo-controlled Ambu bag mechanism provided stable and adjustable airflow based on patient needs.

The 

system's LCD displayed real-time patient data, and the status LEDs helped users quickly assess device operation. The 3D-printed frame ensured portability, while the mini-UPS and lithium-ion batteries-maintained power during outages. In conclusion, the Arduino-based ventilator is a viable solution for emergency and rural applications. It combines affordability, safety, and portability, and can be further enhanced with wireless communication, AI-based control, and advanced ventilation modes for broader clinical use.

Proj.No.35

Real-Time Fall Detection and Alert System for Seniors

Prepared by:

320- Zainab Farhan Maemal
321- Maryam Abdel Azim
322- Sarah Abdul Karim Hajil
323- Dhuha Rafid Hamza
324- Noura Hussein Talib
325- Rafal Mohammed Kazem
326- Ali Haider Abd Mardan
327-
328-

Supervised by:

60- M.Sc. Huda Wasfi Hassoon
61-

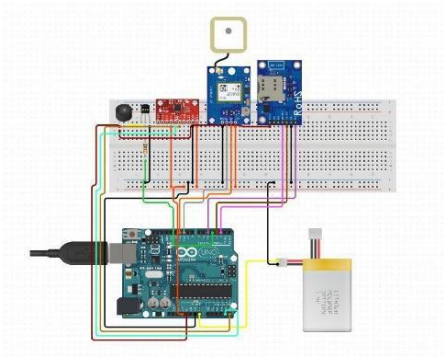
Sustainable Development Goals Performed: 3

Abstract

Abstract: This project develops a wearable device for seniors that detects falls in real-time using sensors, GPS, and GSM. It enhances safety, alerts caregivers, and supports independent living efficiently.

Methodology

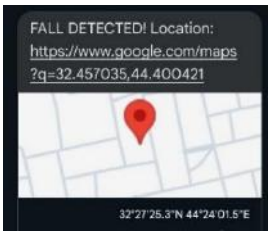
Methodology: This system uses an Arduino Uno, gyroscope, GPS, GSM, and buzzer to detect falls in elderly individuals. When a tilt angle of 80° is detected, a 20-second delay allows recovery. If no movement follows, alerts activate and an SMS with location is sent to caregivers. This ensures real-time monitoring, fast emergency response, and improved safety for seniors, helping reduce fall-related risks and promoting independent living.



Results and conclusions

Results and conclusions: The fall detection system showed high accuracy during testing. It reliably identified actual falls using an 80° tilt threshold and a 20-second delay to reduce false positives. If the user remained immobile, the buzzer and LED activated, and an SMS with GPS coordinates was sent to caregivers. The system operated continuously for hours on a rechargeable lithium-ion battery. GPS ensured precise real-time tracking, while the GSM module transmitted alerts quickly and reliably. A 9V adapter stabilized performance during message transmission, handling power fluctuations effectively.

The system effectively balances user safety with



independence by minimizing false alerts and ensuring rapid response during actual emergencies. The 20-second recovery window proved useful in distinguishing normal activity from real falls. The use of simple, low-power components made the device suitable for long-term, everyday use without frequent recharging. Its accurate fall detection, reliable communication, and GPS tracking make it a valuable tool in elderly care. Power efficiency and low maintenance requirements further enhance its practicality. Overall, the system offers a cost-effective, real-time safety solution, providing peace of mind for both users and caregivers.

Proj.No.36

A Comprehensive Arduino Framework for Mood and Depression Evaluation

Prepared by:

329- Ali Jalal Shahid
330- Ali Ibrahim Ali
331- Nihad Dhahir Mohsin
332- Dawood Salman Khalil
333- Hassan Yammar Abd AL-Hassan
334- Yahia Yasir Khudur
335- Ameer Imad Hatem
336-
337-

Supervised by:

62- M.Sc. Huda Wasfi Hassoon
63-

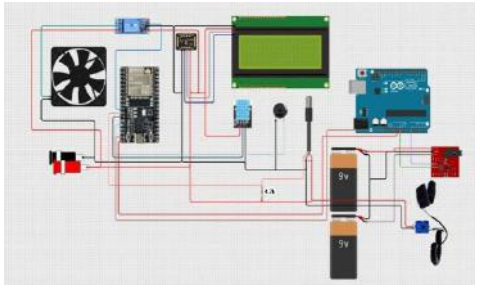
Sustainable Development Goals Performed: 3

Abstract

Abstract: This study presents an affordable Arduino-based system using biomedical and environmental sensors for real-time mood and depression evaluation, enabling early detection through continuous monitoring of physiological and emotional indicators.

Methodology

Methodology: The proposed system integrates multiple sensors—MAX30102, DS18B20, DHT11, GSR, and EMG—controlled by Arduino Uno and ESP32 microcontrollers. It continuously measures vital signs such as heart rate, SpO_2, body temperature, skin conductance, and muscle activity. Sensor data is displayed on an LCD and transmitted via Bluetooth for real-time monitoring. The system emphasizes low cost, portability, and user-friendliness, making it accessible in underserved areas for remote mental health assessment.



Results and conclusions

Results and conclusions: The Arduino-based system was tested to assess its ability to monitor mood and detect depression through physiological signals. In normal conditions, heart rate, oxygen saturation, and body temperature stayed within healthy ranges, while GSR and EMG readings indicated emotional and muscular stability. In contrast, abnormal conditions showed increased heart rate (over 100 bpm), reduced SpO_2 (88–89%), and elevated temperature (38–39°C). GSR and EMG levels also rose, indicating stress and physical tension. Sensor data was displayed on an LCD and transmitted via Bluetooth to a mobile app.

The system reliably triggered alerts when abnormal values were detected, confirming its capability for real-time monitoring and early warning. The system offers a cost-effective, user-friendly tool for tracking mental health, particularly in underserved or remote areas. By identifying early physiological signs of stress or depression, it supports timely intervention and personalized care. In conclusion, this framework enables continuous, non-invasive emotional monitoring.

Proj.No.37	Design and implementation of vital signs monitor using Arduino	

Prepared by:		
1- Saif Habib Karim	2- Mustafa Latif Fakhry	3- Ahmed Bader Katham
4- Hassanein Mahdi Attia	5- Ashraf Hussein Ali	6- Mohammed Asaad Yadam
7- Aysir Ahmed Awad	8-	9-

Supervised by:	
1- Dr. Adnan Hussein Ali	2-

Sustainable Development Goals Performed:

Abstract

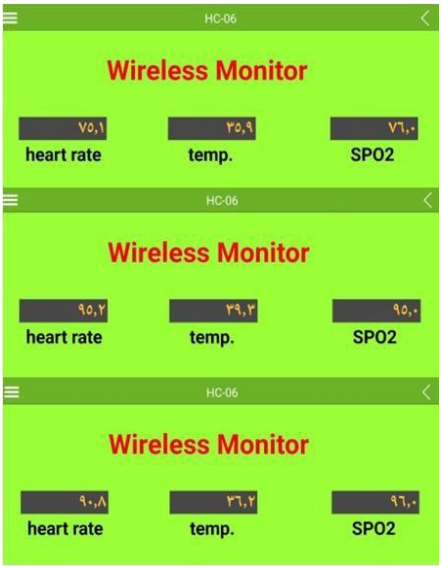
This project involves designing a portable vital signs monitoring device using Arduino Nano to measure heart rate, SpO2, and body temperature. It uses the MAX30100 sensor and an NTC thermistor, with data sent via HC-06 Bluetooth to a smartphone through the RemoteXY app. Powered by lithium batteries, the device is low-cost and compact. Tests showed good accuracy, with one SpO2 reading indicating a need for better calibration. The system is suitable for basic health monitoring in remote or home settings.

Methodology

The bio-system is built inside a dedicated protective box (Caja De Conexiones) to ensure safety and proper organization. It operates using two 18650 lithium batteries connected in series, supplying power through a BMS protection circuit that controls voltage and current. This power is then routed through a push button switch to the Arduino Nano, which acts as the main controller of the system. The MAX30100 sensor is connected via I2C ports to measure heart rate and blood oxygen saturation (SpO2), while an NTC thermistor connected to an analog input reads body temperature. The HC-06 Bluetooth module sends the collected data wirelessly to a smartphone, where it is displayed in real time using the RemoteXY application. A distribution board is used to simplify connections between components without permanent soldering, allowing for future modifications. The system is recharged using a 12V adapter through a DC jack, with the BMS ensuring safe and regulated battery charging.

Results and conclusions

Three practical tests were performed on different individuals to evaluate the device's accuracy in measuring heart rate, blood oxygen (SpO2), and body temperature using the RemoteXY app via Bluetooth. The first reading showed normal heart rate (75.1 bpm) and temperature (36.9°C), but low SpO2 (76%) likely due to misalignment or weak signal. The second reading indicated fever with a high temperature (39.3°C) and increased heart rate (95.2 bpm), while SpO2 remained normal at 95%. The third reading showed all values within normal ranges—heart rate (90.8 bpm), temperature (36.2°C), and SpO2 (96%)—demonstrating the device's reliability when properly used.



Proj.No.38 **Phototherapy device for treating jaundice**

Prepared by:

338- صلاح فلاح حسن شهد
339- محمد حامد حسين هويجل
340- محمد نظام عبيد
341- ايمان حميد ناصر
342- يوسف صالح مهدي
343- آيات سليم داود
344- محمد حسين علي
345-
346-

Supervised by:

64- احمد حلمي كاظم
65- احمد حلمي كاظم

Sustainable Development Goals Performed: **Goal 3: Good Health and Well-being**

Abstract

Abstract:

An integrated phototherapy device was designed to treat neonatal jaundice, using UV lamps and an electronic system to control light intensity, monitor temperature, and manage treatment time with safety and efficiency.

Methodology

Methodology: **The methodology for studying neonatal jaundice involved identifying the problem—high bilirubin levels caused by liver immaturity—and reviewing existing literature on treatment methods. Specific requirements were defined for designing a safe, efficient phototherapy device, including temperature regulation, low energy consumption, and clinical effectiveness. The device was then designed, tested for performance and accuracy, and the results were analyzed to draw conclusions and suggest improvements for future application**

Results and conclusions

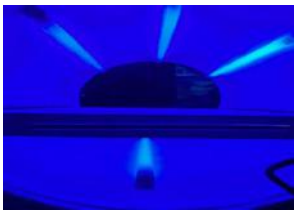
Results and conclusions:

1. Thermal Performance:

Temperature measurements taken above the infant tray showed that, even during the continuous operation of all four ultraviolet lamps, the surrounding temperature remained below 36.5°C. This confirms that the device maintains a safe thermal environment for newborns, avoiding the risk of overheating or dehydration during treatment.

2.Clinical Effectiveness:

Simulated medical trials demonstrated the device's ability to reduce bilirubin levels in neonates by an average of 2 to 5 mg/dL over a period of 24 to 48 hours. This reduction was most effective when initial bilirubin levels were below 15 mg/dL, indicating the device's strong performance within standard treatment protocols.



Proj.No.39	Remote ECG Monitoring Using Arduino	

Prepared by:		
1- Muammal Riyad Abdul Amir	2- Ayman Rateb Saleh	3- Abbas Haider Muhammad
4- Karrar Haider Kazim	5- Mustafa Alaa Hussein	6- Taher Safaa Mohammed
7- Hussein Karim Abdul Hussein	8-	9-

Supervised by:	
1- **MSc. Ahmed Helmy Kazem**	2-

Sustainable Development Goals Performed:	

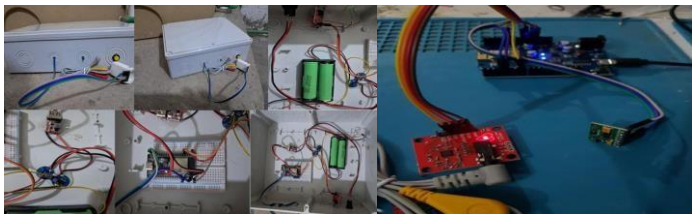
Abstract

Abstract:

This project aims to monitor and help prevent heart disease using an Arduino UNO-based system. It calculates SpO_2, heart rate, and monitors ECG signals. Sensors measure heart rate and blood oxygen saturation, and the data is processed using C++ and displayed on a screen. A mobile application connected via Wi-Fi shows project details and live readings.

Methodology

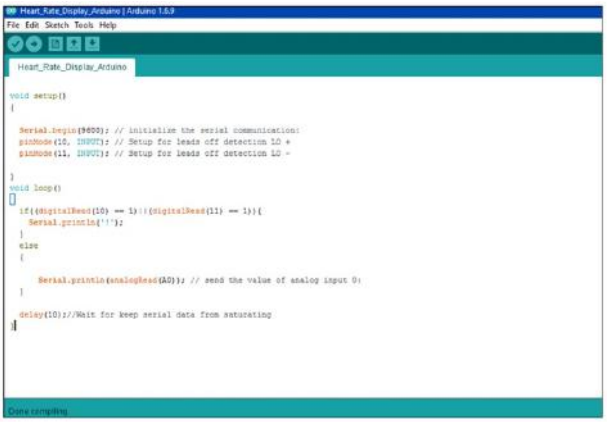
This project focuses on early detection and monitoring of heart disease using an Arduino UNObased system. It integrates ECG and SpO_2 sensors to measure heart rate and blood oxygen saturation accurately. The signals are processed using C++ and displayed on a screen connected to the system. Additionally, through Wi-Fi, the data is transmitted to a mobile application, which displays the university and college names, project title, supervisor's name, student names, and real-time heart rate and SpO_2 readings. This setup helps provide continuous and remote monitoring for patients, aiding in the prevention and early detection of heart-related conditions.

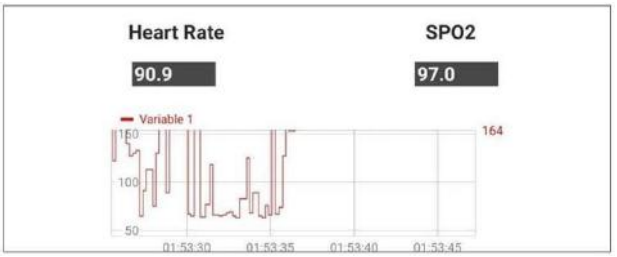


Results and conclusions

Results and conclusions:

The project results, as shown in Figure 3-4, showed that the system accurately measured vital signs, with a heart rate reading of 90.9 beats per minute and a blood oxygen saturation (SpO2) reading of 97.0%. These values reflect normal readings for a healthy person, demonstrating the accuracy of the sensors and the efficiency of the Arduino-based processing. These results confirm that the system operates reliably and is an effective tool for remote, realtime health monitoring.





Proj.No.40	**Design and Implementation of an Intelligent Patient Monitoring System in Healthy Environments**	

Prepared by:		
Hassan Falah Hassan Fayyad	Sara Adel Jawad Kazim	3- Hussein Hamid Lafta Zghair
Amir Karim Ghanem Attia	Ali Hadi Jalib Saeed	6- Yaqdan Ammar Abdul Razzaq
Nabaa Star Jabbar Nahi		9-

Supervised by:	
1- **Dr. Zahraa Hashem Karim**	2-

ıstainable Development Goals Performed:	

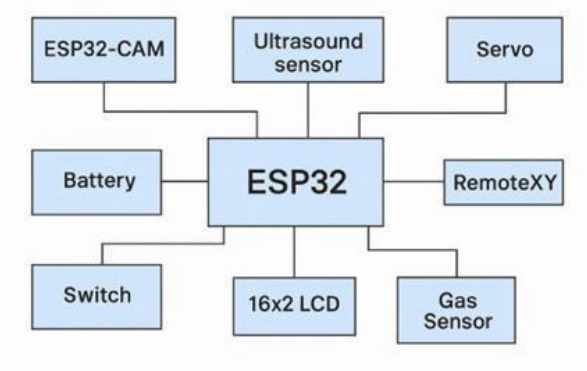
Abstract

Abstract:

This project is a scientific and practical model of a smart system based on the ESP32 controller, designed to track humans and monitor environmental conditions such as temperature, humidity, and air quality. It uses various sensors and an ESP32-CAM, and connects to the RemoteXY mobile app for real-time data display and instant alerts. The system is cost-effective, energy-efficient, and suitable for smart, portable environments. Despite challenges like limited tracking and lack of storage, it represents an important step toward smart monitoring systems based on IoT and AI technologies.

Methodology

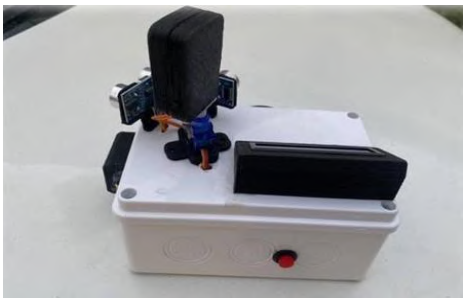
The system uses an ESP32 microcontroller with sensors (ESP32-CAM, DHT11, MQ2, ultrasonic) to detect humans and monitor the environment. Data is shown on an LCD and sent to the RemoteXY app. A servo motor allows tracking, and the system runs on a rechargeable battery. It offers a portable, low-power solution for smart health and security use.



Results and conclusions

sults and conclusions:

e system was successfully built using low-cost components compatible with the ESP32. Tests showed effective human detection, automatic camera movement using a servo and ultrasonic sensor, accurate environmental data from DHT11 and MQ2 sensors, fast real-time updates via the RemoteXY app, efficient battery use, and a simple user-friendly interface suitable for all users.



Proj.No.41

Cardiac (Monitoring System)

Prepared by:

347- Hassan Jassim Abdul
348- Mays Thamer Hilal
349- Zainab Ali Kazim Ra'i
350- Hussein Razaq Mohammed
351- Nour Khalil Ne'mah
352- Mustafa Ahmed Mustafa
353- Ruqaya Ali Abdul Hussein
354-
355-

Supervised by:

66- **Dr. Ziad Taha Yassin**
67-

Sustainable Development Goals Performed:

Abstract

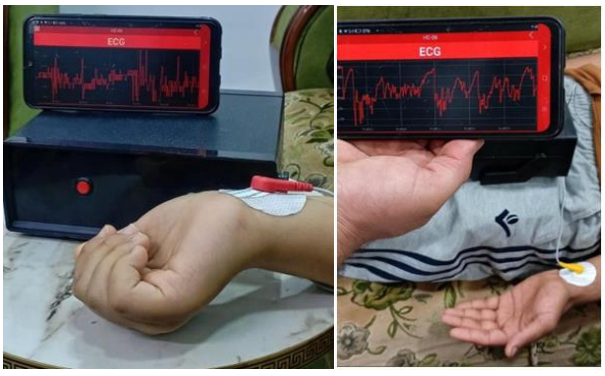
Abstract:
This project focuses on using Remote XY technology to improve cardiac monitoring systems by enabling secure, real-time wireless data transfer between sensors and devices. It offers benefits such as precise data transmission, energy efficiency, and smart device integration. The project also discusses challenges like data security and setup costs. With AI and augmented reality, Remote XY can transform cardiac care through accurate diagnostics and enhanced patient mobility.

Methodology

The cardiac monitoring system was developed using Remote XY technology, integrating an AD8232 ECG sensor with an Arduino Nano and HC-05 Bluetooth module for real-time signal transmission. The system was programmed via Arduino IDE to display heart signals on a smartphone using the Remote XY app. It was powered by a lithium battery lasting 24–48 hours. Testing showed high sensor accuracy (95–98%), minimal data delay (3–5 seconds), and effective real-time alerts, confirming the system's reliability for remote cardiac monitoring.

Results and conclusions

The results of the project confirmed the effectiveness of the Remote XY-based cardiac monitoring system in providing accurate, real-time heart monitoring. The ECG sensor (AD8232) successfully captured clear heart signals, which were transmitted wirelessly via the HC-05 Bluetooth module with minimal delay (3–5 seconds). The data was displayed on a smartphone using the Remote XY app, offering a user-friendly interface with real-time ECG visualization and alerts. Sensor accuracy ranged between 95%–98% when compared with standard clinical equipment. The system also demonstrated reliable battery performance, lasting between 24 to 48 hours depending on usage. These outcomes highlight the system's potential for use in home care, remote monitoring, and emergency settings, offering enhanced patient mobility, timely intervention, and improved accessibility to cardiac data.



Proj.No.42

Design and implementation of device to convert sign into letters using Arduino

Prepared by:

356-	Ali Fadel Abbas	357-	Mohammed Basem Jiad	358-	Ali Al-Rida Haitham
359-	Hawraa Razzaq Abbas	360-	Hassanin Khaled Abdul	361-	Ghafran Sabah Hassan
362-		363-		364-	

Supervised by:

68- **Lec. Hameed Nida Al- Faris** 69-

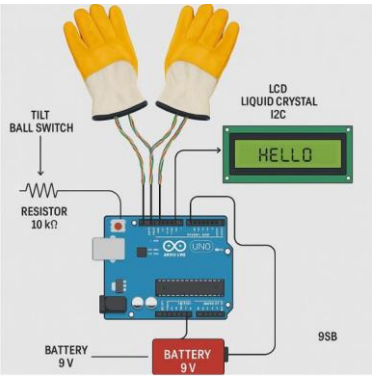
Sustainable Development Goals Performed:

Abstract

Abstract:
This project introduces a low-cost, Arduino-based device that uses tilt sensors to convert finger gestures into written text, aiding communication for people with hearing and speech impairments. It achieved 90% accuracy and fast response. Despite some limitations, the device proved effective and shows strong potential for future development with features like wireless and text-to-speech integration, promoting human-centered innovation.

Methodology

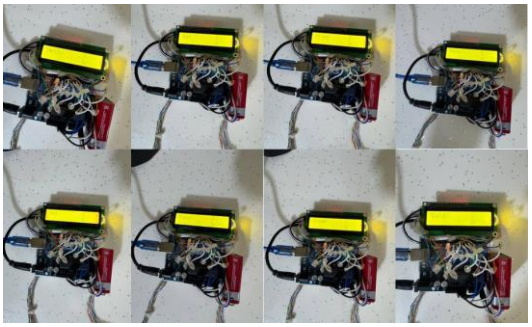
The device links tilt sensors on a glove to an Arduino UNO, using resistors to stabilize signals and reduce noise. Sensors detect finger movements and send data to the Arduino, which processes the input and displays the corresponding text on an LCD via the I2C protocol. Powered by a 9V battery, the system is designed to be lightweight, responsive, and easy to use, enhancing communication for individuals with hearing and speech impairments.



Results and conclusions

Results and conclusions:

The electronic glove effectively translated finger movements into readable text on an LCD screen, with a fast response time of less than one second and an accuracy rate of about 90% under normal conditions. The system showed stable performance in 45 out of 50 test attempts and operated continuously for up to 3 hours on a 9V battery. The displayed text was clear, and the device proved reliable and easy to use. Minor limitations included reduced accuracy with rapid or forceful movements and poorly fitted gloves. Specific finger gestures on the right and left palms were assigned to common words like "Hot," "Cold," "Pain," "Eat," and "Help," enhancing communication for users with hearing and speech impairments.



Proj.No.43	Design of Alcohol Detector by Using Arduino	

Prepared by:		
1- Shams Ibrahim Mohammed	2- Aws Hussein Joudah	3- Taif Mohanad Jawad
4- Baraa Kazem Kareem	5- Ali Adel Abbas	6- Fadel Abbas Talib
7- Ghaith Sadiq Abdul Zahra	8-	9-

Supervised by:	
Prof.Dr. Bayan Mahdi Sabbar	

istainable Development Goals Performed:

Abstract

Abstract:

This project presents the design and implementation of an alcohol detection system using Arduino. The device utilizes an MQ-3 sensor to measure alcohol concentration in the air and triggers alerts when the detected levels exceed a predefined threshold. The system is designed in applications for driver alcohol testing, workplace safety, and public environments to enhance safety and prevent alcohol-related incidents. The project aims to create an affordable, efficient, and reliable solution with potential for future enhancements, such as wireless connectivity and improved sensor accuracy.

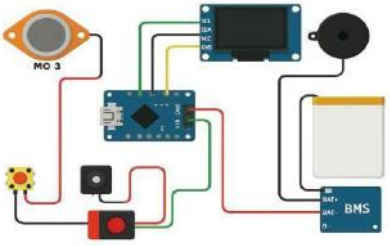
Methodology

The interfacing methodology relies on using the Arduino Nano board as a central controller. The gas sensor (MO3) is connected to one of the analog inputs to read the captured air values, while the OLED display is connected via I2C using the SDA and SCL ports to display the read data. A buzzer is connected to one of the digital outputs to sound an alarm when certain conditions are met, and a push button is used to activate specific functions when pressed and connected to one of the digital inputs. The system is powered by a lithium polymer battery connected to a battery management module (BMS), which regulates charging and discharging and protects the circuit. All components are connected to the Arduino Nano in a manner that ensures safe operation and data integrity between the sensors, processing unit, and display.

Results and conclusions

sults and conclusions:

e results of the project "Design of Alcohol Detector Using Arduino" demonstrate the device's efficiency in detecting alcohol concentration in the air using the MQ-3 sensor, providing accurate and real-time measurements. The system successfully delivers immediate visual or audible alerts when alcohol levels exceed the predefined threshold, enhancing its effectiveness in various settings. It is a cost-effective and user-friendly solution compared to other systems, with potential for future improvements, such as wireless connectivity and enhanced sensor accuracy. The device's practical applications include driver alcohol testing, workplace safety, and public monitoring, displaying its versatility and contribution to public safety.



Proj.No.44

Building and designing a robot arm using the Arduino system

Prepared by:

365-	كرار حيدر حسين جمعه	366-	محمد رحيم حمادي	367-	عباس منذر نعمه
368-	مرتضى عايد عبد الامير	369-	زينب علي رزج	370-	زهراء يوسف خليل
371-	علي محسن جاسم	372-		373-	

Supervised by:

70- أ.م. د. سعد مطشر عباس 71-

Sustainable Development Goals Performed: **Goal 9: Industry, Innovation and Infrastructure**

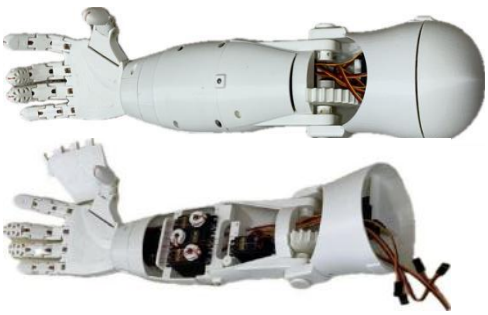
Abstract

Abstract:

This project aims to design and implement a myoelectric prosthetic arm using the Arduino system and 3D printing technology. The arm is controlled by detecting muscle contractions, allowing the user to move it naturally. The design is low-cost compared to commercial prosthetic limbs and serves as a research model that contributes to the development of technological solutions in prosthetics and enhances the understanding of muscle-controlled robotic systems.

Methodology

The prosthetic arm was designed using SolidWorks and manufactured with a 3D printer. A tendon-driven mechanism controlled by servo motors was used to move the fingers. Muscle signals were captured using EMG sensors and processed by an Arduino Uno, which sent control signals to the motors. Basic software logic allowed muscle flexing to trigger hand movements, making the system functional and low-cost as a research prototype.



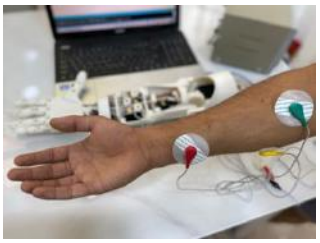
Results and conclusions

Results

The 3D-printed robotic arm was successfully tested and operated using EMG signals. The thumb, index, and middle fingers moved independently, while the ring and pinky moved together. The arm weighed around 950 grams and had over 3 hours of battery life. Although the system worked well for basic control, grip strength was weak, and there were some signal noise issues affecting stability.

conclusions:

The prototype proved effective as a research model, showing the potential of low-cost, EMG-controlled prosthetics. However, it is not yet suitable for real-world use due to limited strength and mechanical durability, especially in the wrist. Further improvements in signal processing and structural design are needed to make it more practical and reliable.



Proj.No.45

Heart Failure Prediction UsingElectrical Signals Approach

Prepared by:

374- Mustafa Hasan Taher
375- Najm Abdalla Oda
376- Mohammed Dhaher Mohsen
377- Zaid Muqdad Tareq
378- Ali Hasan Karko
379- Baneen abadi Duwaij
380- Rabab Ali Marzouq
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382-

Supervised by: Huda Asaad Abd Al-Ameer

Sustainable Development Goals Performed: Goog Health and Well-being

Abstract

This research develops a MATLAB-based model to predict heart failure using ECG signals. Signal filtering, R-peak detection, and feature extraction improve diagnostic accuracy, supporting early, non-invasive clinical intervention.

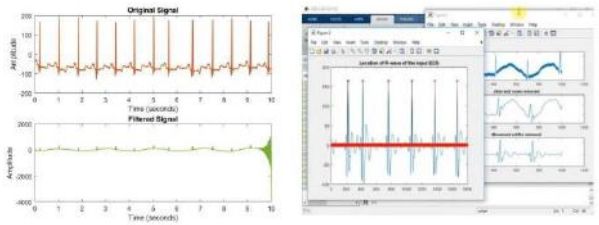
Methodology

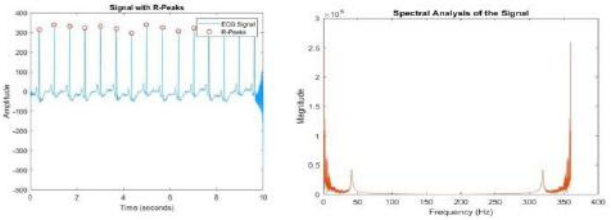
Methodology The methodology focused on acquiring ECG signals and applying various signal processing techniques, including bandpass filtering, R-peak detection, and spectral analysis. MATLAB was used to extract key features and split the data into training and testing sets. These steps helped build a predictive model for early heart failure detection. The approach ensured accurate analysis by reducing noise, enhancing signal clarity, and improving model performance through reliable feature extraction.

Results and conclusions

The implemented heart failure prediction model using MATLAB demonstrated effective ECG signal analysis through advanced filtering, feature extraction, and spectral processing. Three datasets (100m, 217m, 234m) were utilized for validation.
Dataset 100m showed moderate signal quality with identifiable R-peaks and minor noise artifacts. Filtering improved peak detection, allowing successful feature extraction. Dataset 217m had high noise, making initial detection difficult, but post-processing yielded usable results. Dataset 234m presented the cleanest signal with high R-peak clarity and the best performance across all metrics, indicating its strong suitability for automated diagnosis systems.

Spectral analysis confirmed dominant frequency components aligned with cardiac activity. Noise components, such as powerline interference, were successfully minimized. R-peak detection enabled accurate heart rate and HRV analysis, vital for diagnosing early signs of heart failure.The segmentation of training and testing data allowed effective model training with consistent prediction accuracy. MATLAB's machine learning tools facilitated classification, revealing potential for integration into real-time systems.





Proj.No.46

Design and implementation of an intelligent muscle stimulation

Prepared by:

383- Haider Mahdi Muhammad
384- Ali Hussein Shaib
385- Mohammed Al-Sadiq Hadi
386- Hussein Alaa Hadi
387- Benin Abdul Hadi
388- Fatima Imran Taha
389- Fatima Faeq Abd-Allah

Supervised by:

72- Dr zahraa hashim kareem
73-

Sustainable Development Goals Performed: Good Health and Well-being

Abstract

This project presents the design and implementation of an intelligent muscle stimulation system that integrates sensors and microcontrollers to optimize therapeutic outcomes, enhance muscle functionality, and efficiently support rehabilitation processes.

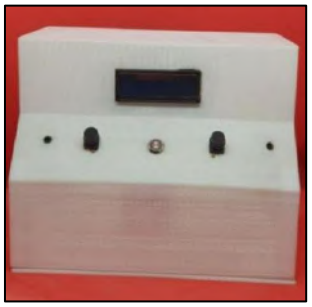
Methodology

The project followed a structured methodology that began with identifying the need for muscle rehabilitation. Appropriate components—including an Arduino microcontroller, various sensors, and a muscle stimulator—were selected. The circuit was then designed and integrated, followed by the development of the control software. The system was tested on individuals experiencing muscle weakness, with continuous monitoring of muscle response, heart rate, and oxygen saturation. Based on the collected data, performance adjustments were implemented to optimize the system. This comprehensive approach ensures a safe, effective, and intelligent solution for muscle stimulation and rehabilitation.

Results and conclusions

We tested a group of ten individuals suffering from muscle weakness. After examining their condition and recording baseline readings, we applied electrical stimulations using the designed stimulation device. The muscles responded positively to the electrical impulses, which was evident through improved muscle readings, along with noticeable changes in heart rate and blood oxygen saturation levels.

This project highlights the critical role of technology in advancing musculoskeletal rehabilitation and improving care for conditions that affect physical performance and daily activities. By offering a personalized and data-driven approach, the system provides targeted therapy tailored to the patient's needs.



No.	Patient Name	Age	Status	Muscle Strength Before Stimulation	Muscle Strength After Stimulation
1	Mahdi Mohammed Nasser	50 years	Weak	Weak	Moderate
2	Zaman Hussein Al-Dulaimi	38 years	Good	Moderate	Strong
3	Abed Hadi Abed	65 years	Weak	Weak	Weak
4	Mohammed Hadi Hanouf	41 years	Good	Moderate	Strong
5	Layal Haidar	8 years	Good	Moderate	Moderate
6	Mohammed Mahdi Mohammed	27 years	Good	Moderate	Strong
7	Ya's Khalil	47 years	Good	Moderate	Strong
8	Ali Abdulzahra Hareemat	47 years	Good	Moderate	Strong
9	Sarah Ahmed Ubaid	32 years	Good	Moderate	Strong
10	Kareem Jabbar Atiyah	56 years	Weak	Weak	Weak

Proj.No.47

Design and Implementation of a Breathing Monitor for Premature Babies

Prepared by:

390- Saif Razzaq Katea
391- Karar Adnan Abadi
392- Enas abd al-kareem abd al-kazem
393- Ayaat Hussain Mohamed
394- Ameen Abbas Farhan
395- Taqi Abdul Kadhim Ghali
396- Noor Hussein Hadi

Supervised by:

1-Dr. Maysar Munther Adnan

Sustainable Development Goals Performed: **Good Health and Well-being**

Abstract

This research presents a non-invasive breathing monitor for premature infants, enhancing accuracy, reducing false alarms, and enabling early apnea detection using advanced biosensors and algorithms.

Methodology

The methodology involves designing a non-invasive breathing monitor using biosensors to detect respiratory patterns in premature infants. The system includes real-time signal processing and machine learning algorithms to identify apnea episodes. Hardware components were integrated on a microcontroller platform, and the prototype was tested in a simulated NICU environment. Performance metrics such as accuracy, sensitivity, and false alarm rates were evaluated.

Results and conclusions

Conclusion:

This study successfully developed a non-invasive, AI-powered breathing monitor for premature infants. The system demonstrated improved accuracy in detecting abnormal breathing patterns, significantly reduced false alarms, and increased efficiency in NICU settings. Future work will focus on conducting clinical trials, integrating the system with hospital networks, and miniaturizing the device for better portability and usability.

Result:

The developed breathing monitor showed high accuracy in detecting apnea episodes, with a significant reduction in false alarms. Real-time monitoring using non-invasive biosensors ensured comfort and safety for premature infants. The AI algorithms reliably classified breathing patterns, and the prototype proved cost-effective, compact, and suitable for NICU environments, enhancing neonatal respiratory care efficiency and reliability.

Proj.No.48

Innovative Electric Chair Design for Enhanced Mobility in Hemiplegic Patients

Prepared by:

397- Hussein Youssef Hussein
398- Hassan Ahmed Khairy
399- Hussein Alawi Abdul Hassan
400- Muntadhar Alawi Majhool
401- Kazem Abdul Amir Kazem
402- Mohammad Abbas Mahdi
403- Mohammad Abdul Kazem

Supervised by:

74- D. Ahmed Helmy Kazem

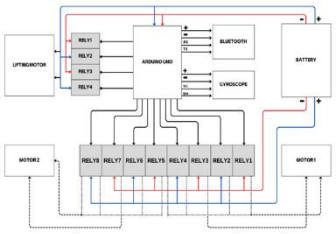
Sustainable Development Goals Performed: This research supports SDGs 3, 9, and 10 by promoting health, technological innovation, and accessibility for individuals with disabilities

Abstract

Abstract:
This research presents a smart wheelchair for hemiplegic patients, featuring head sensor control, 50-degree seat adjustment, and remote app monitoring to enhance mobility, autonomy, and quality of life.

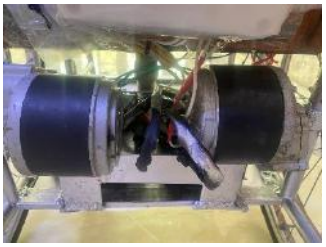
Methodology

Methodology: The methodology involves designing an electric wheelchair for hemiplegic patients, featuring a 50-degree lifting mechanism and head sensor-based control using gyroscopic sensors and an Arduino microcontroller. A 12V, 9Ah battery powers the system. A mobile app enables caregivers to adjust settings remotely. Initial testing focused on functional performance and user satisfaction, demonstrating the system's effectiveness in enhancing mobility and comfort for individuals with partial paralysis.



Results and conclusions

Results and conclusions:
Designing an electric chair for enhanced mobility in hemiplegic patients with a 50-degree adjustment feature requires a comprehensive understanding of ergonomics, user control, and technology integration. The chair's 50-degree adjustment mechanism provides crucial posture support, comfort, and health benefits, while the incorporation of head sensor controls ensures that patients with limited limb function can operate the chair autonomously. Additionally, durable construction and smart features will provide further convenience and personalization for users. This approach aims to improve mobility, independence, and quality of life for individuals with hemiplegia by offering a flexible, comfortable, and adaptive solution.



Proj.No.49

Third Eye for the Blind

العين الثالثه للمكفوفين

Prepared by:

404- **Abbas Ali Mihoul** 405- **Hussein Riad Hussein** 406- **Farah Mohammed Jawad**
407- **Umm Al Banin Ali Hamza** 408- **Auras Salam Ali** 409- **Zainab Majeed Hussein**

Supervised by:

75- **Dr. Zeyad Taha Yaseen** 76-

Sustainable Development Goals Performed: Goal 10: Reduce Inequality Within and Among Countries

Abstract

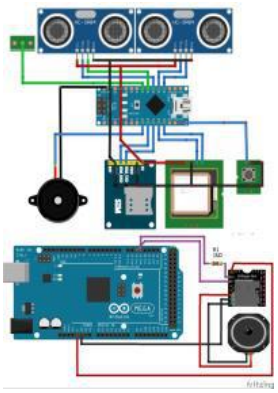
Abstract:
The Third Eye for the Blind is an innovative device that helps the visually impaired detect upper-level obstacles using sensors, GPS, GSM, and audio alerts, enhancing their safety, independence, and navigation experience.

Methodology

Methodology:
This project followed a structured methodology that involved hardware and software integration.

The system was designed using Arduino boards, ultrasonic sensors, GSM/GPS modules, and MP3 players. The methodology began with component selection, followed by circuit design and code implementation.

The prototype was tested in various real-life scenarios to ensure accurate obstacle detection and emergency location alerts, prioritizing usability, safety, and cost-efficiency for visually impaired individuals.



Results and conclusions

Results and conclusions :
The implementation of the "Third Eye for the Blind" project resulted in the successful creation of a smart wearable assistive device tailored for visually impaired individuals. The system effectively detects obstacles at three distance levels (1.5m, 1m, 0.5m) and responds with accurate pre-recorded audio alerts. Field testing demonstrated the device's capability to help users navigate safely in both indoor and outdoor environments. When obstacles were encountered, the ultrasonic sensor reliably measured the distance, triggering the Arduino to play specific voice alerts through the MP3 module. Additionally, the SOS emergency feature functioned as intended; upon pressing the button, the GPS module retrieved the user's coordinates and sent a distress SMS using the GSM module.

These results confirmed that the device can significantly increase the safety and independence of visually impaired users, especially in unfamiliar areas. The system operated reliably in various environmental conditions and required minimal training for use, fulfilling the project's goal of affordability and ease of use.

In conclusion, the "Third Eye for the Blind" project proves that low-cost, open-source technologies like Arduino can be effectively used to develop assistive tools for the visually impaired. This prototype lays a solid foundation for future enhancements such as integration with voice assistants, solar power, facial recognition, and mobile applications. With further improvements and extended testing, this innovation has the potential to become a practical solution for improving the quality of life for blind individuals.

Proj.No.50

Avoid Injuries with Smart Backpack

Prepared by:

410-	Mohammed Sadiq Majid	411-	Haidar Fallah Jawad	412-	Hussein Mousa Mendel
413-	Hussein Jamil Mohammed	414-	Azhar Anis Jalil Saleh	415-	Saja Talib Hussein Hamza
416-		417-		418-	

Supervised by:

77- **Dr. Zeyad Taha Yaseen** 78-

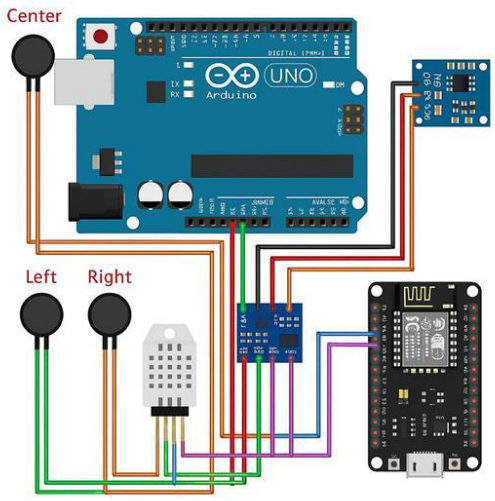
Sustainable Development Goals Performed:

Abstract

Abstract:
This project developed a smart IoT-based backpack that uses sensors to monitor weight, posture, and movement, sending real-time alerts via an app to prevent back injuries. Using Arduino and Bluetooth, the system reduced physical complaints by 30%, proving effective in promoting healthier carrying habits, with potential for broader use in schools and workplaces.

Methodology

The smart backpack's methodology involves integrating load, pressure, and motion sensors with a microcontroller (Arduino/Raspberry Pi) to monitor weight and posture. Data is processed in real time and sent via Bluetooth (HC-05) to a mobile app developed with Kotlin or Flutter, which provides alerts and feedback. Components are enclosed in water-resistant casings and tested for accuracy and reliability.



Results and conclusions

Results and conclusions:

The smart backpack showed high effectiveness using integrated sensors (Load Cell, MPU6050, FSR) to detect incorrect weight and posture. With 92% accuracy and a response time under 1.8 seconds, the system alerted users via sound and app notifications. Over two weeks, users reported a 30% reduction in back pain and 78% showed improved posture. The system also accurately detected dangerous spinal curves and pressure imbalances, confirming its role in promoting safer bag use and reducing physical strain.

Proj.No.51

Design and development of automatic Cardiac resuscitation device

تصميم وتطوير جهاز الإنعاش القلبي التلقائي

Prepared by:

419- 1- Mubeen Alaa Abdulrazzaq
420- Hussein Sanad Adel Sakban
421- Ahmed Mohammed Ali Mahdi
422- Tabarak Hameed Abdulzaid
423- Azal Faisal Jaber
424- Amnah Fadhil Jaber

Supervised by:

79- M.S.C Ali Kareem

Sustainable Development Goals Performed: GOOD HEALTH AND WELL-BEING

Abstract

Abstract: The Automated Cardiac Resuscitation Device (ACRD) delivers precise, guideline-compliant CPR using pneumatic actuation and real-time sensor feedback. Testing confirmed 100% compliance with AHA depth/rate standards, 30% less variability than manual CPR, and elimination of rescuer fatigue while maintaining energy efficiency.

Methodology

Methodology : The ACRD used a pneumatic piston system (8–12 psi) driven by an air compressor to automate chest compressions. An Arduino NANO microcontroller integrated real-time feedback from sensors (pulse oximeter, accelerometer, force sensors) to regulate compression depth (5–6 cm) and rate (100–120/min).

Testing involved 100+ cycles in simulated cardiac arrest scenarios, evaluating AHA guideline compliance, thermal stability, battery endurance, and consistency against manual CPR performance

Key Components Covered:

- Actuation: Pneumatic piston + compressor
- Control: Arduino with sensor feedback (SpO_2, displacement, force)
- Testing: Compliance with AHA standards, variability analysis, and operational reliability

Results and conclusions

Results and conclusions: Results

- Performance Compliance: The ACRD achieved 100% adherence to AHA guidelines (5–6 cm depth, 100–120 compressions/min) across 100+ test cycles.
- Consistency: Demonstrated 30% lower variability in compression quality compared to manual CPR, eliminating rescuer fatigue.

- Efficiency: Maintained stable thermal performance and energy-efficient operation during continuous use.
- Sensor Integration: Real-time feedback from pulse oximeters/accelerometers enabled dynamic adjustments (e.g., halting upon ROSC detection).
- Portability: At 4.2 kg and battery-operated, it outperformed bulkier devices (e.g., LUCAS™: 7.5 kg) in pre-hospital simulations.

Conclusions

- The ACRD standardizes high-quality CPR, overcoming human limitations (fatigue, inconsistency) in both resource-rich and low-resource settings.
- Its pneumatic design (8–12 psi piston + Arduino control) ensures precise, adaptive compressions while integrating real-time vital monitoring.
- Portability and affordability ($3,000 vs. $12,000–$15,000 for competitors) make it accessible for ambulances, clinics, and public spaces.

- Safety protocols (auto-shutdown on ROSC/malfunction) enhance reliability during emergencies.

Proj.No.52

Easy home: A smart automation system for people with physical movement issues

Prepared by:

425- سجاد باسم عبدالسادة هادي
426- بتول عبدالرضا نوري
427- زهراء حازم علي حطحوط
428- علي منهال حسين مجيد
429- علي قاسم جبار
430- منتظر حيدر محمود حميد
431- ضرغام فيصل غازي وابل
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Supervised by:

80- **م.م الاء خالد عبدالرضا**
81-

Sustainable Development Goals Performed:

Abstract

Abstract:
"Easy Home" is a low-cost smart home system designed to help people with physical disabilities. It includes:
* A servo motor for automatic door control
* An LED light that turns on in low light
* A flame detector with an alarm
* An Arduino Uno to manage all components
The system improves safety and independence, and is simple and affordable to install.

Methodology

The development of *Easy Home* followed these key steps:

1. Design: Aimed for a simple, low-cost, and user-friendly system.

2. Component Selection: Used Arduino Uno, servo motor, LED light, flame sensor with buzzer, and optional sensors.

3. Hardware Setup: Connected sensors (inputs) and devices (outputs) to the Arduino.

4. Programming: Wrote code to automate lighting, door control, and fire alerts based on sensor data.

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Results and conclusions

The *Easy Home* system was successfully built and tested using the Arduino Uno V3, flame sensor, 1W LED light, and a servo motor for door control during emergencies. Key results include:
1. Flame Detection: The flame sensor accurately detected small flames and immediately activated the buzzer, showing fast and reliable response.
2. LED Light Activation: The 1W LED light turned on and off successfully using the button in the RemoteXY app.
3. Servo Motor Response: The servo motor opened the door to a 90-degree angle when activated and closed it smoothly when turned off, working efficiently with no delay.
The system proved effective, safe, and easy to use

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Proj.No.53 Wireless body temperature measuring device

Prepared by:

434- Ali yarab Qahtan
435- Hassanein Hamza Essa
436- Hussein Razzaq Muhammad
437- Muhammad Hussein Talib
438- Montather Mohammed Jasem
439- Haider Ahmed Khader
440- Teeba qaaed hussen
441-
442-

Supervised by:

82- Dr.Ziad Taha yaseen
83-

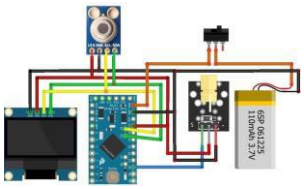
Sustainable Development Goals Performed:

Abstract

Abstract:
This project presents a wireless infrared thermometer using an MLX90614 sensor, Arduino Nano, OLED display, and Bluetooth. It allows fast, accurate, and contactless temperature readings, suitable for health monitoring.

Methodology

Methodology : The system is based on the MLX90614 infrared sensor, which measures the temperature of the human body without contact. This sensor communicates with the Arduino Nano using the I2C protocol (SDA and SCL lines). An OLED display is used to show both Celsius and Fahrenheit readings. The HC-06 Bluetooth module sends temperature data wirelessly to a mobile device. Power is supplied via a rechargeable lithium-ion battery. The casing and hardware layout were designed using SolidWorks.



Results and conclusions

The infrared thermometer device achieved reliable results when tested on human subjects. It accurately measures body temperature and displays it in real-time on the OLED screen. Bluetooth communication enables wireless monitoring, making the device practical for both clinical and home use. The device was tested on various individuals, showing stable readings between 36.5°C and 37.5°C under standard room conditions.

The system's performance depends on maintaining an appropriate distance (2–5 cm) between the sensor and the target area (e.g., forehead or wrist). The OLED display allows for easy reading, while the rechargeable battery ensures portability. All components, including Arduino Nano, MLX90614, and Bluetooth HC-06, worked seamlessly after proper calibration and assembly.

This project supports public health through low-cost, accessible temperature monitoring. With careful design and testing, the device provides a safe, efficient, and scalable solution during pandemics or for personal health care.

Proj.No.54

Smart Breathing Detector

كاشف التنفس الذكي

Prepared by:

443-	Ali Haider Abdulaziz	444-	**Aqeel Hassan Wahab**	445-	Yasser Ayad Naji
446-	**Ali Hussein Kadhem**	447-	Ali Razzaq	448-	Yasser Mohammed
449-	Hassanin Jassim Hilal	450-		451-	

Supervised by:

84- Prof.Dr. Alaa Hussein Ali 85-

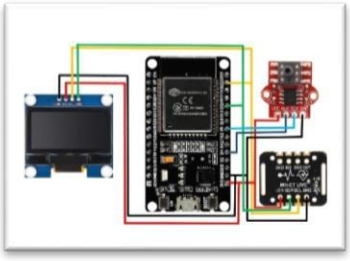
Sustainable Development Goals Performed:

Abstract

Abstract:
This research presents a low-cost, portable smart breathing detection system using Arduino to monitor abnormal respiratory patterns in COVID-19 patients. It uses piezoelectric and MAX30100 sensors, supports alerts, display, and wireless communication.

Methodology

Methodology : **With the outbreak of COVID-19, the need arose for a smart and simple health monitoring system that continuously tracks patients' breathing. Our project aims to design a low-cost device based on Arduino to monitor chest movement using a piezoelectric sensor and measure heart rate and blood oxygen saturation using the MAX30102 sensor.**

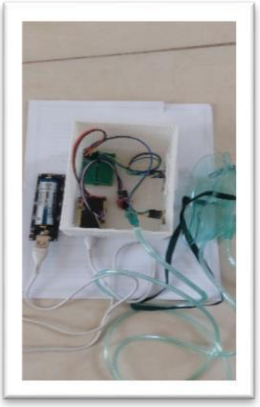


The device helps in the early detection of breathing issues and sends alerts either via sound or to a mobile phone. It is suitable for both clinical and home environments

Results and conclusions

Results and conclusions:

The prototype showed positive results in detecting respiratory irregularities and alerting the user when oxygen levels dropped or breathing patterns changed. Readings were stable and reliable under different conditions. The use of ESP32 supported real-time data transmission to the mobile application.



+

Proj.No.55

Designing a Microcontroller-Powered CNC Machine for Educational Purposes

تصميم آلة CNC تعمل بميكروكنترولر لأغراض تعليمية

Prepared by:

452- Mortada Fares Muhammad Reda
453- Zahraa Majeed Mohan
454- Abu Al-Hassan Haider Ghani
455- Muhammad Hussein Odeh
456- Safaa Jawad Abu Al-Hail
457- Hassan Falah Hameed
458- Zulfikar Wissam Ali
459-
460-

Supervised by:

86- M. Sc. Ali Karim Obaid
87- M. Sc. Dhey aaldeen Faez Sahib

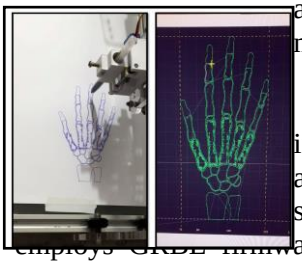
Sustainable Development Goals Performed: Goal Fourth Quality Education

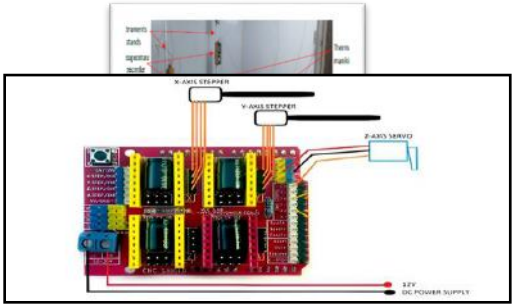
Abstract

This research designs an Arduino-powered educational CNC machine using stepper motors for precise milling (error <0.2 mm) on wood/plastic at 600 mm/min. Its small workspace and material limitations highlight future improvements like CAD/CAM integration and expanded workspace.

Methodology

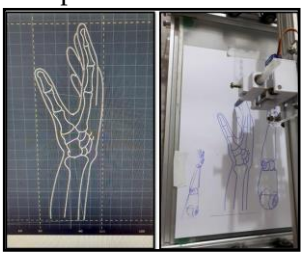
Methodology: The CNC machine uses an Arduino Uno microcontroller with CNC Shield V3 to control stepper motors (X/Y-axis) and a servo motor (Z-axis). Mechanical components include an aluminum frame for stability. Software employs GRBL firmware to interpret G-code commands sent via Universal G-code Sender. Designs are created in Inkscape and converted to G-code. The system executes precise movements (e.g., G1 X10 Y20 F500 for motion, M3 S30 for pen control) based on GRBL settings.

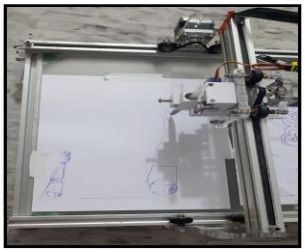




Results and conclusions

The developed microcontroller-based CNC machine proved to be a precise and efficient tool for milling wood and plastic, achieving an error margin below 0.2 mm and a feed rate of 600 mm/min. Its user-friendly interface allowed students with limited technical background to operate it effectively, promoting hands-on engagement in CNC programming and mechanical systems. The project successfully bridged theoretical knowledge and practical application, making it a valuable educational tool. However, certain limitations emerged. The compact 35 × 40 mm workspace restricted project size, and the stepper motors lacked the power to handle harder materials such as aluminum. Despite these constraints, the project met its objective by delivering an affordable, open-source CNC platform based on Arduino and GRBL. Its modular design incorporated low-cost components without compromising core functionality, making it ideal for integration into STEM education. Feedback confirmed its effectiveness in enhancing student learning and practical skills. Future improvements should focus on expanding the working area, upgrading motors for better precision and material compatibility, and integrating CAD/CAM software to streamline the design-to-production process. Additional enhancements—such as remote monitoring, safety improvements, and cost optimization—could further increase accessibility. Incorporating functionalities like 3D printing or PCB drilling would expand its educational utility. These developments would strengthen the system's potential in democratizing advanced manufacturing education while addressing current technical limitations.





Proj.No.56

Design of a multi functional device

تصميم جهاز متعدد الوظائف

Prepared by:

461- Montader Majid Muhammad
462- Muhammad Walid Karim
463- Hussein Ali Jalil
464- Adyan Qusay Hatem
465- Lina Ahmed Harat
466- Mustafa khudhur abbas
467-
468-
469-

Supervised by:

88- MSc. Ahmed Helmy Kadhim
89-

Sustainable Development Goals Performed: The ninth goal of sustainable development Industry

Abstract

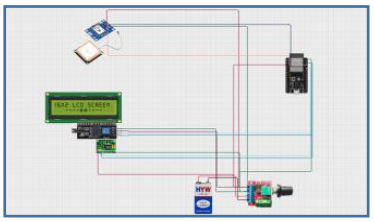
Abstract:

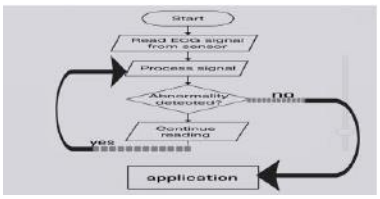
A multifunctional device using Arduino, GPS, and MAX30102 monitors heart rate, oxygen levels, and real-time location, enhancing safety for chronic disease patients, special needs individuals, and Alzheimer's patients

Methodology

Methodology:

The methodology involved integrating the Arduino ESP32 microcontroller with MAX30102 and GPS NEO-8M modules. The system was programmed using Arduino IDE, with data displayed on an LCD and transmitted via Wi-Fi and Bluetooth. Real-time readings of heart rate, oxygen levels, and GPS coordinates were collected and sent to a mobile application. A flowchart guided software development, and circuit diagrams ensured accurate hardware implementation and connectivity.

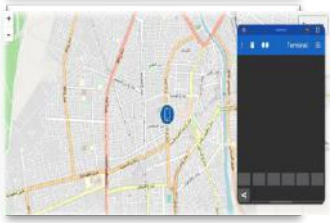




Results and conclusions

Results and conclusions:

The project successfully designed and implemented a multifunctional device to monitor vital signs and track the location of individuals, especially those with chronic diseases, special needs, and Alzheimer's. Using the Arduino ESP32 microcontroller, MAX30102 sensor, and GPS NEO-8M module, the system was able to collect real-time data on heart rate and blood oxygen levels (SpO2), andaccurately determine the user'sgeographic location.TheGPS coordinates were transmitted via Wi-Fi and visualized on Google Maps through a dedicated application. Simultaneously, health data were displayed on both an LCD screen and sent via Bluetooth to mobile devices, allowing caregivers to remotely monitor users' status. The system also generated alerts when abnormal readings were detected or if the user exited a defined safe zone.In testing, the device proved to be reliable in terms of accuracy and responsiveness. The real-time transmission of data ensured immediate awareness of any critical changes in the user's health or location. The integration of hardware and software was efficient, and the system operated smoothly with minimal latency.In conclusion, the project demonstrated a practical solution to enhance the safety and well-being of vulnerable populations..



Proj.No.57

Smart Control Systems for Medical Devices Using Arduino (Oximeter)

Prepared by:

470-	Mohammed Haidar Razaq	471-	Hussein Abdul Hamza	472-	Muntather Abbas Khadir
473-	Ali Hashim Jawad	474-	Hassanin Ahmed Musa	475-	Hassan Karim Hassoun
476-		477-		478-	

Supervised by:

90- MSc. Zahraa Eisa Mohammed 91-

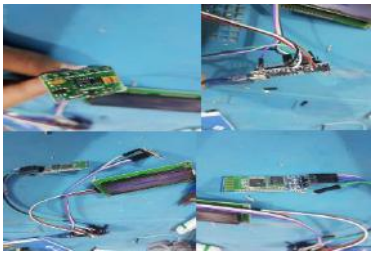
Sustainable Development Goals Performed:

Abstract

This project develops a low-cost, portable Arduino-based pulse oximeter using the MAX30102 sensor to monitor SpO_2 and heart rate, with alarms, LCD display, and wireless remote monitoring capabilities.

Methodology

The proposed method, each sensor—temperature, humidity, gas, and light—was precisely connected using jumper wires and resistors to ensure correct voltage and signal integrity. Proper pin mapping and power distribution were applied to maintain reliable data readings and prevent damage, with a wiring diagram used for reference, troubleshooting, and performance testing.



The project development followed a structured approach starting with component selection and circuit design. Hardware components were assembled on a breadboard or PCB, followed by Arduino programming using relevant libraries. Multiple testing phases were conducted to validate sensor performance and resolve issues.

Results and conclusions

The project results show that in the device's initial state, when no fingerprint is detected or authenticated, the system remains in standby mode. It awaits a valid biometric input to activate the monitoring process. The fingerprint sensor is essential for user identification, ensuring the system operates only when a registered fingerprint is recognized. The device consistently displays normal heart rate readings, confirming its accuracy and reliability in real-time vital sign monitoring, making it effective for clinical and home-care use.
This project presents an Arduino-based smart oximeter system for measuring heart rate and oxygen levels. It offers a low-cost, portable, and user-friendly solution for personal health monitoring. Despite minor limitations like sensor inaccuracy and limited IoT features, the system shows promising results for enhancing continuous and personalized healthcare.

The final SpO_2 and heart rate readings on a smartphone via the RemoteXY app, confirming successful wireless data transmission and enhancing portable, real-time health monitoring.

Proj.No.58	Design and Implementation of Car Alarm System for Children Safety	

Prepared by:		
479- Hussein Muslim Abdul Abbas	480- Roqiea Osama Abbas	481- Fatima Zaki Ne'ma
482- Samar Alaa Sajit	483- Mohammed Hassan Rasool	484- Rasul Hamid Abbas
485- Rania Makki Khader	486-	487-

Supervised by:	
92- MSc. Zahraa Eisa Mohammed	93-

Sustainable Development Goals Performed:	

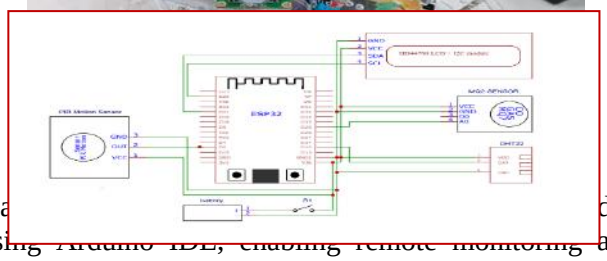
Abstract

Smart car alarm system enhances child safety by detecting presence via sensors (motion, temperature, humidity, gas), sending alerts through alarms and mobile apps, with future AI and geolocation upgrades.

Methodology

The system uses 7.4V from two Li-ion batteries, regulated to 5V, and houses all components in an acrylic case. Code is written in C++ using Arduino IDE and uploaded to ESP32. A RemotXY mobile app enables Wi-Fi-based real-time monitoring of temperature, humidity, and gas levels, allowing remote user interaction.

The system connects ESP32 to sensors, LCD, and power



via ded using Arduino IDE, enabling remote monitoring and control through the RemotXY app.

Results and conclusions

The project successfully integrated hardware and software into a reliable embedded system, with accurate sensor readings and effective real-time mobile communication. Challenges included power stability and Wi-Fi reliability. Development emphasized embedded design, sensor interfacing, wireless communication, and the importance of simulation and testing.

The LCD screen displays real-time data from integrated sensors, including temperature, humidity, air quality, and motion status. The clear output confirms accurate sensor performance and effective data processing.

The system uses sensor-driven alerts to detect abnormal conditions inside the vehicle. Each risk—high temperature, humidity, gas levels, or motion—triggers a unique sound pattern and sends a real-time mobile alert via Wi-Fi, ensuring quick remote awareness and response.

Proj.No.59	Design and Implementation of an Intelligent Patient Monitoring System in Healthy Environments	

Prepared by:		
1- Hassan Falah Hassan Fayyad	2- Sara Adel Jawad Kazim	3- Hussein Hamid Lafta Zghair
4- Amir Karim Ghanem Attia	5- Ali Hadi Jalib Saeed	6- Yaqdan Ammar Abdul Razzaq
7- Nabaa Star Jabbar Nahi	8-	9-

Supervised by:	
1- **Dr. Zahraa Hashem Karim**	2-

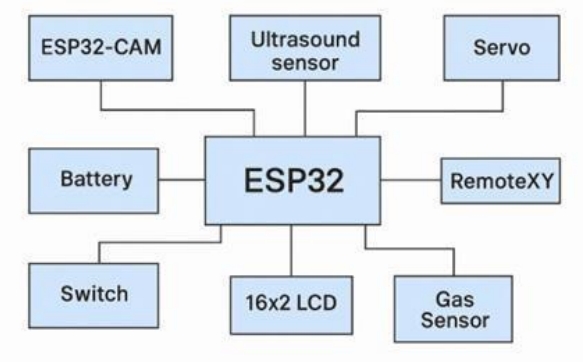
Sustainable Development Goals Performed:

Abstract

Abstract:
This project is a scientific and practical model of a smart system based on the ESP32 controller, designed to track humans and monitor environmental conditions such as temperature, humidity, and air quality. It uses various sensors and an ESP32-CAM, and connects to the RemoteXY mobile app for real-time data display and instant alerts. The system is cost-effective, energy-efficient, and suitable for smart, portable environments. Despite challenges like limited tracking and lack of storage, it represents an important step toward smart monitoring systems based on IoT and AI technologies.

Methodology

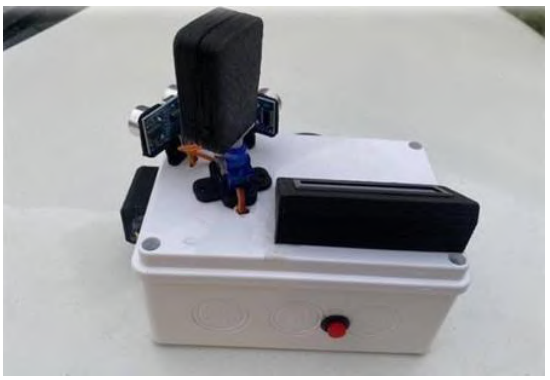
The system uses an ESP32 microcontroller with sensors (ESP32-CAM, DHT11, MQ2, ultrasonic) to detect humans and monitor the environment. Data is shown on an LCD and sent to the RemoteXY app. A servo motor allows tracking, and the system runs on a rechargeable battery. It offers a portable, low-power solution for smart health and security use.



Results and conclusions

Results and conclusions:

e system was successfully built using low-cost components compatible with the ESP32. Tests showed effective human detection, automatic camera movement using a servo and ultrasonic sensor, accurate environmental data from DHT11 and MQ2 sensors, fast real-time updates via the RemoteXY app, efficient battery use, and a simple user-friendly interface suitable for all users.



Proj.No.60

Design of an Intelligent Spirometer System for Lung Function Assessment

Prepared by:

488- Mohammed Jawad Muslim
489- Hussein Wazzaa Sukhail
490- Ali Abbas Radi
491- Murtadha Faez Hamzah
492- Montathar Tawfeeq Jassim
493- Mohammed Asaad Adnan
494- Ali Radi Hamzah
495-
496-

Supervised by:

94- Asst. Prof. Dr. Hasan Hamad Ali
95-

Sustainable Development Goals Performed: 3

Abstract

Abstract:
Chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), asthma, and pulmonary fibrosis, are major global health concerns, yet accessible and affordable lung function monitoring remains a challenge. Traditional spirometers are expensive, clinic-dependent, and require expert interpretation, limiting their use in low-resource settings and remote patient monitoring. This research presents the design and development of an intelligent spirometer system that integrates low-cost sensors, embedded processing, and machine learning (ML) to provide accurate, real-time lung function assessment with automated disease detection.

Methodology

Methodology details the systematic approach used to design and develop the intelligent spirometer system, including hardware architecture, firmware development, AI/ML model training, and clinical validation protocols.

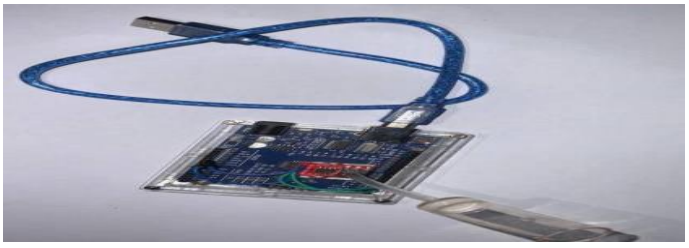
System Design Overview

The proposed system follows a modular architecture with three core components:

- Hardware Unit: Sensor-based airflow measurement and data acquisition.
- Software Platform: Mobile app for data visualization and user interaction.
- AI Engine: Machine learning models for lung disease classification.

Results and conclusions

Results and conclusions:
The project results showed that the smart spirometer was highly accurate in measuring lung function, with readings consistent with approved medical spirometers.
The artificial intelligence models used also demonstrated their ability to classify respiratory diseases such as asthma and COPD with an accuracy exceeding 90%.
The system achieved a rapid response time and immediate data analysis via a mobile App, in addition to supporting remote monitoring through cloud storage.
Users praised the ease of use and accuracy of the results, confirming the device effectiveness in both home and clinical settings.
This project represents an important step toward developing smart, low-cost tools for measuring lung function, combining precise sensor technologies, artificial intelligence, and mobile applications



Proj.No.61

Design and Implementation of a High Efficiency Solar Heater toward a Clean Environment

Prepared by:

497- Jihad Salim Jihad Mahdi
498- Ahmed Jaber Jain Hamza
499- Mohammed Haider Hammoudi
500- Mohammed Abdul Ameer
501- Mohamed Samir Salem
502- Ali Mohammed Abdul Hussain
503- Al-Muntadhar Mohammed
504-
505-

Supervised by:

96- **Asst.Prof.Dr. Hasan Hamad Ali**
97-

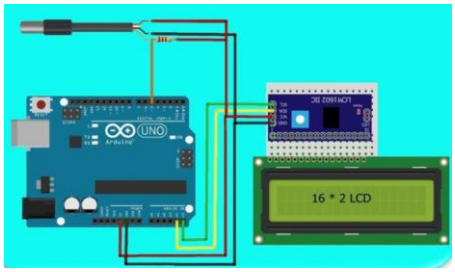
Sustainable Development Goals Performed: 7

Abstract

Abstract:
This project presents the design and implementation of a solar water heater that utilizes advanced technology to heat water efficiently and sustainably. The system consists of a water tank, a 12V heating element powered by a rechargeable battery, a solar panel, and an electric adapter as energy sources. A 12V pump used to circulate water to the tank, while an Arduino unit monitors the water temperature via a sensor and displays the readings on an LCD screen. This system offers a reliable and eco-friendly solution for heating water with the capability of utilizing alternative energy sources.

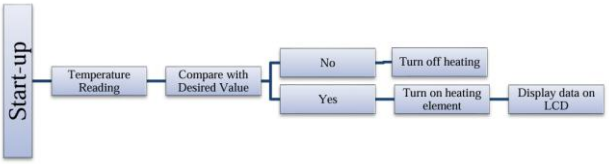
Methodology

This project presents a high-efficiency solar water heating system using a solar panel to convert sunlight into electricity, stored in a 12V, 25Ah battery for continuous operation. An Arduino-controlled water pump circulates water, while a DS18B20 sensor accurately monitors temperature (±0.5°C). The system's thermal performance is evaluated using heat gain ($Q=mc\Delta T$) and efficiency ($\eta = Qout/Qin \times 100$) equations. These calculations help optimize energy usage and system efficiency, demonstrating a sustainable and cost-effective solution for renewable energy applications.



Results and conclusions

This project developed an efficient solar water heating system that successfully heated 1 liter of water from 20°C to 60°C in 30 minutes, using a DS18B20 sensor and Arduino for smart monitoring and control. The system achieved 18% solar panel efficiency and demonstrated peak performance during high solar radiation. It contributes to sustainability by reducing fossil fuel dependence and carbon emissions, supporting environmental and energy goals.



Proj.No.62 **IoT-based Motorised Wheelchair for Paraplegic**

كرسي متحرك آلي قائم على إنترنت الأشياء للمصابين بالشلل النصفي

Prepared by:

506- Ali Naji Radhi **507- Ali Razzaq Kazim** **508- Huda Razzaq Hamid**
509- Ali Azhar Khalil **510- Hamza Ghaleb Hussein** **511- Rowan Abd ALAmir**
512- Mohammed Ali Mohammed

Supervised by:

98- **Dr. Osamah Jaber Ghayyib**

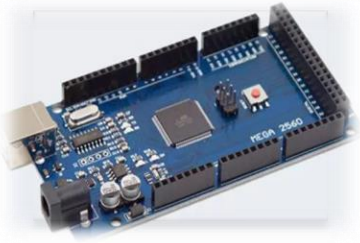
Sustainable Development Goals Performed: **Good Health and Well-being**

Abstract

A smart wheelchair enables independent movement using head control or buttons, solar-powered charging, low-cost design, enhancing mobility and quality of life for disabled individuals.

Methodology

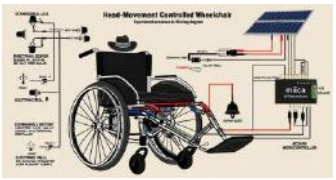
The methodology for the IoT-based motorised wheelchair for paraplegic individuals involves integrating smart control systems with traditional wheelchair mechanics. A microcontroller such as is used to receive input signals from various sources like a mobile app, joystick, or head movement sensors. These inputs are processed to control the direction and speed of the DC motors driving the wheelchair. An IoT module enables remote monitoring and control via Wi-Fi or Bluetooth. To ensure uninterrupted power, solar panels are integrated to charge the battery continuously. The system is tested for user comfort, safety, real-time response, and ease of mobility enhancement.



Results and conclusions

Results :

The prototype wheelchair was tested using head movement and joystick control, achieving 95–100% accuracy with a response time of 1.25–1.67 seconds. The system improved user mobility and independence. Its low-cost design increases accessibility for people with disabilities, supporting smoother daily activity and better integration into society.



Conclusion :

Technological progress has significantly enhanced the lives of disabled individuals. This project introduces a smart wheelchair controlled by head movement or joystick, enabling users to navigate easily in all directions. It promotes greater independence and mobility, allowing users to manage daily tasks more efficiently and enjoy a higher quality of life.

Proj.No.63 Smart Garden with Weather Station

Prepared by:

513- عمار موسى جبر
514- مهيمن مهند مجيد
515- علي جميل مكي
516- مهند ضياء جهاد
517- مرسلين عامر محي
518- زينب صلاح هادي
519- فاطمه محمد جاسم
520-
521-

Supervised by:

99- **Dr Amir Mohammed Khalaf**
100-

Sustainable Development Goals Performed:

Abstract

Abstract:

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In recent years, the rapid advancements in of Things (Bluetooth) technologies have opened up new possibilities for enhancing agricultural practices and improving sustainability in urban environments. One such innovation is the development of smart gardens, which integrate sensors, automation systems, and cloud computing to optimize gardening practices and enhance resource efficiency.

Methodology

Methodology: To build an efficient smart garden system, several components are required to monitor, control, and automate the various garden functions. These include microcontrollers, sensors, actuators, and communication modules, each of which plays a vital role in ensuring the system's functionality

Results and conclusions

Results and conclusions:

. 1. Efficient Water Usage: The soil moisture sensor successfully detected moisture levels, and the relay-controlled water pump activated only when necessary, reducing excessive watering.

2. Accurate Environmental Monitoring: The DHT11 sensor provided reliable temperature and humidity readings, which can be utilized for further climate control implementations.

3. Real-Time Data Processing: The Bluetooth network microcontroller effectively processed sensor data and controlled actuators in real time. 4. Potential for Bluetooth network: The system's Bluetooth capability allows for cloud data storage and remote monitoring, enhancing usability and efficiency.

During testing, minor fluctuations in sensor readings were observed due to external environmental factors such as direct sunlight affecting humidity readings. However, calibrating the sensors improved accuracy. Additionally, response times for the water pump activation were minimal, ensuring that plants received adequate irrigation without delays.

Proj.No.64

Design and Implementation of a High Efficiency Solar Heater toward a Clean Environment

Prepared by:

522- Jihad Salim Jihad Mahdi
523- Ahmed Jaber Jain Hamza
524- Mohammed Haider Hammoudi
525- Mohammed Abdul Ameer
526- Mohamed Samir Salem
527- Ali Mohammed Abdul Hussain
528- Al-Muntadhar Mohammed
529-
530-

Supervised by:

101- **Asst.Prof.Dr. Hasan Hamad Ali**
102-

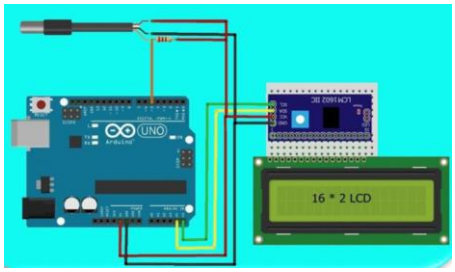
Sustainable Development Goals Performed:

Abstract

Abstract:
This project presents the design and implementation of a solar water heater that utilizes advanced technology to heat water efficiently and sustainably. The system consists of a water tank, a 12V heating element powered by a rechargeable battery, a solar panel, and an electric adapter as energy sources. A 12V pump used to circulate water to the tank, while an Arduino unit monitors the water temperature via a sensor and displays the readings on an LCD screen. This system offers a reliable and eco-friendly solution for heating water with the capability of utilizing alternative energy sources.

Methodology

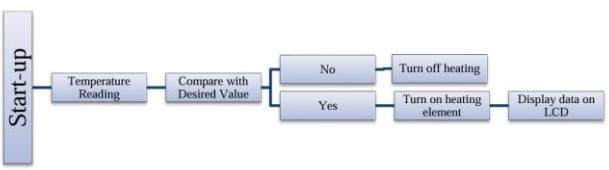
This project presents a high-efficiency solar water heating system using a solar panel to convert sunlight into electricity, stored in a 12V, 25Ah battery for continuous operation. An Arduino-controlled water pump circulates water, while a DS18B20 sensor accurately monitors temperature (±0.5°C). The system's thermal performance is evaluated using heat gain ($Q=mc\Delta T$) and efficiency ($\eta = Qout/Qin \times 100$) equations. These calculations help optimize energy usage and system efficiency, demonstrating a sustainable and cost-effective solution for renewable energy applications.



Results and conclusions

Results and conclusions:

This project developed an efficient solar water heating system that successfully heated 1 liter of water from 20°C to 60°C in 30 minutes, using a DS18B20 sensor and Arduino for smart monitoring and control. The system achieved 18% solar panel efficiency and demonstrated peak performance during high solar radiation. It contributes to sustainability by reducing fossil fuel dependence and carbon emissions, supporting environmental and energy goals.



Proj.No.65	Medication Reminder System based on Arduino and Android	

Prepared by:		
1- Ali Bassim Rahim	2- Ali Falah Hakim	3- Khudhur Hussein Mahdi
4- Hussein Fadel Abbas	5- Hussein Ali Thiban	6- Wisam Ihsan Mousa
7- Mustafa hadeir abd-zaid	8-	9-

Supervised by:	
1- **Assist. Prof. Dr. Saad Mutashar Abbas**	2-

Sustainable Development Goals Performed:	

Abstract

Abstract:

The project presents a low-cost, Arduino- and Android-based Medication Reminder System designed to improve patient adherence. It delivers timely alerts via buzzer, LED, and mobile notifications, allowing patients to confirm medication intake. The system supports real-time tracking and caregiver notifications in case of missed doses. Prototype testing showed reliable performance and user-friendly design. Future improvements may include AI, cloud storage, and IoT integration to enhance remote monitoring and personalized care.

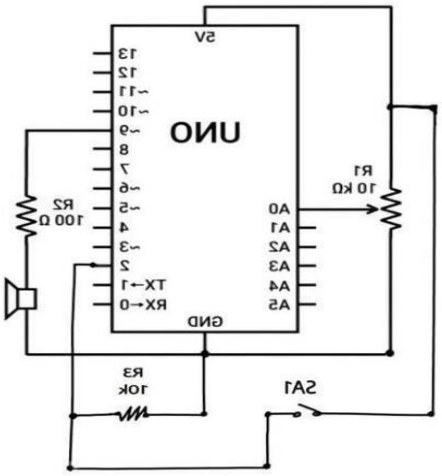
Methodology

The integration methodology connects the Arduino hardware with an Android mobile application via Bluetooth to enable real-time communication and medication management. The Android app sends medication schedules to the Arduino, which then activates alerts (buzzer and LED) at the appropriate times. The patient confirms intake using a button on the Arduino or through the app, and the Arduino sends a confirmation message back to the app for logging. If the patient fails to respond, the app notifies caregivers. This seamless synchronization ensures timely reminders, accurate tracking, and enhanced patientcare giver interaction.

Results and conclusions

Results and conclusions:

The results of the project demonstrated that the integrated system effectively reduced missed medication doses through dual-mode reminders (hardware and mobile alerts). Bluetooth communication enabled real-time tracking and confirmation of medication intake, while user testing showed high ease of use, especially among elderly users. The system proved to be cost-efficient, reliable, and adaptable, with successful prototype testing confirming its ability to support both patients and caregivers in improving medication adherence.



Proj.No.66

Health Care Monitoring System based on Wireless Sensor Networks and GSM Modem

Prepared by:

531- Amir Khadir Abbas Kazim
532- Hassan Falah Hassan
533- Malak Hashim Abdel Moneim
534- Maha Aref Halil Wadah
535- Mustafa Hamid Khadir
536- Muqtada Liwaa Nazim
537- Zahraa Hazem Abbas Abdul
538-
539-

Supervised by:

103- **Prof.Dr. Adnan Hussein Ali**
104-

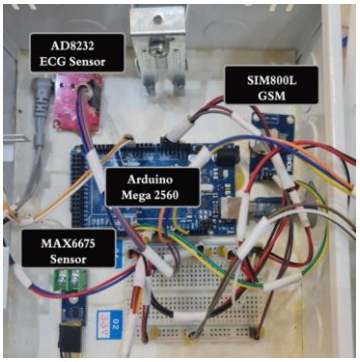
Sustainable Development Goals Performed:

Abstract

Abstract:
The GSM-based Patient Health Monitoring System enables remote tracking of vital signs—heart rate, temperature, SpO_2, and ECG—especially for elderly patients unable to visit hospitals regularly. It sends alerts via GSM if readings exceed safe limits and uploads data to Thing Speak for continuous online monitoring by doctors.

Methodology

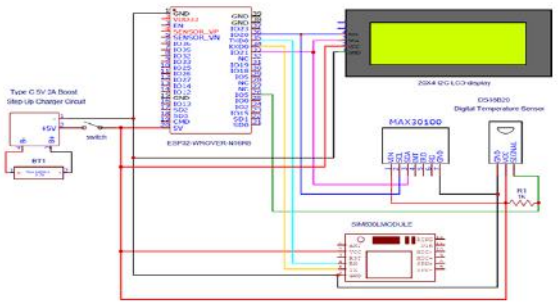
The research methodology follows an iterative process involving several key phases: beginning with system conceptualization through literature review, followed by selecting and designing suitable hardware and software components. The system is then implemented into a functional prototype for real-time health monitoring. Comprehensive testing is conducted to evaluate functionality, data accuracy, GSM network efficiency, and power consumption. The collected data is analyzed to assess system performance and identify areas for improvement. Finally, the system is optimized by refining components and communication protocols based on testing feedback.



Results and conclusions

Results and conclusions:
The "Health Monitor System" graph shows patient temperature data over 24 hours in the Critical Care Department. Temperature remained stable between 30.5°C and 31°C, dropped slightly during the night, then spiked above 35°C, possibly indicating fever, sensor error, or external heat. This highlights the system's ability to detect critical changes.
The heart rate graph shows readings from around 65 bpm rising above 100 bpm, with fluctuations between normal and elevated rates. A drop to 70 bpm is seen around 12:18 before rising again. These variations may result from normal activity, arrhythmia, or sensor noise. Overall, heart rate stayed within 60–120 bpm, proving the system's value in continuous cardiovascular monitoring and early alerting.

Date Time (am)	Temperature (°C)	Heart Rate (BPM)	Oxygen Saturation (SpO_2 %)
27-04-2024 11:15	37.5	85.8	98
25-04-2024 11:20	37.1	70.4	90
24-04-2024 11:25	37.6	82.6	90



Proj.No.67

Name of The Project. Design of an Intelligent Spirometer System for Lung Function Assessment

Prepared by:

540-	Mohammed Jawad Muslim	541-	Hussein Wazzaa Sukhail	542-	Ali Abbas Radi
543-	Murtadha Faez Hamzah	544-	Montathar Tawfeeq Jassim	545-	Mohammed Asaad Adnan
546-	Ali Radi Hamzah	547-		548-	

Supervised by:

105-	Asst. Prof. Dr. Hasan Hamad Ali	106-	

Sustainable Development Goals Performed:

Abstract

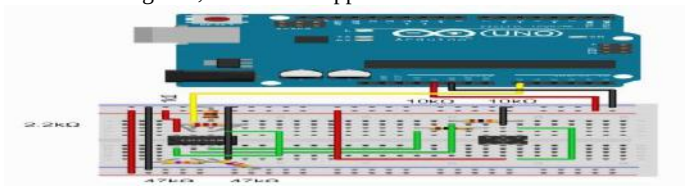
Abstract:
Chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), asthma, and pulmonary fibrosis, are major global health concerns, yet accessible and affordable lung function monitoring remains a challenge. Traditional spirometers are expensive, clinic-dependent, and require expert interpretation, limiting their use in low-resource settings and remote patient monitoring. This research presents the design and development of an intelligent spirometer system that integrates low-cost sensors, embedded processing, and machine learning (ML) to provide accurate, real-time lung function assessment with automated disease detection.

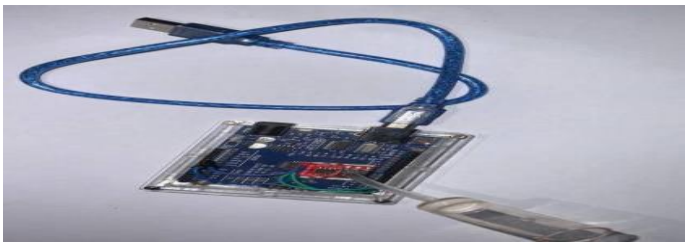
Methodology

Methodology details the systematic approach used to design and develop
The intelligent spirometer system, including hardware architecture, firmware
Development, AI/ML model training, and clinical validation protocols.
 System Design Overview
The proposed system follows a modular architecture with three core
Components:
 Hardware Unit: Sensor-based airflow measurement and data acquisition.
 Software Platform: Mobile app for data visualization and user interaction.
 AI Engine: Machine learning models for lung disease classification.
 Hardware Design and Implementation

Results and conclusions

Results and conclusions:
The project results showed that the smart spirometer was highly accurate in measuring
Lung function, with readings consistent with approved medical spirometers.
The artificial intelligence models used also demonstrated their ability to classify
Respiratory diseases such as asthma and COPD with an accuracy exceeding 90%.
The system achieved a rapid response time and immediate data analysis via a mobile
App, in addition to supporting remote monitoring through cloud storage.
Users praised the ease of use and accuracy of the results, confirming the device'
S
Effectiveness in both home and clinical settings.
Results
This project represents an important step toward developing smart, low-cost
Tools for measuring lung function, combining precise sensor technologies,
artificial intelligence, and mobile applications





Proj.No.68	Smart Medical Box علبة دواء ذكية	

Prepared by:		
1- Muslim Aqil Najih	2- Hassanein Qasim Muhammad	3- Muhammad AlBaqir Yassin
4- Muhammad Abdul-Kazem	5- Murtada Karim Makhif	6- Hassan Abbas Habib
7- Kawthar Ali Muhammad	8-	9-

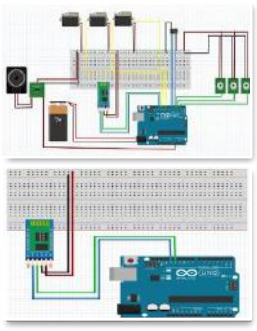
Supervised by:	
1- Dr. Rami Qays Malik	2-

Sustainable Development Goals Performed:	Good health and well-being

Abstract:
Smart, Medication, Reminder, System, improving, adherence, elderly, patients, chronic, memory, Alzheimer's, dosage, complications, Arduino, mobile, interface, schedules, alarms, Real-Time, Clock, Bluetooth, configuration, presence, sensors, servo, compartments, EEPROM, automated, alerts, outcomes.

Methodology

Methodology he system was developed using an Arduino board as the main controller, integrated with an RTC module for accurate timing, a PIR sensor to detect user presence, and servo motors to open specific compartments. A Bluetooth module enabled communication with a mobile application built using MIT App Inventor. Users set medication schedules through the app. Data is stored in EEPROM to ensure persistence during power loss, ensuring reliable medication management and timely alerts



Results and conclusions:

The Smart Medical Box system was implemented and tested to support proper medication management. The system successfully issued timely reminders using sound alarms and controlled the opening of medication compartments via servo motors. The RTC module ensured accurate timing, while PIR sensors effectively detected the presence of the user, allowing access to medication only when the patient was nearby. This helped prevent unnecessary openings and enhanced safety.

The mobile application, created with MIT App Inventor, provided a simple interface for users or caregivers to schedule medications by specifying the day, time, and name of the drug. Communication between the app and the Arduino-based system was stable through the HC-05 Bluetooth module. The process of transmitting and receiving data was smooth and reliable.

EEPROM memory was used to store schedules, preserving them even after power outages. This ensured consistent operation and reliability. The system supported multiple daily medication times and included a feature to automatically reopen compartments if the user missed a dose.

In conclusion, the Smart Medical Box offers a reliable and user-friendly solution for improving medication adherence. It reduces the risk of missed or incorrect doses and is especially useful for elderly.

Proj.No.69	Electrical stimulation to accelerate wounds healing	

Prepared by:		
1- Talib Ammar Talib	2- Sajjad Farhan Kazim	3- Karrar Ali Hussein
4- Ali Ibrahim Abdul Ali	5- Mohammed Rahim Ali	6- Ali Abdullah Hussein
7- Ali Tamah Ahmed	8-	9-

Supervised by:	
1- **A.L. Amir Mohammed Khalaf**	2-

Sustainable Development Goals Performed:

Abstract

Abstract:

This project involves the design and implementation of a device that uses electrical stimulation to accelerate wound healing by applying mild and continuous currents to promote cell growth, improve blood circulation, and regenerate tissue. The device showed a fast response and about 90% accuracy, offering effective therapy with low cost and ease of use. Despite minor issues like sensitivity to quick movements and glove fitting, the prototype proved efficient and reliable. The project opens the door for future improvements such as expanding signal recognition, adding wireless connectivity, and incorporating voice output to enhance the quality of life for patients with chronic wounds.

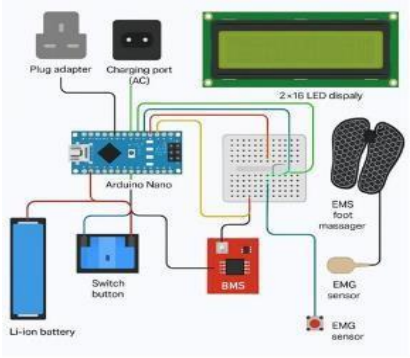
Methodology

This project utilizes a structured interconnection of components to achieve effective wound healing through electrical stimulation. The Arduino Nano acts as the main controller, processing data from the EMG sensor that monitors muscle activity near the wound. A 16x2 LCD screen displays key information like stimulation level and treatment duration. Power is supplied by a lithium battery, managed by a BMS for safe charging, while Dupont cables ensure flexible and secure connections between parts. An EMS foot massager generates the required electrical pulses to enhance blood circulation. The device also includes an AC adapter for charging, a switch for control, a plug adapter for stable power input, and a 2x16 LED display to show charging and operational status, ensuring system reliability and therapeutic efficiency.

Results and conclusions

Results and conclusions:

The results confirmed the device's high effectiveness in accelerating wound healing by stimulating cell growth and improving blood circulation, reducing healing time compared to traditional methods. It showed 90% accuracy and succeeded in 45 out of 50 tests. Minor issues were noted with rapid movements and glove fit, suggesting areas for future enhancement. Its low cost and simplicity make it a promising, affordable solution for chronic wound care, with potential upgrades like wireless connectivity and voice output.



Proj.No.70	Health & Safety Plan in Iraqi Hospitals	

Prepared by:		
1- Salah Hadi Abdul-Kadhim	2- Sajad Waleed Brisam	3- Abdullah Adnan Kadhim
4- Muqtada Raad Hamra Alwan	5- Karar Haidar Hilal Matar	6- Saif Al-Sadiq Abdul-Kadhim
7- Mahdi Moataz Mahdi Hantoush	8-	9-

Supervised by:	
1- **Asst. Prof. Dr. Tareq Raouf Hassan Al-Khatib**	2-

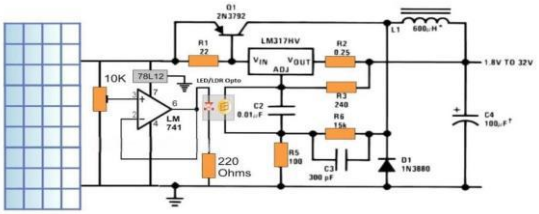
ıstainable Development Goals Performed:	

Abstract

his project presents a solar-powered smart system using Arduino Mega and sensors (temperature, light, flame) to improve health and safety in Iraqi hospitals. The system operates automatically with smart lighting and cooling fans, enhancing emergency response and reducing energy use. Practical tests showed efficiency and suitability for low-infrastructure hospitals. Future improvements include digital interfaces and centralized alerts.

Methodology

e system uses a breadboard for flexible assembly and testing of components before final installation. Solar cells connect to a voltage regulator (LM317HV and 78L12) to store energy in a battery. Capacitors smooth the current, resistors regulate it, and diodes prevent backflow. Sensors (LM35, LDR, flame sensor) send data to Arduino Mega, which controls lights and fans through digital outputs and relays based on environmental conditions. This setup ensures safe and efficient operation in the smart solar-powered hospital.



Results and conclusions

sults and conclusions:

e results of implementing the proposed system demonstrated clear practical effectiveness in improving the work environment within hospitals. The use of solar panels contributed to reducing reliance on conventional electricity by approximately 40% during the day. The sensors used (such as temperature, flame, and lighting) also demonstrated their ability to respond quickly to emergencies in less than three seconds, enhancing safety within the medical environment. Additionally, the system contributed to reducing electrical faults by an estimated 25% thanks to temperature control and automatic activation of ventilation systems. The use of smart lighting also reduced electricity consumption by up to 30%. The system was easy to use by medical

staff, with simple light signals indicating the operating status or presence of any malfunctions, reflecting the effectiveness of the proposed technical solution in supporting health and safety systems within Iraqi hospitals.

Proj.No.71

Artificial intelligence application for diagnoses brain scan reveals disease and tumors.

Prepared by:

549- سامر حمزه مهدي 2-علي الرضا فارس كريم 3-سيف سعد مصري

4-حسن هادي نعمه 5-مصطفى عمران محمد 6- مصطفى قاسم حسين

Supervised by:

1-**MSc. Zahraa Eisa Mohammed** 107-

Sustainable Development Goals Performed: **Goal 3: Good Health and Well-being**

Abstract

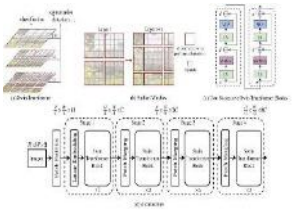
Abstract:

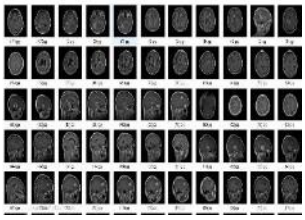
Artificial Intelligence (AI) is an emerging technology used to enhance the accuracy and efficiency of medical diagnosis, particularly in analyzing medical images such as X-rays and MRIs. It enables earlier and more precise detection of tumors by using algorithms trained on large medical datasets. AI speeds up the diagnostic process, allowing physicians to focus more on treatment planning and patient care. Despite its advantages, AI faces challenges such as the need for high-quality data, building trust among healthcare professionals, and the necessity of clinical validation.

Methodology

Methodology:

This study developed an AI-based system for brain tumor diagnosis using MRI and CT images. Data were collected from trusted sources like the BraTS dataset, with expert-annotated images. Preprocessing steps included noise reduction, contrast enhancement, and segmentation. The Swin Transformer model was trained to detect and classify tumor types. A Python-based GUI was created for easy clinical use. System performance was evaluated based on accuracy, sensitivity, and processing speed.



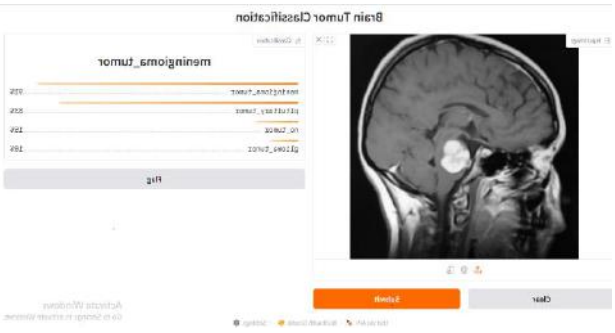


Results and conclusions

Results and conclusions:

The implemented AI system demonstrated strong performance in brain tumor detection, achieving up to 98% accuracy using the Swin Transformer model. It successfully classified tumors as benign or malignant and accurately identified their location within the brain. With a processing time of only 1–2 seconds, the system significantly outperformed traditional diagnostic methods in both speed and precision.

These results highlight the potential of AI to enhance medical diagnostics by reducing human error and enabling quicker clinical decisions. The integration of AI into imaging workflows can support physicians in early diagnosis and treatment planning. However, the system still faces challenges, such as the need for large, high-quality datasets, improved model generalization, and better interpretability. Despite these limitations, the study confirms that AI represents a promising tool for improving diagnostic accuracy and overall patient care.



Proj.No.71	Medication Reminder System based on Arduino and Android	

Prepared by:		
1- Ali Bassim Rahim	2- Ali Falah Hakim	3- Khudhur Hussein Mahdi
4- Hussein Fadel Abbas	5- Hussein Ali Thiban	6- Wisam Ihsan Mousa
7- Mustafa hadeir abd-zaid	8-	9-

Supervised by:	
1- **Assist. Prof. Dr. Saad Mutashar Abbas**	2-

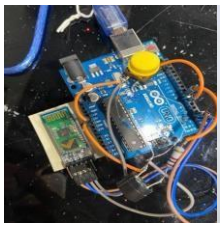
ıstainable Development Goals Performed:	

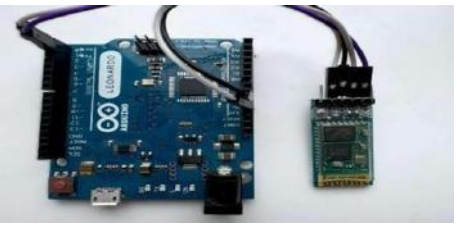
Abstract

The project presents a low-cost, Arduino- and Android-based Medication Reminder System designed to improve patient adherence. It delivers timely alerts via buzzer, LED, and mobile notifications, allowing patients to confirm medication intake. The system supports real-time tracking and caregiver notifications in case of missed doses. Prototype testing showed reliable performance and user-friendly design. Future improvements may include AI, cloud storage, and IoT integration to enhance remote monitoring and personalized care.

Methodology

The integration methodology connects the Arduino hardware with an Android mobile application via Bluetooth to enable real-time communication and medication management. The Android app sends medication schedules to the Arduino, which then activates alerts (buzzer and LED) at the appropriate times. The patient confirms intake using a button on the Arduino or through the app, and the Arduino sends a confirmation message back to the app for logging. If the patient fails to respond, the app notifies caregivers. This seamless synchronization ensures timely reminders, accurate tracking, and enhanced patientcare giver interaction.

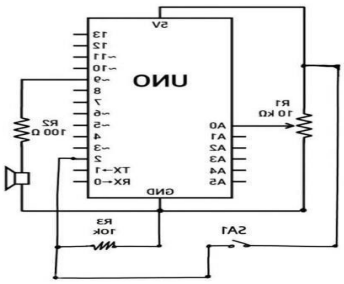




Results and conclusions

Results and conclusions:

e results of the project demonstrated that the integrated system effectively reduced missed medication doses through dual-mode reminders (hardware and mobile alerts). Bluetooth communication enabled real-time tracking and confirmation of medication intake, while user testing showed high ease of use, especially among elderly users. The system proved to be cost-efficient, reliable, and adaptable, with successful prototype testing confirming its ability to support both patients and caregivers in improving medication adherence.



Proj.No.72

Design and Implementation of Insulin Injection Device Using Arduino

تصميم وتنفيذ جهاز حقن الأنسولين باستخدام أردوينو

Prepared by:

550-	Haider Hekmat Abdul Hussein	551-	Amir Haider Hamid	552-	Al-Hassan Hussein Ahmed
553-	Ali Ismail Falih	554-	Mahdi Ruwaihi Dhabah	555-	Musa Sarmed Ali
556-	Ali Hassan Jabbar	557-		558-	

Supervised by:

108-	Dr. Laban Hamdi Hamid	109-	

Sustainable Development Goals Performed:

Abstract

The project aims at the following goals
1. Blood sugar measurement: A glucose measurement sensor is connected to the blood
2. Data processing: The Arduino analyzes the received values and determines the need for insulin.
3. Insulin injection control: Based on the reading, the Arduino controls a precise pump to automatically inject the required amount of insulin.
4. User alert: A screen or wake-up sound can be added to alert the patient of the condition. This system aims to improve the quality of life for patients through intelligent control of sugar levels and reducing human errors in dosages

Methodology

Designing a monitoring and control system for diabetes patients using Arduino Uno: This research introduces a system that uses an Arduino Uno controller to measure blood glucose levels and control insulin doses automatically. 2. Insulin pump design based on Arduino Uno: This project reviews the design of an insulin pump that uses an Arduino Uno controller to control the insulin flow rate and alert when the stock is about to run out. 3. IoT-based intelligent insulin delivery system and diabetes management: This article examines the development of an intelligent system for insulin delivery and diabetes management using IoT technology and an Arduino controller

Results and conclusions

It benefits diabetics, especially those with severe diabetes, as it helps them measure the amount of insulin safely and accurately without worry or fear.
From the remaining tests, the insulin injection device by Arduino is a safe device that helps the patient in their daily life.
Device components

Proj.No.73 **Name of The Project** **جهاز تذكر الادوية بأستخدام الاردوينو**

Medication reminder device using Arduino

Prepared by:

559- Hussein Samir Muhammed
560- Muhammed Abbas Sahib
561- Mukhaled Ali Khoam
562- Ali Saad Meah
563- Hussain Ahmed Abdu Alrazaq
564- Amar Saleh Hassan
565- Ahmed Amer Aliwi

Supervised by:

110- MSC: Ahmed Halmi Kazem

Sustainable Development Goals Performed:

Abstract

Abstract:
It is an electronic device that helps patients remember their medication times through audio or visual alerts, using an Arduino board.

Methodology

Methodology : Brief methodoogy for a medication reminder device using Arduino:

Pre-set medication times in the code.

Read the current time using the RTC module.

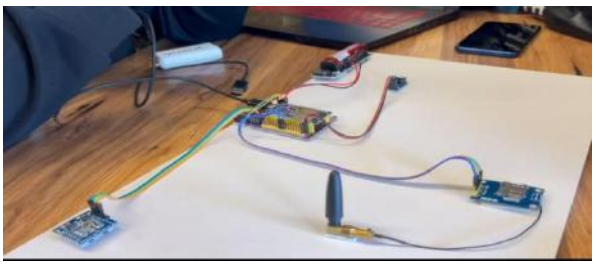
Compare the current time with the medication times.

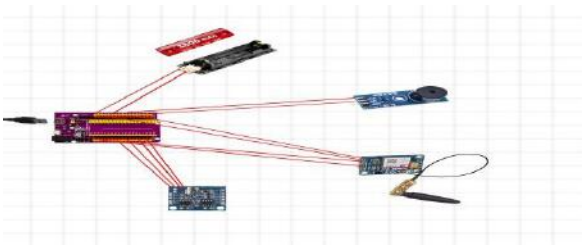
If the time has come, the device will emit an alert (sound/light).

Wait for user confirmation via a button to stop the alert.

Continue checking periodically to repeat the process.

Simple methodology: (Time → Compare → Alert → Confirm → Repeat).





Results and conclusions

Results and conclusions: Brief methodology for a medication reminder device using Arduino:
Pre-set medication times in the code.
Read the current time using the RTC module.
Compare the current time with the medication times.
If the time has come, the device will emit an alert (sound/light).
Wait for user confirmation via a button to stop the alert.
Continue checking periodically to repeat the process.
Simple methodology: (Time → Compare → Alert → Confirm → Repeat).
1. The primary objective has been achieved: The device alerts the user at the specified times to take their medication.
2. The audio and visual alerts are effective in attracting attention, especially for the elderly.
3. The user interface is simple, with a screen and buttons, making it easy to operate.
4. The time accuracy is high thanks to the use of an RTC module.
5. The device can be easily customized for a variety of medications and appointments.
 Conclusions:
1. The device is very useful for patients who forget their medication appointments, especially the elderly or those with chronic diseases.
2. Using simple, low-cost components, a practical and effective solution can be developed.
3. High scalability: Features such as phone notifications, a touchscreen, or a companion app can be added.
4. Accuracy and reliability depend on the quality of the RTC module and a stable power supply.

Proj.No.74	Separation of Plasma from Blood Components Using Centrifugation	

Prepared by:		
566- سجاد حيدر فاروق	567- علي نزار عبد الواحد	568- مصطفى حمدان عبيد
569- تبارك نهاد جابر	570- حسين كاظم مجيد	571- صادق سعد كميني
572-	573-	574-

Supervised by:	
111- **: MSC. Huda Asaad Abd Al-Ameer**	112-

Sustainable Development Goals Performed:	

Abstract

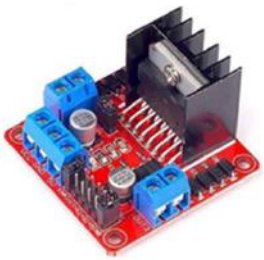
The separation of plasma from blood components is a critical step in clinical diagnostics, therapeutic procedures, and biomedical research. This study focuses on the use of centrifugation as an efficient and widely adopted technique to isolate plasma from whole blood. The research investigates the optimal parameters for centrifugation, including speed (revolutions per minute).

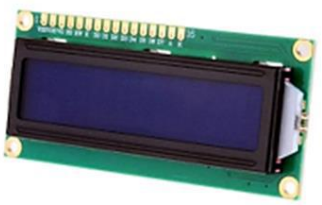
Methodology

e methodology employed for separating plasma from blood components using centrifugation. It focuses on describing the equipment and tools used, as well as defining the optimal operational conditions to ensure efficient and precise plasma separation. Key experimental considerations, including centrifugation speed, duration, temperature, and the type of tubes utilized, will be discussed. Additionally, factors influencing the quality and efficiency of separation will be analyzed.

Results and conclusions

results and future work
The project successfully demonstrated that centrifugation is an effective and reliable method for separating plasma from blood components.
Optimal parameters used were 3500 RPM, 15 minutes duration, and 4°C temperature.
The use of anticoagulant-treated tubes helped prevent clotting and improved separation quality.
The separated plasma appeared clear, uncontaminated, and suitable for laboratory or clinical use.
Careful handling after centrifugation (especially during pipetting) was essential for achieving near 100% separation.
The results were consistent with theoretical expectations and prior research findings.
The method proved to be low-cost, accessible, and efficient for routine applications
.





Proj.No.75

DESIGN AND IMPLEMENTATION OF A SMART MULTI-SCAN MEDICAL DEVICE

Prepared by:

575- AL Hassan Almujtaba Haitham
576- Mohammed Hussein Ali
577- Istabraq Adnan Talib
578- Aseel Nasir Kadhum
579- Mariam Emad Jawad
580- Mohammed Mohsin Ali
581- Nabaa Hamid Abdul-Abbas
582-
583-

Supervised by:

113- **Dr. Rami Qais Malik**
114-

Sustainable Development Goals Performed:

Abstract

Abstract:

This project involves the design and implementation of a smart hydrofacial device that provides deep skin cleansing, exfoliation, hydration, and rejuvenation. It includes a sterilization system (dry heat and UV-C) and an AI-based diagnostic tool to analyze skin conditions. The device is supported by a database for managing treatments and patient records, aiming to offer a safe, efficient, and modern skincare solution.

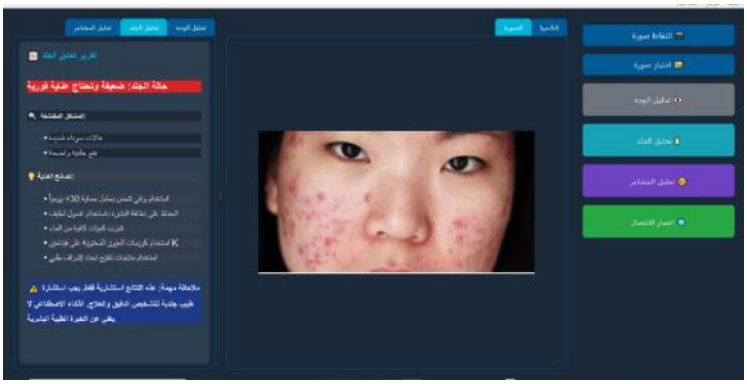
Methodology

The project components were integrated by installing the sterilization system, connecting the AI diagnostic unit, and linking all parts through electrical wiring and a central control panel, supported by a database for managing patient and treatment data.

Results and conclusions

Results and conclusions:

The project successfully resulted in a fully functional hydrofacial device capable of performing deep skin cleansing, exfoliation, hydration, and rejuvenation. The integration of **dry heat** and **UV-C sterilization systems** ensured a high level of hygiene. The **AI system** effectively analyzed various skin conditions and provided personalized reports. Electrical connections and fluid systems operated safely and efficiently. The control panel and touch screen allowed easy operation, while the database system managed patient records and treatment history. Overall, the device proved to be **technically feasible**, **safe**, and suitable for **clinical and cosmetic use**.



Proj.No.76

Design of a Smart Medicine Box Using Arduino

تصميم صندوق دواء ذكي باستخدام الاردوينو

Prepared by:

584- Hussein Mahmoud Omran
585- Fadhel Mohammed Hassan
586- Baqer Mohammed Ibrahim
587- Abdullah Ali Hashim
588- Ali Hussein Sabar
589- Abdullah Ali Jabbar
590-
591-
592-

Supervised by:

115- **A.L Amir Mohammed Khalaf**
116-

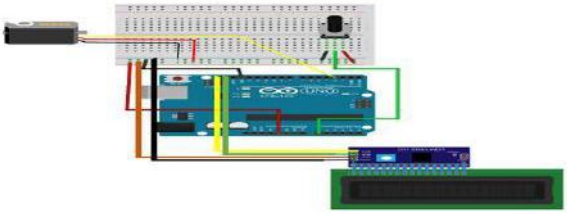
Sustainable Development Goals Performed: Goal no. 3

Abstract

Currently available many medical errors are because people responsible for the medications of patients or the elderly have to deal with sorting huge amounts of pills daily and many deaths occur due to giving patients the wrong medications at the wrong times or forgetting to take the medication. This project focuses on the realization, design and creation of a prototype of a pillbox that aims to solve this shortage in the medical field where we can sort the pills easily; this device is intend for use by hospitals or nursing homes.

Methodology

This study employs a design and implementation methodology for an electronic system based on embedded components. An Arduino board used to control the processes, along with a servomotor to rotate the disk containing the medication compartments. The system was programming in C++ to allow users to set the desired time and dosage through buttons and an LCD screen for information display. Upon reaching the specified time, a buzzer and LED indicators are activate to notify the user and reveal the designated medication compartment.



Results and conclusions

The proposed system is suitable for all types of patients. We can control the time when patients take the medicine, speak the names of each pill, and record new names if necessary with the help of the ISD1820 recording module which can be used to record, repeat and change previous recordings easily. In addition, with the help of the infrared sensor, we can easily know whether the pills have been take from the box or not, it also reduces the percentage of patient, missing and delaying taking the medicine with the help of each component carefully integrate into the circuit and with software programming. We have program the smart pillbox to give reasonable outputs and thus contribute to the best working of the unit.

Conclusions: Now it is common to see people young and old take medication maybe be for health purpose etc. The medication may be require to be take many times per day and people do tend to forget as they have many other things going on with their lives. This project can potentially help caretakers, guardians and patient as it reduces their burden of having to constantly remember the fact that they or the patient under the guidance have to take their medication and a specific time. The project is inexpensive, easy and portable for use.

Proj.No.77

Design and implementation a smart medical bag

تصميم وتنفيذ حقيبة طبية ذكية

Prepared by:

593-	Sajad Qasim Hadi	594-	Moamal Salam Hamza	595-	Harith Habib Alawi
596-	Salam Ali hamza	597-	Hussein Amer Mohsen	598-	Muhaymin Ali Saeed
599-	Ali Hussein Fadil	600-		601-	

Supervised by:

117-	MSc Elaf Hussein	118-	

Sustainable Development Goals Performed: الحد من أوجه عدم المساواة

Abstract

Abstract:
The Smart Medical Bag enables real-time monitoring of vital signs using sensors and Bluetooth. It enhances emergency care with local display, portability, and alerts, without internet reliance.

Methodology

Methodology :
The Smart Medical Bag was designed using ESP32 microcontroller and biomedical sensors (MAX30102, DS18B20, DHT11). It collects data like HR, SpO2, temperature, and humidity, then displays them on an LCD and sends them via Bluetooth to a mobile device. A relay-controlled fan activates if temperature exceeds 30°C. The system is powered by battery and optimized for portability and field use. ……..

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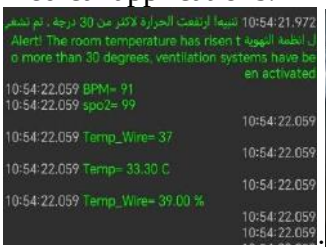
Results and conclusions

Results and conclusions:
The smart medical bag efficiently monitors vital signs such as heart rate, SpO_2, body temperature, and humidity using biomedical sensors connected to an ESP32 microcontroller. Data is displayed on an LCD and sent via Bluetooth to a smartphone. Testing showed accurate, consistent readings across different subjects, confirming system reliability.
The system responds to abnormal conditions by triggering a buzzer and activating a cooling fan when temperature exceeds 30°C. Its design is portable, energy-efficient, and suitable for emergency and remote healthcare use.
Despite its effectiveness, the system has some limitations. Bluetooth range is limited, there's no internet connectivity for remote access, and environmental factors may affect sensor accuracy. Regular maintenance is also required.
Overall, the project achieved its goals, offering a practical solution for local patient monitoring. Future enhancements could include adding Wi-Fi or GSM modules, cloud integration, and improved power management to expand its use in broader medical applications.



Proj.No.78

EEG ROOM MODEL

Prepared by:

602- سبطين باسم عبد الأمير روزي
603- مرتضى عدنان عبودي
604- مصطفى يحيى عناد
605- احمد عدي عبد الكاظم نعمة
606- حسن كريم خضير غزاي
607- حنين باسم مريح حدراوي

Supervised by:

119- **DR. Ahmed Helmi**
120-

Sustainable Development Goals Performed:

Abstract

Abstract:The project presents an optimized EEG room design incorporating shielding, comfort, wireless systems, and AI-enhanced diagnostics, ensuring high-quality brain data collection aligned with modern biomedical engineering standards.

Methodology

Methodology: The room was designed using a systems-based biomedical engineering approach. Faraday shielding, acoustic insulation, and ergonomic zoning were implemented. Signal acquisition used NeuroAmp 4000 with AI artifact filtering. Wireless EEG ensured mobility. Multi-modal integration supported EEG-fMRI and PSG. Sustainable practices included LED lighting and recycled materials. Compliance with IEC 60601 and ISO 13485 ensured safety. Layout design enhanced technician-patient interaction.

Results and conclusions

Results and conclusions: The implemented EEG room model demonstrated significant improvements in signal fidelity, patient comfort, and technological integration. Signal-to-noise ratio exceeded 42.6 dB, confirming exceptional data clarity. Wireless EEG system (NeuroWave X2) ensured seamless data transmission with <0.02% packet loss. AI-based artifact detection successfully minimized physiological and external signal distortions. Ergonomic enhancements, including climate-controlled recliners, acoustic insulation, and ambient LED lighting, improved patient experience and reduced involuntary movements. Environmental feedback from test volunteers yielded an average comfort score of 4.8/5.The room supports multimodal diagnostics, integrating EEG-fMRI and polysomnography (PSG) with accurate synchronization and EMI isolation. Sustainable construction materials, including recycled acoustic foam and energy-efficient lighting, reduced operational costs by 28%. Modular infrastructure supports easy maintenance and scalability for future upgrades.Challenges like EMI interference near the power inlet and wireless dropouts were resolved through reinforced shielding and signal routing strategies.In comparison to traditional EEG rooms, this model outperformed in all evaluated categories, including EMI protection, patient-centered design, wireless support, sustainability, and system flexibility. In conclusion, this EEG room offers a future-ready, medically compliant, and cost-effective environment for both clinical and research applications in neurophysiology.

جامعة المستقبل
كلية الهندسة والتقنيات الهندسية
المشاريع المتميزة لكلية الهندسة المشاركة في أسبوع الاستدامة

ت	اسم المشروع	اسم المشرف	أسماء المشاركين	القسم
1	البيت الذكي المستدام	ا.م.د. أزهر محسن عبد	رسل عباس حيدر جبار علي عبد الكاظم علي عدي محمد فالح اسراء محمد حسن	مركز بحوث الطاقة
2	مجمع المستقبل السكني المستدام	أ.م.د مياده وحيد فلاح م.د. بارق علي عبد الهادي	مريم محمد موسى مصطفى محمد حسن حسنين علي عمران	قسم تقنيات البناء والانشاءات
3	شاحن ذكي مستدام للأجهزة الطبية	أ.د. إبراهيم عبدالله مرداس م.م. ماهر رحمن عبد الأمير	علي كريم كاظم حوراء بهاء عبد الحسين علي فائز عبد الزهرة ضحى حاكم داخل يحيى ماجد محي	قسم هندسة الطب الحياتي
4	طائرة مسيرة ذكية للحالات الطبية الحرجة	م.د. رامي قيس مالك	ليث فارس رسول مجتبى فلاح عبد علياء علاء فتاح حمزه عامر حسن احمد جليل محمد	قسم تقنيات الأجهزة الطبية
5	نظام هجين لتوليد الطاقة النظيفة	ا.د. قصي رشيد عبد الأمير	مرتضى جاسم محمد علي شاكر سيف ماجد حسين سليم عبدالله احمد مصطفى فاضل عباس حبيب	هندسة تقنيات ميكانيك القوى
6	قاذفة الموجات الصوتية المضادة للجاذبية	م.م. زينب كاظم جابو	زيد طارق حمد عبد الله محسن عبز الامير غدير فلاح حسن مريم احمد عبد الامير	قسم هندسة تقنيات الحاسبات

جداول لجان مشاريع التخرج في الاقسام

قسم هندسة البناء والانشاءات						
توزيع المجموعات - مشاريع تخرج العام الدراسي 2024-2025						
رقم المجموعة	اسماء المجموعة	التدريسيين	رقم المشروع	عنوان المشروع	عدد المجموعة	SDGs
1	فرحان عطية سقف احمد محمد نجم فرقد عباس حمزة ازهر علي ديلي حسين طالب حسين عزيز رحيم هادي	م.م مرزة كريم عمران أ.م.د عمران عيسى محمد	14	Study of the effect of marble cutting plant waste as an alternative to coarse aggregate on some properties of concrete.	6	9
2	احمد جاسم محمد حسين صبيح كاظم محمد ميثم عزيز حسنين عبد الهادي منتظر مؤيد محمد علي كاظم عبد العباس	م.م نورا فوزي عبد أ.م.د صباح محمد عبد	34	Strength and sustainability in concrete: The impact of fly ash and superplasticizer	6	9
3	حسين رغيد سعد مجتبى فلاح عبدعون احمد صفاء حمودي زيد علي طارق	م.م اسراء محسن كاظم	16	Utilizing Recycled Materials in the Construction of Sustainable Roads and Bridges	4	11
4	مصطفى ستار حنتوش عباس احمد جواد امير محمد عبد الامير محمد قاسم عباس عبدالله عدي حاتم سمير محمد عباس	م.م فاطمة مسلم هادي	23	Determining the additives optimum ratio for improving the Stability and Air Void ratio of Asphalt	6	9
5	أحمد فاضل عبد الحمزة رولا مهدي اسراء سلمان صبا عبد الرزاق ابراهيم حسن زينب سعيد	أ.د. نجاح مهدي لطيف	8	Design of eccentric cantilever retaining wall	6	9
6	حسين علي جليل جهاد قمر حسين عبد الزهرة صفا محمد نهاد عمار خالد جفات حيدر باسم عبد الجبار امير حيدر هادي	م.م سالي سيلان حسين م.م الاء حسين عبدالأمير	27	The effect of glass fiber on the behavior of specific types of concrete.	6	9
7	حسنين علي عمران شهاد ناصر حسن		22	The effect of seawater on the properties of concrete	4	9

	دعاء موسى عبدالله مريم فاضل سوادي	م.م رغدة علي ناصر م.م نورا فوزي				
8	طاهر علي محمد حيدر ضياء الدين شمس الدين علي مرتضى حسين علي سعد نصار كاظم كريم كاظم	م.م حنين فاضل كاظم	26	Analysis of Common Road Problems and Development of Innovative Strategies to Improve Their Quality and Performance	5	11
9	محمد قاسم عبد هاشم سامر عباس هادي شبر ريسان فاخر نمير بهاء ياس شجاع كرار صالح ايمن محسن غازي	م.م محمد جواد كاظم م.م تمار ميثم عبدالوهاب	18	Appliction on Reuse of Wastwater to Enhance Irrigation purposes to babel	6	6
10	محمد حيدر حسين حسين فائق جاسم محمد علي عباس عزيز قاسم قيس ابراهيم جاسم مرتضى علي محمد	م.م اسراء محسن كاظم	15	Applications of Artificial Intelligence in Sustainable Infrastructure Design	5	11
11	ضي ولاء خضير باسم حسن عبد الحر محمد مهدي علاء محمد محي فاضل عباس جبر عقيل صالح خضير	أ.م.د ميادة وحيد فلاح	2	Investigated the behaivor of hollow self-compacted concrete column	6	9
12	علي خضير عبد الكاظم محمد حسين ثائر ورود فارس ستار مازن صلاح ياسر حسن هندي	م.م فاطمة مسلم هادي م.م تميم محمد هاشم	39	Assessing the Impact of Recycled Concrete Aggregate on the Mechanical Properties of Hot Mix Asphalt Mixtures	5	9
13	لقمان عباس هاني اسراء عادل مهدي حيدر محمد حسين كرار فوزي حمادي محمد خليف فليفل	م.م عقيل عبدالحسن حسين م.د بارق علي عبدالهادي	12	Using management triangle to measure the performance of construction of university new Campus project	5	11
14	مصطفى محمد حسن منتظر عبد الكريم كاظم علي حسن حمود غزوان صباح عبيس دجلة علي حسين الاء نعيم ابراهيم	م.د بارق علي عبدالهادي م.م عقيل عبدالحسن حسين	3	environmental impact comparison between concrete and steel structure building: a case study of university new Campus project	6	13
15	ليث سعيد حسين		1		5	9

	دعاء اسماعيل وسمي سجى زين حسين ميس عدي عبد الصاحب علي احمد جميل	أ.م.د ميادة وحيد فلاح		Explore the behavior of mortar under two point load with Sand replacement		
16	علي عمار زيارة جمعة حيدر ميثم فليح حسن امير احمد سعد مصطفى صادق دشر محسن سجاد ظاهر هرون عليوي	م.م رغدة علي ناصر	21	Using recycled materials in the production of environmentally friendly concrete	5	12
17	احمد جمال مكي أحمد قحطان عباس منتظر محمد خضير عباس احمد حسن جبر حازم عباس دريب عباس	م.م بنين محمد هلال م.م مريم محمد موسى	36	تقييم بعض العوامل المؤثرة على الازدحام المروري في شارع 60 في محافظة بابل	5	11
18	حسنين علاء جعفر حسنين عباس سعد محمد جواد زيد محسن محمد حسين سعيد ثجيل حسين عماد كاظم منتظر حسين عبد محمد	م.م الاء حسين عبدالامير م.م سالي سيلان حسين	20	Water Quality Analysis in Rivers and Environmental Impacts: A Case Study in the [Shatt al-Hillah River]	6	6
19	يوسف ماهر م حسنين علي حريف م مرتضى هضمان عبيد م	م.م مريم محمد موسى م.م بنين محمد هلال	29	تصميم حي سكني مستدام	3	11
20	عباس فاضل عبدالعباس محسن محمد حسن ص محمد عبدالكريم حمد ص مرتضى احمد علي ص	م.م حنين فاضل كاظم	25	Performance Evaluation of Modified Asphalt Mixtures Using microsilica to Improve Their Mechanical Properties	4	12
21	مسلم محمد هادي منتظر كاظم مرزوك سلمان علي رعد حمزة همام كاظم هادي مرزوك	تمار ميثم عبدالوهاب محمد جواد كاظم	31	Geotechnical Properties of soil in Street no 40 in Babylon province	4	9

قسم الهندسة الكيماوية والصناعات النفطية/2024 -2025				
ت	أسم المشروع	أسم المشرف	الطلاب(اربعة طلاب لكل مشروع)	الاهداف المتحققة من التنمية المستدامة
1	استخدام الطاقة الشمسية في التسخين للعمليات الصناعية	أ.م.د علاء ضاري جواد	كرار رزاق صالح	SDG7
			مرتضى حسين علوان محمد حسين كاظم	
			حسين عزيز حسن	
2	تقليل الانبعاثات من غاز ثاني اوكسيد الكاربون بواسطة استخدام الوقود الحيوي	أ.م.د علاء ضاري جواد	أمير كاظم خيرالله	SDG 13
			منتظر عامر كاظم	
			أحمد حيدر كامل	
			منتظر عباس حاتم	
3	أستخدام تقنية الغشاء الحيوي في معالجة المياه الناتجة من محطات توليد الطاقة الكهربائية	م.د مهدي شنشل جعفر	حسين فالح حسن	SDG 6
			حسين ايسر سعيد	
			أحمد محمد عبد الزهره	
			جعفر حسن محمد علي	
4	OXIDE NANOPARTICLE SYNTHESIS USING PULSE LASER ABLATION AND OPTICAL Physicochemical ANALYSIS	مدرس مساعد نور الدين سعد عبيس	حيدر جواد كاظم	SDG 4
			علي عباس جبار	
			عبدالله داخل	
5	Removal of Heavy Metals from Industrial Wastewater in Petroleum Refinery	م.د عباس خليل ابراهيم	زينب حيدر محمد	SDG 6
			فرح زيد سامي	
			ابراهيم صلاح	
6	Production of urea	م.م. رسل احمد هاشم	ابوالفضل سعد شاكر	SDG 9
			محمد عباس حمزة	
			امير حسين حلواص	
			حسين علي كشاش	
			زينب محمد مالك	
7	إنتاج مياه صالحة للشرب من تنقية مياه نهر الحلة بتقنية	أ.م.د شاكر صالح بحر	علي نبيل فيصل	SDG 6
			عبدالله فاضل	
			حيدر جبار	

	كهروكيمياوية حديثة بدلا من الطرق الكلاسيكية		بلال عبد العليم	
8	تصميم خلية لتثبيط أو اعاقة تاكل معدن الحديد (الكاربون ستيل) باستخدام مثبطات خضراء طبيعية صديقة للبيئة بدلا من المواد الكيمياوية	أ.م.د شاكر صالح بحر	مصطفى عبد الكريم هادي احمد مظفر جسام علي كريم بريدي فهد فارس عيدان	SDG 9
9	استخدام البوليمرات الطبيعية للحد من التلوث الناجم من اضرار النفايات	م د أنوار قاسم سعيد	وسام فيصل هرو بسام محمد هرو مرتضى فرحان محيل	SDG 10
10	Recycling of polymer product for of raw Sustainability material	م د أنوار قاسم سعيد	قاسم عباس حسن مصطفى قاسم علي سجاد محمد زويد	SDG 9
11	Converting Food Waste into Energy Anaerobic through Digestion	أ.م.د عباس جواد سلطان	محمد جاسم محمد سلمان يوسف ماجد كامل منتظر حيدر علي	SDG 7
12	Dimethyl Ether Production as a Sustainable Transportation Fuel	أ.م.د عباس جواد سلطان	سجاد جعفر علي راضي حسين سرحان دعيوش عباس عبد الحسن عطشان علي حسين علي مجبل	SDG 7
13	Use of recycled polymeric materials in manufacture of the paving bricke	م د سرى كامل محمد	حسين علي رحيم موسى محمد عبد الامير رحيم حسين ستار سعيد احمد رياض عبد الحسين	SDG 10
14	Use of fly ash waste in the production of polymeric concrete for sustainability aplication	م د سرى كامل محمد	احمد سعد عزيز كاظم عباس عبد الكاظم جبار سلمان محمد احمد كاظم زياد مهدي حسين	SDG9
15	Enhancement of Refinery Furnace using Efficiency by Different Design Parameters	م د خالد عمران علي	ياسين خضير عباس كرار اسماعيل عباس منتظر عقيل عبد الرزاق كاظم جاسم ابراهيم	SDG 9
16	Electro chemical studies on corrosion and protection of carbon سsteel in aqueous solutions	م د خالد عمران علي	أنمار حيدر علي حيدر ليث صالح أحمد حامد جميل عبدالله حسن سلمان	SDG 9

17	**Green Hydrogen Production**	**م د حيدر علاء الجعفري**	**علي حسين عبيد**	**SDG 7**
			عبد الله حسين محسن	
			محمد قيس عباس	
			علي صالح	
18	**Production of Biofuel from Food Waste**	**م د حيدر علاء الجعفري**	**صفاء باسم حسن**	**7 SDG**
			ميثم ابراهيم عبد الحسين	
			حسين عدنان فليح	
			ماجد طالب حسين	
19	**Oil and Gas fields flare systems design and operation**	**م د صقر محمد خلف**	**جعفر حبيب مظلوم**	**SDG8**
			مصطفى محمد جاسم	
			كرار طالب سهيل	
			غيث عجيل نعيم	
20	**Crude oil processing from the wellhead to .shipping point**	**م د صقر محمد خلف1**	**نبيل جابر طاهر**	**SDG8**
			حسين علي موسى	
			احمد حامد جاسم	
			تركي حميد	
21	**Green fuel from Used oil**	**م د ليث سالم صبري**	**رسول فلاح**	**SDG7**
			حسين اسكندر	
			فاطمة الزهراء زهير	
			فاطمة مثنى	
22	**إنتاج دهانات الاسطح الصلبة المضادة للفيروسات والبكتريا والعدوى**	**م.د فوزي عبدالرحمن حمادي**	**كرار مكي حسن**	**SDG8**
	of anti- Production viral, anti-bacterial and anti –infectious .solid surface paints		**امير قحطان خلف**	
			زيد خالد اسماعيل	
			سكينة فريد كاظم	
23	**Converting Needles to skin Creams for Diabetics**	**م.د فوزي عبدالرحمن حمادي**	**علي كاظم مفتن**	**SDG8**
	تحويل الابرة الى كريمات للبشرة لمرضى السكري		**عبدالمعين زهير جليل**	
			زيد محمد عبدالعزيز	
			محمد زهير جابر	
24	**Production of Green (2) hydrogen**	**أ.م.د مالك مصطفى محمد**	**حسين ستار جبار**	**SDG7**
			زيد محمد حسين	
			علي حسين زهوري	

قسم هندسة تقنيات الحاسوب / مشاريع التخرج للعام 2024-2025				
ت	المشرف	اسم المشروع	SDG	اسماء الطلبة
1	أ.د. عبد الكريم عبد الرحمن	Measuring of Cell Phone Electromagnetic Radiation	SDG3	١-عباس عقيل جواد كاظم ٢-علاء حسين ناصر حسين ٣-مسلم عقيل جواد
2	د.ليث عبد الكريم حسناوي	Building a Voice Controlled Home Automation System with Arduino	SDG9	١-بكر ياسين كريم زبالة ٢-سجاد عبدالامير جبر. ٣-حسنين مهند حسن ٤-حسن بلسم عبد
3	د.ليث عبد الكريم حسناوي	Temperature-Based Fan Speed Control and Monitoring Using Arduino	SDG9	١-ديار مؤيد علي ٢- بنين حيدر حسوني ٣-محمد رسول ٤-قاسم حميد جاسم
4	ا.م.د. عبد الله جبار حسين	Design and implementation of smart welding glasses	SDG3	١-احمد وناس شيال ٢-جعفر سعد حسن ٣-علي عبدالكريم كزار ٤-جعفر صادق مهدي
5	ا.م. علي كاظم خضير	Counting AL-Mustaqbal university visitors prediction from sensor Data	SDG4	١-حسنين محمد عبدالرضا ٢- اسمهان سالم عبد زيد ٣-نضال كريم خلف ٤-ايمان حبيب نذير
6	ا.م. علي كاظم خضير	Counting the number of attendances using Python based on face detection algorithms	SDG4	١-امير محمد جبار ٢- سوسن حسين علي ٣-شيماء عبيد محمد علي
7	م.د. محمد حسن علوان	Design of an intelligent traffic system using cameras and sensors for managing and improving traffic flow.	SDG9	١-مهند محمد شاكر ٢-فرناس فرحان عفر ٣-محمد جاسم صافي ٤-ميثم مهدي جاسم
8	م.د. محمد حسن علوان	A smart device for managing and optimizing water consumption in homes using artificial intelligence and sensors.	SDG4	١-مؤيد حسين رشيد ٢-سامر باسم محسن ٣-اكرم سليم كريم ٤-امير إسماعيل خليل
9	م.د حسين عبد الامير عباس	An intelligent system to predict diabetes	SDG9	١-علي زيد كاظم ٢-طه كاظم صافي ٣- حسين جلال احمد

10	م.د حسين عبد الامير عباس	Design and implementation of smart and secure home	SDG9	١-كاظم جودت كاظم ٢-علي معين جدوع ٣-ليليان جاسم محمد ٤-ايات حسن كاظم
11	م.د حسين عبد الامير عباس	A real-time intelligent system for monitoring vehicle and traffic	SDG6	١-امير محمد شاكر ٢-علي محمد حمزة ٣-محمد كريم كاظم ٤-سلام مكي جاسم
12	م.د. مصدق ماهر عبد الزهرة	Design of waste management system based on AI	SDG12	١-محمد عباس جبر ٢-محمد فالح حسن ٣-علي سجاد ابودلة ٤-ازهر عباس مهدي
13	م.د. مصدق ماهر عبد الزهرة	Design of modern irrigation system based on aquaponic and AI techniques	SDG7	١-ظافر محمد فريد ٢- مصطفى علي فرحان ٣-مينا عماد حسن ٤-حوراء عماد فخري ٥-مصطفى عطاء كاظم
14	م.د. مصدق ماهر عبد الزهرة	Design of Smart Stand-up wheelchair using Raspberry Pi and AI	SDG3	١-منتظر علاء عدنان ٢-مهدي سامي عجيل ٣-مصطفى علاوي حسين ٤-فاطمة الزهراء علاء ضياء ٥--زهراء عامر علي. ٦- محمد فلاح حسن
15	م.د مياس محمد مهدي عبد	Using AI to Analyze Agricultural Data to Improve Crop Yields and Reduce Waste	SDG15	١-منتظر عبدالكريم محمد ٢-مسلم شناوة حمزة ٣-وسام شاكر عودة ٤-محمد كامل هاشم
16	م.د مياس محمد مهدي عبد	Disease prediction Using Machine Learning	SDG3	١-علي سامر عباس ٢-نوار عباس علي ٣-علي فارس هادي
17	م.د نور عبد الكريم محمد علي	Smart Grid Management System	SDG9	١-علي عباس شبيب ٢- مصطفى ضياء عبد الرزاق ٣-زهراء طالب ماهود ٤.-محمد إبراهيم حسين

18	م.د نور عبد الكريم محمد	Building a promotion system that recommends products to users.	SDG12	١-عبدالله صفاء عبدعلي. ٢-احمد قاسم عبدالعباس. ٣-باقر سهل نجم
19	م.د.فنر علي جودة	Design of a Medical Support for Arm Rehabilitation Using Microcontrollers	SDG3	١-محمد رحيم شعلان راضي ٢- محمد عقيل غازي شهيد
20	م.د. زيدون وليد جواد	Optimal sizing of standalone for hybrid renewable energy system by using Particle swarm optimization technique	SDG7	١-عقيل ستار حمد ٢-زمن مشتاق صلاح ٣-فرقان عوض عبد الستار ٤-تحسين شمخي جبار
21	م.د. زيدون وليد جواد	Assessment of renewable energy sources to generate electricity for remote areas, South Iraq	SDG7	١-محمد همام عامر ٢-رياض عطية ذياب ٣-احمد صلاح هادي ٤-صلاح هادي حسن
22	م.د. اسعد عبد الرحمن نايف	AI Techniques for Detecting Digital Image Forgery in Cybersecurity.	SDG4	١-روزا عبد عون ٢- رونق فاهم جبار
23	م.د. اسعد عبد الرحمن نايف	Building AI-Driven Microservices Gateway for Hospital Management using Spring Boot and Spring Cloud	SDG3	١-مصطفى حمزة هادي ٢- عباس طارق محم ٣-حسين حسن محمد ٤-محمد حيدر جواد
24	م.د. محمد فاضل محمد	multimedia traffic AI-driven management over softwarized networks	SDG4	١- هاني عبد الكريم مرزه ٢- احمد وسام ذياب حمد
25	م.م. زيد ابراهيم رسول	Smart Agriculture: Integrating IoT and AI for Sustainable Farming Practices	SDG15	١-الحسن مرتضى محمد علي ٢- عبدالسلام طارق خضير ٣-أيسر عمار عبدالرزاق ٤-علي رحيم محمد عبد
26	م.م. سيماء محمد جواد	Swarm optimization algorithm for gender classification from face images	SDG4	1-محمد رعد عبيد ذيبان 2-علي محمد احمد رشيد 3-محمد مهدي احسان
27	م.م. وليد علي حمزة	Improving Harvesting power of PV system using electronic prototyping platform by Arduino	SDG9	١-علي غالب كاظم ٢- ميسون كاظم رستم ٣-حازم خلفة عمران

28	م.م هبه حسين عبد العباس نايف	Healthy Predicting system using the Internet of Things.	SDG3	١-صباح عطيوي منديل ٢-سلام عبدالحسين كحار ٣-زهراء احمد حميد
29	م.م زهراء حازم عبيد	Solar-powered pedestrian bridge	SDG9	١-علاء عايد عبد الحمزة ٢-علي فاضل دنان ٣-احمد حسن هندي ٤-علياء فيحان جبر
30	م.م زهراء حازم عبيد	Generating and storing electrical energy for surveillance cameras using solar cell panels	SDG7	١-احمد طالب هادي ٢-ضرغام ناصر جواد ٣-منذر صباح عزيز ٤-هادي عزالدين هادي
31	زينب كاظم جابر م م.	نضام ذكي لتشخيص الامراض الزراعية باستخدام تحليل الصور	SDG15	١-علاء حسين عباس ٢-ميثم عباس حمزة ٣-حسين علي جاسم. ٤-علي مكي مهاوي
32	زينب كاظم جابر م م.	Anti-gravity acoustic levitator	SDG9	١-عبدالله محسن عبدالامير ٢-زيد طارق حمد ٣-غدير فلاح حسن ٤-مريم احمد عبدالامير
33	م.م مروة عبدالحمزة عبدالعباس	Random Forest algorithm to detect malware	SDG4	١-علي ميثم خليل ٢-علي ياسين ياسين ٣-حيدر جواد كاظم ٤-مهدي ضياء محمد
34	م.م اية علي جمعة الذهب	Mobile application for simple pharmacy database	SDG3	١- مصطفى ياس خضير عبد ٢-حسين جول جمال صيهد
35	م.م رؤى ستار جبار محمد	Smart green house with plastic bottles	SDG12	١-حسين سليم عبد. ٢-جعفر صادق محمد نوري ٣-زيد محمد نوري. ٤-مؤمل ماجد محمد
36	ا.د عبدالرحيم ذياب حمود	Design an Optimal Servo System Using State feedback Controller Tuned by Particle Swarm Optimization Method	SDG9	١-علي احمد زكي صالح ٢- امير احمد موسى جواد
37	م.د. حسنين يعرب محمد	AI-based Approach for Malware Detection: An Empirical Case Study.	SDG4	١-سجاد جواد كاظم ٢- ابو طالب زيد ٣-منتظر رعد غانم ٤-شهد رزاق علي

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ت	أسم المشرف	أسم المشروع	أسماء الطلبة	الهدف
1	د. أزهر محسن عبد	Enhancing Energy Efficiency in Al-University Mustaqbal Campus Building	1-أيهاب محمد عبد السادة 2- علي لطيف موسى 3- ساهر محيسن علي 4-خالد عبيد بعيوي 5-ضحى مصطفى سلمان 6-على طة عباس 7-مسلم عقيل هادي	7,9
2	د. أزهر محسن عبد	Renewable Evaluation Energy Integration with Campus power Grid	1-خالد جاسم محمد 2- محمد محمود حسن 3-سعد نايف عبد 4-أحمد عبيد كرم 5-علي عبد زيد عرف 6-علي حسين عبد الرضا	13,7
3	د. قصي رشيد عبد الأمير د. سلوان عبيد وحيد	and Design implementation for hybrid generator using solar panels and turbine	1-حسين سليم محمد 2-مرتضى جاسم عنون 3-سيف ماجد سالم 4- عبد الله أحمد كاظم 5- محمد منتظر محمد 6- مصطفى فاضل كاظم 7- عباس حبيب كريم 8- عباس سليم جواد 9- محمد علي شاكر 10- مصطفى محمد رزاق	7,9,12
4	د. قصي رشيد عبد الأمير	تصميم جديد لنظام تخزين المياه الشمسي ومجهز بخزان كروي مزدوج الجدران	1-حسن ميثم كريم 2- علي حسين هادي 3 – سجاد فاضل هادي 4-زيد حسين عبد الحسن 5- علي زهير حسن 6- أمين هيثم عبد الرحيم 7- علي أحمد عبد الحسن 8- أحمد حامد عبد المجيد 9- حمزة حسين أبراهيم 10 – مختار ناظم كريم	6,7
5	د. عصام محي محمد	تحسين نظام تبريد هوائي تبخيري غير مباشر	1-أحمد فلاح حسن 2-حيدر بطاح غازي 3-حسام سعد حسين 4- اكرم ماجد مطير 5- حسين جلال عباس 6- مرتضى نوفل صالح	7
6	د.سلوان عبيد وحيد م.م طيب باسم عباس	Optimizing dynamic vibration observer for vibration control cantilever beams under excitation harmonic	1-احمد محمد كطران 2- ميثم كريم هاشم 3-حسن حسن واوي 4- حسن عبد القادر لازم 5- حيدر عباس نايل 6- حسن هادي جواد 7- علي محمد عبد الحسين 8- إيهاب علي حسين	9,11

7	د. قصي رشيد عبد الأمير م.م علي عجمي فالح	Sun flower-inspired solar panel system with dual axis ,sun tracking and auto-mated opening – closing mechanism by intelligent artificial	1-علي فيصل غازي 2- محمد عباس جبار3- حسن عبد الكاظم محمد 4- قاس بار عواد 5- ثامر علي عباس 6-احمد فلاح حسن 7- اكرم ماجد مطيري	7,9
8	م.م زهرة فخري حسين	تصميم وتصنيع منظومة تحلية مياه باستخدام الطاقة الشمسية	1- حيدر هاشم مهي 2- حسين فخري حسين 3- صباح عباس حسون 4- علي فاضل عباس 5- عادل عباس حسون 6- كمال ترتيب عيسى	11,7
9	م.م علي باقر حسين م.م هبة محسن عبد	Heat transfer experimental study in system of cylindrical different arrangement immersed in porous media	1-زيد عادل موسى2 - ثامر علي عبد الحسين 3- امين موسى حسن 4- عباس سعدون عبد 5- مرتضى حيدر كاظم	7,9
10	ا.م.د. محمد علي صيهود	Automatic irrigation system using moister sensor	1-مشتاق طالب عطية 2- حسنين جبار علي 3- اسعد صالح مشعان 4- امجد صالح مشعان5- جواد كاظم فارس 6 – سلام ياسر كريم 7- حمزة عايد عبادة	9,11
11	د. ازهر محسن عبد	استخدام تقنيات المايكرو لتحسين كفاءة واستدامة أنظمة الطاقة الكهربائية في مركز بحوث الطاقة	1-مسلم عقيل هادي 2-سجاد سعدي راضي 3-مصطفى عماد عباس4-عقيل عبد علي كامل 5- حسن مسلم دايخ6- رائد ماجد جمعة 7-مؤمل إبراهيم عريبي	7,9

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ت	اسم المشرف	عنوان المشروع	اهداف التنمية المستدامة	اسماء الطلبة المشاركين بالمشروع
1	أ.د. محمد حمزة دحام	Manufacturing a rehabilitation chair for people with disabilities.	SDG-9, SDG-3	علي ليث فاضل عبد الحسين
				محمد رعد هاشم عبيس
				عبد الله عبد الكريم مهدي
				احمد الامين اركان علي
				عبد الله علي خلف هاشم
2	أ.د. محمد حمزة دحام	Preparing vegetable biomaterials and studying its impact on human health.	SDG-9, SDG-3	محمد الباقر مقداد عبد الستار
				جعفر ميري عبد زيد
				محمد احمد علي عطيه
				احمد عماد وحيد
				غيث حاتم رحيم
3	أ. د. ابراهيم عبدالله مرداس	Design and implemention of portable laser system for dermatology application	SDG-9, SDG-3	علي احمد كامل
				سيف حيدر عزيز
				علي كريم كاظم
				حسن علي عبد الله
				سجاد نجم عبدالزهره
4	أ. د. ابراهيم عبدالله مرداس	Design and implementation of IR laser system for bone fraction detection	SDG-9, SDG-3	حيدر محمد كاظم
				محمود يحيى عبد كاطع
				مصطفى يحيى علي
				مروان باسم غانم
				احمد صالح مهدي
5	أ.د. حيدر جبار عبد نصار	Implementation of intelligent classifier of ECG signals.	SDG-9, SDG-3	بنين عبد الجبار عبد الحسين
				زينب مصطفى صباح هاشم
				فارس المهدي زهير
				المنتظر خالد لطيف
				نور الهدى رزاق هادي
6	أ.د. حيدر جبار عبد نصار	Diagnostic Tests for Brain Tumor using Machine Learning.	SDG-9, SDG-3	حوراء كريم نعمه
				دعاء راضي اسماعيل
				علي هادي صلاح
				زينب حسن عيدان
				ود ابراهيم غريب
7	م.د. امين محمد كتاب	EMG Arm Orthosis for Assistance and Rehabilitation	SDG-3	علي عقيل هادي
				حوراء قاسم فرحان
				غدير مرتضى علي
				طيبه عبد الامير جعفر
				مصطفى عبد الكريم عباس
8				علا احمد جواد

	م.د. علاء محمد حسين ويس	Study coating of Magnesium alloy with ZnO layer using electrophoretic deposition on structure and properties behavior	SDG-3, SDG-4	حسن عباس خليل
				فرقان عماد رزاق
				مريم باسل سعد ن
				محمد ثائر عبيد
9	م.د. علاء محمد حسين ويس	The Structure and Properties behavior of antibacterial Composite Biocoatings onto Ti-6Al-4V Surface by Electrophoretic Deposition.	SDG-3, SDG-4	نور الاسلام ماهر شاكر
				زينب محمد مهدي
				زينب محمد احمد
				تبارك سلام داخل
				حسنين حيدر جواد
				شمس احمد سالم
10	م.د. علي كامل كريم	Design Orthosis for Correction or assist Scoliosis defect	SDG-9, SDG-4	زينب فاضل عبيد
				مريم هادي عبد الامير
				نرجس ناصر كاظم
				طيف باهر مهدي
				نور محمد خضير
11	م.د. علي كامل كريم	Control of upper Limb arm bond with EMG and Robot	SDG-9, SDG-3	مصطفى محمد عبد
				كفاء ستار مظلوم
				محمد عبد الكريم عبد الجبار
				زهراء عبدالله حسين
				ياسر خضير عباس
12	م.د. مجتبى عبد الكاظم	PID controller designed for an artificial pancreas model	SDG-3, SDG-4	اسراء هادي علي
				منار عبد الامير صاحب
				طيبه هادي عيدان
				محمد حسن هادي
				زينب علي جبر
13	م.د. امير نجاح سعود	Investigation of Bioactivity Properties of Bioactive Glass-Ceramics for Bone Regeneration	SDG-3	زينب نجاح محمد
				محمد مرتضى عناد كاظم حسين
				حيدر اركان خليف عبيد
				علي جاسم هنيدي عويز
				هاجر حسين عبد الرحمن
14	م.د. امير نجاح سعود	Investigation into the Mechanical properties of PMMA Bone Cement with Nanoparticle Additives	SDG-9, SDG-3	محمد رشاد علي
				حسن عايد محمد
				فاطمة علي محسن
				صفا حبيب عبد الله
				نور الهدى حسام تيمول
15	م.م. ماهر رحمن عبد الامير	Quantifying Cognitive Performance in Athletes: A Hybrid System Approach Using fNIRS Technology and Electrodermal activity (EDA) meter.	SDG-9, SDG-3	ايام محمد جاسم
				حيدر بهجت مالك
				مصطفى ماهر كامل
				نور ظاهر عبد الكاظم
				زينب احمد فاضل
16	م.م. ماهر رحمن عبد الامير		SDG-9, SDG-3	جيهان خالد كاظم عبيد
				رقيه جليل مسلم حبيب

		Skin Conductance Patterns and their Association with Concentration Levels in 100-Meter Running Trials.		مرتضى جواد كريم علي
				علي موسى عبيس جاسم
				تبارك حيدر ناجي
17	م.م. زينب ستار جبار	Detection and diagnosis of human disease based on medical images using hybird model .	SDG-9, SDG-3	عباس ساطع محمد
				شمس الدين نصير عبدالجبار
				علي رياض سعدون
				محمد فريد علي
				احمد جواد عبدالحسن
				نبأ موفق جبار
18	م.م. زينب ستار جبار	Design and implementation of anti-sleep and health monitoring system for drivers to avoid accidents.	SDG-9, SDG-3	احمد جليل شبيب
				علي عبد الناصر صالح
				ايلاف بسيم مهدي
				محمد عزيز عباس
				امير عباس محسن
19	م.م. زينب ستار جبار	Medical monitoring and tracking system for Alzheimer disease based on IoT	SDG-9, SDG-3	حوراء مهند رضا
				فاطمه ثامر هادي
				فاطمه عباس فاضل
				زهراء احمد محسن شاكر
				احمد فاضل عبدالحسين
20	م.م. هبة ضياء عبد الامير	Developing a Device to Treat Muscle Laziness Using EMG Signals.	SDG-9, SDG-3	مرسلين سعد شاكر
				زهراء احمد محسن كامل
				عبد الله الكرار محمد ناظم
				نور الحسين اركان علي
				فاطمه اياد عبد المحسن
21	م.م. هبة ضياء عبد الامير	Development of an Arduino-Based Smart Glove for Sign Language Translation.	SDG-9, SDG-3	نور عبد الكريم امين
				حسين رسول عباس
				مظفر نصير شهاب
				نرجس عباس عبطان
				شوق كامل داود

قسم هندسة تقنيات الأجهزة الطبية/ مشاريع التخرج لسنه(2024-2025)				
هدف التنمية المستدامة	العنوان	أسماء الطلاب	ت	التدريسي
الهدف الثالث(الصحه الجيده)	1.Shaking and weight device of the blood bag.	علي عصام سالم ياسين	1	ا.د. بيان مهدي صبار
		عمار علاء هادي عبد الأمير	2	
		إبراهيم قاسم تايه عبد الرضا	3	
		كرار علي حسين سالم محمد	4	
		سجاد ستار صاحب كاظم	5	
		حسن عبد علي نايف سلوم	6	
		مرتجى صلاح عبد سعدون	7	
الهدف الثالث(الصحه الجيده)	2.Alarm system for Alzheimer's patient based on WiFi technology	محمد ناظم شاكر جدوع	1	
		حوراء فوزي هادي حمدي	2	
		يوسف صباح حسوني دحام	3	
		زهراء عبد الحسين تكليف علوان	4	
		محمد رائد هاشم كاظم	5	
		امير كريم بدر علد الحمزة	6	
		محمد باقر حميد علي منصور	7	
الهدف الثالث(الصحه الجيده)	3.Design of alcohol detector buy using Arduino	غيث صادق عبد الزهرة حسين	1	
		فاضل عباس طالب جاسم	2	
		اوس حسين جوده سبتي	3	
		طيف مهند جواد كاظم	4	
		علي عادل عباس جابر	5	
		براء كاظم كريم مطر	6	
		شمس إبراهيم محمد خضر	7	
الهدف الرابع(التعليم الجيد)	1. Patient Monitoring System using IoT.	احمد كريم موسى مهدي	1	ا.م.د. اسامه علي عواد
		علي عدنان امين شناوة	2	
		ارشد غيث عبد العباس ناجي	3	
		حيدر احسان عدنان عبد الأمير	4	
		علي قحطان هادي مطلوب	5	
		فاطمه محمد راضي عبدالله	6	
		ميساء محسن عبد جبر	7	
الهدف الرابع(التعليم الجيد)	3. Smart Control of Wheelchair using Voice Commands.	محمد أنور منير مهدي	1	
		حسين علي جواد كاظم	2	
		حسين ماجد كاظم محمد جواد	3	
		احمد رامي عبد الرزاق سلمان	4	
		علي جعفر محمد جواد	5	
		مرتضى قاسم كريم كحيوش	6	
		عباس كريم عبد كريم	7	
الهدف الرابع(التعليم الجيد)	4. Design an Intelligent Spirometer system to assess lung function.	علي راضي حمزة دحام	1	
		مرتضى فائز حمزه مزهر	2	
		علي عباس راضي عبد اللي	3	
		محمد جواد مسلم عبدالله	4	
		حسين وزاع صخيل طحيمر	5	

	6	منتظر توفيق جاسم عبد		
	7	محمد اسعد عدنان حمزه		
	1	جهاد سليم جهاد مهدي	5. Design and Implementation of a high-efficiency solar heater toward a clean environment.	الهدف الرابع(التعليم الجيد)
	2	المنتظر محمد فاضل عبد الواحد		
	3	احمد جابر جاين حمزة		
	4	محمد عبد الأمير عبد زيد عرف		
	5	محمد حيدر حمودي حسين		
	6	علي محمد عبد الحسين عباس		
	7			
ا.د.علاء حسين	1	ذو الفقار احمد عادل جواد	1.Design and Implementation of Smart IOT Device for Child Safety Based on Arduino.	الهدف الثالث (الصحة الجيدة)
	2	حسن ظاهر حبيب شعلان		
	3	حيدر علي قاسم حسين		
	4	زهراء ميثم محمد حسن هاشم		
	5	وصال ياسر جياد حسون		
	6	زهراء سمير سالم خصير		
	7	كوثر حسين عبد كاظم		
	1	ياسر اياد ناجي كاظم	2.Design and Implementation of Smart Breathing Detector Based on Arduino for Combating Covid 19	الهدف الرابع (التعليم الجيد)
	2	علي حيدر عبد العزيز علد الرحيم		
	3	عقيل حسن وهام شكر		
	4	علي حسين كاظم مطرود		
	5	ياسر محمد امين عباس		
	6	علي رزاق عبد الله عبيد		
	7	حسنين جاسم هلال حسون		
	1	محمد عبد العباس خليف محيسن	1. IoT Based Interactive Blind-Person Stick Using Microcontroller	الهدف الرابع (التعليم الجيد)
	2	عبد الله عادل ربح كاظم		
	3	حسين منتصر حافظ نعمة		
	4	مهدي احسان علي سلمان		
	5	علي حيدر عبدزيد هاشم		
	6	نور علي حسين علي		
	7	زينب مهدي حسن جبر		
	1	كرار حيدر حسين جمعه	2. Building and designing a robot arm using the Arduino system	الهدف الرابع (التعليم الجيد)
	2	عباس منذر نعمه ناجي		
	3	زينب علي رزج عطيه		
	4	مرتضى عايد عبد الأمير كاظم		
	5	محمد رحيم حمادي شاكر		
	6	علي محسن جاسم محمد		
	7	زهراء يوسف خليل ماضي		
	1	علي فلاح حكيم هاتف	3. Medication Reminder System based on Arduino and Android	الهدف الرابع (التعليم الجيد)
	2	وسام احسان موسى جواد		
	3	حسين فاضل عباس		
	4	حسين علي ذيبان شوكي		
	5	خضر حسين مهدي		
	6	مصطفى حيدر عبد زيد		
	7	علي باسم رحيم		

الهدف الرابع(التعليم الجيد)	1.Design and Implementation patients monitor	1	امير مازن إبراهيم شناوة	ا.م.د. سعد مطشر عباس فارس
		2	كرار حيدر محمود شاكر	
		3	الاء محي قصب حسن	
		4	علي غالب عبد العظيم مطلق	
		5	ضرغام جميل رحيم كاظم	
		6	ايات عامر عباس حسن	
		7	مرتضى عباس عيدان سعد	
الهدف الثالث(الصحه الجيدة)	2.Health & Safety Plan in Iraqi Hospitals	1	صلاح هادي عبد الكاظم عريبي	
		2	كرار حيدر هلال مطر	
		3	عبد الله عدنان كاظم هادي	
		4	مهدي معتز مهدي حنتوش	
		5	سيف صادق عبد الكاظم هاشم	
		6	مقتدى رعد حمزه علوان	
		7	سجاد وليد حسن إبريسم	
الهدف الرابع (التعليم الجيد)	3. Design and implementation Blind Helper Gloves	1	صادق عدنان رحيم عبيد	
		2	كرار جبار عليوي مخيف	
		3	سيف احمد حسين جبار	
		4	مصطفى هاني عبد سلمان	
		5	مسلم عدنان عبد الحسين علي	
		6	جلال مرسال عبد الحميد عودة	
		7		
الهدف الثالث (الصحة الجيدة)	1.Avoid Injuries with Smart Backpack	1	محمد صادق ماجد حميد	م.د. طارق رووف حسن الخطيب
		2	حيدر فلاح جواد حسن	
		3	ازهر انيس جليل صالح	
		4	حسين موسى مندل عبدالله	
		5	حسين جميل محمد مرزوك	
		6	سجى طالب حسين حمزة	
		7		
الهدف الرابع(التعليم الجيد)	2.Crying Baby Detecto	1	علي كفاح حسين وحيد	
		2	علي خالد فالح جبر	
		3	عبد الله محمد جواد كاظم	
		4	مؤمل جاسم محمد	
		5	زيد احمد شاكر عبد علي	
		6	حسين احمد فاضل عريس	
	3.Cardiac Monitoring System	1	مصطفى احمد مصطفى	
		2	حسن جاسم عبد جاسم	
		3	حسين رزاق محمد حسون	
		4	ميس ثامر هلال كاظم	
		5	نور خليل نعمه جياد	
		6	رقيه علي عبد الحسين	
		7	زينب علي كاظم راعي	
الهدف الثالث(الصحة الجيده)	4.Third Eye for The Blind	1	عباس علي مهول لفته	
		2	فرح محمد جواد كاظم	
		3	ام البنين علي حمزة صالح	
		4	حسين رياض حسين رزوقي	
		5	اوراس سلام علي عباس	

	6	زينب نجيب جادر حسين		
	7			
الهدف الرابع(التعليم الجيد)	1	عبد الرزاق مصلح عبد الرزاق عباس	5. Design and implementation of smart operating room	
	2	سيف عادل زكي نجم		
	3	علي نبيل عبد الجبار شاكر		
	4	مصطفى حبيب كاظم جواد		
	5	حسنين علي حمزة		
	6	حسن باسم حسين عليوي		
	7	محمد باقر عباس كامل فاضل		
الهدف الثالث (الصحة الجيده)	1	حسنين حمزة عيسى علي	6. Design and implementation wireless device to measure the body temperature	
	2	منتظر محمد جاسم عبيس		
	3	حيدر احمد خضر ناجي		
	4	طيبة قائد حسين حميدي		
	5	علي يعرب قحطان محمد		
	6	محمد حسين طالب علي		
	7	حسين رزاق محمد حمزه		
الهدف الرابع(التعليم الجيد)	1	علي جليل هادي راضي	1.Trainer Board For Medical Device Experiments with Arduino sensors.	م.د. زياد طه ياسين
	2	صلاح الدين علي عبود نور		
	3	زيد طارق ناجي عبود		
	4	زينب عبد الأمير لزام عطية		
	5	احمد عبد الكريم ناصر رضا		
	6	امير عواد كاظم دنان		
	7	زينب فاضل عبد الزهرة بشان		
الهدف الرابع(التعليم الجيد)	1	مريم عماد جواد كاظم	2.Design and implementation of hydrofacial device	
	2	اسيل ناصر كاظم صالح		
	3	الحسن المجتبى هيثم إبراهيم هاشم		
	4	نبا حامد عبد العباس طاهر		
	5	استبرق عدنان طالب كاظم		
	6	محمد حسين علي حسن حسين		
	7	محمد محسن علي حسن		
الهدف الرابع(التعليم الجيد)	1	علي تحسين ربيع عودة	3. Design and implementation of health multi-scan medical devices	
	2	علي عبيس محمد حسين رشيد النعيمي		
	3	اماني جاسم محمد هادي		
	4	عباس ستار عليوي صكبان		
	5	حيدر مقصد عمران عبيد		
	6	يسر ماهر موسى احمد		
	7	ابرار براء ابراهيم محمد علي		
الهدف الثالث(الصحة الجيدة)	1	مجتبى فلاح عبد الجليل عبد	4. Smart medical drone for critical cases	
	2	حمزة عامر حسن عيد الزهرة		
	3	محمد جليل محمد كاظم		
	4	ليث فارس رسول عبد الزهرة		
	5	علياء علاء فتاح محمد		
	6	زهراء زياد جسام وسمي		
	7	قمر المثنى خيري ناجي		
	1	غفران قاسم خساره خليل		

الهدف الثالث(الصحة الجيدة)	5. Design and implementation of li- fi system to transport patient voice inside MRI room.	2	نور الهدى حميد محسن دهش	
		3	بركات علي حسين زناد	
		4	ياسمين قاسم جابر داود	
		5	حسين عامر كاظم معيوف	
		6	مصطفى حسين جميل نجم	
		7	ذو الفقار محمد عوده منسي	
الهدف الرابع(التعليم الجيد)	6.smart medicine box	1	مسلم عقيل ناجح محمد علي	
		2	حسنين قاسم محمد عبد	
		3	محمد عبد الكاظم قنود جابر	
		4	محمد الباقر ياسين طه عبد الزهره	
		5	مرتضى كريم مخيف أبو كطيفه	
		6	حسن عباس حبيب عبد الشهيد	
		7	كوثر علي محمد معيجل	
الهدف الرابع(التعليم الجيد)	1- Controlling the ventilation and temperature of an incubator using arduino	1	علي عبد الوهاب عبد الزاق هادي	م.د. رامي قيس مالك
		2	علي رحمن سلومي حمد	
		3	حمزة إسماعيل إبراهيم لطيف	
		4	حسن علي حسين عبيد	
		5	حسين علي عبد الواحد كاضي	
		6	كرار عامر حسين علاوي	
		7	فاطمه حاكم عزاوي كاظم	
الهدف الرابع(التعليم الجيد)	2- Design and implementation of smart suction unit.	1	علي رائد ناجي يوسف	
		2	علي شامل كريم اسدخان	
		3	محمد حسين جهاد حسن	
		4	احمد محمد جبارخليل	
		5	احمد عبد الله عبد دحام	
		6	علي ماجد كاظم ظاهر	
		7	رضا عبد الله عليوي عبدالله	
الهدف الرابع(التعليم الجيد)	3- Design and implementation of an educational board to diagnose premature incubator malfunctions	1	امير عباس حميد صالح	
		2	صادق فلاح حمزه عبد	
		3	مصطفى سالم عبد الرزاق مسلم	
		4	كرار رياض عباس علي	
		5	زيد محسن حبيب كاظم	
		6	زيد حسين عبد الله حسين	
		7	عبد الكاظم محسن كاظم حسين	
الهدف الرابع(التعليم الجيد)	4- Design and implementation of device to convert sign language into letters using arduino .	1	علي فاضل عباس خلف	
		2	علي الرضا هيثم فلاح حسين	
		3	غفران صباح حسن عليوي	
		4	محمد باسم جياد حسون	
		5	حسنين خالد عبد المحسن حمود	
		6	حوراء رزاق عباس جواد	
		7		
	1.Design and implementation of an	1	حيدر مهدي محمد ناصر	
		2	فاطمه فائق عبد الاله معارج	

الهدف الثالث(الصحه الجيده)	intelligent muscle stimulation system	3	فاطمه عمران طه عباس	
		4	علي حسين شعيب علي	
		5	حسين علاء هادي جدوع	
		6	بنين عبد هادي عبد	
		7	محمد الصادق هادي جواد هادي	
الهدف الرابع(التعليم الجيد)	2. Smart alert system for preseription drugs	1	حسين حميد جبار حميد	
		2	مرتضى اياد عبد المنعم عطيه	
		3	هدى عبد الكاظم خاتم عبد	
		4	تقوى عبد الله حسن خزي	
		5	ضيدان ريان دايم حسن	
		6	رقيه محمد علي كويخ	
		7	مريم احمد فيصل طراد	
الهدف الثالث(الصحه الجيده)	3.Design of human detection and tracking system	1	حسن فلاح حسن فياض	
		2	حسين حميد لفته زغير	
		3	يقضان عمار عبد الرزاق سلمان	
		4	نبا ستار جبار ناهي	
		5	امير كريم غانم عطيه	
		6	علي هادي جليب سعيد	
		7	سرى عادل جواد كاظم	
الهدف الرابع(التعليم اجيد)	1.Design of social distance sensor using Arduino	1	عبد الله احمد عبدالكاظم عبدالله	م. حميد نده حميد الفارس
		2	نهاد عيسى حرامي خليف	
		3	نهى عقيل شعيب شرقي	
		4	زهراء حيدر عبد الحسن دغيم	
		5	ياسر فؤاد عبيد فاضل	
		6	ابتهال صالح جبير شمردل	
		7	يوسف بشير نعيم ياس	
الهدف الثالث(الصحة الجيدة)	1.Design a smart waste disposal system in hospitals	1	محمد عامر محمد عبد الزهره	
		2	حسن ماجد محمد عبد الرضا	
		3	نيزك كاظم عباس عجيل	
		4	احمد نعمه مالك عداي	
		5	محمد علي جاسم	
		6	محمد سعيد علي منصور	
		7	تبارك ازهر خلخال حسين	
الهدف الرابع (التعليم الجيد)	2.Iot-based Motorised Wheelchair for Paraplegic	1	علي ناجي راضي كحيوش	
		2	حمزه غالب حسين مصيخ	
		3	علي رزاق كاظم ناصر	
		4	روان عبد الأمير هاشم	
		5	محمد علي محمد هضير مهدي	
		6	هدى رزاق حميد زامل	
		7	علي ازهر خليل جاسم	
الهدف الرابع (التعليم الجيد)	3.Multifunctional electrical lab kit with non-fixed appliances	1	حسين سلام كامل محمد علي	
		2	نبا حسين كاظم مهدي	
		3	محمد عقيل عباس صفوك	
		4	حيدر كرار حسين علي	
		5	عمار حميد عبد المجيد كريم	

	6	مهدي داود نعمه حسون		
	7	زهراء عمران عليوي شلاش		
الهدف الرابع (التعليم الجيد)	1	محمد مرزه إبراهيم كاظم	4.Wearable spine stress monitoring system	
	2	احمد فالح هاشم عبيد		
	3	فاطمه نمير عباس محمد		
	4	زهراء صلاح عباس حمود		
	5	امير فارس وثيق برهان		
	6	منتظر علي إسماعيل محمد		
	7	زهراء علي حميد		
الهدف الرابع (التعليم الجيد)	1	مهيمن مهند مجيد حميد	1. Smart Garden with Weather Station Based on an IoT	م.د زهراء هاشم كريم
	2	علي جميل مكي حسون		
	3	فاطمه محمد جاسم عبادي		
	4	مهند ضياء جهاد هجوج		
	5	زينب صلاح هادي شجر		
	6	عمار موسى جبر عبد الحسن		
	7	مرسلين عامر محي جودة		
الهدف الرابع (التعليم الجيد)	1	كرار علي حسين صادق	2. Electrical stimulation to accelerate wound healing	
	2	سجاد فرحان كاظم عيسى		
	3	علي طعمه احمد لفله		
	4	علي إبراهيم عبد علي عبد الساده		
	5	محمد رحيم علي تعيب		
	6	طالب عمار طالب محمد		
	7	علي عبد الله حسين حمزة		
الهدف الثالث(الصحة الجيده)	1	حيدر عبد الكاظم جبر عبود	3. Smart temperature measurement device	
	2	ريام عماد جابر عباس		
	3	مهدي صلاح حسين مكي		
	4	احمد علي عبد الزهرة كريم		
	5	عبد الله احمد حسن حمزة		
	6	تقى حسنين جواد عبد الحسين		
	7	زين العابدين عامر جاسم حداوي		
الهدف الرابع (التعليم الجيد)	1	باقر محمد إبراهيم مريود	4. Design of A Smart Medicine Box Using Arduino	
	2	عبد الله علي هاشم موسى		
	3	فاضل محمد حسن عباس		
	4	حسين محمود عمران الكيف		
	5	علي حسين صبار حمزه		
	6	عبد الله علي جبار عبيد		
	7			
الهدف الثالث(الصحة الجيده)	1	سبطين باسم عبد الأمير	1_EEG room model	م. جابر حميد مجيد
	2	مرتضى عدنان عبودي		
	3	مصطفى يحيى عناد		
	4	احمد عدي عبد الكاظم نعمة		
	5	حسن كريم خضير غزاي		
	6	حنين باسم مريح حداوي		

	7			
الهدف الرابع(التعليم الجيد)	1	ايمن راتب صالح عباس	2_Remote ECG monitoring using arduino	
	2	عباس حيدر محمد		
	3	مصطفى علاء حسين علي		
	4	حسين كريم عبد الحسين محمد		
	5	مؤمل رياض عبد الأمير عطب		
	6	طاهر صفاء محمد رحيم		
	7	كرار حيدر كاظم عبد		
الهدف الثالث(الصحة الجيده)	1	حسين سمير محمد	3_Medication reminder system using arduino	
	2	عمار صالح حسن		
	3	حسين احمد عبد الرزاق عبد الهادي		
	4	احمد عامر عليوي حمزة		
	5	علي سعد مياح جامل		
	6	مخلد علي خوام عبدالله		
	7	محمد عباس صاحب دوحان		
الهدف الثالث(الصحة الجيده)	1	صلاح فلاح حسن شهد	4_Design of blood transfusion chair taking into account the flow of the engineering drawing programs	
	2	يوسف صالح مهدي ناجي		
	3	محمد نظام عبيد تايه		
	4	ايات سليم داود حسن		
	5	محمد حامد حسين هويجل		
	6	محمد حسين علي عبد		
	7	ايمان حميد ناصر حسين		
الهدف الثالث(الصحة الجيده)	1	حسين يوسف حسين لفتة	5. Electrical chair device	
	2	حسن احمد خيري عبد		
	3	منتظر علاوي مجهول عطيوي		
	4	حسين علاوي عبد الحسن		
	5	كاظم عبد الأمير كاظم عبد الأمير		
	6	محمد عبد الكاظم مهدي راهي		
	7	محمد عباس مهدي نابف		
الهدف الثالث(الصحة الجيده)	1	حسين علي جليل نوري	6-Design of amulti-functional device	
	2	مصطفى خضر عباس تعبان		
	3	اديان قصي حاتم عزيز		
	4	محمد وليد كريم حلوس		
	5	منتظر ماجد محمد شوكت		
	6	لينا احمد هراط عبود		
	7			
الهدف الرابع(التعليم الجيد)	1	عبد الله احمد علي ناصر	1. Design of medical program for drug analysis benefits and risks	م.د. اسامة جابر غايب طالب
	2	مجتبى احمدعدنان عبود		
	3	صاحب شاكر صاحب حسين علي		
	4	مقتدى باسم حسون راضي ال عبيد		
	5	ضمياء جاسم حمادي عبد الرزاق		
	6	رولا سرمد عبد الوهاب عزيز		
	7	مريم محمد حسن علي		

	1	علي إبراهيم كاظم جهاد	2.implementation of vein finder	الهدف الرابع(التعليم الجيد)
	2	محمد حيدر محي		
	3	مصطفى فراس موسى عمران		
	4	غفران قاسم عبد الله وهب		
	5	حسين خالد مهدي رشيد		
	6	محمد حامد عزيز عبيد		
	7	سجاد عباس كاظم علي		
	1	سجاد مسلم جاسم محمد	3. Design of Smart Glasses for the Visually Impaired with Obstacle Alert System Using Integrated Sensors	الهدف الرابع(التعليم الجيد)
	2	ايه حاتم لفته كاظم		
	3	فاطمه فاضل علي عبد		
	4	حسين علاء حسين علي		
	5	روان باسم راهي ساهي		
	6	زينب علي عبيد نهابه		
	7			
	1	مبين علاء عبد الرزاق عبد الرسول	4. Design and Development of an Automated Cardiac Resuscitation Device	الهدف الثالث(الصحه الجيده)
	2	احمد محمد علي مهدي حسين		
	3	امنه فاضل جابر عبد		
	4	طيف مهند جواد كاظم		
	5	حسين سند عادل صكبان		
	6	تبارك حميد عبد زيد موسى		
	7	ازل فيصل جابر غازي		
م.م.عامر محمد خلف	1	مرتضى فارس محمد رضا كاظم	5.CNC machine for Aducational porpuses	الهدف الرابع(التعليم الجيد)
	2	ذو الفقار وسام علي صليل		
	3	صفاء جواد أبو الهيل حمودي		
	4	حسن فلاح حميد فلاح		
	5	أبو الحسن حيدر غني عباس		
	6	زهراء مجيد موحان عبد الله		
	7	محمد حسين عوده حسن		
م.م. أحمد حلمي كاظم	1	زينب فرحان معيمل سلمان	1. Real-Time Fall Detection and Alert System for Seniors.	الهدف الرابع(التعليم الجيد)
	2	رفل محمد كاظم مظهر		
	3	نورا حسين طالب عطيوي		
	4	ضحى رافد حمزه شهاب		
	5	مريم عبد العظيم مذكور دهام		
	6	سارة عبد الكريم حجيل كاظم		
	7	علي حيدر عبد مردان		
	1	محمد كاظم عبد فرحان	2.Enhanced pH Meter for Medical Fluid Analysis	الهدف الرابع(التعليم الجيد)
	2	فاطمه رحيم عبيد عطيه		
	3	نور جعفر كسار كاظم		
	4	حسين هادي كامل هادي		
	5	تبارك كاظم هاشم جاسم		
	6	سجى صالح فاهم عبد		
	7			
	1	محمد منصور عزيز محمد رضا	3.Low-Cost Mechanical Ventilator Using Arduino Technology.	الهدف الرابع(التعليم الجيد)
	2	سجاد يونس ساجت طرخان		
	3	مرتضى احمد اموري صليبي		

		4	سجاد فرحان كاظم محمد	
		5	علي عبد الحسين حبيب عبد اللطيف	
		6	علي كاظم جاسم سلمان	
		7		
الهدف الرابع(التعليم الجيد)	4. A comperhensive Arduino framewok for mood and depression evaluation	1	علي جلال شهيد جابر	
		2	داوود سلمان خليل جودة	
		3	امير عماد حاتم رشيد	
		4	علي إبراهيم علي صادق	
		5	يحيى ياسر خضر عزيز	
		6	حسن يامر عبد الحسن محمد	
		7	نهاد ظاهر محسن حمزة	
الهدف الرابع (التعليم الجيد)	1.Separation of Heart and Respiration Signals using MATLAB	1	رضا محمد صادق إبراهيم	م.م. علي كريم عبيد
		2	سجاد حسين محمد جودة	
		3	جعفر محمد واوي أبو حنين	
		4	احمد معين كاظم	
		5	زيد علي عبد محمد	
		6	احمد حازم فرحان	
		7	زيد عباس صكر	
الهدف الرابع (التعليم الجيد)	2.Heart failure prediction using electrical signals approach	1	نجم عبد الله عوده عبدالله	
		2	علي حسن كركو محمد	
		3	مصطفى حسن طاهر محمد	
		4	بنين عبادي دويج سلمان	
		5	رباب علي مرزوك حريجه	
		6	زيد مقداد طارق محسن	
		7	محمد ظاهر محسن محمود	
الهدف الرابع (التعليم الجيد)	3.Detection and Analysis of Heart Rate Variability (HRV) from ECG Signals using MATLAB	1	حسن مؤيد طالب سلمان	
		2	أيوب طاهر عبد الزهرة ظاهر	
		3	مرتضى محسن كاظم عباس	
		4	حسن ضياء جواد كاظم	
		5	حسين عبد عباس جاسم	
		6	بنين قاسم ماجد خليل	
		7		
الهدف الرابع (التعليم الجيد)	4.Separation of plasma from blood componenets using centrifuge	1	سجاد حيدر فاروق عبد الغفور	
		2	علي نزار عبد الواحد شاني	
		3	حسين كاظم مجيد غدير	
		4	تبارك نهاد جابر صالح	
		5	مصطفى حمدان عبيد حسن	
		6	صادق سعد كميني لفته	
		7		
الهدف الثالث(الصحة الجيده)	5. Smart Air Quality Monitoring System Using IOT	1	امير حسن شمخي جابر	
		2	حسين علي حسين محسن	
		3	عباس اسامه عزت مالك	
		4	ياسر حسين خزي حسين	
		5	حسن غانم خضير فارس	

	6	محمد حيدر محمد علي جبار		
	7			
الهدف الرابع (التعليم الجيد)	1	رقيه اسامه عباس محمد	1.Design and Implementation of Car Alarm System for Children Safety	
	2	سمر علاء ساجت عبيد		
	3	رانيا مكي خضر جاسم		
	4	حسين مسلم عبد العباس عبد الرضا		
	5	فاطمه زكي نعمه يعقوب		
	6	رسل حميد عباس دفار		
	7	محمد حسن رسول حسن		
الهدف الرابع (التعليم الجيد)	1	عماد قاسم خساره خليل	2. Design and implementation of Arrhythmia Detector Using Arduino	
	2	حسين علي رحمان مجيد		
	3	حسين مصطفى صالح عباس		
	4	ذو الفقار علي عبد الكاظم إسماعيل		
	5	مجتبى عايد هادي عبد		
	6	عباس عبد الحسين عباس خضير		
	7	احمد حكمت حمزه عبد الزهره		
الهدف الرابع (التعليم الجيد)	1	محمد حيدر رزاق سالم	3. Smart Control Systems for Medical Devices Using Arduino	
	2	حسن هيثم فارس عبيس		
	3	حسين عبد حمزه صالح مريداوي		
	4	حسن كريم حسون جاسم		
	5	حسنين احمد موسى جواد		
	6	علي هاشم جواد عبيد		
	7	منتظر عباس خضير محمد		
الهدف الرابع (التعليم الجيد)	1	سامر حمزه مهدي عمران	4. Artificial intellegence application for diagnoses brain scan reveals disease and tumors.	
	2	حسن هادي نعمه راضي		
	3	مصطفى قاسم حسين عبد العباس		
	4	علي الرضا فارس كريم حمزة		
	5	مصطفى عمران محمدعبد علي		
	6	مرتضى جمال فاضل فليح		
	7	سيف سعد مصري علوان		
الهدف الثالث(الصحة الجيدة)	1	سجاد قاسم هادي عبد الزهرة	1.Intelligent Support Assistant for Individuals with Muscular Weakness	
	2	مهيمن علي سعيد عباس		
	3	مؤمل سلام حمزه يوسف		
	4	حسين عامر محسن شهاب		
	5	سلام علي حمزة جواد		
	6	حارث حبيب عليوي جريدي		
	7	علي حسين فاضل ناجي		
الهدف الثالث(	1	علاء سمير غازي كاظم	2. Smart Drug Injection System Using Arduino.	
	2	احمد عبد الساده هادي عبد		
	3	طيبه محمد حميد عبد الأمير		

الصحة الجيدة)		محمد خالد تركي جهاد	4	
		علي سعد هادي ياسين	5	
		غيث جبار علي حسن	6	
		مرتضى محمد كاظم عبد علي	7	
الهدف الر ابع(التعليم الجيد)	3.Design and implementation a smart medical bag	حسين كامل ثجيل	1	
		منتظر حسين كاظم هاشم	2	
		هيثم محسن تركي عطيه	3	
		حسين خيري حسين علي	4	
		حسين علي راضي كريم	5	
		علي عباس شاكر عبدالله	6	
		مرتضى سلمان خضير حسين	7	
الهدف الثالث(الصحة الجيدة)	4.design and simulate a fluid suction device	حسنين خالد كاظم ناصر	1	
		حسين صادق محمد امين	2	
		علي محسن عبيس هاشم	3	
		عباس احمد لطيف عبد الخالق	4	
الهدف الثالث(الصحه الجيدة)	1. Design and Implementation of Insulin Injection Device Using Arduino.	حيدر حكمت عبد الحسين علي	1	
		مهدي رويهي ذباح كاظم	2	
		الحسن حسين احمد راضي	3	
		امير حيدر حميد جهاد	4	
		علي إسماعيل فليح حميد	5	
		علي حسن جبار علي	6	
		موسى سرمد علي سلمان	7	
الهدف الثالث(الصحه الجيدة)	2.Design of filling water bottles automatically using arduino	علي صادق كاظم عباس	1	
		علي عادل حسين تومان	2	
		كرار ماجد محمد سعد	3	
		احمد فاضل عباس عبد	4	
		عبد الله كمال عبد الرضا هادي	5	
		حسن علي عبد الرضا نهاب	6	
			7	
الهدف الرابع (التعليم الجيد)	1.Design and implementation of device to traansfer any movement made by aparalzed patient into vioce commands	إبراهيم حسين محمد عبود	1	
		حسن صلاح خلفه جاسم	2	
		هبه رحيم كريم يوسف	3	
		موده داخل عباس كاظم	4	
		امير شهيد محمد انهير	5	
		زينب محمد رحمن عبد	6	
		مروه محمد نهاد محمد	7	
الهدف الثالث(الصحة الجيدة)	2.Design and implementation of smart monitoring and Alarm system for patient	امير حيدر خماط شعيب	1	
		محمد بخيت شداد هاوي	2	
		حسين ناهض هاتف طراد	3	
		ساره امين محمد جلاب	4	
		علي كاظم ويسي غضب	5	
		أطياف عماد عليوي ناصر	6	
		طيبه علي هادي وناس	7	
	3.Design and implementation of	سيف رزاق كاطع مرداس	1	
		امين عباس فرحان حسن	2	

الهدف الثالث(الصحة الجيدة)	breathing monitor for premature babies	3	تقي عبد الكاظم غالي محيسن	
		4	ايات حسين محمد عزيز	
		5	كرار عدنان عبادي عبدان	
		6	نور حسين هادي لوفه	
		7	ايناس عبد الكريم عبد الكاظم عبد الرضا	
الهدف الرابع (التعليم الجيد)	1. Design and implementation of vital signs monitor using arduino	1	سيف حبيب كريم حبيب	
		2	حسنين مهدي عطيه مدير	
		3	مصطفى لطيف فخري حسين	
		4	محمد اسعد يدام منصور	
		5	احمد بدر كاظم ذياب	
		6	ايسر احمد عواد جمعه	
		7	اشرف حسين علي عبد حسين	
الهدف الثالث (الصحه الجيده)	2.Healthcare monitoring system based on Wireless Sensor networks and GSM modem	1	امير خضير عباس كاظم	
		2	حسن فلاح حسن محمد	
		3	ملاك هاشم عبد المنعم موسى	
		4	مها عارف هليل وذاح	
		5	مصطفى حميد خضير عياس	
		6	مقتدى لواء ناظم عبد الجبار	
		7	زهراء حازم عباس عبد	
الهدف الثالث (الصحه الجيدة)	1.Smart ventillator device in the intensive care unit (ICU)	1	كاظم كريم جحيل خشمان	
		2	ميثم ياسر موسى حسن	
		3	كرار حاتم مطشر فهد	
		4	مؤمل فواز محي جاسم	
		5	مصطفى رزاق تركي عطية	
		6	زينب نجيب جادر حسين	
		7	كرار كريم دحام نعيمه	
الهدف الرابع(التعليم الجيد)	1.Easy home: A smart automation system for people with physical movement issues.	1	ضرغام فيصل غازي وابل	
		2	سجاد باسم عبد الساده هادي	
		3	زهراء حازم علي حطحوط	
		4	بتول عبد الرضا نوري مطر	
		5	منتظر حيدر محمود حميد	
		6	علي قاسم جبار كاظم	
		7	علي منهال حسين مجيد	

نماذج لصور مناقشات التخرج الحاصلة في كلية الهندسة والتقنيات الهندسية
2025-2024


Our Team Slide


Galaxy S24 Ultra


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كلية الهندسة والتقنيات الهندسية
قسم هندسة
تقنيات الوقود والطاقة
تأسس القسم عام 2023


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