GLP-F020

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سجل التجارب للعام الدراسي 2024-2025

Experiment No. 1: Introduction to Arduino

Introduction:.

Arduino is an open-source electronics platform used for developing various electronic projects. It is easy to use and widely applied in fields like robotics, smart systems, and device control. Arduino can read data from sensors and send signals to control motors, lights, and other devices.

1. What is Arduino?

• Arduino is a programmable electronic board that contains a microcontroller, which can be programmed using the Arduino language (similar to C++).

• It interacts with sensors and actuators to control the physical world.

• It is easy to connect components using simple wiring and has a rich library that simplifies programming.

Popular Arduino Models:

1. Arduino Uno – The most commonly used board.
2. Arduino Mega – Offers more input/output ports.
3. Arduino Nano – A compact version suitable for small projects.

2. Difference Between Digital and Analog in Arduino

(1) Digital Signals:

• Digital signals are binary (0 or 1).

• They can be either HIGH (ON - 5V) or LOW (OFF - 0V).

• Digital pins are used to control devices that operate in an ON/OFF manner, such as:

• Turning an LED on and off.

• Controlling motors.

Example: Turning an LED On/Off on Digital Pin D13

```
void setup() {
  pinMode(13, OUTPUT); // Set pin 13 as output
}

void loop() {
  digitalWrite(13, HIGH); // Turn LED on
  delay(1000);            // Wait 1 second
  digitalWrite(13, LOW);  // Turn LED off
  delay(1000);            // Wait 1 second
}
```

2) Analog Signals:

• Analog signals are continuous and can vary between 0V and 5V.

• Used to read changing data from sensors like:

• Temperature sensors.

• Light sensors.

• Analog signals are read using the analogRead() function, which returns values between 0 and 1023.

Example: Reading Data from a Light Sensor on Analog Pin A0

```
int sensorValue;

void setup() {
  Serial.begin(9600); // Start serial communication
}

void loop() {
  sensorValue = analogRead(A0);  // Read value from A0
  Serial.println(sensorValue);   // Print value to Serial
Monitor
  delay(500);                    // Wait 500 milliseconds
}
```

3. Difference Between Reading and Writing in Digital and Analog Pins

Operation Digital Pins Analog Pins

Reading digitalRead(pin) analogRead(pin)

Writing digitalWrite(pin, HIGH/LOW) analogWrite(pin, value) (PWM)

4. Practical Project Combining Digital and Analog

Project: Controlling an LED Based on Light Sensor Readings

- If the light level is low (sensor value < 500), the LED turns on.
- If the light level is high, the LED turns off.

Code: Light Sensor Controlling LED

```
const int sensorPin = A0;  // Light sensor pin
const int ledPin = 13;     // LED pin

void setup() {
  pinMode(ledPin, OUTPUT); // Set LED as output
  Serial.begin(9600);      // Start serial communication
}

void loop() {
  int sensorValue = analogRead(sensorPin); // Read light
sensor value
  Serial.println(sensorValue);            // Print value
to Serial Monitor

  if (sensorValue < 500) {
    digitalWrite(ledPin, HIGH); // Turn LED on
  } else {
    digitalWrite(ledPin, LOW);  // Turn LED off
  }

  delay(500); // Delay to slow down readings
}
```