وزارة التعليم العالي والبحث العلمي
جامعة المستقبل
كلية الهندسة والتقنيات الهندسية

GLP-F020

اسم القسم: هندسة تقنيات الأجهزة الطبية / اسم المختبر: المستشعرات الطبية / المرحلة: الثانية / رمز المختبر:BL 409

سجل التجارب للعام الدراسي 2024-2025

Experiment No. 3: Sound Sensor

Introduction

A sound sensor is an electronic device used to detect sound waves in the surrounding environment and convert them into electrical signals. This type of sensor is widely used in security systems, robotics, and .smart control devices

Working Principle

The sound sensor works based on a microphone, which is the main component that converts sound waves into electrical signals. These signals are amplified through an electronic circuit and then sent to a controller like Arduino or Raspberry Pi for analysis and decision-.making

Components of Sound Sensor

.1 Microphone: Converts sound into electrical signals.

.2 Amplifier: Amplifies the electrical signals.

.3 Filter: Improves signal quality and removes noise.

.4 Output Unit: Sends the signal to the controller.

.5 LED Indicator (Optional): Lights up when sound is detected.

Types of Sound Sensors

- Analog Sound Sensors: Provide variable output based on sound intensity.
- Digital Sound Sensors: Provide ON/OFF signals when sound exceeds a certain threshold.

How to Use with Arduino

Required Components:

- Sound Sensor
- Arduino Board
- Jumper Wires
- LED (Optional)

Wiring:

- VCC to 5V
- GND to Ground
- OUT to Arduino input pin (e.g., A0 or D2)

:Code Example

```
int micPin = A0;  // مدخل حساس الصوت
int ledPin = 9;   // مدخل الـ LED (يجب أن يكون منفذ PWM)

void setup() {
  Serial.begin(9600);
  pinMode(ledPin, OUTPUT);
}

void loop() {
  int soundLevel = analogRead(micPin);  // قراءة الصوت
  Serial.println(soundLevel);  // طباعة القيم لمراقبتها

            // حساب الفارق بين الصوت الحالي ومتوسط الصوت (Noise Filtering)
  static int baseline = 40;  // قيمة مبدئية (يمكن تعديلها حسب القيم الحقيقية)
  int soundVariation = abs(soundLevel - baseline);  // حساب التغير في الصوت

                                        // تحويل القيم إلى نطاق 0 - 255 لـ PWM
  int brightness = map(soundVariation, 0, 300, 0, 255);
  brightness = constrain(brightness, 0, 255);  // التأكد من أن القيم بين 0 و 255

  analogWrite(ledPin, brightness);  // ضبط سطوع الـ LED حسب شدة الصوت

  delay(50);
}
```

10:16 AM

Applications

- **Security systems (Intrusion detection(**
- **Interactive robots**
- **Smart home devices**
- **Voice assistants like Alexa and Google Assistant**
- **Toys**

Advantages

- **High sensitivity**
- **Low power consumption**
- **Compact size**
- **Easy to use**

Disadvantages

- **Sensitive to noise**
- **Cannot distinguish between different sounds**
- **Always requires signal amplification**

Conclusion

Sound sensors play an essential role in smart systems, making devices more interactive with their environment. Thanks to their ease of use and low cost, they have become a key element in IoT applications and .robotics

Discussion Questions

.1 What is the difference between analog and digital sound sensors?

.2 How can the sensitivity of a sound sensor be improved?

.3 What are the future applications of this technology?

.