THE MOTION DETECTOR

COMPUTER NETWORKING

Time: 60 mins

Introduction

In this class, the student/s will learn how to create a motion detector and experiment with its delay and inhibit time attributes.

New Commands Introduced

pinMode(PIR_PIN, INPUT_PULLUP);	Mentions the pins as input pin with LOW state when no motion
pinMode(LED_PIN, OUTPUT);	Mentions the pins as output pins for LED
bool motionDetected = digitalRead(PIR_PIN);	Reads the current pin state
Serial.println("Motion Detected");	Prints Motion Detected
digitalWrite(LED_PIN, HIGH);	Turns the LED on
delayTime	The number of seconds OUT pin will stay high
inhibitTime	The number of seconds the sensor will ignore motion when OUT returns to low
retrigger	Sets time to "0" to disable retriggering

Vocabulary

- PIR stands for passive infrared sensor and works entirely by detecting infrared radiation i.e., radiant heat emitted by or reflected from the objects.

- Triggering the sensor will drive the OUT pin high for 5 seconds (delay time), and then go low again. The sensor will ignore any further input for the next 1.2 seconds (inhibit time), and then start sensing for motion again.

Learning Objectives

Student/s should be able to:

- ***Recall*** how to connect components to the ESP32 pin and add delay.
- ***Demonstrate*** how to add a PIR sensor to detect motion.
- ***Explain*** how to experiment with the PIR sensor to blink the LED and explore the attributes of the sensor to lock and unlock the door.

Activities

Class Narrative: *(3 mins)*

- Brief the student/s that the next door unlocked and got immediately locked before all the group members could enter the room.

Concept Introduction Activity: *(4 mins)*

- Let the student/s the motion sensor which detects a moving object and glows the LED.
- Explain different sensors and its application. Highlight the PIR sensor, its use for motion detection and its application.
- Using the slides, explain that the student/s will learn:
    - to connect the components
    - to detect the motion
    - to experiment with the motion detector

Activity 1: Connect the Components *(16 mins)*

Teacher Activity: *(8 mins)*

- Explain how PIR sensors work and explain it's pins.
- Explain the applications of PIR sensors.
- Introduce and explain connecting the components to create a motion detector.

Student Activity: *(8 mins)*

- Guide the student/s to connect the components to create a motion detector.

Activity 2: Detect the Motion *(10 mins)*

- Explain how we will detect the motion by configuring the pins, pin mode.
- Explain how we will glow LED on clicking on motion detector and then stop the LED.

Student Activity: *(10 mins)*

- Guide the student/s to detect the motion by configuring and coding ESP32.

Activity 3: Experiment with Motion Detector*(12 mins)*

- Explain how the detection and LED glowing time can be changed using attributes like delayTime, inhibitTime and reTrigger.
- Demonstrate and experiment with locking and unlocking the door using the motion detection.

Student Activity: *(6 mins)*

- Guide the students to experiment with motion detection time to lock and unlock the door.

Introduce the Post class project: *(2 min)*

- Design a smart study lamp which glows dedicated LED's on motion detection.

Test and Summarize the class learnings: *(5 mins)*

- Check for understanding through quizzes and summarize learning after respective activities.
- Summarize the overall class learning towards the end of the class.

Additional activities:

- Encourage the student/s to ring the buzzer on motion detection.
- Encourage the student/s to debug the code to make the buzzer functional.

State the Next Class Objective: *(1 min)*

- In the next class, student/s will learn to add the motion sensor to the door to lock or unlock it on motion detection.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	Activity Name	Link

Class Presentation	The Motion Detector	https://s3-whjr-curriculum-uploads.whjr.online/1acfdef6-9df5-4707-a61c-735fff9fe3d2.html
Explore Activity	The Motion Detector	https://wokwi.com/projects/384620621028130817
Student Activity 1	Connect the Components	https://wokwi.com/projects/384619135639304193
Teacher Reference: Student Activity 1 Solution	Connect the Components	https://wokwi.com/projects/384619075941758977
Teacher Activity 2	Design a Motion Detector	https://wokwi.com/projects/384619996541295617
Teacher Reference: Teacher Activity 2 Solution	Design a Motion Detector	https://wokwi.com/projects/384619339175266305
Student Activity 2	Design a Motion Detector	https://wokwi.com/projects/384619996541295617
Teacher Reference: Student Activity 2 Solution	Design a Motion Detector	https://wokwi.com/projects/384619339175266305
Student Activity 3	Experiment with a Motion Detector	https://wokwi.com/projects/384620766899757057
Teacher Reference: Student Activity 3 Solution	Experiment with a Motion Detector	https://wokwi.com/projects/384620621028130817
Student's Additional Activity 1	Design a Motion Detector Alarm	https://wokwi.com/projects/385176350681422849
Teacher Reference: Student's Additional Activity 1 Solution	Design a Motion Detector Alarm	https://wokwi.com/projects/385176084809718785
Student's Additional Activity 2	Debug the Code	https://wokwi.com/projects/386058937835995137
Teacher Reference: Student's Additional Activity 2 Solution	Debug the Code	https://wokwi.com/projects/386058779277656065
Post Class Project	Design a Smart Study Lamp	https://wokwi.com/projects/385178027305247745
Teacher Reference: Post Class Project Solution	Design a Smart Study Lamp	https://wokwi.com/projects/385176747344108545