DOOR LOCK SYSTEM

INTERNET OF THINGS

Time: 60 mins

Introduction

In this class, the student/s will learn how to create a simple motion-activated door lock simulation using an ESP32, a PIR sensor, a servo motor, and an LCD.

New Commands Introduced

ESP32Servo library	Allows ESP32 boards to control servo, tone and analogWrite motors using Arduino semantics
Servo doorLock;	Creates a servo object named doorLock.
doorLock.attach(SERVO_PIN);	Establishes the connection between the servo and the ESP32
doorLock.write(0);	Sets the position of the servo motor to 0 degrees.
pinMode(PIR_PIN, INPUT);	Set PIR pinMode to INPUT

Vocabulary

- **A servo motor** is an electronic component that turns a specified degree, for example, a robot arm.
- **A horn** refers to a mechanical attachment or arm that is connected to the output shaft of the servo motor.

Learning Objectives

Student/s should be able to:

- ***Demonstrate*** how to connect a servo motor to rotate the horn at a specific angle.
- ***Recall*** how to connect the PIR sensor and LCD screen to the ESP32 pin.
- ***Explain*** how to use the servo motor's horn to lock and unlock the door.

Activities

Class Narrative: *(3 mins)*

- Brief the student/s that the next challenge is to create a door lock system and show the status of the door on display.

Concept Introduction Activity: *(4 mins)*

- Let the student/s undertake the explore-activity to observe the working of the servo motor in the door lock system to open and close the door.
- Explain the servo motor and its application. Highlight the servo motor and its use for opening and closing the door.
- Using the slides, explain that the student/s will learn:
    - to connect with the servo motor
    - to detect the motion
    - to complete the door lock system

Activity 1: Connect the Servo Motor *(16 mins)*

Teacher Activity: *(8 mins)*

- Explain how the Servo Motor works and explain its pins.
- Explain the applications of Servo Motors.
- Introduce and explain connecting the components to control the servo motor using buttons to lock and unlock the door.

Student Activity: *(8 mins)*

- Guide the student/s to control the servo motor using buttons to lock and unlock the door.

Activity 2: Detect the Motion *(14 mins)*

Teacher Activity: *(6 mins)*

- Explain how we will detect the motion by configuring the pins of a PIR sensor.
- Explain how we will control the servo motor using a PIR motion sensor to automatically open and close the door.
- Demonstrate how to control the servo motor using the PIR sensor.

Student Activity: *(8 mins)*

- Guide the student/s to detect motion with a PIR sensor and control a servo motor based on that motion.

Activity 3: Display the Door Status*(12 mins)*

- Explain how LCD is used to display the message "Door is locked or unlocked" on the LCD screen.

  Student Activity: *(12 mins)*

- Guide the students to build a door lock system by attaching a servo motor, a PIR sensor, and an LCD to an ESP32 board.

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

- Create a sweep circuit and indicate the direction using an LED

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 Identify and fix the bug as to why the door is not getting locked again.
- Encourage the student/s to Identify and fix the connections.

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

- In the next class, student/s will learn to connect and interact with an ultrasonic sensor using an ESP32.

U.S. Standards:

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

Links Table		
Activity	Door Lock System	Link
Class Presentation	Door Lock System	
Explore Activity	Door Lock System	https://wokwi.com/projects/384616166818193409
Teacher Activity 1	Connect the Servo Motor	https://wokwi.com/projects/387144447266755585
Teacher Reference: Teacher Activity 1 Solution	Connect the Servo Motor	https://wokwi.com/projects/387144540153817089

Student Activity 1	Connect the Servo Motor	https://wokwi.com/projects/384612838048957441
Teacher Reference: Student Activity 1 Solution	Connect the Servo Motor	https://wokwi.com/projects/384612566622906369
Teacher Activity 2	Detect the Motion	https://wokwi.com/projects/387144567614977025
Teacher Reference: Teacher Activity 2 Solution	Detect the Motion	https://wokwi.com/projects/387144596061796353
Student Activity 2	Detect the Motion	https://wokwi.com/projects/384616063415971841
Teacher Reference: Student Activity 2 Solution	Detect the Motion	https://wokwi.com/projects/384612943707687937
Student Activity 3	Display the Door Status	https://wokwi.com/projects/384617050332749825
Teacher Reference: Student Activity 3 Solution	Display the Door Status	https://wokwi.com/projects/384616166818193409
Student's Additional Activity 1	Debug the Door Lock	https://wokwi.com/projects/385174998745997313
Teacher Reference: Student's Additional Activity 1 Solution	Debug the Door Lock	https://wokwi.com/projects/384813318422012929
Student's Additional Activity 2	Debug the Connections	https://wokwi.com/projects/385175164167266305
Teacher Reference: Student's Additional Activity 2 Solution	Debug the Connections	https://wokwi.com/projects/385175407446361089
Post Class Project	Sweep Circuit	https://wokwi.com/projects/385163152907546625
Teacher Reference: Post Class Project Solution	Sweep Circuit	https://wokwi.com/projects/385162804210900993