IoT with Humanoid Robotics

Workshop Overview

This workshop is designed for mechanical engineering students, focusing on IoT and robotics. Participants will learn how to control a robot of their choice using NodeMCU, servo motors, and web-based control systems. Each group will choose one robot from the following options:

- Humanoid Robot
- 5-DOF Robotic Arm
- Biped Robot

The workshop provides practical experience in robot design, assembly, and control through IoT, helping students explore the intersection of mechanical design and electronics.

Workshop Duration: 3 Days.

Workshop Price: ₹ 700 per person.

Accommodation: ₹ 300 per person.

Date: 24, 25 & 26 of October.

Venue: Department of Mechanical Engineering, JNTUA college of Engineering,

   Pulivendula -516390, Muddanur road, YSR Dist., Andhra Pradesh.

Kit Type: Shared, not for take away.

Workshop Highlights

1. **Participants should select one Robot to Build and Control:**
   - Humanoid Robot
   - 5-DOF Robotic Arm
   - Biped Robot
2. **IoT-Driven Control via NodeMCU and Web Servers:** Learn how to integrate web-based controls with the robots using NodeMCU and IoT protocols for remote operation.
3. **Servo Motor Integration with MG90S:** Hands-on experience working with MG90S servo motors to create dynamic robot movements.

Who can Enroll

- Any Branch of Engineering & Diploma students.
- Individuals with an interest in robotics, automation, and IoT.

Kit Contents

Each team will get one kit for Hands-on Experience. The kit includes:

- 1 x NodeMCU microcontroller
- 10 x MG90S Servo Motors
- 1 x Power Supply Unit
- 1 x Wi-Fi Router (for web server control)
- Jumper Wires and Connectors
- Breadboard
- 1 x Set of Mechanical Components (depends on chosen robot):
    - Humanoid robot structure parts
    - Robotic arm structure parts
    - Biped robot structure parts
- Miscellaneous: Screws, mounts, and fasteners for assembly

Workshop Plan

Day 1: Microcontroller Basics and Introduction to Sensors & Actuators

Session 1: Introduction to Microcontrollers

- Introduction to Embedded Systems and Microcontrollers
- Overview of NodeMCU (ESP8266/ESP32)
- Pin configuration, power requirements, and connectivity options
- Introduction to programming environments (Arduino IDE)
- First steps: Writing a basic program (blinking an LED)

Session 2: Basic LED and Sensor Control

- Interfacing an LED with NodeMCU
- Controlling an LED via digital outputs (on/off, blinking)
- Introduction to sensors: What they are and how they work
    - Examples: Temperature sensor (DHT11), Light sensor (LDR)
- Interfacing basic sensors with NodeMCU

Lunch Break

Session 3: Hands-on with Sensors and LED Control

- Reading data from sensors (Temperature, Light, etc.)
- Controlling an LED based on sensor data (e.g., turn on the LED when it's dark)
- Basic troubleshooting techniques for sensor readings
- Group activity: Building a simple IoT system to monitor a sensor and control an LED using NodeMCU

Day 2: Robotics Assembly and Servo Motor Control

Session 1: Introduction to Servo Motors and Robot Control

- Introduction to Servo Motors (MG90S)
  - How servos work, angle control, and position feedback
  - Differences between servo, DC, and stepper motors
- Hands-on: Controlling a single servo motor with NodeMCU
  - Programming servo angles (0°, 90°, 180°)

Session 2: Robot Assembly

- Teams choose one robot from:
  - Humanoid Robot
  - 5-DOF Robotic Arm
  - Biped Robot
- Assemble the mechanical structure of the chosen robot
- Integrating MG90 servo motors into the robot joints

Lunch Break

Session 3: Controlling Multiple Servos

- Programming NodeMCU to control multiple servos
- Hands-on: Writing code for coordinated movement of robot parts
- Testing individual servo movements
- Group task: Programming the basic motion of the selected robot (e.g., arm movement for robotic arm, walking motion for biped robot)

Day 3: IoT and Web-Based Robot Control

Session 1: Introduction to IoT and Web Control

- Basics of IoT and its applications in robotics
- Overview of web servers and client-server communication
- Setting up a simple web server on NodeMCU
- Hands-on: Controlling an LED through a web interface

Session 2: Web-Based Control of Robots

- Creating a web-based dashboard to control the robot
- Sending commands from a web browser to NodeMCU
- Hands-on: Controlling servos and robot movements via a web interface

Lunch Break

Session 3: Final Project and Demonstrations

- Group activity: Full integration of hardware and software
- Testing and refining the robot's movements using web-based control
- Final presentations and demonstrations of the completed robots
- Q&A, feedback, and closing remarks

Takeaways

- In-depth knowledge of IoT and robotics integration
- Practical experience in building and controlling robots
- Team collaboration on the chosen robot project

Certification:

- Participants will able to get certificate of participation.

Requirements from participants:

- Students who wish to enroll in this workshop try to bring your laptops. 1 laptop can adjust with 2 or 3 people.
- It is not mandatory to bring laptops but if you can bring it would be better understanding.
- Participants are responsible for their laptops & Gadgets.

For any queries:

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