Report on

Hands on Training on Interfacing of Sensors

IEEE BANGALORE SECTION

Organized by IEEE Student Branch, KSSEM

In association with IEEE Bangalore section.

Topic: Hands on Training on Interfacing of Sensors

Date of event: 8th June, 2024 to 9th June 2024.

Venue: Aryabhatta Seminar Hall, Dept of ECE, KSSEM

Number of participants: 80

Targeted Audience: 2nd year ECE students

Event Coordinator: Mr Syed Waseem Tabraiz and Mrs. Tejaswini G V, Assistant Professor, Dept of ECE, KSSEM

The IEEE Student branch in association with the ECE department, of KSSEM, had organized a Hand on training on, "**Interfacing of Sensors**" on 8th June, 2024 to 9th June 2024 at 9:30am IST.

The Department of Electronics and Communication organized a workshop on the "Introduction to Sensors" for 4th semester ECE students. The workshop was led by the founders of Inversa Technosoft, Mr. Bharath and Mr. Rahul. Dr. K. Senthil Babu, Professor and Head of the Department of Electronics and Communication, graced the occasion by introducing and welcoming the delegates and officially declared the workshop open.

The Arduino workshop aimed to provide participants with hands-on experience in using Arduino microcontrollers and various sensors and actuators. Throughout the workshop, attendees explored the

fundamentals of Arduino programming and circuitry design while working on exciting projects such as temperature sensing, ultrasonic sensing, servo motor control, and line-following robotics.

The objective of the training is given below;

- To introduce the students to various commonly used sensors and their working principles;
- To interface the sensors with microcontrollers and write simple code to acquire data from the sensors.
- To formulate applications based on the knowledge acquired.

Introduction to Arduino Microcontroller

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices.

Different types of Arduinos

1) **UNO and MKR** is fairly beginner friendly, with the more expensive MKR offering greater connectivity (WiFi and Bluetooth) options.
2) **Mega** is good for robotics projects, including CNC machines and 3D printers.
3) **Nano** families are cost effective alternatives to the MKR, and are good for networks of sensors.
4) **Due** is good for efficient graphics and sound processing.
5) **Leonardo and Micro** are good alternatives to the UNO, particularly for USB connectivity.
6) **Yun** offers an embedded Linux system which can function as a multi-tasking server
7) **Portenta** is incredibly powerful.

Day 1

The workshop began with an introduction to the basics of Arduino. Students were familiarized with the Arduino architecture, coding patterns, and programming techniques. After covering the basics, each group of students was given a kit containing multiple sensors and other components. This hands-on approach helped students understand how sensors work in practice.

The first session focused on how to light up an LED. Following this, students learned how to light LEDs of three different colors—red, blue, and green—and how to create various combinations of these colors. The students were then introduced to several other sensors.

Light Dependent Resistor (LDR): LDRs are used to measure the intensity of light and detect the presence or absence of light in an environment. Their resistance decreases with increasing light intensity, making them ideal for applications like automatic lighting systems and light level meters.

Moisture Sensor: These sensors measure the moisture level in the soil by using probes to detect the electrical resistance of the soil, which changes with moisture content. They are commonly used in agricultural applications for irrigation management and in gardening to ensure optimal soil moisture for plant growth.

Raindrop Sensor: Raindrop sensors detect the presence of raindrops by using a conductive surface that changes resistance when wet. They are used to measure rainfall and can be integrated into weather stations, automatic windshield wipers, and smart irrigation systems to respond to rain conditions.

Infrared (IR) Sensor: IR sensors emit infrared light and detect the reflected light from objects to determine proximity, detect motion, and measure distance. They are widely used in security systems, remote controls, obstacle detection in robots, and automatic doors.

Each sensor's real-life practical applications were discussed, enhancing the students' understanding of their utility in everyday scenarios.

The first day of the workshop concluded with a session on writing code for a bot that can turn left, turn right, and move forward and backward. To sum up, the first day was very informative and fun-filled, providing students with a hands-on approach to deal with basic sensors. Overall, Day 1 of the workshop was a great success, offering valuable practical knowledge and experience to the students.

Day 2

The day started with the introduction and applications of additional sensors, namely;

Temperature sensor: Participants learned how to interface a temperature sensor with the Arduino board and read temperature values using analog or digital pins. This session provided insights into real-time data acquisition and monitoring applications.

Sonar Temperature: The workshop covered the integration of ultrasonic sensors with temperature measurement. Sonar temperature sensing combines ultrasonic distance measurement with temperature sensing, enabling participants to measure temperature at a distance using sound waves.

This application is useful for non-contact temperature monitoring in industrial or environmental settings.

Servo Motor Control: Participants learned how to control servo motors using Arduino. By understanding pulse width modulation (PWM) and servo motor control signals, attendees could precisely manipulate the position of servo motors. This knowledge is crucial for developing robotic systems, automated actuators, and remote-controlled devices.

Line Follower Project: One of the highlight projects was the Line Follower Robot. Participants were tasked with designing and programming a robot capable of autonomously following a predefined path using infrared (IR) sensors. The project encompassed sensor calibration, PID (Proportional-Integral-Derivative) control algorithm implementation, and real-world testing. Through this project, attendees gained insights into robot navigation, sensor fusion, and algorithm optimization.

Fig 1. Inauguration of Hands on training on interfacing of sensors

Fig 2. Students Interfacing various sensors and to Arduino

Fig 3. Guest Speaker, Faculties and Students present in the Event

Competition

To culminate the workshop, a competition was held where participants showcased their Line Follower Robots. The competition challenged teams to demonstrate the speed, accuracy, and robustness of their robots in following a complex line course. Using IR sensors, the robots navigated through twists, turns, and intersections with minimal human intervention. The competition fostered friendly rivalry and encouraged participants to apply their skills in a competitive environment.

Conclusion

The Arduino workshop provided participants with a comprehensive understanding of microcontroller programming, sensor integration, and robotics applications. Through hands-on projects such as temperature sensing, servo motor control, and the Line Follower Robot, attendees gained practical experience and valuable insights into the world of Arduino-based prototyping and automation. The workshop not only equipped participants with technical skills but also fostered creativity, problem-solving, and teamwork essential for future endeavors in the field of electronics and robotics.

Coordinator

Signature of HoD, ECE
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