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THE SPARK

Igniting Innovations

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

OCT 2025

UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

Inside

ACHIEVEMENTS

- Sri V. S. N. K. Chaitanya, Assistant Professor (C), successfully completed a six-day online Faculty Development Programme (FDP) on “Advanced Power Converter Technologies for Next-Generation Electric and Hydrogen Fuel Cell Vehicles.” The programme was conducted from 13th to 18th October 2025 and was organized by NIT Manipur under the AICTE–ATAL Academy.
- Mr. Shanmukha Naga Raju Vonteddu, Assistant Professor at Jawaharlal Nehru Technological University Kakinada, successfully participated in and completed the AICTE Training and Learning (ATAL) Academy Faculty Development Programme on “Advanced Power Converter Technologies for Next-Generation Electric and Hydrogen Fuel Cell Vehicles.” The programme was conducted by the National Institute of Technology (NIT) Manipur from 13th October to 18th October 2025.


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AICTE Training and Learning (ATAL) Academy

Certificate

It is certified that Mr. Shanmukha Naga Raju Vonteddu, Assistant Professor of Jawaharlal Nehru Technological University Kakinada has successfully participated & completed AICTE Training And Learning (ATAL) Academy Faculty Development Program on Advanced Power Converter Technologies for Next-Generation Electric and Hydrogen Fuel Cell Vehicles at National Institute of Technology Manipur from 13/10/2025 to 18/10/2025.

BENJAMIN A SHIMRAY
Associate Professor Level (AICTE Institute), Coordinator
National Institute of Technology Manipur

Dr. Sunil Luthra
Director & Bureau Head
Training and Learning Bureau, AICTE

EVENTS AND WORKSHOPS

- The SPARK Program was conducted at JNTUK on October 24, 2025, focusing on innovation and the refinement of technical project ideas. Five students from the III B.Tech EEE department—Mr. D. Raja Gopal Sai, Mr. A. Adarsh, Mr. G. Srinivas Reddy, Mr. Ch. Niteesh, and Mr. S. M. Santosh Reddy—attended this session. The workshop provided a platform for the participants to "revise and rebuild" their concepts, allowing them to engage with new perspectives on engineering design and prototyping.
- The Department of Electrical and Electronics Engineering, University College of Engineering Kakinada (A), JNTUK in association with Vellore Institute of Technology (VIT), conducted a two-day workshop on **AI/ML Applications in Electrical Engineering** on October 24th and 25th, 2025. Coordinated by **Dr. K. Venkata Reddy** Professor and Head of EEE dept. Sri V. S. N. K. Chaitanya , Sri N. sagar Teja Yadav asst. proffesor (C), UCEK, JNTUK. The resource persons was **Dr. Mahesh Kumar** , **Dr. S. Sivasubramani,** from IIT Patna and **Dr. Narsa Reddy Tummuru** from IIT Bhubaneswar.

LINE TRACKING CAR WITH OBSTACLE AVOIDANCE & DESTINATION CONTROL

During our 3-2 internship, we decided to build something more advanced than a simple line follower. Our goal was to design a Line Following Robot Car capable of traveling to multiple destinations along the same track while also avoiding obstacles. The main objective of this project was to develop a robot that could navigate autonomously between the points, setup through mobile interface make intelligent turns at junctions, and halt whenever an obstacle is detected in its path

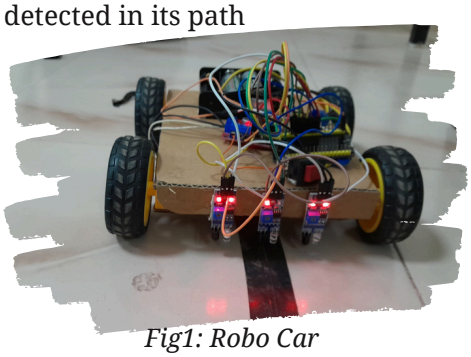

Fig1: Robo Car

The Idea and the Challenges :

At first, everything seemed simple — just make the car follow a black line. But as we added multiple destinations and junctions, the logic became more complicated. The robot had to decide whether to turn left, right, or go straight at each junction, and also needed to avoid collisions while maintaining its accuracy.

Initially, we used two IR sensors to follow the black line. Later, to make it detect junctions, we added one more IR sensor at the middle. When all three sensors detected black at the same time, the robot identified that point as a junction.

Developing the Junction Logic :

Creating the turning logic at junctions was the toughest part. We first tried to turn the bot until the respective sensor detected black again, but the IR sensors were too sensitive — they detected black for just a few milliseconds, which caused the robot to lose the track.

Then we tried fixed-time turns, but that too failed because the time to detect junctions varied every time the bot moved.

Finally, we combined both approaches. We added a small pause when the bot detected a junction, then made it move slightly forward to increase its turning radius, and implemented a hybrid turning logic — the bot turns for a few milliseconds in a fixed duration and then continues the turn until the correct sensor detects black again

This combined logic worked perfectly and gave accurate and smooth turns most of the time.

Mapping the Destinations:

After solving the junction logic, we started focusing on mapping multiple destinations.

We designed a mapping table like a matrix inside our code, which included all the routes and turns for every possible path.

Our track had six destinations, so we coded the robot to know exactly which turns to take for all paths like 1-0, 1-2, 1-3, 1-4, 1-5, and 1-6. This mapping made the robot smart enough to travel between any two destinations automatically.

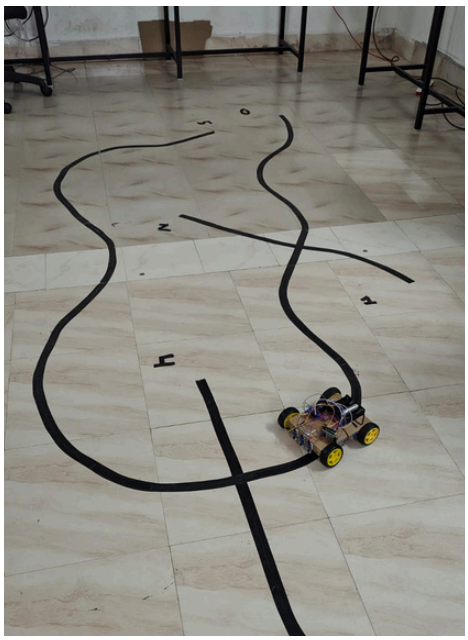

Fig2: Car at the Junction

Web-Based Control Using ESP32 :

The ESP32 acted as the main controller as well as a web server for our robot. We added an HTML page inside the ESP32 code, so when any device connects to its Wi-Fi and opens http://192.168.4.1/, a control page appears.

From this page, we can easily choose destinations, use manual control like a remote car, and enable a repeat mode for continuous runs. This made our robot fully wireless and easy to control without using Bluetooth or any external module.

Components Used :

- ESP32 Module – Main controller and web server
- IR Sensors (3) – For line and junction detection
- L298N Motor Driver – Controls the motors
- BO Motors (2) with Wheels & Chassis – For movement and support
- Lithium-ion Battery (7.4V) – Power source
- Ultrasonic Sensor – For obstacle detection
- Jumper Wires – For circuit connections
- Switches & Connectors – For easy operation

Fig3:Web Based Mobile Interface

Applications of Our Robot Car :

- It can be used in chemical or hazardous areas where humans cannot safely go.
- It can be used in industries to automatically transport materials between different sections or workstations on the shop floor.
- It can be used in disaster places like fire or gas leak to check the path before humans enter.

Future Upgrades :

- Use camera-based line detection for smoother and faster path tracking.
- Add image processing to identify routes and destinations more accurately.

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Smart Dustbin: Revolutionizing Waste Management

Imagine a world where dustbins make their own decisions about when to open, when to close, and even alert for emptying when full. This simple idea inspired us to create an affordable, smart dustbin for our 3-2 internship project. Built with sensor technology and automation, this system helps maintain cleanliness by detecting waste levels and managing the lid operation without human contact.

Objective:

The Smart Dustbin project aims to improve waste management with a special cap that fits the bin perfectly. It uses simple technology like sensors to detect when someone is near, a motor to open the lid automatically, and an Arduino to make it all work smoothly. This reduces the need for people to touch the bin, keeps things cleaner, and is affordable for everyone. The Smart Dustbin helps make cities smarter and more efficient, supporting the idea of smart cities.

Methodology:

The smart cap of the dustbin incorporates ultrasonic sensors to detect objects on the lid. The lid is positioned at a depth within the cap so that any thrown waste lands on it, allowing the sensors to recognize the presence of the debris. The number of ultrasonic sensors required depends on the dustbin cap's dimensions. A servo motor is employed to open the lid, enabling the waste to fall into the bin. Additionally, an IR sensor monitors the fill level, and a LED or buzzer alerts users when to empty the dustbin. The lid only opens when the IR sensor value is 1 and either of the ultrasonic sensors sense the presence of object.

To ensure precise lid control, minimize false triggers, and reduce power consumption, techniques such as averaging five recorded samples, confidence levels, and cooldown strategies are utilized.

Components Used:

Arduino UNO(Microcontroller)- processes sensor data and controls other components.
Ultrasonic sensors - detects the dust thrown on to the lid of dustbin.
IR sensor - detects the level of waste inside the bin.
Servomotor - operates the lid mechanism.
Buzzer/LED - indicates when the bin is full.
Power supply - a external source like battery or adapter to provide necessary voltage.

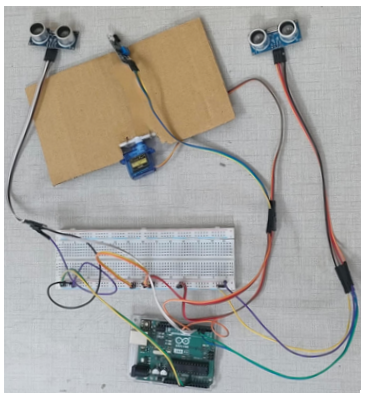

Fig1 - Components used

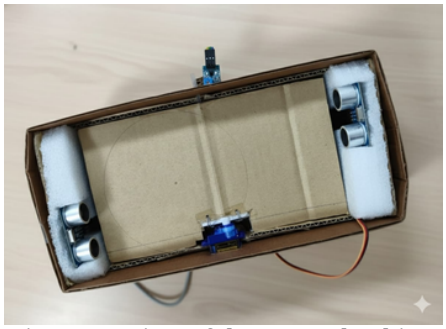

Fig2 - Top view of the smart dustbin,

(length of the lid is 17cm in the case of prototype. Ultrasonic sensors range of detection is set up-to 17cm and the servo motor is rotated to 50 degrees when dust is thrown.)

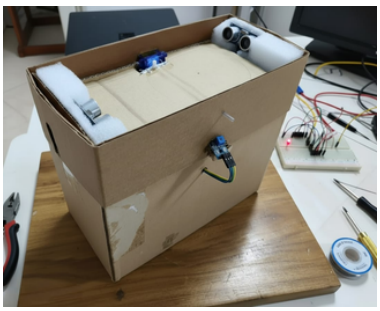

Fig3 - Front view of smart dustbin

Advantages:

- Promotes hygiene and automation.
- Reduces manual waste monitoring.
- Low power consumption and cost-effective.

Applications:

- Can be effectively used in smart cities, hospitals, schools, and residential areas.

Limitations:

- Detection ability of ultrasonic sensors is limited and affected by the environmental factors.
- Lacks inbuilt wi-fi, bluetooth connectivity.

Future Enhancements:

- Ultrasonic sensor is replaced with time of flight sensor for more reliability and robustness.
- Integration of solar sticker/wafer on the lid of the dustbin can make the system independent of external power source.
- Replacing Arduino UNO with ESP32 microcontroller enables IoT-based waste management and alerts can be sent via wi-fi /Bluetooth to a smartphone or control center.
- Can be used for waste segregation by modifying the lid operation and adding an internal partition to separate different types of waste.

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EVOLUTION OF MICROCONTROLLERS: FROM 8051 TO ESP32

A Journey from Simplicity to Smart Connectivity

Microcontrollers power everything from washing machines to drones, making devices intelligent and responsive. Over time, they have evolved from simple 8-bit chips to Wi-Fi-enabled processors. This article traces the journey from Intel's 8051 to the modern ESP32, showcasing key milestones in embedded technology

THE BEGINNING – 8051 MICROCONTROLLER

Introduced by Intel in 1980, the 8051 became one of the most influential microcontrollers ever made.

Features:

· 8-bit architecture

· 4 KB ROM, 128 bytes RAM

· 32 I/O lines, two 16-bit timers

Despite its limits, the 8051's simplicity and reliability made it ideal for education, industrial control, and automation

THE TRANSITION – 8-BIT TO 32-BIT ERA

As systems demanded more speed and memory, microcontrollers advanced. The PIC and AVR series added faster processing, flash memory, and built-in peripherals like ADCs and PWM outputs.

The arrival of ARM Cortex-M microcontrollers was a major leap — offering 32-bit performance, low power use, and real-time control. These chips became standard in consumer electronics, and automotive systems.

Developed by Espressif Systems, the ESP32 combines computing power with wireless connectivity.

Highlights:

- Dual-core 32-bit Xtensa CPU.
- Built-in Wi-Fi and Bluetooth.
- 520 KB SRAM, up to 16 MB Flash.
- Ultra-low-power modes for IoT.

Its open-source SDK, Arduino support, and affordability made it popular for IoT and wearable tech.

From the 8051 to ESP32, microcontrollers have grown from basic controllers to intelligent, connected systems. The 8051 built the foundation of embedded learning, while the ESP32 brings IoT, AI, and cloud capability into one chip — reflecting a world that's faster, smarter, and more connected.

Written by

B. M. Bala Shankar

II B.Tech

Ultra-Fast EV Charging Stations: Powering the Future of Electric Mobility

Introduction

The rapid transition from internal combustion engine (ICE) vehicles to electric vehicles is driven by environmental concerns, fuel cost reductions, and government policies promoting clean mobility. However, the convenience gap between "refueling a petrol vehicle in minutes" and "charging an EV for hours" remains a major obstacle.

Ultra-fast EV charging stations (also known as high-power or ultra-rapid chargers) offer a solution by reducing charging time to minutes while enabling long-distance travel and large-scale EV deployment.

What Are Ultra-Fast EV Charging Stations?

Ultra-fast chargers are advanced DC charging systems that deliver 150 kW to 350 kW and even up to 500 kW of power. These chargers directly supply high-voltage DC power to the EV battery, bypassing the vehicle's onboard AC charger.

Modern EVs designed with 800–1000 V battery architecture can utilize this high input power to charge rapidly and efficiently.

Conclusion

Ultra-fast EV charging stations are a cornerstone of the future electric mobility ecosystem. By drastically reducing charging time and supporting large-scale EV deployment, they enable a smoother transition from fossil-fuel-based transport to clean, efficient mobility. While challenges like high cost, grid demand, and standardization exist, technological advancements and strategic investments will make ultra-fast charging a widespread reality.

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PHOTOGRAPHY

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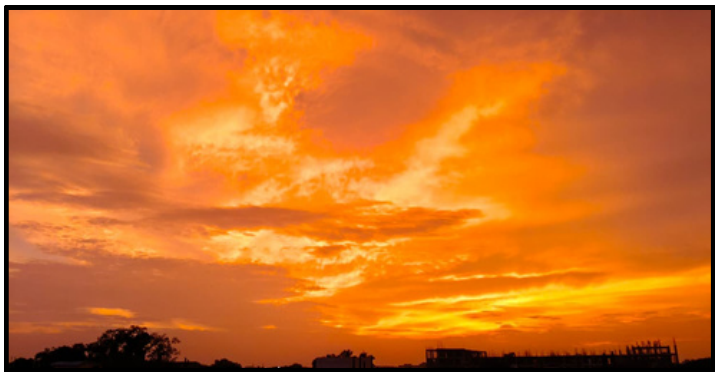

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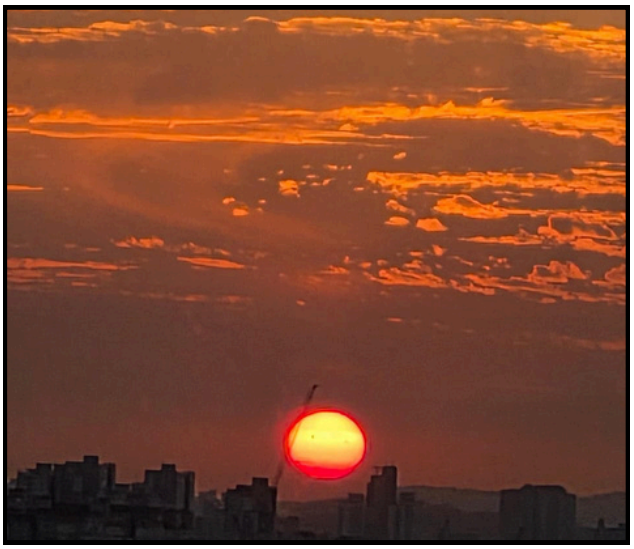

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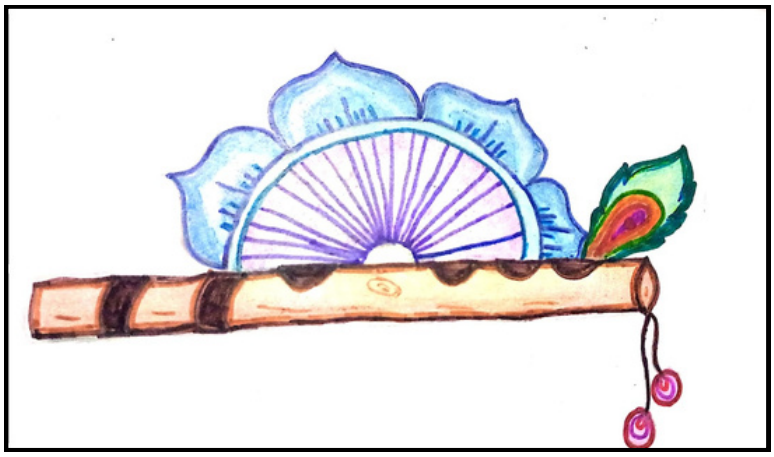

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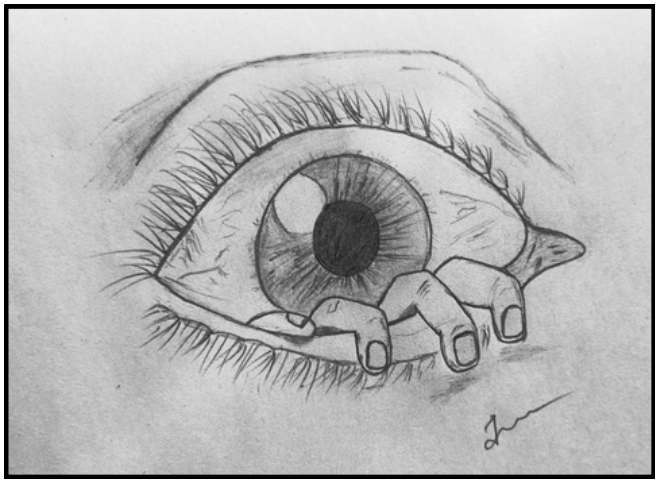

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