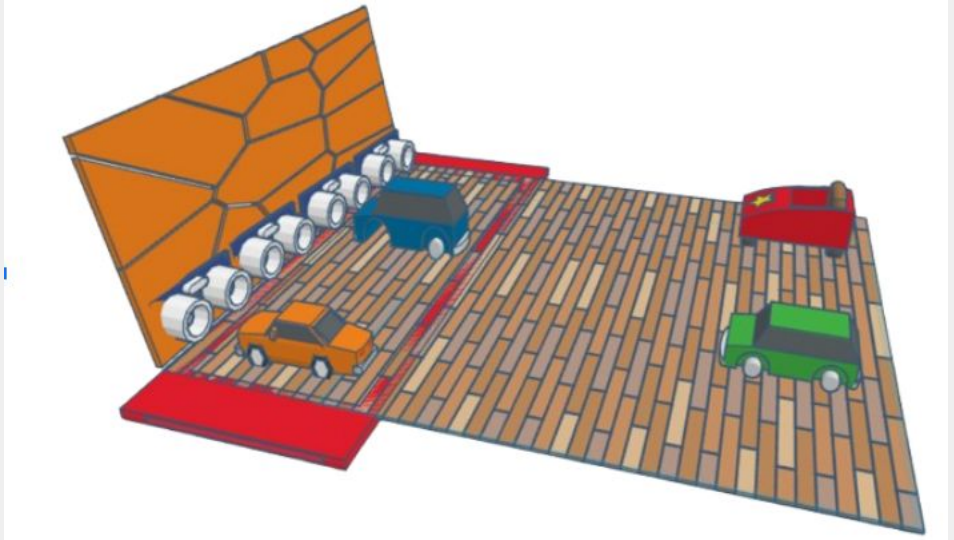
Smart Campus Parking System

An approach to solve: Limited parking space and inefficient parking management on campus.



Team Members

Naman Mulani - 21CSB0B38

Harshit Gupta - 21CSB0B21

Upre Ashish Kumar - 21CSB0B62

Supervised by :

Prof. Shiva Darshan S L

Internet of Things [CS-451]

Course Assignment

Objectives

- Develop a Smart Campus Parking System to efficiently monitor parking space occupancy.
- Utilize ultrasonic sensors to accurately detect the availability of parking spots.

- Transmit real-time parking data to a central system for seamless monitoring.
- Enhance the parking experience by providing an easy and efficient way to locate available spots.

Approach

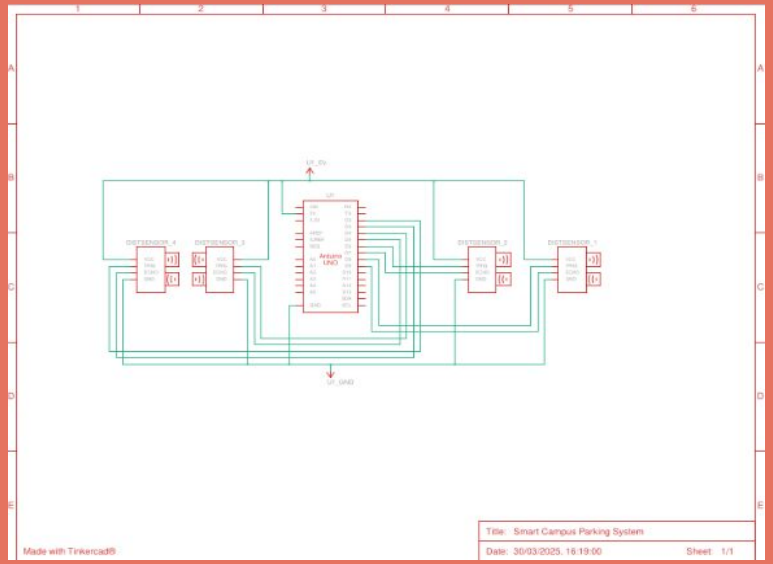
- The development of the smart parking system followed a structured approach, integrating both hardware and software components to ensure accurate vehicle detection, real-time data transmission, user-friendly and authenticated display of data.

The following is the step by step flow we have taken:

- 3D modelling
- Simulation in TinkerCAD and Wokwi
- Initial testing
- Integration with ThingSpeak
- Firebase integration and Matlab analysis
- Testing and results

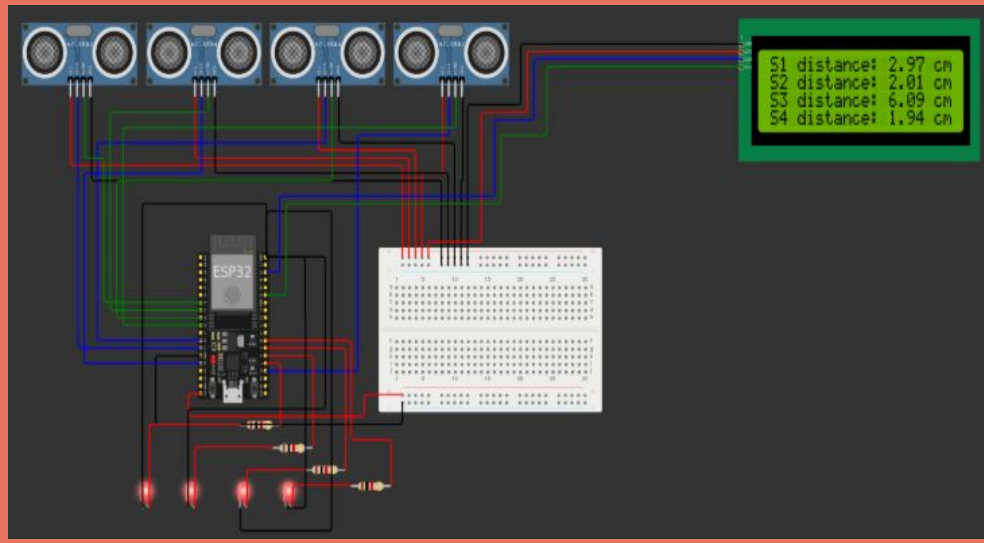
- We have used ESP32 along with ultrasonic sensors at each parking space to detect occupancy, because of WiFi capabilities of ESP32, the data can be sent to cloud such as cloudDB, ThingSpeak etc..

Design



Circuit Components Used:

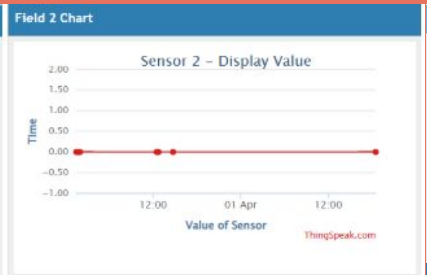
- Microcontroller: ESP8266/ESP32
- Ultrasonic Sensors (HC-SR04): Used to detect the presence of vehicles in each parking slot.
- LED Indicators: Used to indicate parking availability.
- LED Screen: Wi-Fi Module (ESP8266): To send real-time data to cloud platforms.

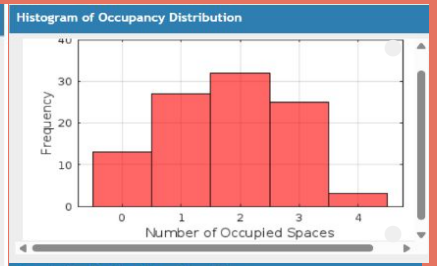


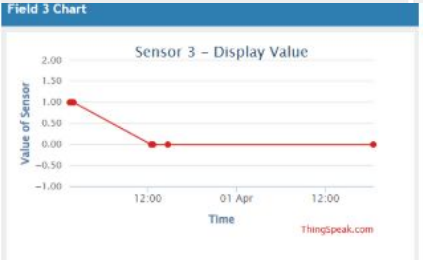
Software Components Used:

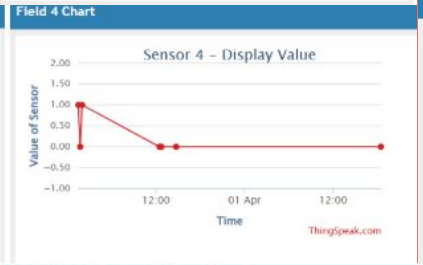
- Wokwi – Circuit simulation
- Firebase – Dashboard integration
- ThingSpeak – Data logging
- MATLAB – Analytics

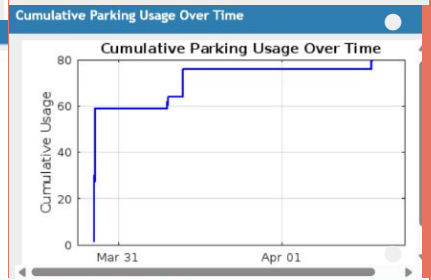
Results

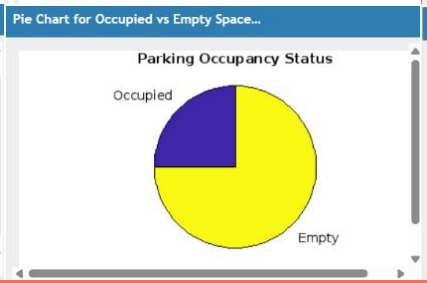


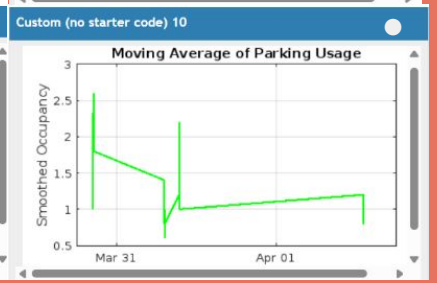












Sensor Data Accuracy: Ultrasonic sensors recorded the distance with an average accuracy of 99.9%.

Data Transmission Delay: The time taken for data to be uploaded to ThinkSpeak and Firebase was approximately 0.2-0.5 seconds.

Alert System Response Time: The system successfully triggered alerts within 0.8 seconds of detecting a full parking lot and within 0.3 seconds of notifying a user about the available parking spot.