Smart Parking
Internet Of Things
Phase_5

Project Overview:

The Smart Parking System is an IoT-based project designed to address the challenges associated with parking in urban areas. This project aims to improve parking management, enhance the user experience, and optimise parking space utilisation by providing real-time information about parking space availability to drivers. This system leverages a combination of hardware and software components to achieve its objectives.

Project Objectives:

- This Provide drivers with real-time information about available parking spaces.
- This Helps drivers to find parking spaces more quickly and easily. This will be done by providing real-time information about parking availability, as well as guidance to available spaces.
- Reducing traffic congestion. By helping drivers to find parking spaces more quickly and easily, smart parking systems will reduce the amount of time that drivers spend circling around looking for parking. This will lead to reduced traffic congestion and emissions.
- Improvement parking management. Smart parking systems provide parking operators with real-time data about parking occupancy and usage. This data will be used to improve parking management decisions.
- Increasing revenue. Smart parking systems can help parking operators to increase revenue by providing drivers with more convenient and efficient parking options. For example, drivers are willing to pay more for parking if they can reserve a space in advance or pay for parking with their mobile phone.

IoT sensor setup:

● Sensor Introduction:

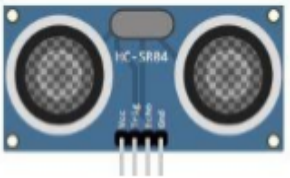
This is a simple implementation of a sensor data collection system using Raspberry Pi Pico. It utilises ultrasonic sensors to send the occupancy data to a cloud server. This project can be extended for applications such as parking management, occupancy detection, and more.

● Working Principle:

The code sets up three ultrasonic sensors, each consisting of a trigger pin and an echo pin, connected to the Raspberry Pi Pico. By emitting ultrasonic waves and measuring the time taken for the waves to bounce back, the sensors determine the distances of nearby objects. If the measured distance is less than a predefined threshold, it is considered as occupancy. The script then sends this occupancy data to a cloud server using the Wi-Fi module, allowing real-time monitoring and analysis of the sensor data for various applications

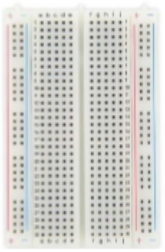
Components :

- HC-SR04 Ultrasonic Distance Sensor



- Raspberry Pi Pico

- Mini BreadBoard



ESP32

- Jumper wires

PIN Connection :

For the first sensor:

- **VCC Pin**: Connect to the 5V pin on the Raspberry Pi Pico (usually labelled as VBUS or VSYS).
- **GND Pin**: Connect to any of the ground pins on the Raspberry Pi Pico (labelled as GND).
- **Trigger pin**: Connect to Pin 0 (GP0) on the Raspberry Pi Pico.
- **Echo pin**: Connect to Pin 1 (GP1) on the Raspberry Pi Pico.

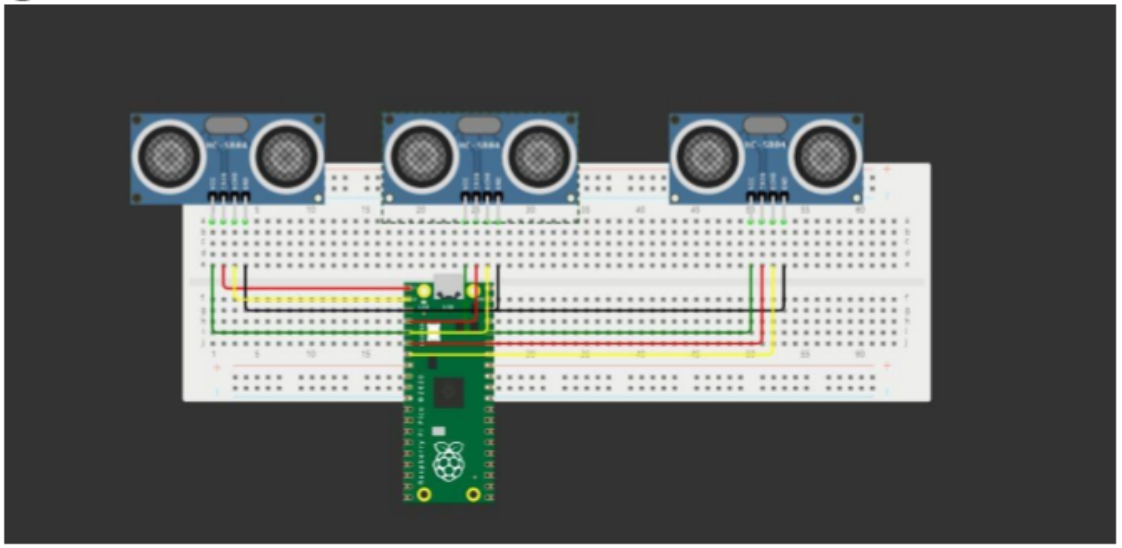
For the second sensor:

- **VCC Pin**: Connect to the 5V pin on the Raspberry Pi Pico.
- **GND Pin**: Connect to any of the ground pins on the Raspberry Pi Pico.
- **Trigger pin**: Connect to Pin 2 (GP2) on the Raspberry Pi Pico.
- **Echo pin**: Connect to Pin 3 (GP3) on the Raspberry Pi Pico.

For the third sensor:

- **VCC Pin**: Connect to the 5V pin on the Raspberry Pi Pico.
- **GND Pin**: Connect to any of the ground pins on the Raspberry Pi Pico.
- **Trigger pin**: Connect to Pin 4 (GP4) on the Raspberry Pi Pico.
- **Echo pin**: Connect to Pin 5 (GP5) on the Raspberry Pi Pico.

Diagram :



Steps involved:

IoT sensor setup in a smart parking project involves deploying sensors to detect the occupancy status of parking spaces. Here's a brief overview of the process:

- **Sensor Selection**: Suitable IoT sensors is chosen for detecting parking space occupancy. Common options include ultrasonic sensors, magnetic sensors, infrared sensors, or cameras.

- **Sensor Placement**: The selected sensors are installed in individual parking spaces, ensuring they are positioned to accurately detect the presence or absence of vehicles.

- **Wiring and Power**: The sensor is connected to a power source and, if necessary, to a communication module. Depending on the sensor type, this involves wiring the sensors to a central control unit or power source.

- **Communication Module**: If the sensors are not directly connected to the central control unit (e.g., a Raspberry Pi), Communication modules(e.g., Wi-Fi, LoRa, or Zigbee) are used to relay sensor data to the central system.

- **Calibration**: The sensors are Calibrated to ensure they provide accurate data. This will involve adjusting sensitivity settings or fine-tuning sensor parameters.

- **Testing**: The sensors are tested to confirm that they reliably detect vehicle presence and absence. Check for any false positives or false negatives and make necessary adjustments.

- **Data Transmission**: Ensure that sensor data is transmitted to the central control unit or gateway in a consistent and timely manner.

The IoT sensor setup is a critical component of a smart parking system, as it provides real-time data on parking space availability. Accurate and reliable sensors are essential for the successful operation of the system, allowing users to access up-to-date parking information via a mobile app or other interfaces.