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SMART PARKING SYSTEM USING IOT

[1]Dharbale Aaryan Bhivsen , [2]Salmuthe Sumit Vishnu , [3]Naik Ayush Prashant , [4]Nanavare Bhushan Gangadhar, [5]Shaikh .S.F

[1]UG Scholar, Dept. of Computer Engineering, SND Polytechnic,, Yeola
[2]UG Scholar, Dept. Computer Engineering, SND Polytechnic,, Yeola
[3]UG Scholar, Dept. of Computer Engineering, SND Polytechnic,, Yeola
[4]UG Scholar, Dept. of Computer Engineering, SND Polytechnic,, Yeola

ABSTRACT- Finding available parking spots in crowded urban areas is a significant challenge for drivers. This problem can lead to increased traffic congestion, air pollution, and time wastage. To address this issue, we propose a smart parking system that utilizes IoT technology to provide drivers with real-time information about available parking spaces. Our system includes sensors that detect parked cars by measuring the distance to the nearest obstacle. The sensor data is stored in AWS IoT shadow, which can be easily configured to represent free, occupied, or dirty parking spaces. Using a mobile app, drivers can access real-time parking availability information and reserve a parking spot if available. The app also helps drivers navigate to the suggested parking Use the app to find a spot and pay for parking.Our approach decreases the time and effort needed to find parkin g and also contributes to lowering noise, air, and traffic pollution.The design, installation, and evaluation of our smart parking system are discussed in this paper, with an emphasis on the advantages it offers for effective and environmentally friendly parking management.

Index Terms- smart parking, IoT, parking management, sensors, real-time information, mobile app, parking availability, reservation, navigation, payment, traffic congestion, air pollution, sustainable solution.

I. INTRODUCTION

Finding available parking spaces in crowded urban areas is a persistent problem that causes significant inconvenience, time wastage, and environmental issues. The conventional parking system relies on manual searching for available parking spots, leading to inefficient and unsustainable parking management. To address this problem, we propose a smart parking system that utilizes IoT technology to provide drivers with real-time information about available parking spaces.

The proposed system includes sensors that detect parked cars by measuring the distance to the nearest obstacle. The sensor data is stored in AWS IoT shadow, which can be easily configured to represent free, occupied, or dirty parking spaces. A mobile app is used to access real-time parking availability information and reserve a parking spot if available. The app also helps drivers navigate to the suggested parking space and pay for parking using the app.

Through the reduction of traffic congestion, air pollution, and noise pollution, our suggested smart parking syste m provides a long-term solution to the parking issue.

Additionally, it supports effective parking management and saves drivers time and effort when looking for a par

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king space. This article details the planning, execution, and evaluation of our smart parking system, highlighting its benefits for efficient and sustainable parking management. The paper is structured as follows: Section 2 discusses the related work in smart parking systems, Section 3 describes the proposed system design, Section 4 presents the system implementation details, Section 5 presents the experimental results, and Section 6 concludes the paper with a summary of the contributions and future directions.

II. II. PROPOSED SMART PARKING SYSTEM

Our proposed smart parking system is designed to provide an efficient and user-friendly parking experience for drivers while also promoting sustainable parking management. The system is based on Raspberry Pi controllers, IR sensors, and a web application built using the Django framework.

2.1 Parking Sensors

The parking sensors are IR sensors that are placed at each parking spot to detect the presence of a vehicle. The IR sensor emits infrared radiation, which reflects off the surface of the vehicle and is detected by the sensor. The sensor then sends a signal to the Raspberry Pi controller, indicating whether the parking spot is occupied or not.

The Raspberry Pi controllers are responsible for processing the data received from the sensors and sending it to the web application for real-time monitoring and analysis.

2.2 Web Application

The web application is built using the Django framework and is responsible for processing the data received from the Raspberry Pi controllers and providing real-time parking information to drivers. The application uses a database to store the parking data, including the occupancy status of each parking spot.

The application provides a user-friendly interface for drivers to view the availability of parking spots near their location and reserve a spot if available. The application also provides real-time parking utilization data to parking operators, allowing them to optimize parking management and reduce congestion.

2.3 Raspberry Pi Controller

The Raspberry Pi controller is a low-cost, credit-card-sized computer that is used to control the parking sensors and process the data received from them. The controller is equipped with Wi-Fi connectivity, allowing it to transmit data to the web application in real-time.

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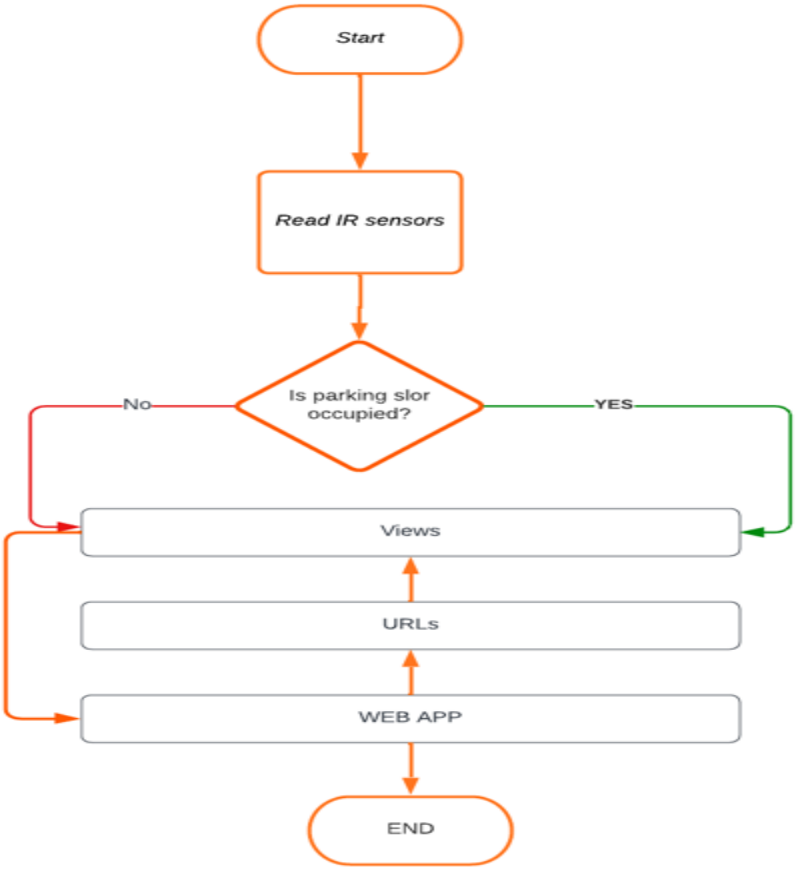
The Raspberry Pi controller also runs a program that communicates with the web application and sends the occupancy status of each parking spot to the database. The program can be configured to send alerts to parking operators when a parking spot becomes vacant or occupied.

Our proposed smart parking system offers several benefits, including reduced search time for parking, reduced traffic congestion, improved parking management efficiency, and reduced carbon emissions. The system also promotes efficient and sustainable parking management by providing real-time parking utilization data to parking operators and encouraging drivers to use alternative modes of transportation when parking is limited.

III. WORKING OF THE SMART PARKING SYSTEM



The smart parking system works in the following steps:

Step 1: Parking Sensors detect Vehicle Presence

The IR sensors placed at each parking spot detect the presence of a vehicle by emitting infrared radiation that is reflected off the surface of the vehicle. The sensor then sends a signal to the Raspberry Pi controller, indicating whether the parking spot is occupied or not.

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Step 2: Raspberry Pi Controller Processes Sensor Data

The Raspberry Pi controller receives the data from the parking sensors and processes it. The controller is programmed to communicate with the web application and send the occupancy status of each parking spot to the database.

Step 3: Web Application Displays Real-time Parking Data

The web application displays real-time parking data to drivers, indicating the availability of parking spots near their location. The application uses a database to store the parking data, including the occupancy status of each parking spot.

Step 4: Parking Operator Monitors Parking Utilization

The web application provides real-time parking utilization data to parking operators, allowing them to optimize parking management and reduce congestion. The application also sends alerts to parking operators when a parking spot becomes vacant or occupied.

The smart parking system is a user-friendly and efficient solution for parking management. It reduces search time for parking, reduces traffic congestion, and promotes efficient and sustainable parking management. The system is based on Raspberry Pi controllers, IR sensors, and a web application built using the Django framework.

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IV. SYTEM DESIGN

The Smart Parking System comprises three main components: parking sensors, Raspberry Pi controller, and web application. The architecture of the system is shown below:

Parking Sensors <--> Raspberry Pi Controller <--> Web Application (Database, Server, User Interface)

Parking Sensors

The parking sensors are used to detect the presence of a vehicle in a parking spot. The sensors use infrared radiation to detect the vehicle's presence and send a signal to the Raspberry Pi controller, indicating whether the parking spot is occupied or not.

Raspberry Pi Controller

The Raspberry Pi controller processes the data received from the parking sensors and sends it to the web application. The controller is also responsible for controlling the sensors and communicating with the web application.

Web Application

The web application is built using the Django framework and is responsible for displaying real-time parking data to drivers and allowing them to reserve parking spots. The application also provides real-time parking utilization data to parking operators and allows drivers to pay for parking spots using the app.

The web application comprises three main components:

Database

The database is used to store the parking data, including the occupancy status of each parking spot. The database is responsible for storing and retrieving data related to parking spots, reservations, and payments.

Server

The server is responsible for handling requests from drivers and parking operators and communicating with the database. The server uses the Django framework to handle HTTP requests and return appropriate responses.

User Interface

The user interface is responsible for displaying real-time parking data to drivers and allowing them to reserve parking spots. The interface is designed to be user-friendly and easy to use. Drivers can search for available parking spots near their location and reserve them for a specific time period.

In summary, the Smart Parking System comprises parking sensors, Raspberry Pi controller, and web application. The system architecture is designed to be user-friendly, efficient, and sustainable. The system can

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reduce search time for parking, reduce traffic congestion, and promote efficient and sustainable parking management.

V. CONCLUSION

In conclusion, the Smart Parking System is a revolutionary technology that aims to make parking easier, faster, and more efficient. By using advanced sensors, controllers, and software, the system can accurately detect available parking spots and provide real-time information to drivers via a mobile app or web interface. This technology has several benefits, including reduced traffic congestion, cost-effectiveness, environmental sustainability, increased security, and user-friendliness.Moreover, this project utilized IR sensors and Raspberry Pi controllers and Django framework were used to create the web app and to detect the presence of automobiles in parking spaces.The implementation of this effectively illustrated how costeffective and widely accessible tec hnologies can be used to provide smart parking.It is anticipated that the Smart Parking System will gain more ac ceptance and become a critical component of the parking infrastructure of the future.