SMART PARKING SYSTEM USING IOT

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Abstract-The SMART PARKING SYSTEM using IoT is a project aimed at reducing traffic congestion in high-density areas such as roads, skyscrapers, and shopping malls by addressing the issue of limited parking spaces. The system will display the nearest available parking spot in relation to the user's location, with the goal of optimizing parking space utilization by tracking free spaces and assigning them to users. The use of an intelligent parking system like this one results in a reliable, safe, and efficient management system.

Smart cities have been made possible by the advancement of the Internet of Things (IoT), which aims to optimize the efficiency and dependability of city infrastructure. IoT technology holds promise for addressing issues such as traffic congestion, insufficient parking, and road safety. An IoT-based smart parking system is suggested, using sensors to track and notify users of parking spot availability, and a mobile app to enable users to check and reserve parking spaces. The system's structure is described, and examples are given to demonstrate its effectiveness.

I.   INTRODUCTION

The SMART PARKING SYSTEM using IoT is a project that aims to reduce traffic congestion caused by limited parking spaces in high-density areas like roads, skyscrapers, and shopping malls.The project utilizes IoT to display the nearest empty parking spot relative to the user's location, withthe goal of maximizing parking space utilization. The system tracks free parking spaces in parking lots and assigns them to users, resulting in an error-free, reliable, safe, and fast management system.

The productivity and reliability of urban infrastructure has been enhanced by the development of IoT, resulting in the realization of smart cities. IoT has the potential to resolve issues related to traffic congestion, insufficient parking, and road safety. The proposed smart parking system utilizes on-site IoT modules to keep track of and inform users about available individual parking spaces.
Additionally, a mobile application is offered to end-users, allowing them to verify availability andbook parking spots. The system's architecture is clarified, and various use cases are provided to showcase the proposed model's efficacy.

II. LITERATURE REVIEW

Dr. Madhavi, Naveen Kardula et., al [1] "Smart Parking with IoT" Discuss the use of Firebase Realtime Database to manage parking data. Certainly! The data in this database is stored in JSON format and is synchronized with connected clients in real-time as it is cloud-hosted. When changes occur in the database, all clients receive updates with the latest data, reducing the load on the database server and minimizing network traffic. The database is used to send parking data to clients when parking changes occur on the website, and it adds slot reservation functionality to location-based systems. Drivers can reserve available slots that implement these functions with their agreement. Overall, this results in a more reliable and consistent parking management system.

Bike. C, Aram. Z, Pieri. G et al. [2] "Smart Parking Systems" Smart parking research mainly concentrates on technical aspects such as system architecture, design, operating algorithms, models, and prototype design. Electric vehicles (EVs) introduce an additional parameter to consider, as the speed at which they leave the parking space affects their charge balance.
Self-driving cars also change the way vehicles are used and exit parking lots through their auto-abandon feature. Parking operators have historically leveraged integrated services to increase revenue streams with smart parking systems, which tackle the issue of limited parking spaces resulting from urbanization.

Diana Laura Gomez-Ruiz, Daphne Espejel Garcia et., al [3] "Implementation of an available parking space detection system in a congested parking lot." The study aimed to create a prototype space detection system for a specific area with reserved parking spaces. The system allowed users to easily find available parking spaces and make quick decisions, thus reducing the stress of searching for parking. However, the study did not evaluate the impact of changes in ambient lighting on the imaging process, as the prototypes could potentially collide and cause problems, particularly during night shifts.

Zexin Yang, Xueliang Huang et al. [4] ``Real-time energy management strategies for parking lots considering maximum penetration of electric vehicles". There have been suggestions for grouping techniques that consider certain energy properties to enable smart charging strategies that use G2V and V2G charging technology to maximize EV usage in parking lots without requiring changes to the power distribution network infrastructure. Among the proposed charging cost strategies, this paper's strategy is the most cost-effective, and it achieves the highest possible EV penetration.

Awais Abdul Khaliq, Adeel Anjum, et al. [5] "Safe and secure parking recommendation system using elliptic curve cryptography and local differential privacy" To create a reliable and efficient parking system, the Smart His Parking App is designed as a network, with a threat framework in place to safeguard user privacy by preventing attackers from identifying users through their park ID or reputation score. The app processes user requests and suggests available parking spaces, taking into account factors such as traffic conditions, nearby parking options, and user experience. However, the inability to access certain services presents a challenge for smart parking applications to assess all pertinent factors accurately, limiting the app's ability to provide accurate parking recommendations to users.

Muhamad Muzhafar Abd kadir, Mohad Nizam Osman Nor, et al. [6] "IoT -based parking management system using IR sensors". A prototype of an IoT-based car parking management system that utilizes IR sensors to detect the availability of parking slots and display the information on an LCD display has been developed. The system architecture includes IR sensors, Node MCU, a web server to store the database, and an LCD display. The IR sensors are used to determine the presence or absence of cars in the parking slots and determine the availability status of the parking slot. However, the system does not include a mobile application system that could assist in navigation and parking slot reservation through a mobile app.

Ms.Megha Dhegde, Geetanjali Bishtanavan [7] "Review of papers on smart parking systems". This system follows the FIFO (First-In-First-Out) method of parking allocation, which assigns parking spaces to users based on the order of their requests. Users reserve a parking slot by entering their information and selecting a slot, which is then reserved for them. The system uses RFID sensors to detect the presence of vehicles and other objects. Using a mobile application connected to the cloud, users can pre-book parking slots. An alarm will be triggered if the user fails to occupy the reserved slot within the stipulated time. The system can detect parking spaces in nearby locations only and does not utilize GPS sensors to search for parking slots from a distance. Once a parking space is assigned to a user, it cannot be assigned to another user.

Mirchandari et., al [8] "Smart Parking System Using IoT Technology" One method for smart parking utilizes camera modules to detect vehicles and identify available parking spaces.
However, this approach comes at a higher cost. The parking system was designed to benefit society by helping tourists find the closest available parking spaces in multiple parks. The use of cameras increases the overall project cost, but it was developed to provide an easy way for users to check parking space availability, as only a

few parking systems are capable of displaying which spaces are available in specific areas.

Rachana Yeravelli, Chand ulal Tejavauth et., al [9] "Smart Parking System Using IoT" The system incorporates IR sensors to detect parking space availability and is accessible through a mobile application. The categories and features of intelligent parking systems areelaborated upon in detail, accompanied by an overview of the most recent developments in parking infrastructure. The system is intended to assist tourists in locating nearby parks and available parking spaces. Users may pre-book their parking spots, and the parking fee is calculated based on the duration of parking and shown on the screen. Online payment options in the future could enhance the system's efficiency and intelligence even further.

Elakya R, Juhi Seth, Pola Ashritha et., al [10] "Smart Parking System Using IoT" The data transmitted by certain devices is extracted to provide relevant information, which is then sent to an Arduino device to issue simultaneous command instructions to specific devices. The Arduinodevice directs the servo motor, as well as a GSM module that delivers instructions and alerts to the user upon their arrival in the parking area. To ensure the user's identity, the radar module scans the RFID card assigned to the registered user. Additionally, users can remotely reserve parking spaces, and reservation facilities and license plate scanners can be incorporated.

III. METHODOLOGY

The creation of a smart parking system involves the utilization of various components, such as an Arduino UNO R3 board, IR sensors, servo motors, and an LCD display. The central control unit of the system is the Arduino microcontroller, while the IR sensors are responsible for detecting vehicles atthe entrance and exit barriers, as well as available parking spaces. At the entrance gate, a servo motor controls the opening and closing mechanism, while an LCD display informs users of available parking spaces. The ultimate objective of this project is to provide users with the number of available parking spaces to minimize the time and fuel consumed during the search for a spot. The display also shows the start and end times of the parking session, enabling users to keep track of their vehicle.
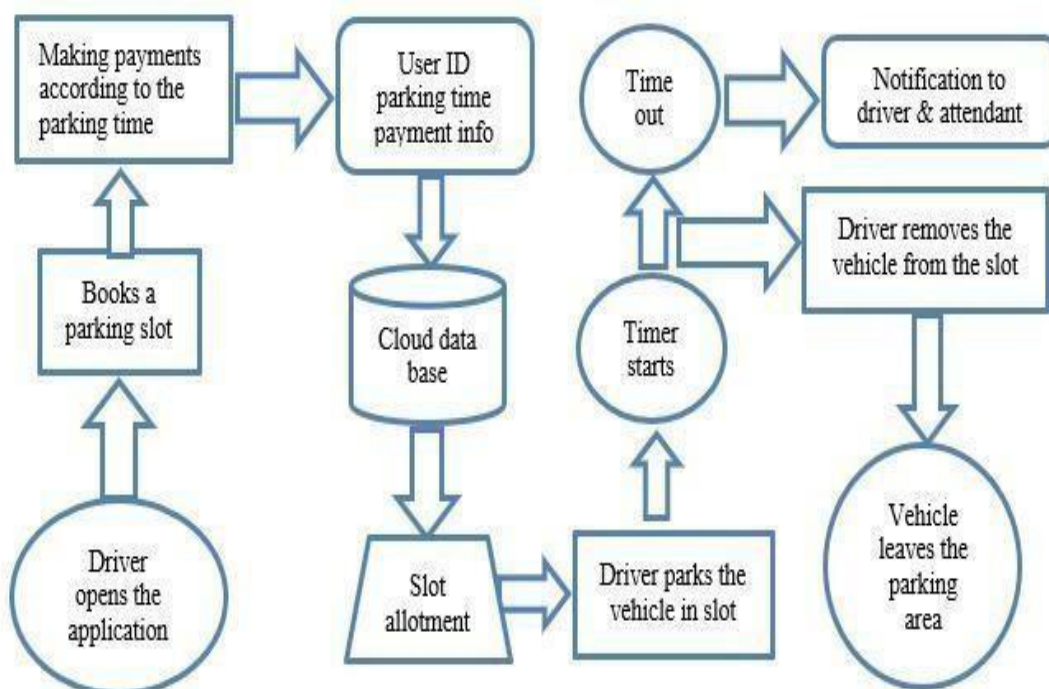
IV. CONCLUSION

The concept of smart cities has been a long-standing goal for humanity, and recent advancements in technology have brought this vision closer to reality. The advent of the Internet of Things and cloud computing has opened up new avenues for smart cities to develop. In particular, the implementation ofsmart parking systems and traffic management solutions are crucial components in building smart cities. This project focuses on smart parking by introducing an IoT-based system that leverages cloud technology to provide real-time information on parking availability. Remote users can reserve parkingspaces via a mobile application. The ultimate goal of this project is to enhance the parking infrastructure in cities, resulting in improved quality of life for their inhabitants.

V. REFERENCES

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