

SMART CAR PARKING SYSTEM

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Abstract- Growing population in metro cities is leading to huge vehicle density; the problems for car parking have become an unending question. To avoid roadside parking and associated traffic problems centralized car parking systems are established. In this paper a centralized system is demonstrated, where in car driver is directed to select the closest traffic free path to reach the parkings lot identifying the free slots. Conventional parking systems do not have any intelligent monitoring arrangement; causing wastage of time to find the slot and traffic on the way to park. Conditions are worse when there are multiple lanes and multiple parking slots. Fully automated parking systems are expensive. The availability of a driver can be utilized but he/she should be directed to select a route in such a way that no traffic congestion results and parking/retrieval of car results in minimum time. Use of semi-automated system presented in this paper can reduce the human efforts

Keywords- smart parking, IoT, OCR

I. INTRODUCTION

The aim of the project named "smart parking system" is to reduce traffic congestion in roads, multi-story buildings, and malls caused by a lack of parking spaces. The system shows the nearest available parking slot to the user based on their location, there by efficiently utilizing parking spaces. The system tracks vacant slots and assigns them to users. The smart parking system is designed to be error-free, reliable, secure, and fast. The concept of smart cities has gained popularity in recent times, and with the help of the Internet of Things (IoT), it seems achievable. IoT is being utilized to address problems such as traffic congestion, limited car parking facilities, and road safety.

The proposed system consists of an IoT module that is deployed on-site to monitor and signalize the availability of each parking space. Additionally, a mobile application is provided to allow end-users to check availability and book parking slots. The paper also provides a high-level view of the system architecture and a use case that proves the system's correctness.

II. LITERATUREREVIEW

Parking system based on Internet-of-Things (IoT) technology for smart cities to find the available parking spaces, thereby the proposed system operates robustness, and effectiveness of the proposed system are located at different parking spaces, along with encrypting the database on the Data Encryption Standard (DES) analytics along with monitoring the statuses of the parking spaces and reporting the availability of the parking spaces for reservation and parking to the car-users.[1]

Now a day's smart cities have been proposed with smart parking system for maintaining the traffic of vehicles.

In the proposed IOT based Cloud integrated smart parking system. Time information of parking is shared with the user using users.[2]

Identification of available parking slots to possibly reduce the congestion in parking arena. Automatic parking systems facilitate the drivers to locate available spaces at parking arena. Focus on allocation specific location to customers already registered from online parking management system.[3]

Project specializes in automated slot searching for large parking zone. They determine the good the usage of vehicle parking place location utilizing the web The framework edges of reasonable stopping framework that formulate on the manner side avoiding obstruction. Developing this technique inside a town solves the pollution downside.[4].

The allotment of the parking slot by an autonomous searching method makes the parking of vehicles at public The searching and allotment of parking the microcontroller, makes the path-tracing for the vehicle, to the proposed system makes efforts required for parking of vehicle at public places like proposed design would provide an efficient car parking system

By using an efficient searching method, supported by the efficient functioning of the GSM Module, RF Module and the microcontroller.[5].

Development of smart parking management system using the internet of things: smart car parking system developed to manage parking and solve problems efficiently using the technology and apply technical solutions to improve the smart cities concept. The proposed system essential services to users including searching for parking, reservations and payment .The system connected to sensors to detect occupancy and automatic number plate recognition CANPRI camera to control access.[6]Real time car parking system using image processing:

In this paper methodology consisting of image acquisition, RGB to gray conversion, image enhancement and image matching using edge detection.[7]

Intelligent parking space detection system based on image processing: This paper consisted of five modules such as system initialization, image acquisition, image segmentation, image detection, and image enhancement.[8]

Integration of RFID and WSN technologies in a smart parking system: In this paper the system consists of WSNs, SG (smart

gateway), CS (central server), parking app for drivers and policemen app for traffic cops.[9]

A smart parking system based on smart phones embedded sensors and short-range communication technologies: In this paper consisting of main components of the system are parking event detection, parking data repository, parking data dissemination and parking data fusion.[10]

Woojaekim and inbumjung proposed Smart Parking Lot Based on Edge Cluster Computing for Full Self-Driving Vehicles that gives a novel solution to the self-driving vehicles with edge cluster computing. The system uses a smart parking technology with fixed edges and mobile edge vehicles and it also uses gridmap for parking lot management[11]

Deni Kristin Manase,Zahir Zainuddin, Syafruddin Syarif and Arsan Kumala Jaya proposed the paper Detection in Roadside Parking for Smart Parking System Based on Image Processing. This study aims to detect vehicles that are on the availability of parking spaces.

Haar Cascade Classifier, andYOLOv3thencomparedthemtogetthebestaccuracyindetectingparkedcars.Obtainedinthisstudywas96.88%usingYOLOv3, the accuracy obtained by using the Haar Cascade Classifier is63.34%. [12]

DesignandImplementationofaSmartParkingManagementSystemforSmartCitiesbySiou-HongLiou, Yun-ChinHsieh,andCheng-YuanChangproposedasystemhavingseveralappealingfeaturesusingtheimageprocessingtechniques,Arduinoboardhardwareandelectricalapparatuses.[13]

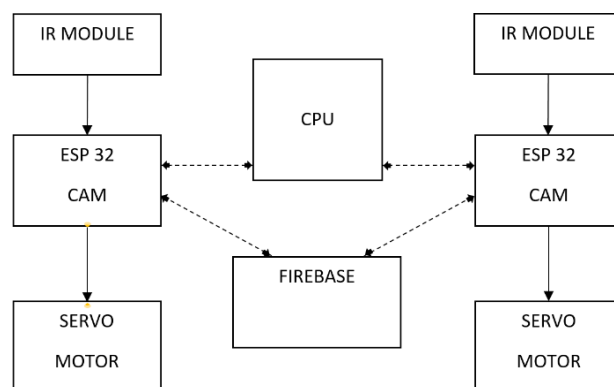
Smart Distributed Parking System using Internet of Things by G.J.Leelipushpam Paulraj, I.Johnraja Jebadurai, P.

F. Khan, N. Sumanth and K. V. Reddy proposed an idea as a solution of many parking problem the paper suggest an idea that the user or driver gets the real time parking space availability and details in the mobile application.[14]

A secure and intelligent parking system assure better Privacy and efficiency with a framework NOTICE ;asecure and privacy aware that provides notification of traffic incidents. This paper was proposed by Gungun Yan, Stephan Olariu, Michele C.Weigle, Mahmoud Abuelela[15]

III. METHODOLOGY

A. BLOCKDIAGRAM



B. WORKING

This parking system utilizes machine learning and real-time updates to identify vehicles and their number plates, while also keeping track of available parking slots .The system includes an application that allows users to pre-book parking spaces. When a vehicle approaches the entry gate ,it is identified using machine learning, and if it is a car, its number plate is recognized using optical character recognition (OCR)and recorded. The gate opens if there is an available parking space at the entry time, and the system calculates the available slots by subtracting the used space from the total space.

The application provides real-time updates on available slots and allows users to create accounts using their email addresses or phone numbers. Multiple vehicles can be added to a single account. At the exit gate, another camera reads the vehicle's number plate and calculates the payment amount. A QR code is generated by the system for the total payment, which can be used for payment at the parking place's display.

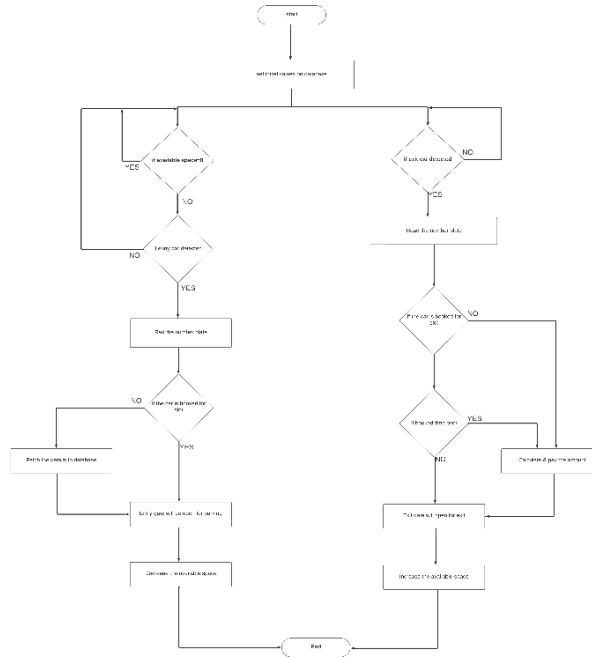
The parking system consists of hardware and software components, as well as a database. The hardware section includes modules such as ESP32_Cam, LCD displays, servomotors, and IR sensors, along with a computer. The software section involves using Arduino IDE to upload code to theESP32_Cammodule, Python for car and number plate detection, and Android Studio for developing the application. The Google Firebase real-time database is utilized to store sensor data, parking slot data, and user signup data.

Both the entry and exit gates are equipped with ESP32_Cam, LCD displays, servo motors, and IR sensors. The camera at the entry gate detects incoming cars and captures the number plates. It checks the availability of parkings lots, and if there are vacant slots, the gate (controlled by a servomotor) opens. An IR sensor is positioned behind

the servo motor to detect when a car passes through and subsequently closes the gate. The LCD display provides information on space availability, number plates, and other relevant details. If a car is not pre-booked through the application, the system stores the vehicle's number plate and entry time in the database.

The entry gate also calculates the payment amount based on the entry and exit times, generating a QR code for the total payment, which is displayed on the LCD. Once the payment is made, the exit gate opens. When the car exits, the IR sensor detects its presence and triggers the closure of the exit gate.

C. **FLOWCHART**



IV. **RESULT**

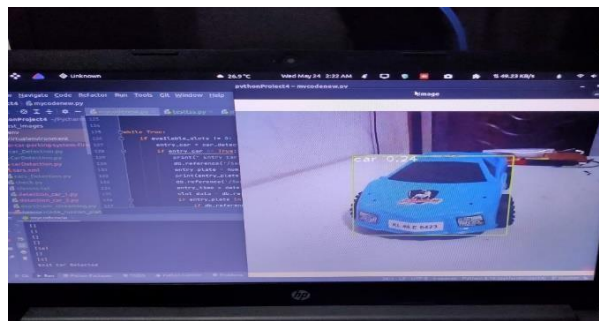


Fig1. Number plate detection



Fig2. Vehicle entry after verification

Fig3 Registration page

Fig4 Login page

Fig5 Check the availability

Fig5 Book the slot

V. FUTURE SCOPE AND CONCLUSION

The Smart parking system based on Slot booking is implemented, using the Android application. Using the slot allocation method, we can book our own cheapest parking slot. It is an efficient one for solving parking problems, which overcomes the traffic congestion and also provides an automated billing process. This work could be further extended as a fully automated system using multilayer parking method. Safety measures such as tracing the vehicle number and face recognition of the drivers so as to avoid theft & automatic billing process can also be designed. We plan to expand the tests on the real-time environment where the users can have the "Smart Parking" system in their hand-held device. Proposed work does not give a fully automated system, but utilizes the existence of drivers, it primarily focuses on the traffic management, reduces user time and efforts by directing him/her for traffic-free, minimum distance route. In real-time implementation of such a project would be cost-effective, as full automation is not advised, yet the system would appear sophisticated and user-friendly. The system would provide a good amount of communication with drivers to park or retrieval of the cars safely and smoothly. For identifying traffic-free routes, this is more convenient than other technologies. Features like authenticity, vehicle details; automatic billing based on time can be added using mobile and server applications.

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