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Smart Parking System based on IOT

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ABSTRACT:

As we heading towards the smart cities there is an important role of smart parking. The population is increasing day by day, so the dependency on transportation is also increasing. People are visiting the public places like malls, temples, theatres, etc. are facing difficulties in parking their vehicle. Though, there is are some parking spots but the driver needs to search it. Traditional parking systems are too old for urban cities where we find difficulties in finding the vacant slots. In this case there may be a lot of traffic, minor collisions and accidents. Therefore, to overcome such problem and via making the use of IoT [Internet of Things] we can design a smart parking system which will be easier and efficient to park the vehicle.

Keywords: Smart Cities, IoT, Vacant Slots,

Introduction:

Weather changes have a huge negative impact on the ecosystem and might suddenly precipitate natural disasters. There are numerous machine learning approaches and algorithms that can be used to forecast these changes and predict them early. It has been noted that, based on past research, there are a variety of additional ways to weather prediction. Various parameters such as rain, temperature, humidity, wind direction, precipitation, evaporation, and so on are taken into account based on theseAs India has smart cities mission to develop smart cities across the country and it was launched in 2015 with aim making 100 cities of India on par with comparable global cities in terms of infrastructure and facilities. As there are smart cities developing there is also an increase in population and when population increases there are 50% chances to increase in vehicles. Thus, increase in vehicle head towards the traffic congestion and scarcity of parking amenities. In busy cities like Hyderabad and Pune, it is near to impossible to find a vacant parking slot easily during peak hours. The drivers tend to move around in search of parking slots which indirectly leads to traffic jams and traffic congestion. The groping around for parking leads to increase in utilization of Petrol/Diesel which indirectly cause pollution and affect the environment. Accident chances tend to raise as the driver's mind would be half occupied in searching parking. This requires developing a "Smart Parking System" that would be one of the critical solutions for developing a rapid urban area. With advanced IoT technology, it will monitor and manage parking spaces in real-time. The IoT sensors fitted into the parking spots will identify the status of its occupancy and notify this information to the central cloud-based server. The data is accessed through a mobile or web interface made easy. This would enable the driver to quickly locate available parking spots and even reserve a space ahead of time. It, therefore, saves time in the search for parking. Such a parking system helps reduce traffic congestion and subsequently saves on fuel. This would subsequently reduce vehicular emissions and support environmental sustainability. This reduces the chances of accidents as drivers are less preoccupied with parking and more focused on driving. This technology driven approach goes in line with the Smart Cities Mission of India by optimizing infrastructure usage, better mobility in the urban areas, and forming a clean, efficient urban ecosystem. The Smart Parking System is one of the important steps to the development of intelligent, eco-friendly cities that can take care of demands from the ever-growing population and intense density of vehicles.

Objective And Scope:

The objective of this project is to develop an efficient smart parking system that simplifies the process of finding available parking slots using sensor technology. The system will detect the occupancy status of each parking slot through sensors installed in individual spaces. In this project real-time data will be displayed on mobile application at the parking facility. Users can easily access the information of location where the parking's have engaged and vacant spots without wasting time for finding nearby parking. The mobile app will provide live updates, where it will show the status of slots whether it is occupied or vacant, helps users identify and navigate to available parking quick. For parking managers, the application will send the message to manager helping them manage the space more effectively. This Project will make parking experience easier and reduce traffic and improve the efficiency of parking operations.

Scope:

- Real-time parking slot availability detection.
- Mobile app or digital display for user convenience.

- Analytics dashboard for parking slot managers to view parking trends.
- Potential for scalability to accommodate large parking slots.
- Time saving as we don't want to search nearby parking as it will be showed in mobile application.

Literature Review :

[1]Gayatri N Hainalkar and Mousami S Vanjaleexplores, "Smart parking system with pre & post reservation, billing and traffic app" basically talks about the added feature that is pre & post reservation, billing and traffic management. The paper also conveys the vast knowledge of IoT. In this paper there is related work where there is use of RFID tag, IPA [Intelligence parking assistance] which allows managing and reserving road side parking spot. In this system there is no need to install device in drivers' car. It also gave an overview of proposed system and system architecture

[2**]** D.VAKULA and Yashwanath Krishna Koli present the paper titled "Low-Cost Smart Parking System for Smart Cities" gives an overview circuit connection, implementation and the working of system. The paper also conveys information about the resources we have to use to build the system. It also has the information about the parking challenges in Hyderabad and Pune. This paper concludes with an online based parking booking and management system to address the parking issues in Hyderabad city and for deployment in Smart Cities. The users can book parking slot at any time and from any location with their Mobile Phone or with a computer.

[3]C. Ajchariyavanich1, T. Limpisthira1, N. Chanjarasvichai1 present the paper titled "Park King: An IoT-based Smart Parking System" gives an overview of four feature that are Check, Reserve, Scan and Park. The paper also has a technology building blocks means the information about the components used in the system. The paper also has a basic functional and non-functional requirement. It has Use-case diagrams and flowchart which easily gives a short idea about the system. In their project the SQA [Software Quality Assurance] was performed to provide the assurance of the requirement quality, design quality, code quality and quality control effectiveness within the software. It concludes with giving information about this project and where it can be used.

[4] GokulKrishna. S, Harsheetha. J, Akshaya. S, Jeyabharathi. Present the paper titled "An IoT based Smart Outdoor Parking System" gives an overview of the features by specifying the vacant spots by Led's and allow the user to prebooked the slot by using scan and pay and they also used GPS and Camera to track the location. They also mentioned algorithms and overview of the modules. Thelimitations in this project there was no authentication of user's data. The information was not provided for parking managers to make project more efficient.

[5]G. Revathi;V. R. Sarma Dhulipala, "Smart parking systems and sensors: A survey", gives a basic information, based on WSN (wireless sensors network) for identification and communication process. They also authenticate the users by using cameras to recognize the vehicle's license plate. It showcases the advantages which provides genetic algorithm to increase the possibility that resulting lower emission toxic greenhouse gases. This paper has limitations which shows that it doesn't shows any interface between GUI and model and there is no any system architecture in this paper and only provides information about ultrasonic sensors.

Problem Statement :

As Smart cities developing day by day the people leaving in smart cities are facing problem of parking due to rising vehicle no's and limited parking areas or infrastructure. Traditional parking systems fail to efficiently manage and monitor parking spaces, leading to wasted time, fuel, and increased traffic congestion. Driver often struggles to search and locate available parking spaces especially in peak hours and resulting it in environmental pollution The proposed system highlights the need for a real-time, automated solution that should be filled by a smart parking system based on IoT. This system will monitor and manage spaces in real-time with the help of IoT sensors and data analytics and provide instant information to drivers regarding free spots along with optimizing space utilization. The system that would reduce traffic congestion, lower emissions, and improve the driving experience of operators while streamlining parking management.

Proposed Methodology :

System Overview

The smart parking system will contain a number of elements that will make a system for managing parks efficiently and automatically. The system will rely on the use of parking sensors laid down in all the parking lots, monitoring the status of the parking lot in real time. These sensors are able to detect whether or not a vehicle occupies a given parking spot and report this status to a parking manager. This work is done by Arduino UNO. The Arduino UNO will read data from the parking sensors in both Lane A and Lane B and forward them to a cloud server for further processing and storage.
On the entrance side of the parking lot, an automated gate system controls vehicle access by using the Servo motor. Here, the gate operates dependent on available parking spots; vehicles receive access when spaces exist in the lots and denial when the parking lot is full. The cloud server will process all incoming data, allow it to function with real-time monitoring, analytics, and user notifications. The whole system becomes accessible to a web application by drivers getting real-time information on the parking status and being able to reserve parking space and pay for service. Integrated Solution With the integrated solution, parking management is far more efficient by automating space monitoring, optimizing access, and enhancing the user experience.

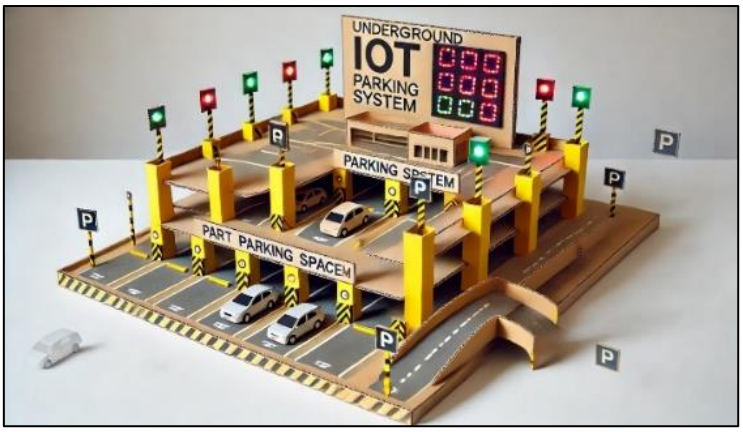
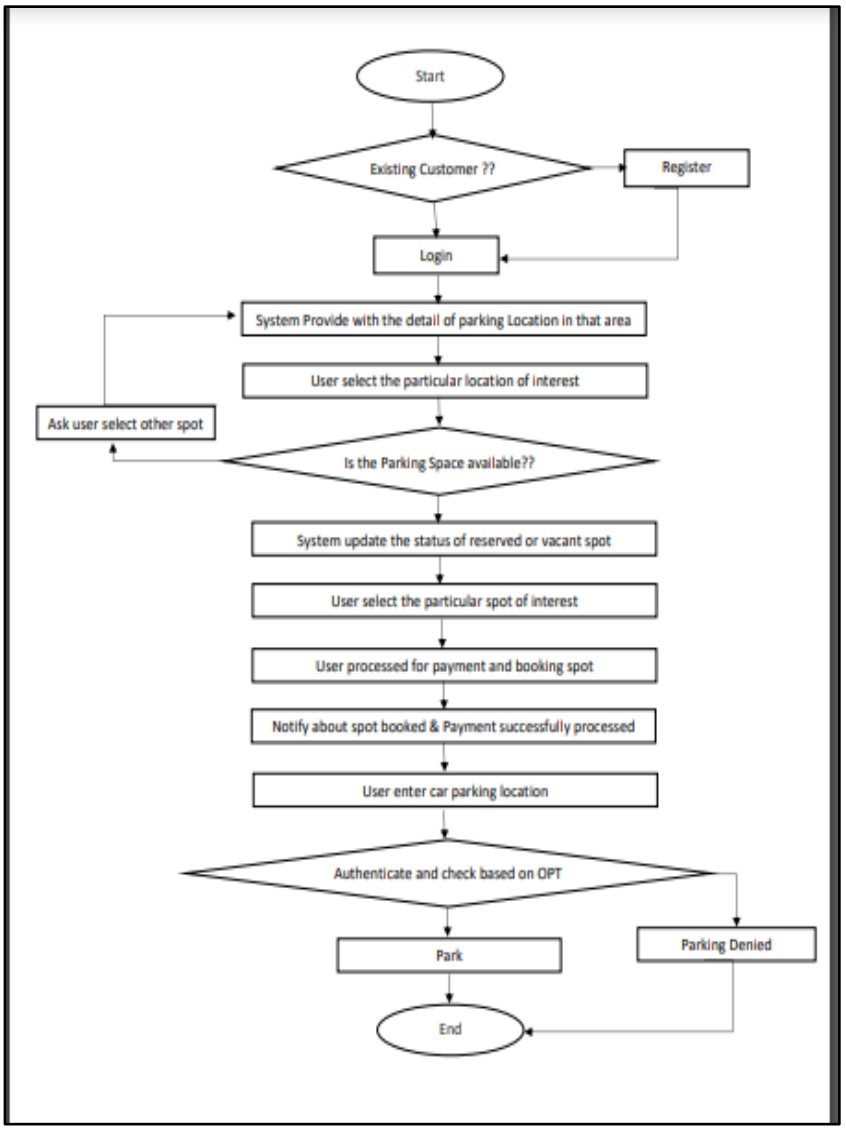


Fig.Overview of Smart Parking System

System Architecture

The architecture of the IoT-based smart parking system includes an interconnected components aimed at driving parking management and enhancing users' experiences. Users access the user interface through a mobile or web application that allows them to view available slots, adjacent options, and reserve space. The parking sensors have been installed in each slot to detect the occupancy status, and LED indicators are utilized to visually communicate whether the slot is vacant or occupied, as indicated by a green or red light. This also enables an edge computing layer that aggregates and processes the data in real time, such that latency is reduced to near real time to support immediate updates of the status. It manages a database on the cloud for the user and parking information, supports data analytics, and offers a RESTful API for interaction with the app. A booking and payment module would manage reservations and direct payment processing. The system architecture must be as secure as possible using data encryption and user authentication, design which allows scalability to accommodate the future enhancements such as dynamic pricing, integration of smart city infrastructures, etc. A system as a whole, it will streamline the parking process and, in general, be useful for users in terms of enabling real-time information capabilities and efficient management.

Fig 2. Flowchart of Smart Parking System



Hardware And Software Details

Name	Description
Sensors	Ultrasonic sensors for Detecting the presence of vehicles in parking slots and Infrared sensors which is Alternatively used for occupancy detection.
Microcontroller	Arduino For processing sensor data and managing communications with the cloud.
WIFI module	ESP 8266 For connecting devices to the internet.
Power supply	Batteries will be used.
Servo Motor	Which will act as authentication of users where it will open and close the gate
Frontend & Backend and Database	Technologies like HTML,CSS,JavaScript and at backend Django with MYSQL database
Cloud and API's	Google cloud and RestFull API's

Conclusion :

This study has proposed an IoT based smart parking system which is more advantageous than the traditional parking system. The system helps in reducing the number of peoples who fail to park successfully, thus reducing the urban traffic congestion, pollution etc. The proposed system has been successfully implemented. The Results shows that the waiting period of drivers has been drastically reduced. The system can also be implemented on large scale. The system thus helps in upgrading the lifestyle of common people.

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