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IOT-BASED SMART PARKING SYSTEM WITH REAL TIME BOOKING APPLICATION (With Plot Area Mapping System)

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ABSTRACT
In an urban metropolitan setting, this project suggests a private parking field reservation system. In a vehicle park, the suggested system design might be utilized to cut down on needless time spent looking for an open parking space. With this method, we address the issue brought up by earlier research, which found that driving around looking for parking spaces accounts for 15 to 25 percent of fuel waste in automobiles trapped in traffic. The user makes reservations under this proposed approach by using an internet smartphone application. As a result, the user locates an open parking space and uses an internet connection to reserve it using an IoT server. Rapid check-ins and check-outs will be combined with simultaneous user authentication to prevent lengthy car lines that clog roads. This increases the effectiveness of land and traffic management in an urban metropolis area while also making it easier for customers to choose their own likely parking slot based on the time and cost function.

Keywords:
Fuel Wastage, Parking Slot, IoT Server, MetroPolitan Areas.

1. INTRODUCTION
Due to disorganized parking spots, it is now exceedingly difficult to get a spot in an urban location during peak hours. since of this, there is traffic congestion since vehicles are either stopped in traffic or are searching for parking spaces nearby. Time and gasoline are wasted as a result. Therefore, we suggested the research idea of "Smart car parking management system" employing mobile application for booking in order to arrange for advance booking based on time slots for the convenience of drivers. parking lots designated for multiplexes or airports. These issues are handled and fixed in our suggested solution by combining IOTs with IR sensors for An efficient and secure cloud-based tool for managing and booking parking spaces in real time. With more people living in metropolitan areas and hence more cars on the road, parking becomes a major problem. According to a study, thirty percent of the automobiles in a traffic jam are looking for a place to park, and it takes an average of eight minutes to find one. This leads to a waste of time, money, and gasoline. The great IOT revolution will give users flexibility by keeping a database of registered drivers for security purposes and to facilitate online payments as well as parking availability. The "IoT based Smart Parking System with Real-Time Booking Application" project aims to use mobile applications and Internet of Things (IoT) technology to address the growing problems related to urban parking. By giving consumers access to real-time parking availability information, the project seeks to improve the parking experience for both drivers and parking operators. This will enable users to plan ahead and make well-informed decisions. The system makes sure that parking occupancy data is accurate and reliable by integrating Internet of Things (IoT) sensors into parking spaces. This makes it easy for customers to find open spots and prevent wasteful traffic. Furthermore, the corresponding mobile application streamlines the reservation

procedure by providing an intuitive user experience for perusing, making, and overseeing parking bookings with ease. In the end, the project aims to contribute to a more sustainable and effective urban environment by improving user convenience, optimizing parking utilization, and improving overall traffic management in metropolitan settings.

2. LITERATURE SURVEY

According to previous related works, there are several methods used to develop the system. It is highly crucial to have knowledge on the systems that have been developed in order to ensure a better enhancement of the proposed system in this project. In some studies, image processing is given more importance instead of sensor based system. Driver's number plate is captured by Image processing is used to capture the number plate of the drivers and the information is stored in database. This is to avoid theft and illegal car entry. The users must register first before using the Android application. This application consists of basic information of the drivers which will be stored for future references. After registration, the driver is required to select the parking location and the server will immediately process the data received and sends back the information needed to the user. In research paper "Smart Parking System based on Reservation", states that the expansion of monetary conduct for everyday comfort has rapidly increases the ratio of people who owns vehicles giving boost to busy cities traffic. This is commonly why traffic congestion and air pollution occurs. The management will system will broadcast the details on the available parking slots to drivers.

2.1 LITERATURE SURVEY:

The literature survey for the "IoT based Smart Parking System with Real-Time Booking Application" project encompasses a range of scholarly works focusing on the integration of Internet of Things (IoT) technologies into parking management systems. Papers such as "Smart Parking Solutions Based on Internet of Things (IoT) Technologies: A Survey" provide an overarching view of IoT-based parking systems, discussing technological architectures, deployment strategies, and recent advancements. Other research, like "Real-Time Smart Parking System Using IoT," delves into specific implementation details, outlining sensor deployment, data processing methods.

These papers collectively contribute to understanding the state-of-the-art approaches, emerging trends, and future research directions in IoT-based smart parking systems, providing valuable guidance for the development and implementation of the project.

Overall, a literature survey serves as a foundation for research by providing researchers with a comprehensive understanding of the current state-of-the-art, informing the development of research objectives, and guiding the selection of methodologies and approaches for the proposed project.

3 Implementation Study

The parking management problem can be viewed from several angles. Limited number of parking lots, drivers not knowing where parking lots are, drivers not sure if parking lots have enough space and a tendency to park illegally on the roads. Due to above such issues, major problems faced by people are consumption of fuel, pollution, wastage of time, mental stress, etc.The existing system for the "IoT based Smart Parking System with Real-Time Booking Application" project typically comprises traditional parking management methods, which often lack real-time visibility and user-friendly booking options. In conventional systems, drivers must physically search for parking spaces without access to accurate real-time availability information. Booking options, if available, are often limited or cumbersome to use, requiring manual reservation processes or third-party services. Furthermore, the absence of IoT integration means that parking occupancy status is not monitored in real-time, leading to inefficiencies in space utilization and increased traffic congestion. Overall, the existing system is characterized by a lack of user convenience, suboptimal parking utilization, and limited technological integration.

.3.1 PROPOSED METHODOLOGY

Smart car parking system help us to reduce chaos of vehicles for parking place. Most of the time, in case of some places, there is no parking space available. So that, people park their vehicles on

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the road itself. This creates very bad picture and acts as a hurdle in everyone's life. This project is useful for avoiding this situation. Hardware used in this system i.e. IR sensors detects whether the car is present their or not and then it will pass this information towards MCU 8266. MCU will update this information on cloud. With the help of databases collected, admin can keep account of each user. Due to this proposed system fuel as well as time for searching parking space will be reduced. It will be helpful for user and unorganized parking on the road will be reduced. NodeMCU is an open source IoT platform. This is used for making the things work using Wi-Fi. This board includes firmware which runs on ESP8266 Wi-Fi SoC Express Systems and the hardware is based on ESP-12 module. The second ultrasonic sensor

- Optimized Parking Utilization: By providing real-time information about parking availability, the system optimizes parking space utilization, reducing the time spent searching for parking spots and minimizing congestion in parking facilities.
- Enhanced User Convenience: The real-time booking application allows users to reserve parking spaces in advance, ensuring a guaranteed spot upon arrival. This eliminates the uncertainty and frustration associated with finding parking in busy urban areas, enhancing overall user convenience.
- Time and Cost Savings: Users save time and money by avoiding unnecessary circling and searching for parking spaces. With the ability to reserve parking spots in advance, users can plan their journeys more efficiently and avoid wasting time looking for parking.
- Improved Traffic Flow: By reducing the number of vehicles circling in search of parking, the system helps improve traffic flow in urban areas, leading to reduced congestion, lower emissions, and a smoother driving experience for all road users.
- Data-Driven Decision Making: The system collects and analyzes parking usage data, providing valuable insights into parking patterns and demand. Parking operators can use this data to make informed decisions about resource allocation, pricing strategies, and infrastructure improvements.

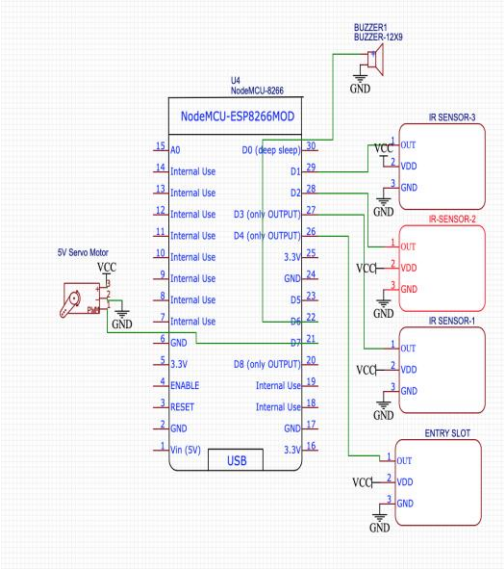

Fig 1:- proposed method and model

4. METHODOLOGY & Algorithm

- ESP8266 microcontroller board: To control and manage the IoT functionality of the parking system.
- IR (Infrared) sensors: To detect the presence or absence of vehicles in parking spaces.
- Piezo Buzzer: To provide audible alerts or notifications to users regarding parking availability or reservation status.

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- Power supply: To provide the necessary power to the ESP8266, IR sensors, and Piezo Buzzer.

Development Environment:

- Arduino IDE: To write, compile, and upload code to the ESP8266 microcontroller board. Install necessary board definitions and libraries for ESP8266 development.
- Adafruit IO or other cloud-based IoT platform: To store and manage real-time data from the parking system, facilitate communication between devices, and enable remote monitoring and control.
- Programming skills: Basic knowledge of C++ programming language and Arduino programming concepts for developing firmware for the ESP8266.
- Understanding of IoT concepts: Familiarity with concepts such as MQTT (Message Queuing Telemetry Transport), IoT protocols, and data communication principles.

Networking Setup:

- Wi-Fi network: Ensure access to a stable Wi-Fi network for connecting the ESP8266 to the internet and enabling communication with the cloud-based IoT platform.
- Configuration of Wi-Fi credentials: Configure the ESP8266 to connect to the Wi-Fi network by providing SSID and password details in the firmware.

Sensor Calibration and Testing:

- Calibration of IR sensors: Calibrate the IR sensors to detect the presence or absence of vehicles accurately within the parking spaces.
- Testing of Piezo Buzzer: Verify the functionality of the Piezo Buzzer and implement appropriate sound patterns or alerts as per the system requirements.

Cloud Platform Setup:

- Create an account on Adafruit IO or the chosen cloud-based IoT platform.
- Set up feeds, dashboards, and integration with the ESP8266 firmware to send and receive data to/from the cloud platform.
- **9V Battery Module:**The 9V battery module supplies power to the Arduino Nano and other low-power components of the system.It ensures continuous operation of the system even in the absence of an external power source.12V DC Power Supply Module.

5 RESULTS AND DISCUSSION

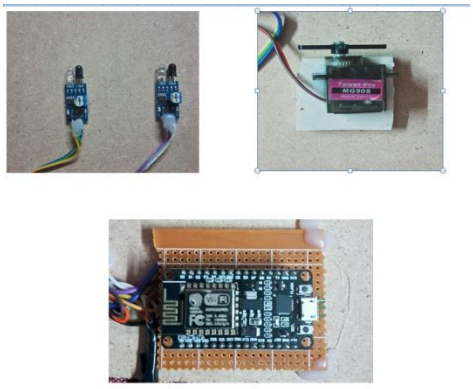

Fig 1:-components used for project $ IR SENSOR $ SERVO MOTOR$ WIFI MODULE ESP8266

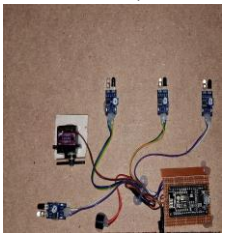

Fig 2:- prototype of the project

6 conclusion

In conclusion, The idea of Smart Cities has dependably been a revolution for humankind. Since the recent years substantial breakthroughs have been made in making keen urban areas a reality. The development of Internet of Things and Cloud advances have offered ascent to new potential outcomes as far as brilliant urban areas. We have introduced a constant real time smart parking system utilizing IOT which disposes of the need to scan for parking spots and to productively choose and pre-book the ideal parking space. The user is thus feasible enough to get a parking slot as per its own choice at any time and from anywhere using just the mobile application. The whole system works in real time as well as lots of problems like wastage of time, fuel consumption, pollution, etc. are minimized drastically.

1. FUTURE ENHANCEMENT:

Following are the aspects which can be improved in both software and infrastructure aspects.

- Platform Independence :Platform can be com-piled on several different hardware platforms to alter the applications of the system for custom purposes without platform dependent configurations
- Exchangeability : Components can be exchanged with other implementations without affecting the existing system. Moreover, to increase the scope of the system both generic components and highly optimized platform-specific components can be used simultaneously
- Reservation Flexibility: Offering users the flexibility to extend parking reservation durations or cancel bookings seamlessly improves user experience. This feature caters to changing user needs and unexpected circumstances, reducing inconvenience and enhancing satisfaction.
- Dynamic Pricing: Implementing dynamic pricing based on demand and availability encourages users to adjust their parking preferences according to price fluctuations. For example, lower prices during off-peak hours or in less crowded areas can incentivize users to park strategically, optimizing space utilization.
- Incorporation of Sensors: Advanced sensors can detect various parameters such as vehicle size, occupancy status, and environmental factors like air quality and noise levels. This data can be utilized to optimize parking management, improve user experience, and ensure safety and security within the parking facility. Integration with Payment Gateways: Expanding payment options to include digital wallets, mobile payment apps, and contactless methods streamlines the payment process for users. This enhances user convenience and satisfaction, especially in today's digital-centric environment.
- IoT-enabled Safety Features: Integrating CCTV cameras, panic buttons, and emergency notifications enhances security and safety for users. Real-time monitoring and immediate response mechanisms contribute to a safer parking environment, instilling confidence in users and deterring potential security threats.
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