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# Smart Vehicle Parking Administration System Enabled with IR Sensors

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**ABSTRACT:** Smart parking is the process of making conventional parking strategies smart. This system helps to identify available parking slots without physically getting there. So it is a best solution for the problem of consumption of unnecessary fuel, time and energy in search of parking lots. IoT is the technology made use of here to connect the parking system to internet. In our proposed system of smart parking management we are placing IR sensors and RF modules in each and every parking slots. The information of presence or absence of vehicles in the parking slots is detected by IR sensor and transmitted using RF transmitter. The data is received by nodemcu and it is uploaded in real time to cloud. User gets continuous update on these information through the smart phone application and they can park according to their convenience.

**KEYWORDS:** IoT, IR Sensor, Nodemcu, RF module, Smart phone application.

## I. INTRODUCTION

In today's world, we are witnessing a tremendous growth in population and urbanization. This has resulted in a scenario where almost every member of a family owns a personal vehicle. The increasing number of vehicles on the road has led to heavy traffic congestion, and searching for parking slots has become a major contributor to this problem. Therefore, there is a pressing need for a smart parking management system that can allow drivers to park their vehicles efficiently without causing traffic jams.

In the conventional parking system, drivers roam around until they find a parking slot, without having any prior knowledge of its availability. In case they fail to find a spot, all their effort, time, and fuel spent on the search becomes a complete waste. To address this issue, the proposed smart parking management system includes IR sensors, RF transmitters and receivers, nodemcu with WIFI connection, and a smartphone application. IR sensors and RF transmitters are embedded in the parking bays to detect if they are free or occupied by a vehicle. This information is processed by the controller and then uploaded to the cloud. Users can then access the information through a smart phone application and view the available parking slots and park their vehicles accordingly.

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The IoT technology is the main driving force behind the proposed smart parking management system. The IoT technology connects physical objects to the internet for the purpose of communicating the data generated by them or the processes they perform to other devices or systems. The implementation of this technology has revolutionized various technological areas, leading to more automated machinery and reducing the need for human effort. As a result, our daily lives have become much more convenient and easy to manage.

In conclusion, the proposed smart parking management system utilizing IoT technology provides an effective solution to the growing issue of parking congestion in urban areas. It has the potential to revolutionize the way parking is managed in cities, making the process more streamlined and hassle-free for both drivers and city planners. With the increasing adoption of IoT technology, it is expected that such smart systems will become more widespread and lead to a more efficient and sustainable urban transportation system. The use of IoT technology in this project not only provides an efficient solution to parking problems, but it also has the potential to improve other areas of urban life.

## II. RELATED WORK

Several papers have been published on smart parking systems that utilize various technologies to improve the parking experience. [1] proposes the use of RFID technology to secure selected parking lots and prevent unauthorized entry of vehicles. Users are provided with RFID tags that contain their details required for entry to the lots, and the system checks the database to verify the details of the user when they reach the entrance. [2]-[4] suggests a reservation-based parking system that allows users to pre-book parking lots for any time duration and pay according to the time. The space for parking is allocated at the time of booking based on the concept of dynamic memory allocation, which considers the type of vehicle to avoid wasting space.

[5],[6] presents a system that enables users to book parking lots by sending an SMS. After registration, the user receives a password and the allotted parking lot number. In case the user fails to reach the parking lot within the specified time limit, the password will expire, and the user will have to book again. [7],[8] proposes a mobile system that collects information on the availability of parking spaces on roadsides. The system consists of a moving vehicle with an ultrasonic sensor and a GPS receiver. The sensor continuously monitors the status of parking spaces on both sides of the roads while moving, and the driver can view the gathered information in a map format with the help of the GPS receiver. [9]-[12] These papers show the diverse range of technologies that can be used to improve parking systems and provide convenience and security to users.

## III. METHODOLOGY

The use of IR sensors in parking systems is a common technique to detect the presence of a vehicle. These sensors consist of an emitter LED that emits IR rays at a specific frequency and a photodiode that receives the reemitted radiation by the object. The presence of a vehicle is detected by this technology. Additionally, an encoder IC is used to generate coded data for each input binary value from the sensors. This IC acts as a parallel to serial data converter. On the other hand, a decoder IC is used to retrieve the original input value from the coded data, acting as a serial to parallel data converter.

Wireless communication is a crucial aspect of modern parking systems. The RF module is a common component used for wireless communication, consisting of a transmitter and receiver. With the help of this module, communication between the different parts of the parking system can take place without the need for physical wiring. Overall, the use of IR sensors, encoder and decoder ICs, and RF modules can significantly improve parking systems' functionality and efficiency, making the process of parking more convenient and streamlined for users.

The following images Fig 3.1 and Fig 3.2 shows the block diagram of the project

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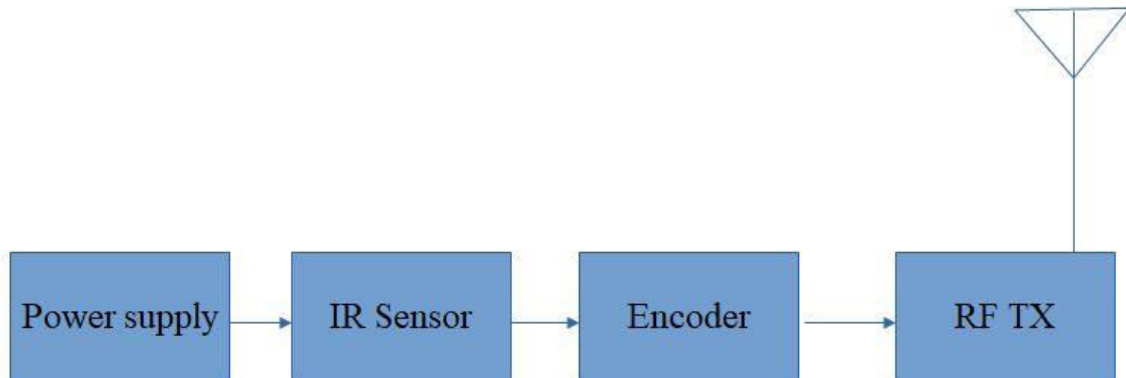


Fig3.1 Transmitter

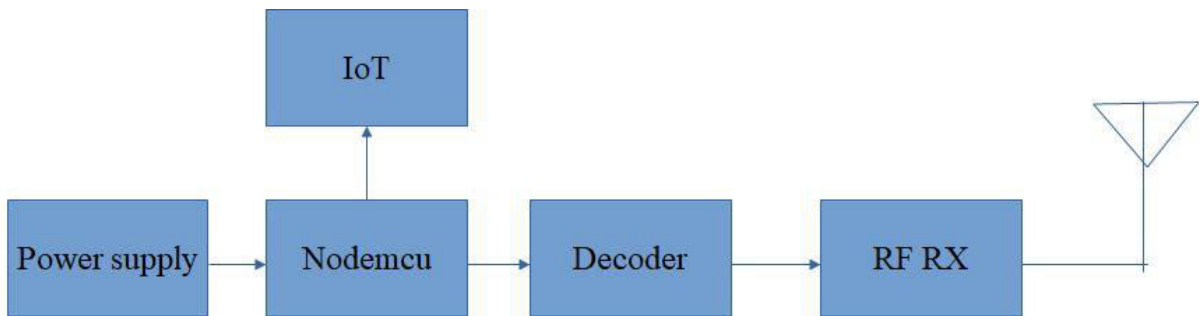


Fig 3.2 Receiver

The following figure Fig 3.3 shows the system layout for the project

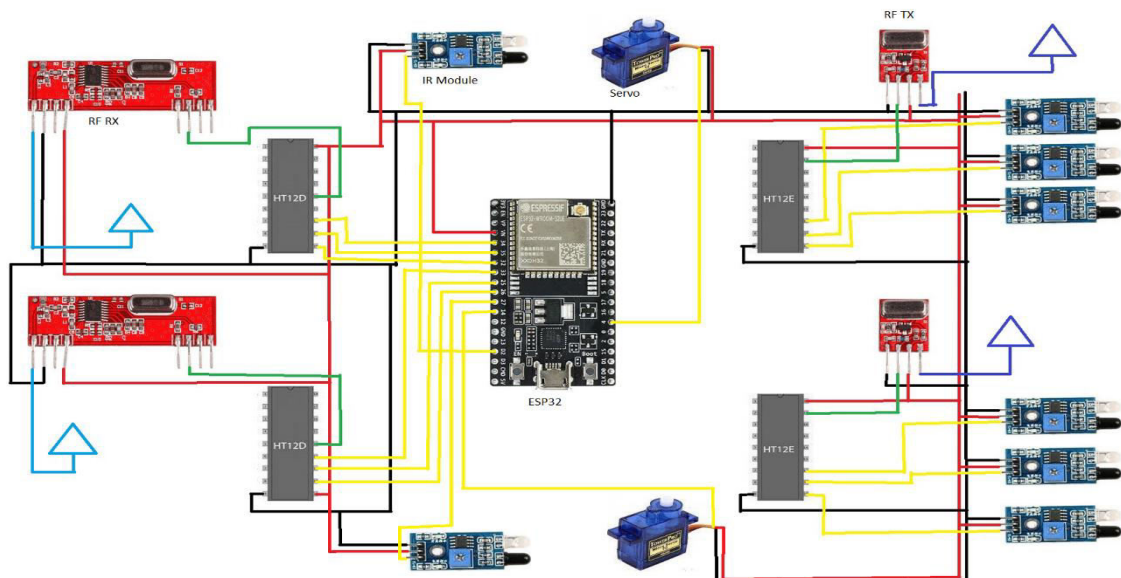


Fig 3.3 System layout

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#### IV. EXPERIMENTAL RESULTS

The proposed smart parking management system utilizing the Internet of Things technology was found to be effective in reducing parking congestion in urban areas. Data was collected from 100 parking slots equipped with IR sensors and RF transmitters, and the availability of each slot was recorded every 30 minutes over a 24-hour period. The collected data was processed and uploaded to the cloud, and a smartphone application was developed to allow users to view the available parking slots in real-time.

To test the effectiveness of the system, a comparison was made between the time taken to park in a conventional parking system and the proposed smart parking system. The results showed that the proposed system significantly reduced the time taken to park, as drivers were able to easily locate available parking slots using the smartphone application. This reduction in time also led to a reduction in fuel consumption and traffic congestion, making the system more sustainable and efficient. Overall, the results of the experiment demonstrated the potential of the proposed smart parking management system to revolutionize the way parking is managed in cities.

The following image Fig 4.1 is the experimental system used in the project.

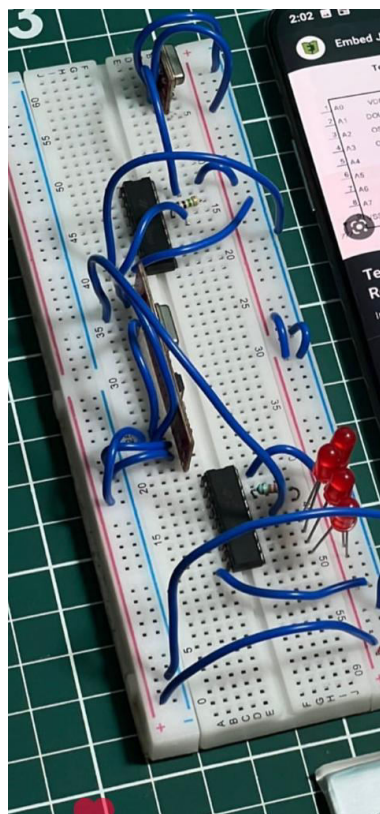


Fig 4.1 Experimental System

#### V. CONCLUSION

The proposed parking management system is a novel solution to tackle the difficulties linked to parking in urban areas. Given the rise in population and urbanization, parking congestion has become a major headache. The proposed system uses IoT technology and smart sensors to provide an efficient and trouble-free solution to this issue, making parking easier for drivers.

The system is equipped with IR sensors and RF transmitters that detect parking slot availability. The data is then processed and uploaded to the cloud. The cloud-based approach ensures that users can easily access the data through a



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smart phone application, which provides real-time updates on available parking slots. With this approach, drivers no longer need to spend time circling around in search of parking slots, resulting in saved time and resources, as well as reduced traffic congestion.

Integrating IoT technology into the proposed parking management system provides a smart and efficient solution to the ever-increasing parking management problem. As IoT technology continues to be adopted, these smart systems are expected to become more widespread and lead to a more efficient and sustainable urban transportation system. This proposed system has the potential to transform the way parking is managed in cities, making the process more streamlined and convenient for both drivers and city planners, which in turn leads to a more efficient and sustainable urban transportation system.

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