

# IMPLEMENTATION OF SMART PARKING SYSTEM USING INTERNET OF THINGS (IOT)

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## Abstract: -

*With the fast growth in population in major cities, the number of cars on the road is rising at a similar rate. People prefer private transportation over public transportation, resulting in a rise in automobiles on the road. As a result, finding a vacant parking spot becomes difficult, resulting in several difficulties such as increased consumption of fuel, time, and energy usage. Internet of Things (IoT) has the potential to improve almost every industry. By utilizing IoT and solving challenges such as traffic congestion, limited vehicle parking facilities, and road safety, big cities or metropolitan cities are also on the path to becoming smart cities. In this paper, we using an IOT integrated smart parking system. In this proposed Smart Parking system consists of an on-field deployment of the IOT module that is used to monitor and signalize the state of availability of each single parking space. The mobile app is that it allows the user to check out, parking facilities, and check parking slot availability. At the end of the paper discusses the working of the system in the form of use cases to prove the correctness of the proposed model.*

**Keywords:** - Internet of Things; Smart Parking; Smart City; Microcontroller, Sensor

## 1. INTRODUCTION

Vehicle-related traffic congestion is becoming a serious issue that is rapidly worsening. Every day, around 1400 new automobiles enter Delhi's roadways in India. People frequently find it stressful to look for an empty parking place during rush hour. It has made it more difficult for individuals to park their cars during peak hours in busy public locations such as restaurants and malls. Every day, we consume around million barrels of oil. According to the latest survey, a motorist takes roughly 8 minutes for car parking. This type of search causes 30 to 40% of traffic congestion [1]. According to research, if appropriately implemented, Smart Parking may save 2, 20,000 gallons of gasoline by 2030 and about 3, 00,000 gallons of fuel by 2050. For around 66% of tourists, finding a parking spot on weekends takes 10 minutes [2]. Our primary goal is to reduce cost and time, two of man's most essential aspects. It also aids malls in effectively regulating parking lot traffic. By routing cars via our self-contained system, we can save a lot of human resources. Parking is a time-consuming and costly procedure in terms of capital, effort, and time. According to the report, cars are parked roughly 95% of the time. The primary issue is finding a place to park the automobile for such a long period. The problem of finding a parking spot has grown as the population has increased; 30% of traffic is affected by drivers looking for parking slots, and a 2006 study in France estimated that 70M hours were spent searching for parking each year in France, resulting in a loss of 700 million euros per year [3]. Another impact is increased air pollution from harmful gases released by cars, since the longer it takes to park [4]. IoT, where the internet refers to a vast international network of linked servers, laptops, tablets, and mobile devices that utilize the internet to transmit. Intelligent parking systems based on the Internet of Things (IoT) and cloud computing are now being implemented in many countries. To enhance driving safety, several countries are seeking to manage traffic using many approaches. Intelligent parking systems can provide quantitative information to drivers via a platform that they can access.

## 2. LITERATURE SURVEY

1. Robin Grodi et al., have figured out how the vehicle will fit into the designated space. The presence of a car or other things is detected using RFID sensors. The system must warn drivers about a parking place being occupied after a vehicle has been spotted. The drawback is that the parking spot will only be recognized in neighbouring locations because of absence of GPS.
2. This method was built by Alireza hassani et al., utilizing a cloud-connected mobile application. The user will choose a time when he will assign the space. If he does not engage later, the user will be notified. The application will display the number of assigned and available parking spaces. The drawback is that after allocating, if another person requests the same spot, he cannot assign that spot, resulting in a waste of space, time, and money if the first user cancels later.
3. Dharmini Kanteti and colleagues, have created a Smart Parking System. IP cameras would collect the car registration number in the event of pre-registered customers, allowing them to continue without interruption. According to their information, such as estimated parking time, the location of their visit, and so on. The money will be taken from the E-wallet of pre-registered customers. For new users, a similar price scheme will be used, but payment will be made offline.
4. By analysing integrated smartphone sensors and Bluetooth connectivity, Rosario Salpietro et al., developed automated identification of parking activities done by users. Once the parking incident has been identified, an autonomous method allows the data to be disseminated across the goal scenario, utilizing a mix of an internet connection to a distant server and device-to-device communication.
5. The principal aim, according to Anusha G et al., is to minimize cramming in the vehicle parking space by adopting an effective automobile parking system and an application for ease of use. Typically, one feels uncomfortable seeking an empty parking spot in public venues, even if it is a paid facility with an attendant/security officer. To show hazel-free parking, a parking management system is offered. The proposed method uses infrared transmitter-receiver pairs to a remote location to communicate the parking occupancy status to the Raspberry Pi and display the empty slots on display at the parking entrance to be aware of the availability/unavailability of parking space before entering. The implementation requires minimum human intervention and delivers a smooth parking experience, saving the user a significant amount of time parking his or her vehicle.

6. Chi-Hung Chuang at al., established a monitoring system for parking lot management by identifying car licences, and the result of access control is a reduction in human resources. This research has a drawback in that the recognition method takes longer to compare.

### 3. DISCUSSION

Various innovative smart parking technologies are being deployed to address parking difficulties. Intelligent parking solutions allow a vehicle to reserve a parking spot even if it is not in the immediate neighbourhood. There may also be a mechanism in place that enables the motorist to withdraw a reserved parking spot. There may also be the option for a driver to pay for a parking spot every month. If applied separately, recently developed intelligent parking systems have drawbacks. A flexible reservation pattern should aid drivers in reserved parking places where they would book a slot for a few hours or several days. The parking reservation system must be real-time for users to have a good chance of securing a space. As a result, the SPS is the most critical component in ensuring innovative parking system efficiency. It must also be efficient in calculating fees and assigning parking places.

#### Challenges in Smart Parking

- We need to upgrade infrastructures to create an SPS since the current structure will not function.
- There should be a mix of technologies that must be employed since a single technology will not suffice.
- As IoT devices demand more electricity, maintenance costs will rise.
- Managing the database of free parking spots is problematic since any other object in the place may cause the sensor to believe the parking slot is not free.
- If the system is down due to an error, vehicles will have difficulty finding a parking spot.
- If a motorist who had previously reserved parking space was a little late in moving the car from the slot, and someone else had booked the same slot, that person will be unable to park the automobile, resulting in a dispute.

#### Benefits of Implementing an Online Parking system

- There's no need to waste time hunting for a parking spot.
- Less time and fuel consumed by motorists looking for parking.
- There will be fewer lines since motorists will be directed to parking spots.
- Appropriate car selection based on parking space availability.
- Parking facilities benefit from increased income and profitability as a result of online parking.

### 3. PROPOSED SYSTEM

In generalized block diagram of a smart parking system (SPS) utilizing IoT. The SPS provides drivers with parking assistance and reservations. It necessitates using an Android application that allows a user to reserve a parking spot before arriving at the parking location.

#### Major Components of proposed system:-

##### 1. Sensor Nodes:

The detection of car in the parking slot is determine by the IR sensor. The IR sensor has several benefits, including the fact that it is not colour dependant, that it can function in any weather, detects things accurately, and that its detection range can be modified. To see the item, it emits infrared radiation. The primary characteristic of this system is that it comprises an embedded system that controls the system and a gear motor placed in the parking area that closes the main gate and restricts access if the user is not confirmed.

##### 2. Embedded Controller:

The information from the sensors at each parking slot is sent to the controller, which keeps track of the state of each parking spot. The database server receives an update from the controller in the form of the parking spot. If the person is not authorized, the embedded system controls the gear motor, closing the gate at the parking area.

##### 3. Database Server:

The database server stores all information related to user authentication, parking space ease of use, and the time for which the slot is reserved. The database server receives data from two servers. Sensors and an embedded system are the two servers.

##### 4. Mobile Application:

It's a program that runs on the user's computer. It is necessary to utilize the Android application. It allows users to look for available parking spaces, reserve parking spaces and integrates with the Adhaar card for user verification.

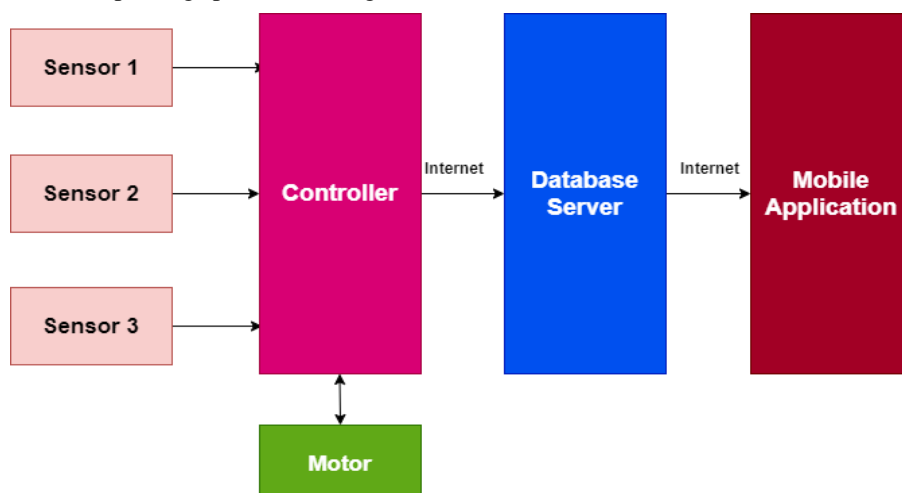
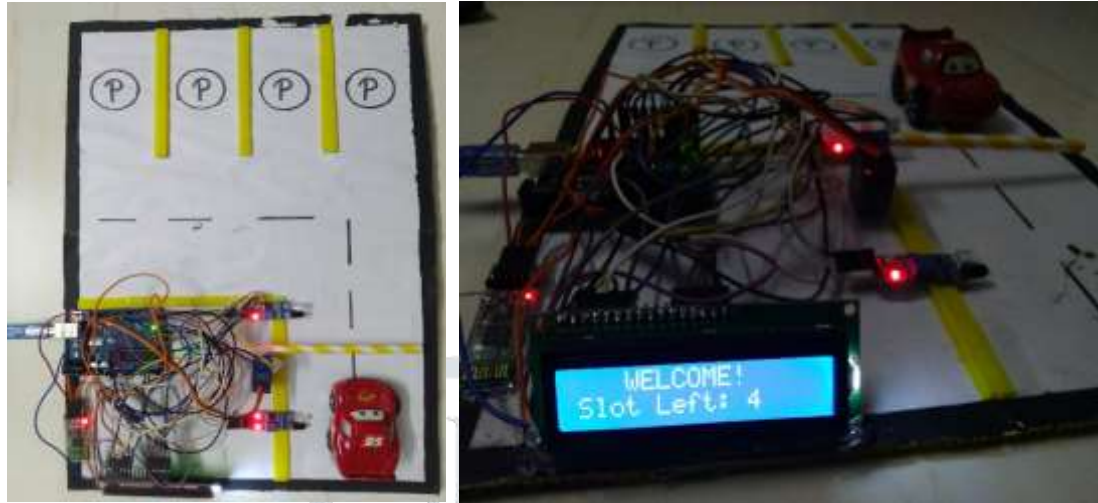


Fig. 1 Generalized block diagram of the smart parking system.

### 3.1 Working of Smart Parking System

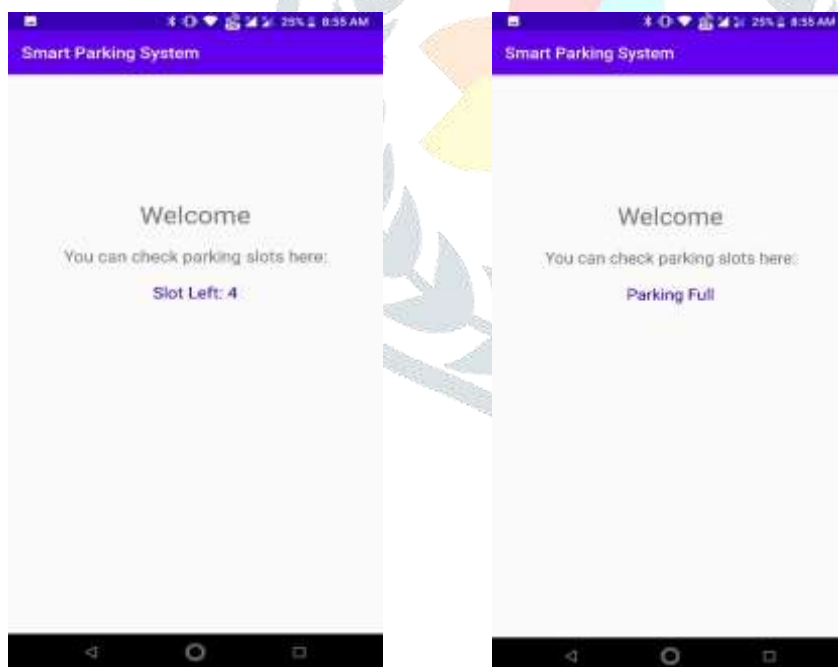
The proposed system is the combination of the hardware and software to form a complete module. Exchanging of all the information or data between mobile and sensor circuitry. The algorithm defining the parking slot allotment is as follows:

1. Before entering parking area person initially selection & checking for car parking is displayed on external led display and mobile apps.
2. Checks for availability for parking slots.
3. If parking slot is free, it will be displayed on the external led display and mobile or computer.
4. If all parking are full, the display will generate a pop up "Parking Full".



**Fig. 2 Smart Parking System**

**Mobile application:** The mobile application acts like an interface for the end users to interact with the system. The application is developed in android programming. The purpose of this mobile application is to provide information regarding availability of parking slot to end user.



**Fig. 3 Mobile application**

The above figure depicts the presence of vacant and occupied parking slots. In this case parking slots is full that also display on screen.

### 4. CONCLUSION

In large cities, parking difficulties linked to time, effort, and fuel use in finding unoccupied spaces and reservation facilities and procedures are important challenges. Researchers have used a variety of ways to alleviate parking difficulties. This study examines several research methods for technology deployment and analysis to address the primary concerns and secondary issues such as traffic congestion and resource waste. The goal is to compile a list of the most up-to-date methodologies and technologies to aid academics in developing a global solution for IoT-based parking.

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