# A Review on Advance Parking System

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***ABSTRACT:*** ***The Internet of Things (IoT) allows objects to be sensed and controlled remotely over existing network infrastructure, allowing for more direct integration of the physical world into computer-based systems and improved efficiency, accuracy, and financial advantage; when Internet of things is augmented with sensors and actuators, the technology becomes an example of the more general class of cyber-physical augmentation. This paper offers an IOT based advance parking system which gives an optimum solution for the parking issue in metropolitan areas. Due to fast rise in vehicle density particularly during the busiest hours of the day it is tough job for the users to locate the parking space to park their cars. This research offers a advance parking system consists of a Arduino components and mobile phone app. The suggested advance parking system comprises of an onsite deployment of a slot module that is utilised to monitor and signalize the status of accessibility of each single parking spot. A mobile application is also offered that enables an end user to check the availability of parking space and reserve a parking spot appropriately.This Advance parking system can improve the economy by decreasing fuel use and pollution in metropolitan areas.***

***KEYWORDS:*** ***Advance Parking System, Internet of Things (IoT), Parking, Ultrasonic Sensors.***

## INTRODUCTION

The Internet of Things (IoT) is a network of physical things, such as gadgets, cars, buildings, and other items, that are equipped with electronics, software, ultrasonic sensors, and network connection to gather and share data. Each item is individually recognisable due to its integrated computer system, but it can also communicate with other things on the Internet [1], [2]. Advance parking is an Internet of Things application that debuted in 1999. More precisely, the Internet of Things (IoT) is a concept in which a collection of things/objects that may be linked through wireless and wired connections interact with one another to create new services and applications. The number of cars on the road is growing on a daily basis as the population and economic development increase. Parking is quickly becoming one of the city's most serious issues, and it is getting prohibitively expensive. Finding a parking spot at work, for example, may be difficult. Finding a parking space in a parking lot is more difficult for users. Many advance parking systems were developed in recent years to attempt to improve the basic parking system in order to solve this issue. A method to identify whether a car is in a parking space is required in all systems. The individual may reserve a parking spot for his or her vehicle. For each registered user, a unique ID is created, as well as a time limit. The system will compute in and out time of the car parked in the slot and deduct the appropriate amount from their account[3].

Advance parking system that uses IoT to detect empty and occupied parking spaces, eliminating the need to spend time looking for a suitable spot for the vehicles. The state of the parking space detected by the wireless sensor is transmitted to the database through a gateway, and the vehicle information is saved and stored in the database. The system records the time and date of entrance into the parking lot, as well as the time and date of departure. Appropriate and balanced parking planning based on an automated and intelligent system that organises parking and includes a sensor system that detects available, filled, and allocated parking spaces. Streamlined parking entrance and exit, no need to waste time and fuel looking for a parking spot, smart parking function, and security cameras. To guarantee the vehicle's and passengers' safety, as well as the presence of fire extinguishers around the parking lot. Smart parking does not create traffic jams since time is not spent looking for an open parking spot in the parking lot, and the vehicle's driver is informed of the location of available parking spaces [4].

Benefits of using a smart parking system: The smart parking system is advantageous to car park owners, car park customers, and environmental conservation. The data obtained via the installation of the Smart Parking System may be used by car park owners to forecast future parking trends. Pricing plans may also be tweaked based on the information gathered in order to boost the company's profits. In terms of environmental protection, pollution levels may be decreased by reducing vehicle emissions (air pollutants) in the atmosphere. This may be linked to the reduction in automobile travel. Because fuel usage is proportional to vehicle miles traveled, it will decrease.

Patrons may also profit from a smart parking system since parking spaces can be fully used with a more effective and efficient structure in order. Since of the information supplied by the smart parking system, the system is more efficient because vehicle travel time and search time are substantially decreased. With the information given, drivers may easily avoid parking spots that are completely filled and find empty parking spaces nearby. As cars are absorbed into car parks, the number of vehicles parked illegally along the roadside, which causes traffic congestion, decreases. The most essential point to remember is that traffic congestion may be decreased. All of this would ultimately contribute to patron convenience.

Payment mechanism that is smart: By redesigning the payment process through parking meter and investing in research and development, the smart pricing structure aims to overcome the limitations of traditional payment methods. This is because the traditional approach leads customers to wait and be inconvenient since they must deal with cash. It also lowers the need for maintenance and personnel for payment processing and traffic management. Contact method, contactless technique, and mobile devices are all part of the Smart Payment System used in countries such As finland, Italy, England, and the Usa. The contact approach employs contactless payments, card payments, and bank cards, while the contactless technique use contactless cards, tablet phones, and an Automated Vehicle Identification (AVI) tag that employs RFID technology. Because contact methods need card interaction with a parking meter or payment machine in the facility, customers will choose the latter.

Parking meters have now been upgraded with technologies that change the payment system by allowing for the acceptance of a variety of card types, including credit cards, debit cards, and smart cards. Other technologies are included, such as a solar power source and wireless connection. The PhotoViolationMeter (Photo Violation Technologies, n.d.), which accepts a variety of payment options, detects vehicle presence using ground sensors. Most significantly, technologies such as WiFi connection (Photo Violations Technologies, n.d.), as well as the capacity to process fine payments and take pictures of cars that breach parking rules for proof, are included. Following test studies, personal parking meters, which are basically installed in the car, have been implemented in Buffalo, New York and Aspen, Colorado.

The use of RFID technologies in digital currencies has been applied in commercial systems such as Mobipower Ltd., which uses RFID-based cellular technology, and EZPass, which has created an RFID-based payment system for car parks and toll facilities. The need for the installation of a transponder device in the vehicle is same in both systems. Moving forward, mobile gadgets such as cellphones and personal digital assistants (PDAs) are often found incorporating other devices such as parking meters and cards. Prior registration through the internet is needed for certain systems, such as those deployed in Groningen, the Netherlands, and Oulu, Finland. Because mobile phones are being used, the system deployed in Oulu, Finland, also includes the possibility of sending SMS notifications to warn customers that the time is nearly up and to enable them to pay for the extra time extension that is needed.

The primary problem impeding the Smart Payment System's adoption would have to be mistrust about privacy and security concerns. This is owing to the fact that patrons' sensitive data, such as personal information and perhaps account information, is handled in a very secret manner. It is reasonable to be concerned about the development of different dangers. Exploits, viruses, and worms, as well as sniffing, spoofing, replay assaults, and denial of service attacks, are just a small part of the problem. Of course, techniques for protecting data and combating threats have been created, ranging from encryption, detection and evasion, as well as temporary deactivation, which are continuously improving from the traditional approach used during World War II.

E-parking: E-parking is a service that allows customers to check for availability and/or book a parking spot at their preferred parking facility, ensuring that an empty parking space is available when they arrive. The system may be accessible through a variety of ways, including SMS and the internet. Aside from the benefits obtained by utilizing the E-parking system as a whole, one of the other advantages is that it can easily be expanded to include the payment mechanism of a smart payment system, in which customers' payments are made hassle-free using the technologies mentioned before. Patrons may be given personalized information either before or during their visit to the car park[5].

## LITERATURE REVIEW

Robin Grodi et.al has accomplished that how the car will occupy in the specific allotted space. RFID sensors detect the presence of a vehicle or other things. Once a car is spotted, the system requires a method to inform

drivers of a parking space being occupied. The drawback is, the parking space will be discovered only to the local locations there is no GPS sensor to seek the parking slots from the distant place [6].

Alirezahassani et.al has developed this method utilising a mobile application that is linked to the cloud. The user will specify the time for when he is going to assign the spot. If he didn't occupy after the alarm will be provided to the user. The app will display the amount of allotted and the vacant spaces in the parking slots. The drawback is, after allocating if another user request for the same spot then he is unable to allot that place thus it is the waste of space if the first user cancel later, loss of time and money [7].

DharminiKanteti et.al has created a Smart Parking System In the event of pre-registered customers IP cameras would record the car registration number and they may continue without interruptions. As per their information like parking time estimation, their location of visit etc. For pre- registered customers, the money will be taken from E-wallet and there by users will be informed. A similar price structure will be used for new customers but the payment is offline. The drawbacks are, the system could fulfil all the parking requests but after 80 it couldn't accept additional vehicles because the parking is full [8], [9].

Georgios Tsaramirsis et.al makes advantage of the wired sensing systems. There are two types invasive and non-intrusive sensors. Intrusive sensors are most frequently placed directly on pavement surfaces or holes in the roadways surface. In turn, on-intrusive sensors may also be characterised as above ground sensors, which are placed above the traffic lane and are monitoring on either side of the road. The drawback is, intrusive sensors type are the reductions of pavement life owing to the need of pavement cut for installation [10].

Rosario Salpietroet.al developed automated detection of parking activities done by the users, via the analysis of smart-phone integrated sensors' and of the Bluetooth connection. Once the parking incident has been identified, an adaptive approach enables the spreading the information across the target scenario, utilising the combination of internet connection to a distant server, and device-to- device communication via wifi direct connections [6].

DharminiKantetiet.al developed a smart parking system in which CMOS sensor which identifies the number plate of the vehicle and data is checked with the database and the user will be assigned with his needed space. When the user enters allotted rotary parking space, the ultrasonic sensors are activated and the timer begins on. When the user get down, he should be giving the information of smart card which guarantees that the user got down as well as it will be useful when he wants to exist from the parking spot [5].

Basavaraju S R et.al developed a smart parking system which utilises the cloud based IoT architecture for smart parking system \swhich includes cloud service provider which offers cloud storage to store the information about the state of parking slot in a parking area. The centralised server which handles to store complete smart parking system information such as number of slot, availability of car etc [11].

1. *Suggested Methodology:*

The user uses the suggested system to book a parking space. The user may book a parking space for their vehicle here. When he enters the slot, the time period begins. When the user exits the slot, he must pay the money for the time period and park his vehicle in the slot area.The system architectural design defines the structure, behaviour, and other aspects of the system as well as analysis. The aim of design is to create a system module that will be utilised to construct the system. According to the suggested scheme. When a user first logs into the programme, he may see the real-time parking spaces that are available. After seeing the slot using the FIFO technique, the parking will be assigned to the users, and after he chooses the parking space by providing all of the necessary information, he will be able to book the parking space. So, when he reaches the parking area, his parking time begins; if the person does not remove the vehicle within the specified period, an alert message is sent. Then, when he exits the area, the time in and time out will be computed, and the appropriate amount will be paid.

*1.1.System Architecture*

The aim of design is to create a module of the system which is utilised to construct the system. Fig 1 illustrates the suggested system where:The user will register to the application,later he get login in to the programme by providing the user name and password.Intially on the site he is able to see the actual time slots that are accessible.By checking the availability of the slots he chooses the appropriate slot location and inputs the

necessary information such as vehicle number,parking slot number,intime,outtime.The data is transferred into the cloud that slot is assigned to the user.Once the chosen outtime is getting in to the end, if the individual did not get back his vehicle the alert message will be delivered to the user.Later the user departs the parking slot area he gets in to pay to the appropriate time period.Later the accessibility of the spaces will be updated on the site to see.

*1.2.Algorithm*

Computation, data analysis, and automated reasoning are all activities that an algorithm may accomplish. An algorithm is a technique for computing a function that can be stated in a limited amount of space and time and in a well-defined formal language.

Algorithm 1 outlines the interaction between the user and the staff while assigning a parking spot.

*1.3.Algorithm 1 : System Operations Algorithm*

Step 1: Start
Step 2: If user not registered
User registers into the system
Else
Login into the system Step 3: user sends the request
Step 4: staff will receive the request
Step 5: if parking space is not available
Staff will sends the message that slot is not available(try another Park! Unavailable space)
Go to step 3
Else
Staff will send the reserve parking slot number to the user
Step 6: user enters the car parking
Step 7: End

When a user attempts to locate a parking space, he must first register with the system in order to locate a free parking space, after which he must submit a request via the application. To get the message and check the park using the table, the system will receive the request and check the table of available parking. When a vehicle pulls into a parking lot, the drivers should be checked by security. This verification is accomplished by visiting the parking website. If all of the information is accurate, the motorist will be given a receipt and be allowed to enter the park. Later, the driver checks to see whether the parking lot is still empty. If such is the case, he will park and the status will be changed from reserved to park. If the present vehicle parking spot is filled, the system will deliver a fresh message instructing you to "Try another Park!" As demonstrated in algorithm 1, there is no space available.

*1.4.Algorithm 2: Update Staff Table*

Step 1: Start
Step 2: detects the vehicle using the ultrasonic sensor Step 3: update the staff table
Step 4: if the vehicle is leaving
Update the staff table
Go to step 2
Else
Go to step 2
Step 5: End

The sonar sensors detect a variation in the signal after the vehicle has been parked. The system refreshes the table case every 2-3 minutes by updating the status of each lot, which is accomplished by configuring the system as indicated in algorithm 2; The new address is included in the urgent data on a new car park. The message or information will be chosen depending on the present vehicle's reserved parking lot.
The ultrasonic sensor will send a signal to the Arduino when it detects the presence of the vehicle. The signal will then be sent to the relay via Arduino. The led lights are linked to the relay. When it gets the signal from the Arduino, it turns on or off the light depending on that signal. Ultrasonic sensors operate by sending out

sound waves and then waiting for them to return. When the automobile enters the designated slot, the ultrasonic sensor's sound waves strike the car and are reflected back, allowing the sensor to detect the presence of the vehicle.

## DISCUSSION

The Advance Parking System, accurately sense and predict spot/vehicle occupancy in real-time, The Advance Parking System directs visitors and residents to available parking spots. It can make the most of parking spaces. It provides value to parking stakeholders such as merchants and drivers by simplifying the parking experience.The Advance parking system uses IoT technology to aid in the free flow of traffic in the city. The Advance parking system enables intelligent data-driven decisions, such as real-time status apps and historical analytics reports. Advance parking helps to improve the urban environment by lowering $CO_2$ and other pollutant emissions. Advance Parking allows for better and real-time monitoring and management of available parking spaces, resulting in increased revenue. Advance Parking system offers tools for better workforce management.

## CONCLUSION

Because of the increase in the number of cars on the road, traffic congestion is unavoidable. This is because the existing transportation infrastructure and parking facilities are inadequate to handle the increased number of cars on the road. The smart parking system was created to address the aforementioned issues. Patrons can quickly find and obtain an empty parking spot at any car park that is convenient to them thanks to the installation of the smart parking system. The installation of a hassle-free payment system also makes vehicle entry and exit easier. With so many vehicle detection sensors on the market, the choices chosen may vary according to the various needs as well as the benefits and drawbacks of each. Following that, the different sensor systems utilized in the development of the systems, as well as current research and commercial systems on the market, are investigated, since vehicle detection is critical in the smart parking system.

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