

## AN OVERVIEW OF SMART PARKING SYSTEM USING IOT

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### Abstract

Nowadays increase in population leads to traffic congestion in cities in and around the world. It is already a big issue that is rapidly worsening in recent years. In addition to that, one major issue people faced today is parking their vehicles including two wheelers and cars. Parking spaces are very essential to the people. Cities must have enough dedicated areas as parking spaces to provide their residents and their visitants to park their car. IoT has gained more popularity in Smart City's development which have been improved with Automation for the car parking are being notable ones. The smart way of vehicle parking system assigns well-organised parking slot using Internet of Things technology. IoT comes with wireless access to the system and the user can keep track of the availability of the parking space using the cloud. This paper proposes an overview of the smart car parking system, will oblige users to finding an opt parking space within a flash time. This paper throws light on the views of IoT and its usage in parking in a nutshell through a smart city based cloud integrated and using the mobile application system.

**Keywords :** IoT, Intelligent Search, Smart Parking sensors, Smart cloud and Smart Gateways.

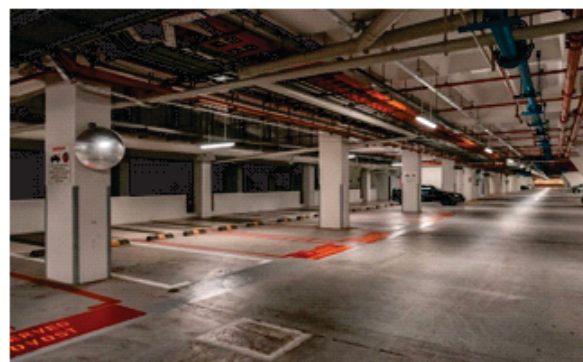
### I .INTRODUCTION

IoT transfer data through network without the human intervention through wireless technology via cloud. Recent growth in IoT made automation simple and smart. IoT searches things through the internet and help the user to take

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care of transparency. The technological growth of the Internet of things maximizes the productivity and reliability of the parking guidance and information system. The major problems of traffic jams, [1]small car parking spaces and road safety are solved by the Internet of Things.

The Smart Parking system use slow cost smart parking sensors, cameras or counting sensors and real time data and applications. The lighting, sensors, cameras and IPS (Indoor Positioning System) are embedded into parking slots or positioned next to them to detect convenient and occupied parking spots. The goal is to automatically reduce the amount of time spent searching for a place to park.



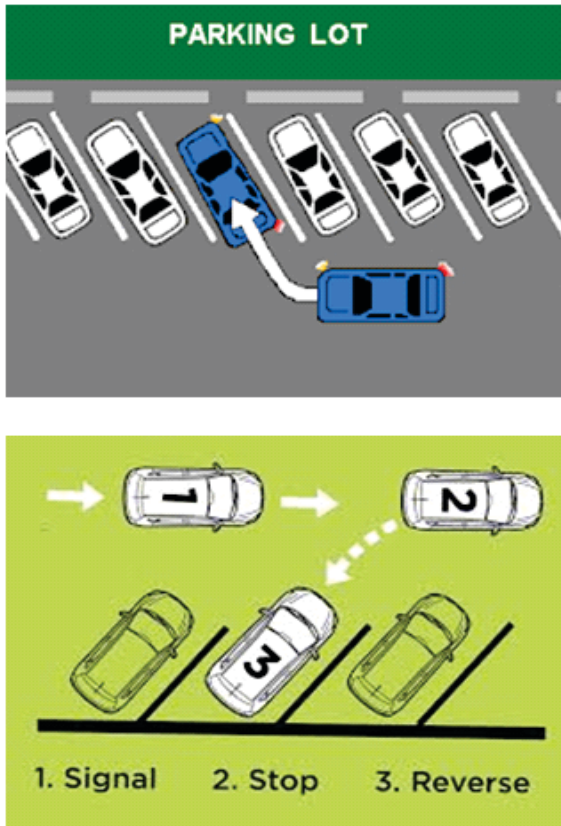
### II TYPES OF PARKING

There are different types of parking. The most common sorts of parking are parking angles, perpendicular parking and parallel parking. [2]

#### Angle Parking

Angled parking lots include two angle angles – 60 and 45 degrees. The 60-degree parking model requires a 60 degree turn to enter the parking area at a slight angle. Direct parking is also much faster than suspended parking because two car lanes are usually occupied. If cars are able to get in and out,

and using the parking lot lanes quickly will lead to less congestion.[3]



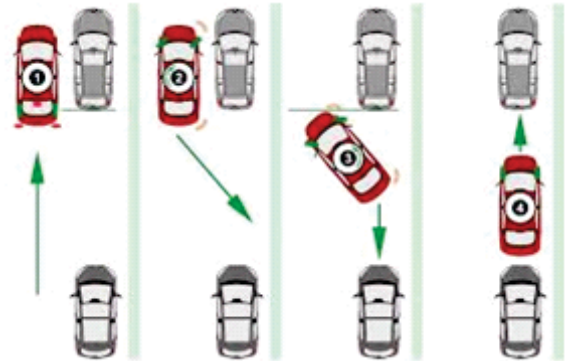
**Perpendicular Parking**

Perpendicular parking is a form of parking that requires vehicles to be parked on either side, at either crosswalk or sidewalk. This type of parking takes up less space than the parallel parking and is often used in parking lots and car garages. [4]



**Parallel Parking**

Parallel parking is a way to park a car in line with the road, in conjunction with other parked cars. The parallel parking lot usually requires that first drive to slowly pass the parking lot, like a car parked in front of that area, keep a safe distance, then return to that parking lot.[5]



**Components of Smart Parking**

The smart parking market has been established

Type of park assistance - guided park assist, smart park assist)

- Components (parking sensors, steering angle sensors, display units, ECU)
- Sensor technology (ultrasonic, radar and image)
- Vertical parking management market (government and commercial)
- Parking. [6]

**III PARK ASSIST SYSTEM TYPE**

**SENSORS – FIRST PHASE**

- Smart Parking has designed and developed for a variety of in-ground, surface-mount and overhead indicator vehicle detection sensors. Global Positioning System or On-Board Diagnostics sensors is used to detect the location data of a car and occupation of the parking lot. The collected data are passed to the gateway of cloud, worked and dispatch to the network server. Information will be presented to users (drivers/ car company managers)in an interpretable format.[7].

- Wireless sensor networks (WSNs) have attracted increasing attention in both academic and industrial communities. It often installed in various locations to monitor and collect data.

### Parking Sensors

• In Smart parking, to identify vehicles the RFID (Radio Frequency Identification) identifiers are embedded into parking gates. There are two categories of devices one is with wired and other one is a wireless communication to a gateway where the situation can be recognized. The important roles played by the sensor devices are:

- To reveal the car's presence/absence, the sensing slave nodes are located in the parking spot.
- Master nodes are situated at the edges of the parking lot to detect the presence of a vehicle and gather sensor readings from the slave nodes.
- Repeater sensor nodes or anchor nodes, tactically placed at particular spots in the parking lot to increase the network coverage and wireless sensor network connectivity which is positioned based on geographic constraints.[8]

### Steering Angle Sensors

- The steering angle sensor (SAS) determines where the driver wants to guide, matching the steering wheel or operating rudder with the vehicle's wheels. The steering angle determines where the wheels are pointed. The information collected from the wheel speed sensors, yaw and accelerometer are used to calculate the dynamics of the vehicle. [9]
- The directional angle can be measured with optical sensors, by looking at the performance of the Hall effect and other technologies. These sensors measure the movement of the wheel by degrees.

### Display units, ECU

- Communication with other devices in the car is provided in two built-in modes, independent Controller Area Network Bus and communication ports. CAN models are provided with the most popular Electronic Control Units, which are fully configurable, allowing us to bind hardware to any engine management system. The automatic controller is paired with the graphic art processor. This combination provides the perfect working environment for any engineer or driver.



## IV SENSOR TECHNOLOGY

Parking sensors are located in the car bumpers. The sensors aware the environments and measure the distance between the car and obstruction on the road. The driver is alerted by a beeping noise as their vehicles got closer approaches to an object. [10]

### Smart Counter Systems

The counting system is detected when a vehicle enters and leaves the parking lot. IoT - based platforms offer drivers with a real-time counter of available free spots. Facility administrator uses counter systems to extend the efficiency of the parking facility, determine styles and patterns according to consumer flow, and be able to predict future vehicle surges.

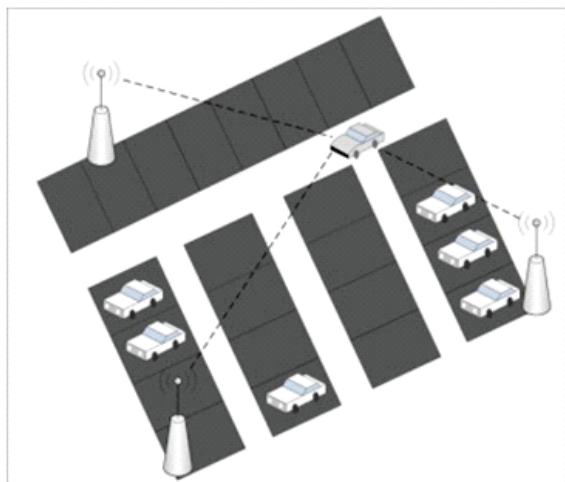
### Control systems

IoT contributes road safety in urban areas by acting as traffic regulator and reinforcer. Sensors mesh-work and rapid data processing algorithms, intelligent parking control systems

can identify and register the parking violations, respective evidence, issue a notice, and notify the violating people in a matter of seconds.

### Communicating to User

The second phase communicates the collected data to the user remotely. The system was developed and tested in the parking lots, where it had been tested actually in section A and in a simulation mode B in both car park lot sections A and B.



### Smart Parking Steps

**Mobile Application:** The smart parking system app installed in the users mobile.

Wi-Fi internet connection is utilized for wireless communication. Android Application has two ways to link that uses a Wi-Fi IP address directly connected to the mobile app for initial testing. Another one permits the user to view the space, decide the slot and park the vehicle.

Light Emitting Diode Indicator used to show the available parking slot. When the LED light is on the slot is available and not available, when it is in the off state.

Slot Detection using Infra-Red (IR) sensors discovers the objects and sensory barriers. Whenever the vehicle

enters, the IR sensors continue to transmit infrared light and detect the vehicle.

Proximity Access Control System using Radio Frequency Identification tags is installed on vehicles to register the arrival and departure times depending on parking cost. Cloud computing was used to save the daily data from each sensor. The cloud storage provides the benefits of unlimited storage capacity, low cost and ease of use for both door and gate entry structure.

- Cloud Based Server keeps track of all resource details located in each parking lot. The structure allows the driver to search and retrieve information regarding parking slots from car park by directly accessing the cloud-based server.

### Parking management system :

Installing a smart platform in the parking industry should adhere to:

- Tracks and predicts the availability of parking spaces.
- Real-time parking monitoring from any PC or smart phone.
- API used to perform end user management and administrators.
- Easy-to-use, access permissions for various user groups.

### Pros of Smart Parking Systems

The increase of the city's populace, increases in the mobilization of people from one place to another look for more parking spaces. Smart Parking systems taken care of the users necessitate recreation space. The benefits of parking slot management offer: [11]

- Real-time Monitoring: IoT parking tools assist to seek a place in an unknown location, trace the real time situation and assure that the driver time is not wasted by searching for parking lots full of jam.

- Contribute best control to drivers, owners, consumers, law enforcement officers, businesses and traffic management system.
- Smart parking system ensures safety by let to know drivers not to leave a vehicle in a non-parking area. Traffic rule execution agencies able to create a proficient way to detect parking violation and thus help them in safety parking.
- Improving parking extent and reduce search time in a busy area.
- Intelligence parking system discovers an accessible spot with less search in traffic area. The holdup issue are often lessened, allowing city dwellers to conserve their productive time.
- The parking tools used by the IoT will help users by automatically adjusting the meter fare depending on the current structure. Also, automatic meter renewal tools will help out parking lots to save money and attract new visitors.
- Car navigation by inspecting parking methods in supermarkets, departmental stores, airports.
- Parking software is not compatible with the decision-making processes that bring clarity to increase parking in an empty slot. Regular real time data collected predict the smart platforms to determine complex season patterns and trends.
- Parking management will have an idea of how traffic flows throughout the year, what causes the growing demand for parking at the regular intervals and make better use of parking spaces. [12]

## V. CONCLUSION

The Smart Parking System has reduced traffic time and search time and helps the user to park the car more easily. It has helped the road management system to avoid

unnecessary crowd and unnecessary accidents using IoT. It provides new ways to engage with the community and reduces the proliferation of traffic and pollution. It also provides economic growth. Different types of sensors and communication through cloud using mobile were analyzed.

## REFERENCES

- [1] Goyal, D. and Kataria, D. (2015) Traffic Congestion on Roads. SSRG International Journal of Civil Engineering (SSRG-IJCE). 2 (5). p.12-15.
- [2] Thorat, P., M, A., Kelshikar, A., Londhe, S. & Choudhary, M. (2017) IOT Based Smart Parking System Using RFID. International Journal of Computer Engineering in Research Trends. 4 (1) p.9-12.
- [3] Abhirup Khanna, R. A. (2016). IoT based Smart Parking System. International Conference on Internet of Things and Applications (IOTA)(p.5).Pune:IEEE.
- [4] O.Orrie, B.S.(2015). A Wireless Smart Parking System. IECON(p.5). Yokohama: IEEE.
- [5] Khaoula Hassoune, W.D.(2016). Smart parking Systems: A Survey. IEEE, 6.
- [6] Wael Alsafery, B.A.(2018). Smart Car Parking System Solution for the Internet of Things in Smart Cities. IEEE, 5.
- [7] Rachapol Look muang, K.N.(2018). Smart Parking Using IoT Technology. IEEE, 6.
- [8] R.H.Giva Andriana, Anak Agung, "Sensor Comparison for Smart Parking System," pp.4-9, 2012.
- [9] Deng, D. (2015). A Cloud - Based Smart-Parking System Based on Internet-of-Things Technologies. IEEE, 11.

- [10] P.Mane, R.Deoghare, S.Nagmote, S.Musle, and S.Sarwade, "Android based Smart Parking System," pp. 3981–3985,2015.
- [11] Sajeev, A., Mallick, C.,Vidwans, S. and Jog, Y. (2015) Understanding Smart and Automated Parking Technology. International Journal of u - and e - Service, Science and Technology. 8(2). p. 251-262.
- [12] M. Computing, "Smart Car Parking Using Arduino," vol. 5, no. 2, pp.230–234,2016.