

# SMART PARKING SYSTEM FOR SMART CITY

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**Abstract** - Now a days there is so many problem for parking system. since the numbers of vehicles are running on the road are increasing day by day and the free spaces in the cities are the same. There is productivity and reliability of urban infrastructure. Problems such as, traffic congestion and road safety are being addressed by IoT. So using embedded system we can solve these problem. Using embedded system there is chance to develop a application which can solve these problem. The proposed smart parking solution gives an onsite deployment in which, IoT application monitors and indicate the availability of each parking space. A mobile application is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly. The aim of this paper is to reduce the traffic problem, pollution problem for smart cities.

**Key Words:** Internet of Things, Cloud, Smart Parking, Smart City, MQTT.

## 1. INTRODUCTION

Now a days internet is the basic need of every person. Internet is a thing which is making our lives easier as well as faster. The use of smart phones has tremendous applications. There are so many applications we can use with internet. The parking system is one of the application. With the help of this application we can the problem related to parking can be solve. As There are so many problems related to parking like blockage of road, pollution, traffic problem etc. so to solve this problem Hence we are trying to introduce a parking system based on IoT to make the parking systematically. This can reduce blockage of road, accidents, pollution and traffic problem. suppose In the process of searching a parking place, driver has to slow down the speed of vehicles which increases the traffic. This type of situations may increase accidents, pollution and also can wastes the valuable time of commuters. Also the space finding process consumes lot of fuel. Hence to solve all these problems there is one solution a solution i.e. "Smart Parking System For Smart City". the smart parking system for smart city is base on IoT. The IoT (Internet of Things) have two prominent words and they are "internet" and "things". Internet means a vast global network of connected servers, computers, tablets and mobiles using the internationally used protocols and connecting systems. Internet enables sending, receiving, or communicating of information. The meaning of "Thing" is a term used to reference to a physical object, an action, situation, in case when we do not wish to be precise. IoT, in general consists of inter-network of the devices and physical objects, number of objects can gather the data at remote

locations and communicate to units managing, acquiring, organizing and analyzing the data in the processes and services. It provides a vision where things become smart and behave alive through sensing, computing and communicating by embedded small devices which interact with remote objects or persons through connectivity. The Cloud computing is allowing developers to create and host their applications on it. Cloud acts as a perfect partner for IoT as it acts as a platform where all the sensor data can be stored and accessed from remote location. At present there are certain parking systems that claim to citizens of delivering real time information about available parking spaces. Such systems require efficient sensors to be deployed in the parking areas for monitoring the occupancy as well as quick data processing units in order to gain practical insights from data collected over various sources. The smart parking system that we propose is implemented using a mobile application that is connected to the cloud. The data of user is store in cloud. The system helps a user know the availability of parking spaces on a real time basis. With the help of these app user will know where user can park vehicle. This app can help manage and reducing the road traffic and helps customers to save time in finding a parking spot. so the rest of paper is organized as follows. Section 2 contain System Architecture of the parking system, section 3 contain implementation and working of parking System, and Section 4 conclusion with references.

## 2. SYSTEM ARCHITECTURE

In this we will discuss the architecture of system. Below is the figure of Smart Parking System. In that figure we will know how the parking system will be for smart cities.

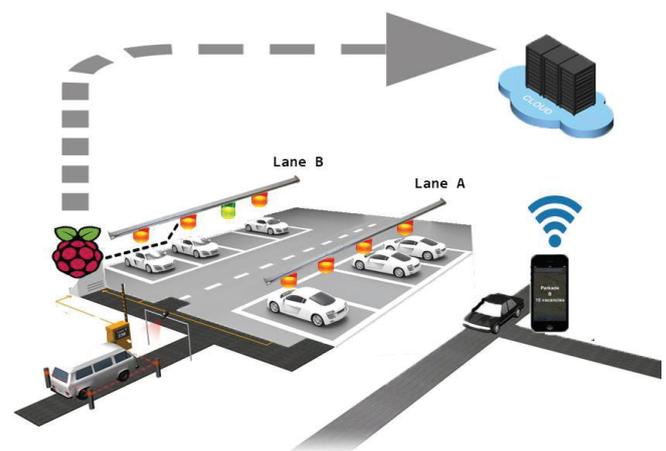


Fig -1: Smart Parking System for Smart City.

Above is the figure of Parking System for Smart City. In above figure there is green light indicate that there is empty space to if anyone user want to park then user can park after registration. There is also a red light which indicate that there car is parked. In lane B there is no booking so green light is on. In lane A there is red light is on. In lane there is no car is present but there is red light is on because user registered for that slot. These are about different color of light indicate that there is any space for parking or not.

As there are some modules for smart parking system. They are as follows:

### 2.1 Ultrasonic Sensor:

For the parking system we have made use of sensor Ultrasonic Sensors. The use of sensor is to determine the parking area is vacant or not. the ultrasonic sensors to detect the presence of a car. The ultrasonic sensors are wirelessly connected to raspberry pi using the ESP8266 chip. An ESP8266 chip is the Wi-Fi chip, which is low in cost. It is a small module which allows microcontrollers to connect to the Wi-Fi network.

### 2.2 Processing Unit:

It comprises of Raspberry pi which is a processor on chip. The processing unit acts like an intermediate between the sensors and cloud. All the sensors are wirelessly connected to the processing unit.

### 2.3 Raspberry pi:

Raspberry pi is a single board computer which is of credit card sized. the system on chip It has several versions model A, A+, B, B+, zero. A single raspberry pi unit comprises of 26 GPIO pins i.e. 26 different sensors can be connected to it. Suppose if we want to connect more than 26 pins then we can increase this number by attaching a multiplexer (MUX) to it. It is essential that the ground of raspberry pi and sensors must be connected in order to transfer data using the GPIO pins. There is a python script running on the chip that checks the status of various GPIO pins and updates this information onto the cloud. Data collected from various sensors is sent to the raspberry pi through the esp8266 chip. The raspberry pi then transmits this data to the IBM MQTT Server through MQTT protocol over a channel.

### 2.4 MQTT Server:

MQTT (Message Queue Telemetry Transport) Protocol is a publish-subscribe based "light weight" messaging protocol. It is also a Machine to machine connectivity protocol. It connect physical devices to the server. It works by exchanging a series of MQTT control packets in a defined way. The control packet sent over the network has a specific purpose and every bit in the packet is carefully crafted to reduce the data transmission an MQTT topology has an MQTT server and an MQTT client. MQTT client and server are communicating through different control packets.

### 2.5 User Side Platform:

On the user side there is a application for user to registered for parking. After registered then and then only user can park vehicle. So for parking the vehicle registration is compulsory. so for registration there will be a application for user.

### 2.6 Mobile Application:

The purpose of mobile application is for user. Because of this user can do registration and this app will provide information regarding availability of parking spaces and allowing the a user to book a slot accordingly it. The application is developed in Apache Cordova and Angular Js framework using JavaScript as a programming language. The purpose of using Apache Cordova is to create applications that can run on both android and iOS platform with the same source code.

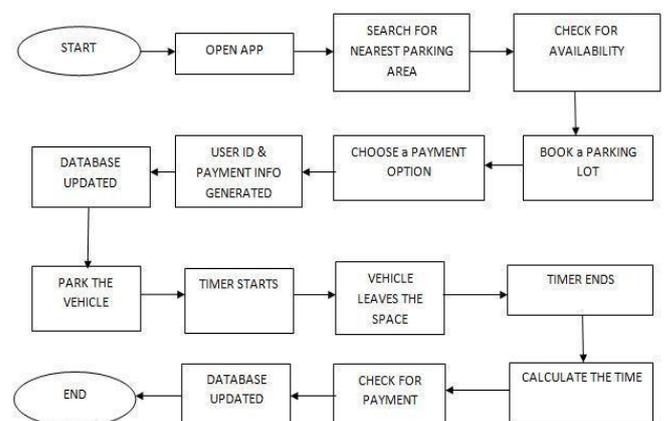
### 2.7 The Cloud:

Cloud acts as a database to store all the records related to parking areas and end users that have access to the system. It keeps a track of every user connected to the system and maintains information such as time at which the car was parked, time duration for parking a car, amount paid by the user and mode of payment. It is due to the flexible nature of cloud which permits the system to add any number of users at any time of the day. Continuous backup is made of the data stored on cloud in order to ensure easy and quick recovery of data in case of any kind of system failure.

## 3. IMPLEMENTATION & WORKING

In implementation and working we will discuss that the scenario of smart parking system. The complete working of booking the parking slot, the vehicle is in that slot, and leaving the vehicle. These all scenario is discuss in the parking system.

Below is flow chart of Smart parking system. From that flow chart the working of the Smart parking system is clear.



**Fig-2: Flow chart of Smart Parking System**

Above is the flow chart of Smart parking System. Suppose a driver want to park a vehicle. so for parking the vehicle the driver firstly open a application and book a slot. After booking driver will do the online payment according to parking time. After making payment a slot is allocated to driver. The information of that driver that is name, parking time etc all these information will be stored in a cloud because here cloud is doing the role of a database. As the user will register and make payment the data of that user will be stored in cloud. The data will be updated. As when another user leave the parking system then data of that user that leave the system that data will be deleted from cloud. In cloud update and delete process is done. Cloud will take a backup of all data. As driver done with registration and payment Now the driver park his vehicle in the slot and the timer will get start. After the time out driver will get notification and after getting notification driver has to leave that space with vehicle. In the case if driver shoot its parking time then driver have to pay extra charges while leaving the parking area. the above procedure we all have to follow for proper parking. As we do these type of proper parking then there is no problem to anyone for parking the vehicle. This is the best way for parking.

Let see the parking the vehicle step by step. Steps are as follows:

- Step 1: Install app in mobile.
- Step 2: Search parking area near the destination.
- Step 3: Browse through the various parking slots available in that parking area
- Step 4: Now select parking lot.
- Step 5: Registered for that parking slot.
- Step 6: Select the amount of time (in hours).
- Step 7: Make online payment .
- Step 8: After registration and payment step user get message of successful registration.
- Step 9: Confirm your occupancy using the mobile application.

#### 4. CONCLUSIONS

Now a days everyone want smart city. For smart city there is a parking problem. while parking the vehicle there is a parking issue, blockage of road, chances of accidents, air pollution this type of problems are there for parking. There is a solution which is IoT based and cloud computing based that is smart parking system for smart city. The system will provide true information regarding availability slots for parking. User have to install a app and after installing user have to registered for parking vehicle and after that user will a lot a slot. This is the proper way for parking the vehicle . for smart city this is the proper way for smart parking.

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