

# Smart Parking Reservation System using IOT

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**Abstract** - Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access the things from any remote location. It's inevitable for the people to update with the growing technology. And generally, people are facing problems on parking vehicles in parking slots in a city. In this paper we designed a Smart Parking Reservation System which gives availability of parking slots in that respective parking area with the help of Mobile app and it mainly focuses on reducing the time in finding the parking slots and also it avoids the unnecessary travelling through filled parking slots in a parking area by making use of sensor which continuously detects the parking slots and with the help of android app user comes to know the status of the parking area. Thus it reduces the fuel consumption which is eco-friendly and in turn reduces carbon footprints in an atmosphere.

**Keywords** - Smart Parking, IR Sensors, Wi-Fi Module, LCD display, Internet of Things (IOT), Android Mobile.

## I. INTRODUCTION

Finding a parking slot to park their vehicle has ended up being a disappointing issue to the drivers all the time. It has saved the way for traffic congestion which has turned out to be an alarming problem on a global scale. Also, it has been found that it has led to the burning of world's oil over a million. According to a report, Smart Parking system could benefit in saving 2,20,000 gallons of gas till 2030 and 3,00,000 gallons of gas by 2050, if it is executed perfectly. In order to alleviate this condition, many smart parking facilities evolved but failed to bring relief to all. They could only give the parking information but didn't prove to "smart" enough. For example, if they could publish the vacant parking slots many drivers rush to fill the limited spaces. So, we have tried to address these issues in this paper. Here, we propose an idea to realize Smart Parking structure in perspective of reservation using Internet of Things (IOT).

**Real Objects + Internet + Sensors and Controllers = Internet of Things**

Internet of Things plays a vital role in the creation of Smart Cities. The most important factors for the emergence of smart cities are cozy parking facilities and efficient transportation and management. According to the latest report made by The International Parking Institute, we found that many innovative parking ideas have been developed.

They were able to deliver the parking information about the vacant parking lots. These systems used effective sensors in the parking areas and by tracking information from various sources and also deployed active data processing units. Here our proposed idea could be implemented using a mobile application so the drivers could get their parking information and reserve the vacant spaces of their wish as per their vehicle's width via Wi-Fi or Internet because today almost everyone can possess a smart phone with them.

## II. LITERATURE REVIEW

**[1] Smart Parking System using optic Wireless Sensor Network** - This system experienced the use of video cameras where they are deployed in the parking slots and are able to capture the license plate of the car and also monitor the parking spaces.

**Advantages:**

1. They are cost-efficient.
2. Optic WSNs are easy to maintain and to install.

**Disadvantages:**

1. They are not much powerful as there is a high chance of failure in the device.
2. Accuracy of the license plate detection is quite impossible.

**[2] Smart parking reservation system using Bluetooth and Zigbee sensors** -This system uses a Bluetooth communication technique which is used for verifying the driver's identity and also to book a slot by identifying the vacant spaces. Zigbee sensors are used to detect the vehicle.

**Advantages:**

1. Internet usage is not necessary.
2. It is a decentralized system.

**Disadvantages:**

1. Range of Bluetooth is limited.
2. Installation and maintenance is difficult.
3. Connection gets disconnected if the driver is inactive and again a new slot has to be booked.

**[3] Smart Parking System using RFID** - This system uses RFID to match the vehicle's unique RFID tag with the value in the database when it is read by the RFID reader in the parking lot entrance.

**Advantages:**

1. This is a fast method of identification and quite cost efficient.

**Disadvantages:**

1. If the RFID tags are damaged or more than one tags are read at a time, the system fails to work accurately.

III. SYSTEM ARCHITECTURE

Basic components need for the smart parking with reservation system is:

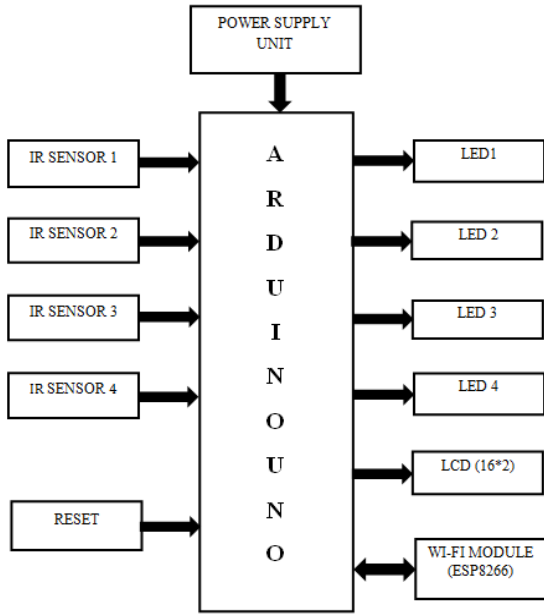


Figure 1: Block diagram.

**A. Arduino UNO** - A microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

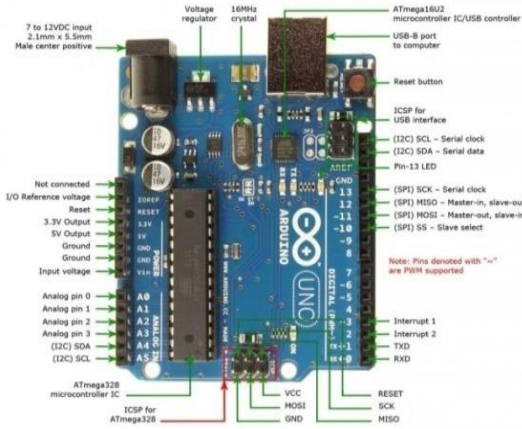


Figure 2: Arduino UNO

**B. Sensor** - The Infra Red photoelectric reflective module, with a range of 0.02 to 0.4 meters was used. It requires 5Volts and less than 2mA of current the required power is provided by the raspberry pi board. The output goes low in the presence of an obstacle.



Figure 3: IR sensor

**C. LCD Display** - A Liquid Crystal Display is a thin, flat plate used for electronically displaying information such as text. In the Proposed System LCD shows the condition of parking slot whether the slot is booked or vacant.

**D. Wi-Fi Module (ESP8266)** - The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

**E. SPRS (Smart Parking Reservation System) Architecture** - The system architecture for the smart parking with reservation system has major components:

- i). **User App** performs four operations searching, checking availability, reservation and cancelation. User interface of the app is easy to use.
- ii). **Parking Slots:** In the parking slots, all sensors are kept in the individual lot were that gives the appropriate data to the Arduino Uno. Arduino uploads the data to the cloud.

IV. IMPLEMENTATION AND WORKING

We here explain the real time working of the system with the help of a flowchart as given in Figure 4.

We had implemented the system using a toy car and android app, but this system could be implemented in malls and multi storied buildings. Below are the steps involved in booking a slot in our parking system

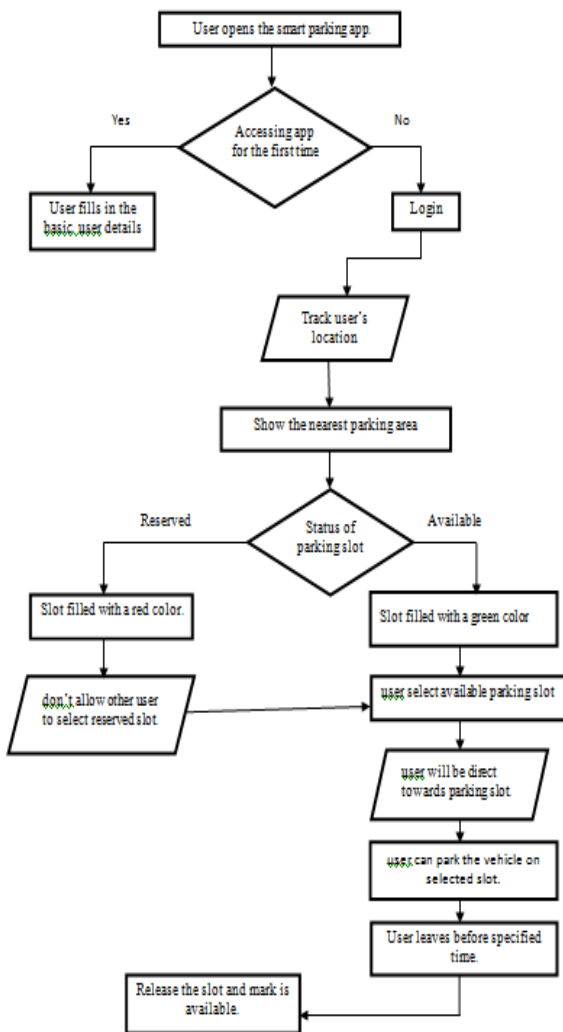


Figure 4: Flow Chart of the System

- Step 1:** Install the android app in the mobile.
- Step 2:** Register the app using the credentials.
- Step 3:** Login to the system.
- Step 4:** The parking map displays the free slots in the parking area.
- Step 5:** If the user wishes to reserve a slot in the parking area then click on book option to reserve the parking slot.
- Step 6:** Status of the reserved area notified via LED lights in parking area.
- Step 7:** Once the car is parked and then taken off from the parking slot, the parking charges are deducted.
- Step 8:** If user wants to cancel the reservation, user can just give the cancellation request in the mobile app.

V. RESULT ANALYSIS

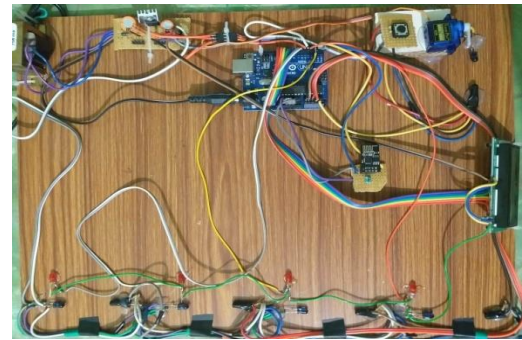


Figure 5: Prototype of System

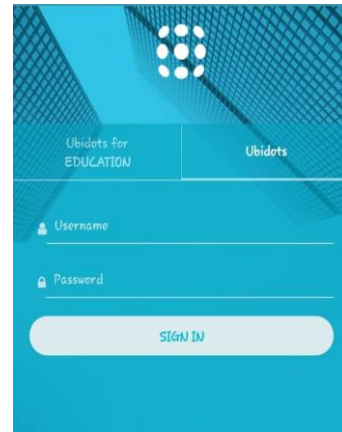


Figure 6: Login of User

User has to login with a specific details as shown in the android app.



Figure 7: To book the slot in Mobile App.

If the slot is booked it indicates the full or it indicates the Vacant in the mobile app. In the above figure it indicates booking of slot 1 in the parking area.



Figure 8: Identification of the available Parking Slot.

Red color indicates the parking slot is not available.  
Green color indicates the parking area is available to Book.

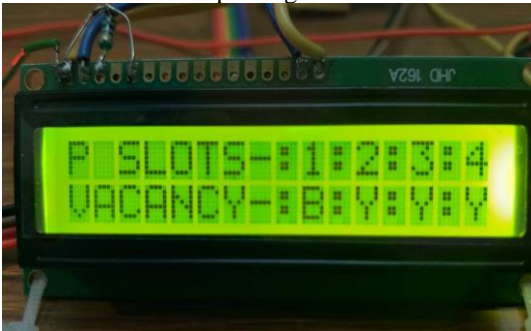


Figure 9: Indication of Parking Slot on the Display

**B** indicates parking slot is Booked.  
**Y** indicates parking slot is Vacant.

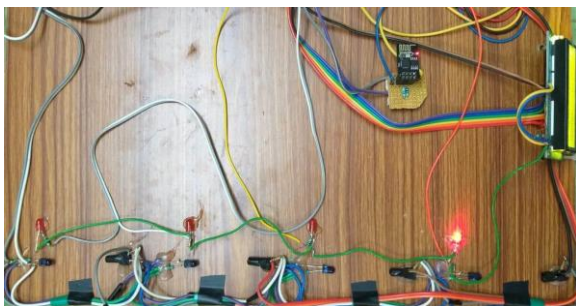


Figure 10: LED at the Parking Area

LED indicates the Status of the parking slot in the parking Area.



Figure 11: Indication of No vacancy on Display.

If all the parking slots are filled, then it indicates the “No Vacancy, All Slots Are Full” on the Display at the Parking Area.

### VI. CONCLUSION

An IOT based smart parking solution has been described in this paper. The world moves towards smart cities, such a parking solution is the need of the hour. This work focuses on a parking system with prior reservation to overcome waiting in the queue. This prototype is developed using IR sensor, Arduino, mobile app, thus by using this prototype the average waiting time for vehicle parking becomes minimal. Smart parking with reservation system increases the revenue for service providers, provides service differentiation for users with different needs, eliminates traffic congestion pertaining for parking.

### VII. FUTURE SCOPE

The sensors used to detect the vehicle are the essential components. Here, we have employed Arduino which seemed to be cost efficient with easy installation and maintenance. In future we would develop application for OS and also with virtual reality and test its workability in a real time environment. We infer that our future work would facilitate parking issues and decrease traffic congestion and pollution created by the search for parking.

### VIII. REFERENCES

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