# Parking Allocation Using Ultrasonic Sensors and Android Application

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***Abstract —*** *In recent times the concept of smart cities has gained much popularity. Thanks to the concept of Internet of Things (IoT) where access to smart city ideas are possible. Problems such as traffic congestion, limited parking and road safety have now been given priority by IoT and android apps. Mobile application is provided when the user is allowed to view and book parking. This paper describes an advanced concept of system design and how ultrasonic sensors and microcontrollers are used to determine the availability of parking spaces. This paper aims to improve the amount of user time and ease of use in the parking system.*

***Keywords—Internet of Things; Smart Parking; Ultrasonic sensors.***

## I. INTRODUCTION

Finding a parking space has become a daily practice for many people around the world. It is often a time-consuming and frustrating process that many citizens have to go through. Next to parking becomes the daily pain, which in turn contributes to the pollution of the planet.

In short, Smart Parking is a parking solution that can include Smart Parking sensors on the ground. These devices are usually plugged into parking lots or placed next to them to find out if parking is free or occupied by people. This happens with real-time data collection. Information is then transferred to the mobile parking app, which communicates the availability to its users. This gives you a chance to explore every parking option you can find. Smart Parking and its Smart Parking sensors can be seen as part of smart cities. These smart cities are cities driven by IT infrastructure and through this infrastructure, cities can improve the quality of life and promote economic development for its citizens.

Thanks to the use of Smart Parking, people looking to find parking will find it more efficient and companies or municipalities can expand their parking spaces. It also makes cities more accessible, safer and less stressful.

At the entrance, the ultrasonic sensor detects the presence of the vehicle. The sensor transmits the signal to the Arduino uno. Arduino stores information and sends it to your android app. When a slot is found, the booking is confirmed. After that, an OTP is generated and sent to a registered mobile number, which helps to open the boom barrier installed and allow the vehicle to enter. The vehicle goes to the allotted level and continuously inspects the allotted portion. The car is parked in a designated area and is audited with an ultrasonic sensor. The project follows the "pay-as-go" model. At the time of departure, details are stored with vehicle details, time of entry etc. It is issued and used to calculate the time the car was parked. According to the time frame, the bill was generated.

The main function of this app is to help the user find the parking slots where parking is available and the total number of free slots in that area. Our proposed approach therefore reduces the user's effort and time to search for a parking space.

## II. EXISTING SYSTEM

The existing system is very difficult to manage because all events are managed manually. In a traditional parking lot, finding a parking space is a very tedious process that requires a lot of physical effort. It takes time and bustle as the user has to find a place and park his car.

*A. Drawbacks:*

i. It is a very Time-Consuming process.

ii. The users check manually where the slot is free and park the vehicle with a lot of physical work and bustle.

iii. A number of human resources are needed.

iv. There will be some Security issues that may arise with this system.

## III. USERS OF THE SYSTEM

- Civilians owning private vehicles.
- System administrator

## IV. PROPOSED SYSTEM

The proposed Smart Parking consists of deploying an IoT module that will be used to monitor and indicate the availability state of each parking space. A mobile app

allows the end user to check the availability of parking slot and to book a parking slot accordingly.

*A. ULTRASONIC SENSORS*

For our parking system we have made use of Ultrasonic Sensors. The work of these sensors is the same to sense the parking area and determine whether a parking slot is vacant or not. In this proposed system we are using ultrasonic sensors to detect the presence of a car.

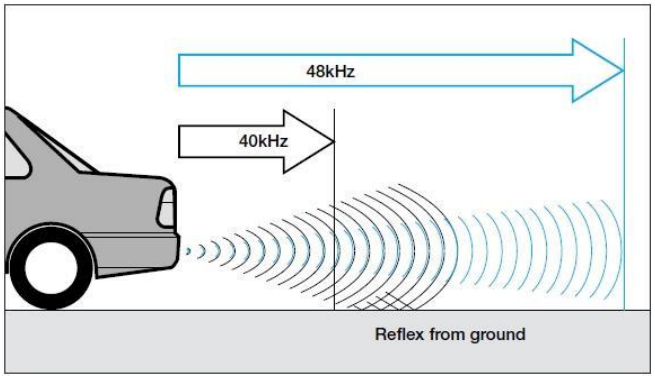



Fig.1 Working of ultrasonic sensors

*B. Arduino Uno*

Arduino is a prototype platform (open-source) based on easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The purpose of the arduino is used to transmit the command through the signal. It can be powered using a power supply or by using USB cable.The supply voltage is 6 to 20 volts either it is an AC or DC supply. The Arduino communicates either with another arduino, or with another microcontroller or another computer. It supports Inter Integrated circuit and SPI Communication.

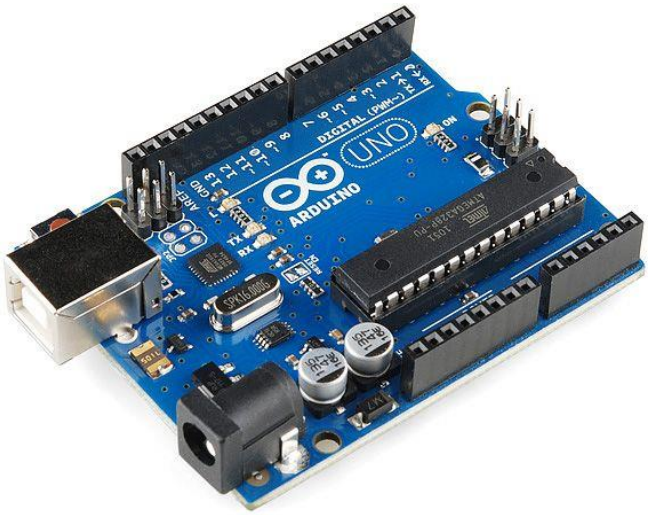



Fig.2 Arduino Uno

*C. MOBILE APPLICATION*

The mobile application acts like an interface for the end users to interact with the system. The purpose of this mobile application is to provide information on the availability of parking spaces and allow the end user to book a parking slot accordingly. The working of the mobile application is initiated when the user enters the vehicle number and registers himself and later views the user interface where the slot availability is shown. The green slot indicates it is vacant and the red slot indicates occupancy. Once the slot is selected, the message displaying booked will be sent to the registered number following which the generated OTP is received.The user enters the OTP and parks his vehicle in the slot given.

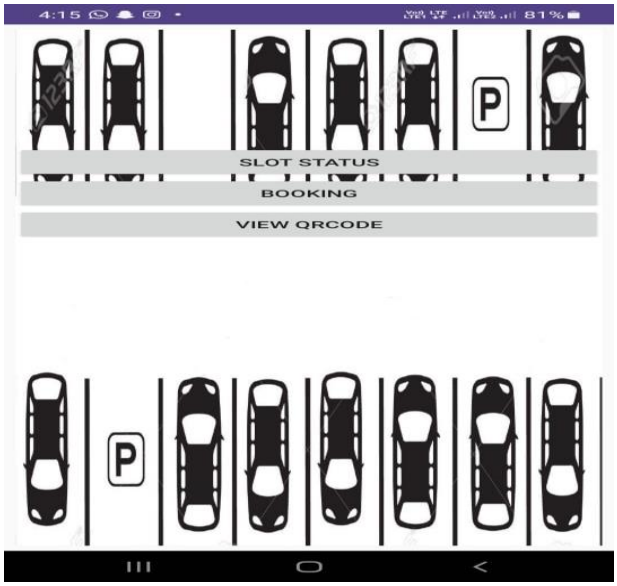
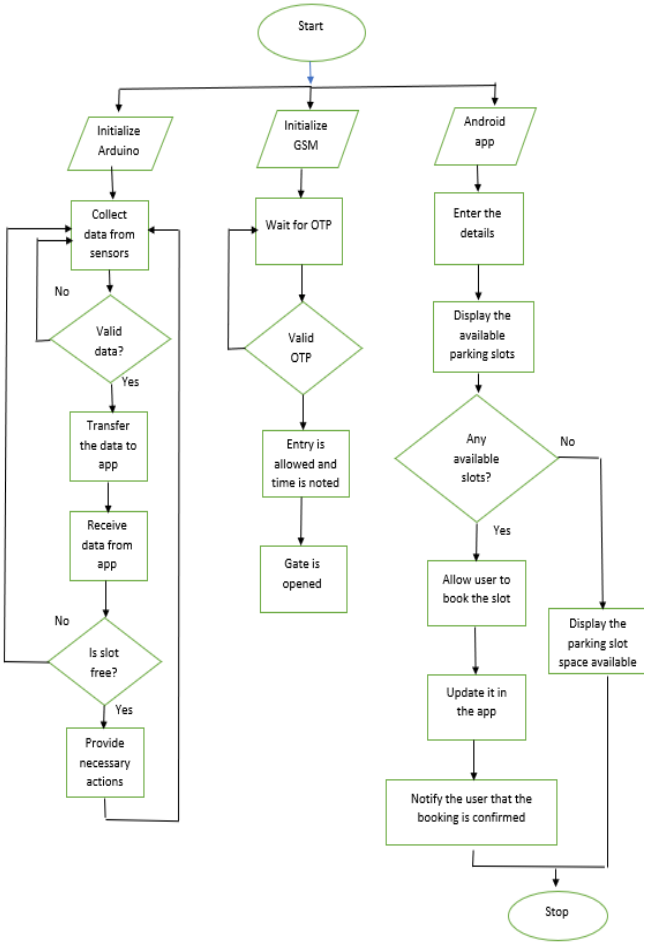



Fig.3 User interface of the app

## V. IMPLEMENTATION AND WORKING

The complete working of the proposed system starts when the user with the help of the app is able to book a slot. Initially, the user must enter his details such as vehicle number, email and phone number. The slots will be available on the screen where the user selects one particular slot. These slots are displayed based on the information collected from the sensors. Ultrasonic sensors emit waves and detect if the parking space is free or not based on the speed the emitted waves are reflected. This information is transferred to the android app with the help of a microcontroller. Once the user selects the slot and books it, the registered number will get an OTP and this OTP will be valid exactly for the time which has been programmed. The OTP is achieved using an GSM module. If the user does not reach the space, the OTP will be cancelled and this will be intimidated.

The user selects the slot and the OTP will be entered at the parking spot. The gates open and the entry time is noted. Once the user scans the QR code, the cost for the parking based on the time the vehicle was parked will be displayed. The payment has to be done manually at the parking space.




## VI. CONCLUSION

The main contribution of this proposed system is to introduce a solution to the most significant parking problem — i.e., finding an empty space. Ultrasonic sensors are used for parking space detection. The proposed architecture for a parking detection system will decrease searching time for vacant spaces and reduce instances of vehicles improperly parked across two spaces. Future research might examine vehicle park booking procedures and optimization of sensor usage. Cost effectiveness and marketing could be studied as well.

The research shows that when smart parking systems have been installed, the time taken to find a parking space can be reduced by up to 43%, vehicle miles travelled can be reduced by 30% and traffic volume decreased by 8%.

The proposed system improves the performance by decreasing the empty space in a parking lot, and numbers of drivers who fail to find a parking space, reducing the cost of fuel to find a parking space and reducing air pollution when the user tries to find parking lots. Adapted in environment friendly cities, our system can be used in public and private sectors. The update of the status can be sent as the message for users which makes the driver more satisfied. The system benefits both the users and the owner of the park to go. The system minimizes the waiting time of the user to find a parking lot. Managing smart parking becomes a strategic issue to process, for economic interest beside the research interest.

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