

# Car parking Android app using Wireless Sensors Network

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**Abstract-** Finding the parking space in public place is a common frustration of commuters. Parking lots are often overcrowded during certain times of the day and making parking a guessing game. The mission of the car parking system is to provide current parking availability of different parking lots, reduce the average time it takes drivers to reach their destination ,collect parking information for future parking optimization and decrease the use of the gas need to find a parking space. The proposed scheme consists of wireless sensor networks, central web-server and mobile phone application. In the system, low-cost wireless sensors networks modules are deployed into each parking slot equipped with one sensor node. The state of the parking slot is detected by sensor node and is reported periodically to central web-server via the deployed wireless sensor networks. This information is sent to the vehicle driver that can find vacant parking lots using standard mobile devices.

**Index Terms-** Parking issues ,wireless sensors .

## 1. INTRODUCTION

The industrial growth of the world is reflected by the increase in the number of automobiles on the streets throughout the world, which has caused a lot of parking related problems. The slow paced city planning has increased the problem even more. The search for the parking space is a time consuming process which not only affects the economic activities' efficiency, but also the social interactions and cost.

Human errors are the major source of traffic accidents, therefore building in-car technologies for checking the parking lot, avoiding accidents and guidance to the parking facility is turning out to be an integral area for research. The objective of such technologies is the reduction of the burden on driver, improvement of the traffic capacity, and provision of reliable and secure car functions.

Hence there is a need for a system which can take all relevant information into consideration, for finding the parking vacancy.

The proposed smart parking service based on wireless sensor networks and mobile phone application guide vehicle drivers about the available vacant parking slots. It consists of wireless sensor networks, central web- server and mobile phone application as Android.

### 1.1 Project goals and objective

- Guides drivers find available parking spaces near them.
- Less number of drivers searching to park, thus Reduces the traffic congestion.
- Avoids air pollution & global warming.
- Scalable, robust and reliable.
- Accurately find out the vehicle occupancy in real time.

### 1.2 Roles and Responsibilities

The user will first login and check the parking availability . If the parking is available then he/she will book the parking slot.

The sensor will sense the parking slot is available or not and will send this information to web server and user can access this information from server via network.

## 2. PROBLEM STATEMENT

In modern cities there is an ever increasing number of vehicles. This is leading to the problem such as large urban parking lots becoming inefficient, increasing difficulty to find open spaces in busy parking lots, as well as increasing need to devote larger areas of land for additional parking spaces.

The three main problems that the increasing number of vehicles and the decreasing efficiency of modern busy parking lots are:-

- (1) Valuable time wasted for inconvenient and inefficient parking lots.
- (2) More fuel consumed while idling or driving around parking lots, leading to more CO<sub>2</sub> emission being produced.
- (3) Potential accidents caused by abundance of moving vehicles in disorganized parking lots.

We present the system of Smart Parking Services based on Wireless Sensor Networks (WSNs) that allows vehicle drivers to effectively find the free parking places. The proposed scheme consists of wireless sensor networks, central web-server and mobile phone application. In the system, low-cost wireless sensors networks modules are deployed into each parking slot equipped with one sensor node.

## 2. PROPOSED SYSTEM

### Overview of Car parking system

In this section, smart parking system is presented. The fig.1 shows the connectivity of various components of smart parking system. Central Web-Server (CWS), and Mobile Phone Application (MPA) of vehicle driver such as smart phone and PDA (Personal Digital Assistant) as well as laptop and desktop computer. In this smart parking service, every components performing well defined roles as follows-

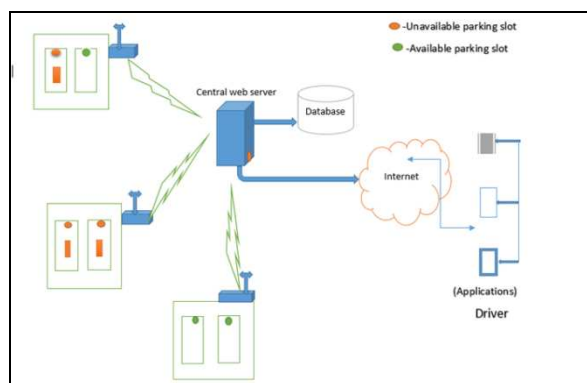


Figure 1 : Overview of car parking system

### 3.1 Wireless sensor networks module

- Collect sensor data.
- Check parking slot state in real-time.
- Send parking slot information to central web Server.

### 3.2 Central Web-Server

- Receive parking slot information from wireless Sensor network.
- Display the parking slots state of parking Zone In real time.
- Send these information to mobile phone application.

- Save these information in Mysql database.

### 3.3 Mobile device of driver

- Connect to central web-server.
- Receive parking slot information from central Web server.
- Display the real-time monitoring of parking slot.
- State in nearest parking zone.

## 3. IMPLEMENTATION

In this section, we explain the system implementation of smart parking service for monitoring parking slots state. The system is developed as a proof of concept to meet the real-time requirements of parking monitoring services. This section describes the development environment, service scenario and monitoring experiments. Wireless sensor network node has a cover the parking slot become unavailable for parking, then red-marker is indicated. Therefore, the vehicle driver will be able to confirm the parking slots state using mobile phone application in real-time. On the other hand, if wireless sensor network node does not the cover, the parking slot become available for parking, then the green marker is indicated.

### 4.1 Wireless sensor network implementation

Data collection is achieved by sensors located at the parking slots that detect the presence of a vehicle. We chose ultrasonic sensors as the main sensors that react with the real world, also due to their reliability in different environments as well as the fact that they are really easy to install.

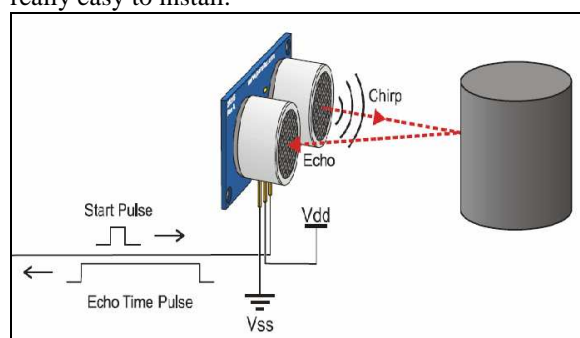


Figure 2 : Ultrasonic sensor

Ultrasonic distance sensor determines the distance to an object by measuring the time taken by the sound to reflect back from that object. The frequency of the sound is somewhere in the range of ultrasound, this ensures more concentrated direction of the sound wave because sound at higher frequency dissipates less in the environment. A typical ultrasonic distance sensor consists of two membranes. One membrane produces sound, another catches reflected echo.

When the triggering pin is set high the sensor generates 40 kHz ultrasonic wave which is 8 periods long. At that moment the echo pin becomes high and remains high until the reflected sound is reached back to the sensor. So the echo signal reflects basically the time during which the sound reaches to the object and comes back from the object as shown in figure 2. By measuring that time and multiplying it by the speed of sound and then divide it by two, is calculated the distance to the object.

Some advantages of ultrasonic sensors are:-

- (1) A simple linear formula that converts time taken by sound waves to travel into distance .Since it is known that the speed of sound in air at room temperature is approximately 330m/s.
- (2) They have good dynamic range and can sense distance upto 12m with high resolution.
- (3)They also use very little power and are easy to run on readily available batteries.
- (4) Ultrasonic sensors are quite compact.

The data collected by the sensors continuously transmitted to the Arduino Uno. The Arduino Uno is a microcontroller board simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. It can be programmed with the Arduino software. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The Arduino Uno is designed in away that allows it to be reset by software running on a connected computer.

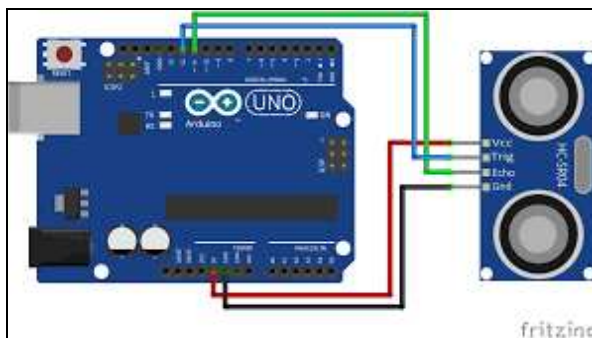


Figure 3: Arduino Uno

To transmit information from sensors network to web server ESP8266 wifi module is used. It is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. This is an extremely cost effective board with a huge, and ever growing, community. It can be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime.

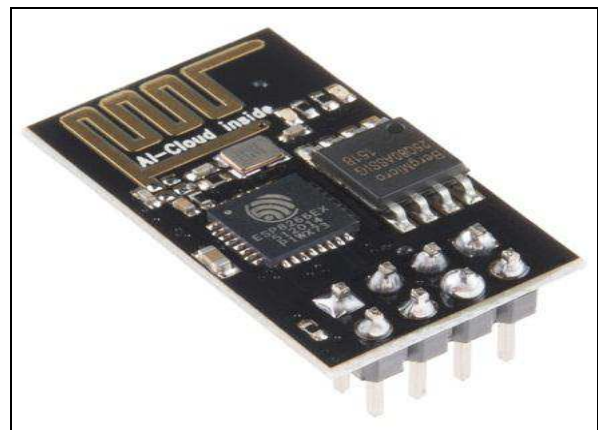


Figure 4: ESP8266 wifi chip

## 4.2 Central web Server Implementation

The server implements the various gateways via which the clients and sensors interact with the central system services. The distinct ‘users’ and ‘parking spaces’ databases contain all the information that the system requires in its operation. Such information includes user details and the current status of the various parking slots as well as the current reservations and detected violations. The implementation of the database service is based on MySQL and client interactions are enabled through Glassfish and JSON.

## 4.3 Mobile phone Application Implementation

Mobile phone application is based on Android . The mobile phone is used to access Internet,over Wi-Fi or a 3G cellular network, to obtain the information of parking availability and parking zone position from the central web-server. The Android phone application is developed in JAVA based on Android SDK .

Here we are using moving vehicles so while moving itself how we book the parking area in destination place. For that feasibility only we are using android phone. Now a day’s all users using Smartphone, so while moving it we can book the slots Android application collects all information from server through gateway, and it calculates total number of slots engaged and frees slots. It shows graphical view for engaged and free slots via application. Green color indicated as vacancy and red color indicated as occupancy. This information frequently updated into server via gateway from android mobile phone. It validating information’s continuously to the server. Android gateway maintains all updations from server and it also sends a sms for every car delay. Android server sends a delay message to particular user.

## **5. CONCLUSION**

This paper proposes a set of smart parking services based on Wireless Sensor Networks. We design and implement a system that allows vehicle drivers to effectively find the vacant parking spaces. The proposed smart parking system consists of wireless sensor networks, central web-server and mobile phone application as Android . We also implemented a system, which can effectively satisfy the requirements of WSN-based parking slots monitoring service. In this system, low-cost wireless sensors networks module are deployed into each parking slot equipped with one sensor node. The state of the parking slot is detected by sensor node and is reported periodically to the web-server via the deployed wireless sensor networks. And this information is sent to Android App in real-time. Besides, the vehicle driver can find vacant parking lots using their mobile devices. Though this system we demonstrate that the proposed system can effectively satisfy the requirements of smart parking service and we believe that wireless sensor networks and mobile device application can be an encouraging technology to solve future parking management.

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