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*International Journal of Current Research*
*Vol. 9, Issue, 03, pp.47893-47896, March, 2017*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

**ISSN: 0975-833X**

## RESEARCH ARTICLE

# SMART CAR PARKING SLOT RESERVATION USING MOBILE APPLICATION

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**ARTICLE INFO**

***Article History:***
Received 31th December, 2016
Received in revised form
30th January, 2017
Accepted 08th February, 2017
Published online 31st March, 2017

***Key words:***

Car Parking,
Parking Reservation,
SMS,GSM, RFID.

**ABSTRACT**

This project proposes a parking system to solve the problem of inessential time consumption in finding parking space in college campus car park areas. The proper operation of these systems depends on their ability to detect the presence of vehicles in the parking spaces. A parking reservation system is established in such a way that users book their parking slot through short message services (SMS). A communication device called GSM used to send a SMS to the user. Once the sensor range is below some fixed range, so the RFID tag stops transmitting the data, and the system recognizes the slot as booked. The micro controller will send the information of booking slot details. An Android based application is used to commanded the entering to or leaving from the parking slot.



**Citation: Sandhya Devi, R.S. Dr. Vijay Kumar, V.R. and Sridevi, S, 2017.** "Smart car parking slot reservation using mobile application", *International Journal of Curent Research*, 9, (03), 47893-47896.

## INTRODUCTION

This project presents a model of car parking system that regulates the number of cars that can be parked in a given space based on the parking space availability. The objective of this project is to park the car for allowing into the parking slot. Booking for the car parking is done through Mobile Application where the parking slot preference can be selected by the car driver. The booking information are send and receive by using the GSM. The total number of parking slot details are displayed in the LCD. When a car arrives at the entrance gate, the owner should show the RFID tag to the RFID reader. The RFID reader,then sends the information to microcontroller, if the information is matched the entrance gate will be open. In case the information is incorrect the entrance gate will be closed.

The basic modules required for the implementation of the system includes

- Mobile Application
- Interfacing of Microcontroller with GSM.
- Interfacing of Microcontroller with RFID module.
- Interfacing of Microcontroller with LCD.

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## LITERATURE SURVEY

Various methods are prevalent for the development of intelligent parking systems. Study of these systems, requires more human intervention for the functioning. Several intelligent car parking systems have used Image processing [Norazwinawati Basharuddin, 2012]. This system identifies the free parking slot using brown rounded image which is captured by camera. The seven segment display is used to display about the currently available parking space information. In the brown rounded image is create into binary image. Then the noise is removed from the image and the object boundaries are identified, using image detection module to find which objects are round and also find the area and perimeter. Correspondingly, the free parking space is allocated. In this vision based automated parking system [Patrick Sebastian, 2010] is developed by two types of images (positive and negative) to detect free parking slot. In this method, positive image is used to identify the various angles of car and negative image is used to identify the free slot.

The co-ordinates are used as input to detect the presence of cars in the region. The limitations in this system depend on the type of camera used, in specific parking locations the camera are allocated in the fixed location. Positive and negative images may put some limitations on the system. Automatic parking management and parking fee collection based on number plate recognition [Ataur Rehman et al., 2012] for developing autonomous car parking system uses image processing. The license number plate of the vehicle is acquired, to obtain individual characters in the number plate. Free-parking slots are detected by ultrasonic sensors. The number plate images are taken and analyzed. At the same time, parking fee is also calculated. When parking slot is not available, LCD displays 'FULL' in background color being required black and character color white. Also, search is limited to number plates with in one row. Smart Parking system [Sarkar, 2012] proposed system with an image processing that facilitates multi level parking.

## Proposed Work

The proposed architecture of the car parking system aims to develop a car parking system by Mobile application.The Proposed system architecture design includes two sub-architectures – one for authenticating the car and another one for the parking area. The available parking slots in the given area is listed as requested by the user in the mobile appand the same is shown in the figure1. The parking system communicates with the GSM. The parking control system is responsible for proper parking of the vehicle to the destined position.

### The proposed system is divided into 4 modules

- Mobile Application Development.
- Interfacing GSM with Microcontroller. [Faiz Ibrahim Shaikh et al., 2016]
- Interfacing RFID Module with Microcontroller.
- Interfacing LCD with Microcontroller.

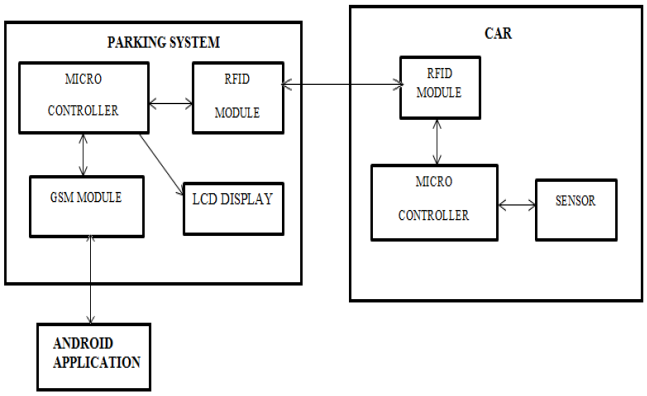


**Figure 1. Proposed Car Parking System Architecture**

## MODULAR DESCRIPTION

### Mobile Application Development

An Mobile Application is developed for instantiate the system. The Mobile Application to be designed would generate encoded message that shows the availability of parking slot. The parking control unit decodes the message and depending on the status of the parking area, reply is sent back in encoded form.

This message would be receive at the parking area unit by the GSM. The GSM sends the message to microcontroller and response would be sent to the user. LCD displays the current status.

### Interfacing GSM with Microcontroller

The GSM module is used for sending and receiving messages to or from the microcontroller. The GSM module is shown in the architecture diagram. Data obtained from the mobile phone is buffered in the GSM module and then transmitted serially.

### Interfacing RFID Module with Microcontroller

RFID stands for Radio Frequency Identification. RFID Module is an electronic circuit to transmit and receive radio signals on number of carrier frequencies. This paper uses RFID module for the data communication between the microcontroller of the parking area and that of the car. The various RFID Tag details in the Table1.

**Table 1. Comparison of different RFID systems**

| | RF Code | Identec solutions | Aero Scout |
|---|---|---|---|
| Reading range (outdoor/indoor) | 100 m | 100 m | 200 m/60 m |
| RSSI/TDOA Measurability | Not possible | Not possible | Possible |
| Not possible | 2 s/12.5 s | 0.5 s ~ 60 s | 128 ms ~ 3.5 h |
| Battery | Not replaceable | Not replaceable | Replaceable |
| Tag programmability | Not programmable | Transmission interval programmable | Transmission interval Programmable |
| On board motion sensor | Available | Not available | Available |

### Interfacing LCD with Microcontroller

LCD Unit is used for displaying the parking slot status to the user. The LCD module displays commands for parking slot availability, GSM initialization. The LCD module communicates with the micro-controller and displays the details of free slots to the user.

## FLOW CHART

The status of parking slot is found by following the process as shown in the figure 2. First the parking space is checked whether it has any cars in it, if yes, number of vacant slots are detected next to find the completely filled parking space. If no, all the empty slots are marked.

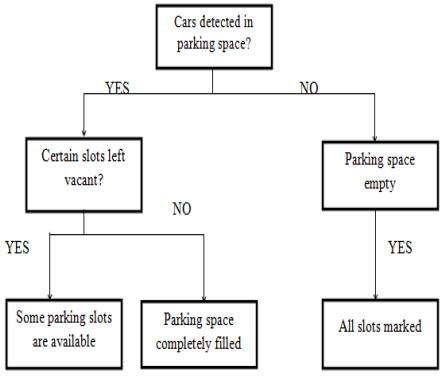


**Figure 2. To find out the status of parking slots**

## SIMULATION RESULTS

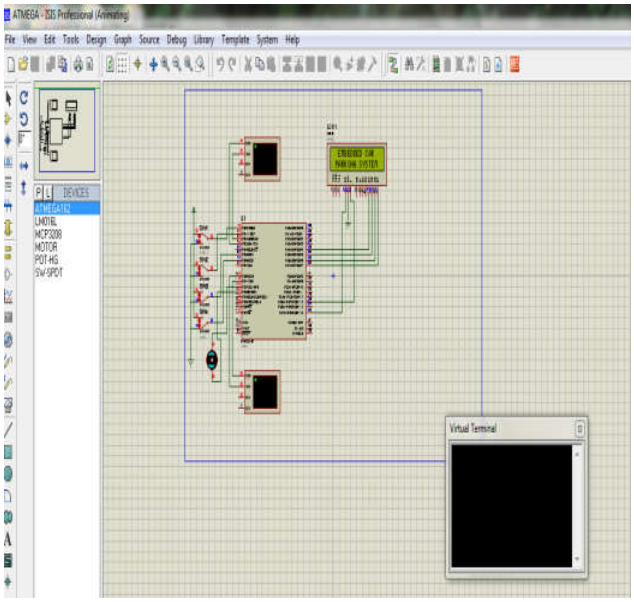

**Figure 3.Car parking system using Proteus**

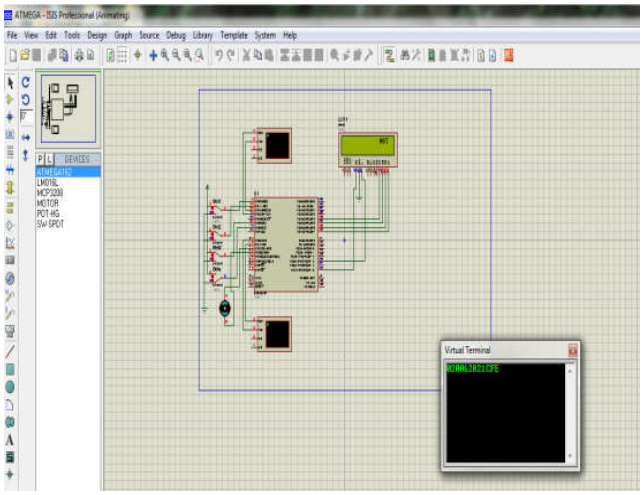

**Figure 4. Free space using Proteus**

## HARDWARE RESULT

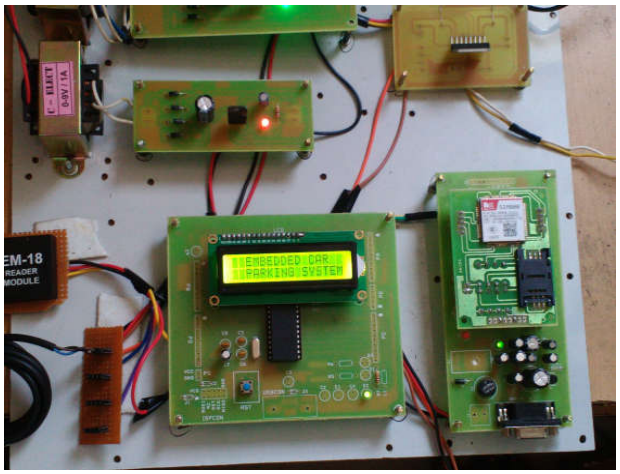


**Figure 5. Embedded car parking system**

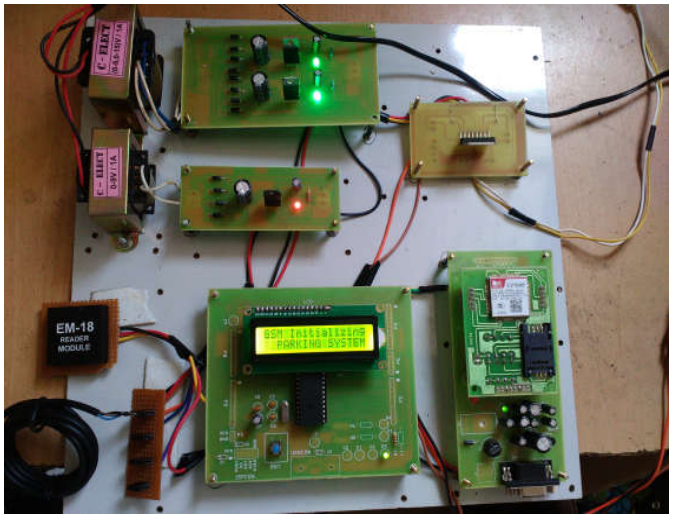


**Figure 6. Gate model**

## Conclusion

The proposed system investigates on the model for allocating parking slots at a single place within the test environment. The simulation and hardware result for the above methodology is implemented on the basis of FIFO and the system ensures that it reduces the tension of the car owners with safe car parking. The same system is to be extended at various identified locations within the campus where the near real time requirement can be fulfilled using optimization techniques.

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