

# Smart City Parking: A QR Code based Approach

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**Abstract-** In this paper, we implement a system that allows drivers to find parking slots online and reserve it. The drivers use this system on their personal devices having the android. It eliminates the drawbacks of existing system like use of RFID, LED, and IR sensors. In this system, driver can reserve the parking slot in the specific zone, checking the free slots and reserving it as per the needs of the vehicle. Further the QR code is generated which encodes the unique details of the user. QR code is used for encryption and to ease the process of authentication. Furthermore, we explain the detail working of SPS. Thus by using this system it may be very useful to reduce the load on the driver as well as to reduce traffic on road and can be helpful to park the vehicle in the peak hours.

**Keywords:** Smart Parking System (SPS), Radio Frequency Identification (RFID), Light Emitting Diode (LED), Infrared Sensors (IR), Short Message Service (SMS).

## I. INTRODUCTION

In this chapter, we would shortly summarize on the introduction of the project and its requirement needed for SPS and its purpose and aim. Also, a development plan and its design. An overview of the system initially planned to be developed is also being presented here.

## II. AIM AND OBJECTIVES

This project would be mainly focused on assisting driver to easily find vacant parking spaces in a specific parking region with the help of QR code based Smart Parking System and to reduce traffic and energy consumption and air pollution. Thus this project has come up with an optimal solution that gives liberty to the people to book their own parking space as per their need and specification of the vehicle.

The purpose of this project is to make people more convenient to park their vehicle, which in this case is Reservation Based Smart Parking System, The question to be addressed here in this module is, how to give parking slots to the drivers?, The project is to mainly answer this particular question addressed by providing an Android application to reserve parking slot as per drivers need.

## III. LITERATURE SURVEY

In this chapter we will see several smart parking system which helps driver to park the vehicle but there are some disadvantages in that system which are overcome in our paper. We mainly focus on designing a new smart parking system that assists drivers to find vacant parking spaces in the region they are going to a specific parking district.

In [1] this system is to develop a Reservation based vehicle parking reservation system to overcome the problem of unnecessary time consumption in finding parking spot in populated areas. In this proposed system, we reserve the parking by using short message service (SMS). Slot reservation is done by sending a message to GSM modem placed at the parking end. If the parking slot is available then GSM modem gives slot number and a password. IR sensor is used for the indication of empty slot are denoted by green LED. User can park the vehicle at the allotted zone, and this is valid up to a certain period of time only after that the priority will be given to next user. RFID technology is used for entering and exiting parking area and payment transaction is done through RFID tag. Advantages of this system are GSM technology is used, IR sensors and RFID are used for accuracy, SMS based system, Barrier gate are used for security. Disadvantages are Network failure may occur, Expensive due to RFID, IR sensor, GSM card and Barrier gate, Complex circuit.

In [2] the design and implementation of a system of Smart Parking Services based on Wireless Sensor Networks (WSNs). The proposed system consists of wireless sensor networks, web-server, central web-server and mobile phone application. In the system, wireless sensors are deployed into each parking slot equipped with one sensor node. The status of the slot is detected by sensor and is reported periodically to web-server via the wireless sensor networks. This information is sent to central web-server using Wi-Fi networks, and also the vehicle driver can find vacant parking lots using standard mobile devices. Advantages are using wireless sensor there is accuracy of parking slot, Real

time update is fast due to WI-FI usage at web server. Disadvantages are Wireless sensor is used to update the status of parking slot which is expensive, Web page is use to know the information of the parking place and slot, Reservation cannot be done through web page, Sever failure can be happen due to load on server.

In [3] it shows the design and implementation of an android application, which is parking system, based on Reservation that allows drivers to easily find and reserve the vacant parking slots in the specific zone with the help of Internet with slot allocation method and performs automated billing process. In this system the billing process is also done using the RFID technology which has the details of the user bank account. RFID's mainly use is primarily for tracking, this technology has quickly created an extremely number of areas including easy gas payment and credit card. Advantages of the system are Using slot allocation we can book and block our own reservation, IR sensors and RFID are used for accuracy, RFID tags are used for automated billing process. Disadvantages are Hardware failure may occur, Expensive due to RFID and IR sensor, Complex circuit.

#### IV. PROBLEM STATEMENT

Some of the existing system used RFID technology. Thus every car has to be provided RFID tags and RFID reader at parking space and other existing system uses GSM and INFRARED technology.

All this appliances becomes very much expensive, hence our paper overcomes this problem as it uses android application. Moreover our system depends on the QR code which is an alternative for the existing system which is based on RFID tags. QR code reduces the data space in database; it also reduces the cost of as compared to other existing system.

#### V. PROPOSED METHODOLOGY

In this section, we are representing the architecture and design of proposed QR code based smart parking system, which implements a reservation service and gives the details information of generation of the QR code algorithm.

##### i. System Architecture and Design

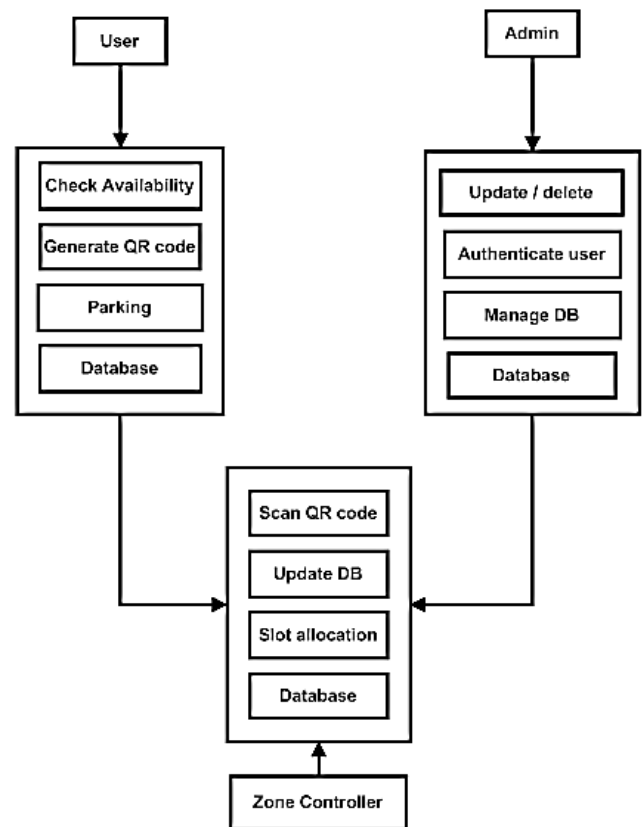
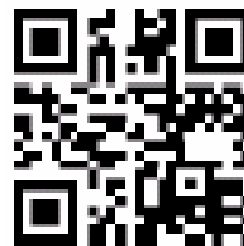


Fig. 1. Block diagram of proposed system

The Fig. shows three components in the smart parking model, including admin, user and the zoner. The app will show the parking slot as per the region selected with its price, type and time. The user will receive the information as per the selection of the parking slot and region for a selected period of time. As per the user information unique QR codes are generated by SPS in which the identity of the user is encrypted which can be used for authentication process and sent to the user. After each user books the database is updated which shows which slots are occupied and which are empty. The zoner identifies each user by the randomly generated unique QR code, zoner directly scans the QR code by QR code scanner and verifies the details and authenticates the user. Due to this the time consumption is less and there is no need of communication between the user and zoner making authentication fast and convenient.

##### ii. QR code (Quick Response Code)



In [17] QR Code (Quick Response Code) is developed by Denso Corporation in 1994. There are 40 versions in QR Code, four levels of error correction, and the maximum

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## CONCLUSIONS

Thus in this paper, we have developed a new system of Smart Parking to optimize parking management of the vehicle in city. We implement parking reservation technique to balance the benefit of both the service providers and requirements from the users. Moreover, we have represented the detailed design, implementation and evaluation of the system how it works. We hope that this app may help to reduce the traffic on the road in cities and also helps the drivers to park the vehicle easily.

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symbol size (the highest version) can encoding 7089 numeric data or 4296 alphanumeric data [17]. The highest level of error correction allows recovery of 30% of the symbol code words.

In [17] addition to, QR Code have many advanced features:

1) High capacity encoding of data QR Code has high capacity encoding of data, its maximum symbol can encode 7089 characters; while PDF417 only encode 2710 characters.

2) High-speed reading Adapted with CCD reading, it can recognize more QR Code symbol per second than PDF417 symbol for encoding same data capacity.

3) Readable from any direction from 360 degree QR Code is a matrix two-dimensional barcode; it can be readable from any direction from 360 degree. But the stack two-dimensional barcode, for example PDF417, is very difficult to realize the readable from 360 degree.

### Algorithm

#### QR Code Generation Algorithms: (GenQR)

STEP 1: Start

STEP 2: Input the source file(infile) or Text.

STEP 3: Call GenSig(infile)

STEP 4: Compress 'suepk','sig' and 'infile' into 'test.zip' file

STEP 5: Create an empty string data

STEP 6: Convert 'test.zip' into string and store in 'data'

STEP 7: Input the image format and resolution of the QR Code to be generated

STEP 8: Input Error Correction Level

STEP 9: Using zxing[1] library method convert 'data' into a BitMatrix object 'bitmatrix'

STEP 10: Write bitmatrix to an image

STEP 11: End

BitMatrix represents a 2D matrix of bits.

#### QR Code Decoding Algorithm: (Decode\_QR)

STEP 1: Start

STEP 2: Input QR Code image

STEP 3: Construct a Binary Bitmap object 'bitmap' from source image

STEP 4: Using zxing library method decode the 'bitmap' and store it in the object 'result'

STEP 5: Convert 'result' into string and write it to 'result.zip'.

STEP 6: Extract result.zip

STEP 7: If requested by user call VerSig('suepk','sig',infile)

STEP 6: End