

Design and Implementation of Reservation of Parking Spaces Using RFID and GSM technology

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Abstract— In this project a solutions has been provided to the problems encountered during parking a vehicle at commercial parking lots. This problems has been resolved using Parking Reservation System. The Parking Reservation System is an access control and automated Reservation system that provides ID based parking slot provision system. This system is designed for Multiple Dwelling Units (MDU), offices, schools, colleges, Malls, Cinema theaters, Airports, railway station and many more where there is a requirement of a systematic parking reservation of vehicles. The unique identification of the Vehicle entering using RFID tags permits tracking of vehicles entering and exiting the parking premises. It helps the system to know whether the vehicle or its owner is registered so as to prioritize allocation of parking spaces to incoming customers.

Keywords— RFID tag, RFID reader, GSM, Micro-controller, IR sensors

I. INTRODUCTION

In country like India which has a tremendous growing population, parking management is the real concern. Increase in spending power of Indians also makes it unable for the people to park their cars on roads. So Parking Reservation is required so that user's time is not wasted in search of parking space. Parking Reservation is done by sending SMS to the GSM module present at the base station. As soon as the GSM module receives the SMS, it revert back with parking slot allotment information via SMS. All of this is handle by a dynamically developed PC software. ID based authentication of user is done. RFID tags are attached to every registered vehicles, as soon as the vehicle enters the parking lot entrance, the reader sense the tag and the user as well as vehicle gets authenticated. Only after the identification the user can enter the parking premises. Use of RFID permits us to keep track of vehicle entering and exiting the gate.

II. HARDWARE SPECIFICATION

A. RFID tags and Reader

- 1. RFID Tags:** RFID reader i.e. radio frequency identification uses RFID tags to get authenticated by them. There are two types of tags present i.e. active tag and passive tag

Active tags: It is self-charged tag having battery on its board which transmits ID signals

Passive tags: It is not self-charged which makes it more cheaper and available.

RFID Reader (Model EM-18): This can be connected serially to a microcontroller or even a PC (if in case the PC has an onboard RS 232 Comport or if one uses an RS232 to USB converter).

There is a chip present inside the reader which acts as the operating system of reader which has a unique identification number. More than one antenna are present inside the chip to generate power and communicate, which enables the RFID tag to exchange data with reader. Reader use Radio frequency waves non-line-of-sight technology. RFID receives the analog signals from tag and convert the analog signal into digital form of information.

GSM: Global system for mobile communication Model Sim 300, this is selected because communication can be done serially. In this Sim300 two ports are present which provides serial communication. These serial ports can be used to easily develop any applications. SIM300 provide RF antenna interface with two alternatives: antenna connector and antenna pad. In this implementation there will be connection of the GSM module to the PC and the PC app will control and send SMS to any mobile through this device. SIM300 can be integrated with a wide range of applications.

Micro-controller (AT89S52 Sensor Unit): The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.



Fig.1. GSM 300

IR sensors: IR sensors work on the basis of intensity of the light. The changes in the intensity of light are identified by the detectors. IR are used because in this LED produces light at the same wavelength which is required in this project. When there is any object present at the sensors the detectors detects that the intensity of the IR light is no longer there so it identified that there is some vehicle standing at the place and helps to indicate about the presence of an obstacle



Fig.2. IR motion sensors

III. FUNCTIONAL DESCRIPTION:

Figure 3 shows the first working part of the GSM module. The user has to send SMS to the GSM modem to reserve the parking slot. The GSM modem then checks into the database, is the user registered user or not. If the user is the register user, than the GSM modem reply back to the user for the time they want to park their vehicle. The SMS should be in the particular format otherwise the SMS will not be consider. [4]

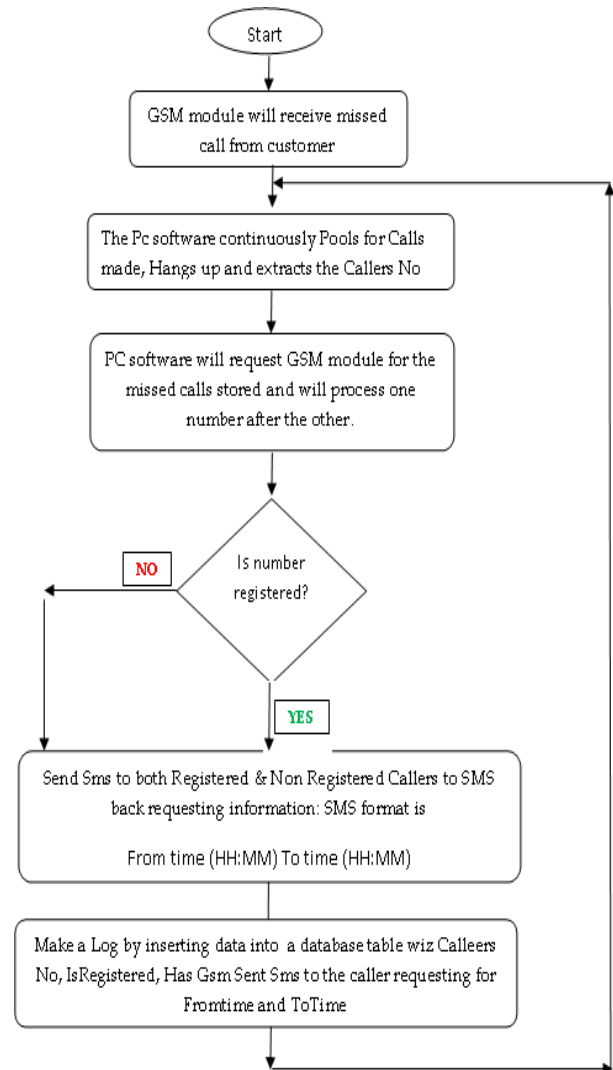


Fig.3. System Flow Diagram

As soon as the user reply back with the time they want to park their car the SMS is send to the GSM modem and the GSM modem start the counter and wait for the user arrival. If the user doesn't arrive before the time they have registered the parking area, the parking slot they have registered will be expired. In this case the user has to register the parking slots and get the parking space reserved again. As soon as the vehicle is parked at the parking slot the sensor sense the vehicle and indicate that the parking lot is occupied by updating the information at the database table at the PC side using the micro-controller unit at the sensor side connected wirelessly to the PC side. As soon as the user arrives at the gate the RFID tag is placed near RFID reader all the user personal information and information about the vehicle is displayed on the PC screen and both are identified. The user first has to register with the parking lot owner for the reservation system and get the RFID tag. The tag is unique to every user, used for

authentication purpose. By using Radio frequency identification, drivers will not have to stop at the circulation points and parking tickets will be out of usage during check-ins and check-outs

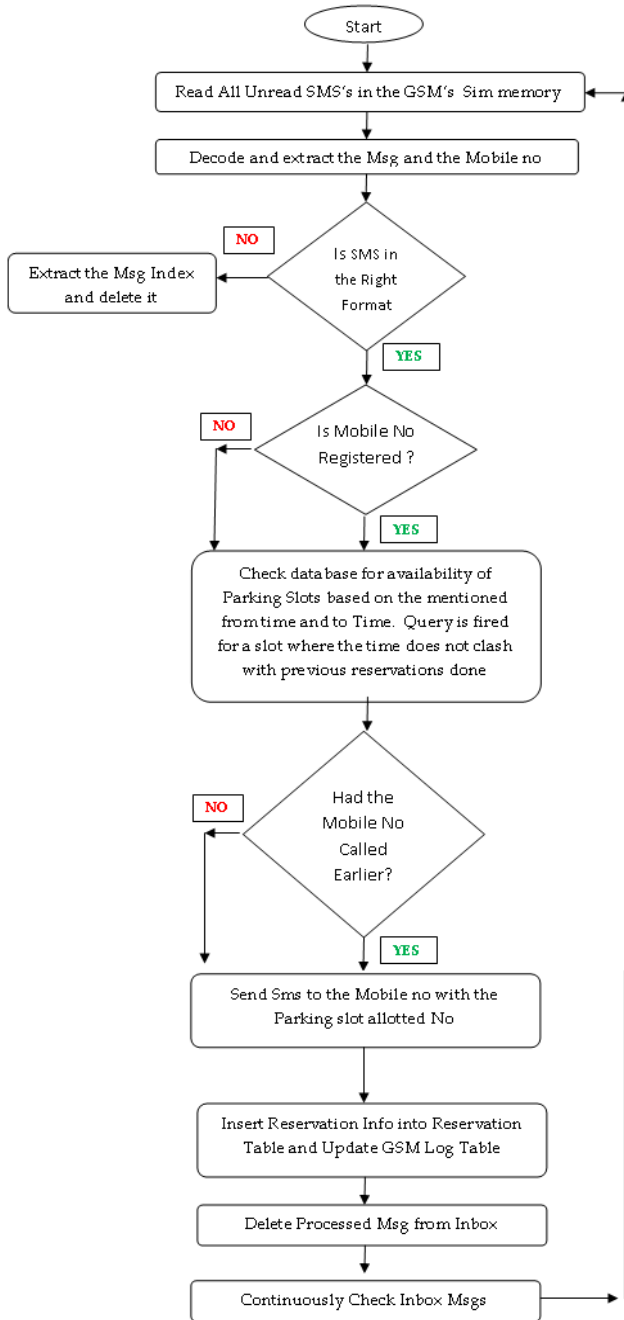


Fig. 4 Flowchart of GSM Module

IV. RESULT ANALYSIS

Fig.5 Show the registration form. In this implementation, first a registration form is field for a new user with all the personal as well as user's vehicle information.

ID	Card_ID	Reg_Date	Veh_No	Name	Pr_MobileNo	Sec_MobileNo	Email	Address
59	98378373	16-Oct-14	CH-02-VS-1427	ahrunagshri	8277122804	8275122804	ahrunagshri91@gmail.com	Vile parle (W) Mumbai-4000

Fig.5 Registration form.

In next step after the registration is done user receives one RFID tag with unique identification number.

As shown in fig. 6. Shows the SMS send to user who is unregistered. To do Reservation user call to the GSM number. As soon as the GSM receives the call or SMS the GSM checks if the user is registered user or not, if yes than it checks for the availability of the Parking lot and accordingly allocate parking space. The user should reply with SMS having 'From time' and 'To time' SMS format otherwise the SMS will get discarded. As soon as the parking lot is allotted to the particular vehicle, confirmation SMS is send to the user. As shown in figure 7.

Sensors placed at each parking slot pass the information to the GSM modem via RF transmitter. These are IR sensor which keeps track of vehicles, parked at the parking slot or not. If yes than green led light turns OFF.

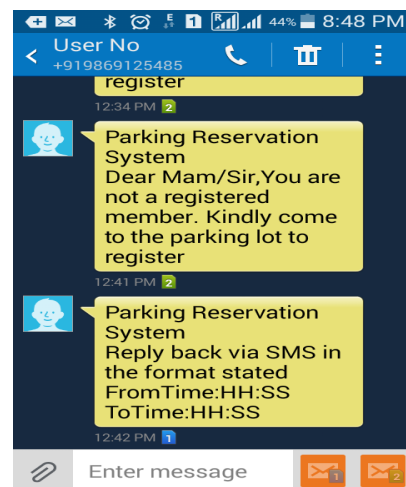


Fig. 6. GSM reply to the Unregistered user.

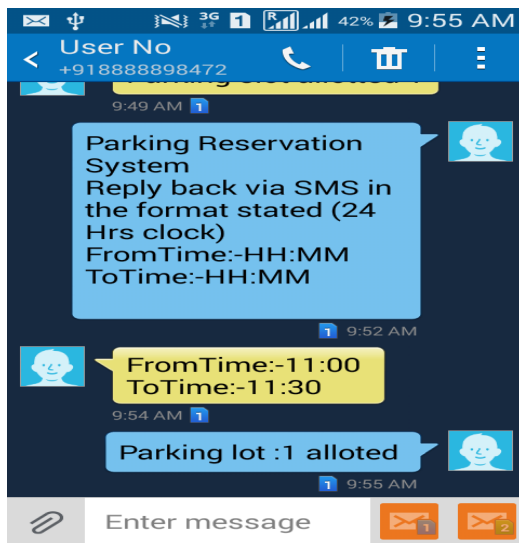


Fig.7 GSM reply to Registered user with confirmation SMS.

Fig.8 Shows Entrance of vehicle at parking area. After allocation, user when arrives at parking area, user get automatically authenticated by RFID reader, RFID reader senses the tag from a distance and all the information of the user as well as the vehicle get display on the screen.



Fig.8 Entrance of vehicle at parking area

Hence after user gets authenticated, he is permitted to park his vehicle at the parking premises. Hence using RFID technology tracking of vehicle while entering and exiting the gate become easy.

Conclusion

This paper introduces Parking Reservation System using sensors nodes, GSM and RFID technology. Due to this System, tracking and handling of vehicle has become flexible. Vehicle tracking while entering or exiting the gate is easy. After reservation confirmation, user can park their vehicle at the parking premise allocated to them. After the vehicle is parked, this information is passed through RF transmitter to the base station. The RF transmitter at sensor

side, pass the information at every interval of 5 seconds to the base station, updating the database table. IR sensor keeps the track of vehicle present or not. This research satisfies the need of Reservation of the parking lots and authentication of the user through SMS and RFID technology respectively and avoids user's wastage of time in search of available parking space.

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