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Arduino Based Quest for Parking Slot Using GSM and IR Sensors

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ABSTRACT: Locating a parking spot during rush hours in most populated areas like shopping malls, universities, exhibitions or convention centres is difficult for the drivers. The main difficulty arises in checking the availability of parking space at required time. Smart parking is an efficient solution for metropolitan cities to reduce congestion and save persons time by helping them in finding a spot to park. Smart parking system not only regulates parking in a given area but also reduces the large number of staffs at the parking area.

KEYWORDS: Arduino Mega, GSM, IR Sensor, Servo Motor, Keypad, LCD Display, LM 2596 Buck converter

I. INTRODUCTION

Seeking a vacant parking space during peak hours in areas like Hospitals, Hotels & Shopping Centers, Airports, Universities, and Exhibitions & Convention Center has always been frustrating for many drivers. Surveys says that traffic generated by cars searching for vacancies in Parking Spaces is up to 40% of the total traffic. Now that is a serious issue to look after and Smart Car Parking System is one of the best available solutions to at least reduce the traffic congestion caused due to the above problem. This application gives information about the occupancy status of the spaces in the parking lot equipped with sensors that detect the presence of vehicles.

In real time, the environment have sensors in the parking spaces, transmitting data on the occupancy status; and the vehicle drivers can search for parking availability using their mobile phone. Hence the driver would know where there is an available spot to park his vehicle in less time, reducing the energy consumption and air pollution.

The Smart Car Parking System like this helps drivers make smart decisions which will reduce congestion and make the most of available spaces. To find a parking space has become a daily concern these days, and that is where the motivation for this project came up from. With the evolution of technology, we have smartphones, IR sensors that detect the presence of any object and it is a system where parking spaces are equipped with these sensors that tells about the occupancy status of the parking spaces. GSM module is used to give prior knowledge about the vacancy of slot in parking area and it also give direction to the nearest slot. Smart car parking system not only regulates parking in a given area but also keeps the manual control to bare minimum.

II. RELATED WORK

1. Noor Hazrin Hany Moham [1] have proposed a smart parking system using short message services which solves the unnecessary time consumption. In this system users can book their parking spots through short message services (SMS). The message will be processed by a wireless communication instrumentation device called micro-RTU (Remote Terminal Unit). This micro-RTU will answer the confirmation of booking by giving the details of reservation like password and lot number. A password will be used to enter the parking area and it will be valid for a certain period of time. The system is fully automated with the Peripheral Interface Controller (PIC). This microcontroller is smart enough to store information of empty parking spaces, provide passwords as well as allowing

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or denying access to the parking area. A prototype of a car park system has been designed to demonstrate the functionality of the proposed work. It has proven that the system can reserve the parking, access entry to the parking area and hence eliminates the struggle of searching empty parking lots.

2. YusnitaRahayu and Fariza N. Mustapa[2] have proposed a secure Parking system using GSM Technology. It helps the drivers to eliminate the problem that always occurs at the car park, such as time being wasted in searching for the available parking spaces and keep circulating the parking area until they found an empty parking spot. This problem usually occurs in town areas, where number of vehicles are higher as compared to the availability of parking spaces. Here two modules are developed such as parking lot monitoring and security reservation modules. For the parking lot monitoring module, a layout animation will display the parking lot status. In security reservation module, the users need to send SMS to reserve the parking lot and use the password provided to enter and exit the parking slot. This system provide more security than other previous research with the use of password to enter and exit. For this system, we mainly focus on designing a smart and secure parking reservation system that allow drivers to reserve and park their vehicle in safety condition

III. METHODOLOGY

The idea is to make car parking more easily and to reduce traffic congestion caused by searching of parking area. In our system we allow the driver to get prior information about parking slot availability in a parking area. For example if we take a mall which have a parking area numbertowhich the driver need to send SMS “CAR PARKING”, then driver will receive SMS about the slot availability there at present. When a car reaches the gate, primarily the gate will be closed. The driver needs to enter his phone number in the available keypad connected to the system. The gate will only be open when phone number is entered. A SMS will be send to this number which involves the nearest parking slot and the direction to this slot. A LCD screen is placed besides the gate which displays the vacant parking slots and when the phone number is entered it will also show the nearest parking slot and direction to it. Each and every parking slots are provided with IR sensors with the help of which the availability of vacant slots are determined.

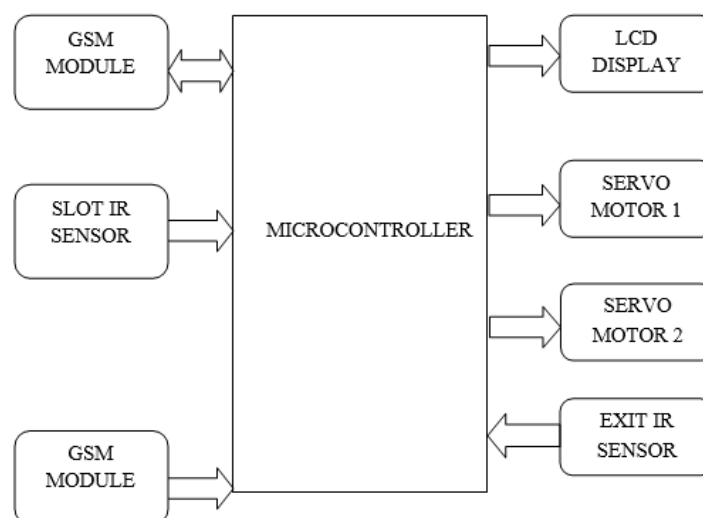


Figure 1: Block diagram of the proposed system

Arduino mega 2560 is the microcontroller that we are using for this project. The proposed system consists of slot IR sensors which detects the presence of vehicles in the area so we can find the vacant slots in the respective area. There is a LCD screen which shows the space available and direction to it. Keypad is provided to enter the phone number of the

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driver who wants to park his car at the area. Two servo motors are provided one as the entry gate and other as the exit gate it will work according to the information from the Arduino mega. The entry gate will open only when the phone number is entered. The exit gate will open and close according to the exit IR sensor. GSM module will be used to establish a communication between a mobile devices, it helps in sending the SMS. A single Arduino board cannot drive a lot of components together. Hence, we have to use an external power supply to drive those components. 230 v AC is given to a 12 V DC adapter. Which is given to a DC to DC buck module that step down the voltage to 10 V. Then it is given to L7805 and later to other components.

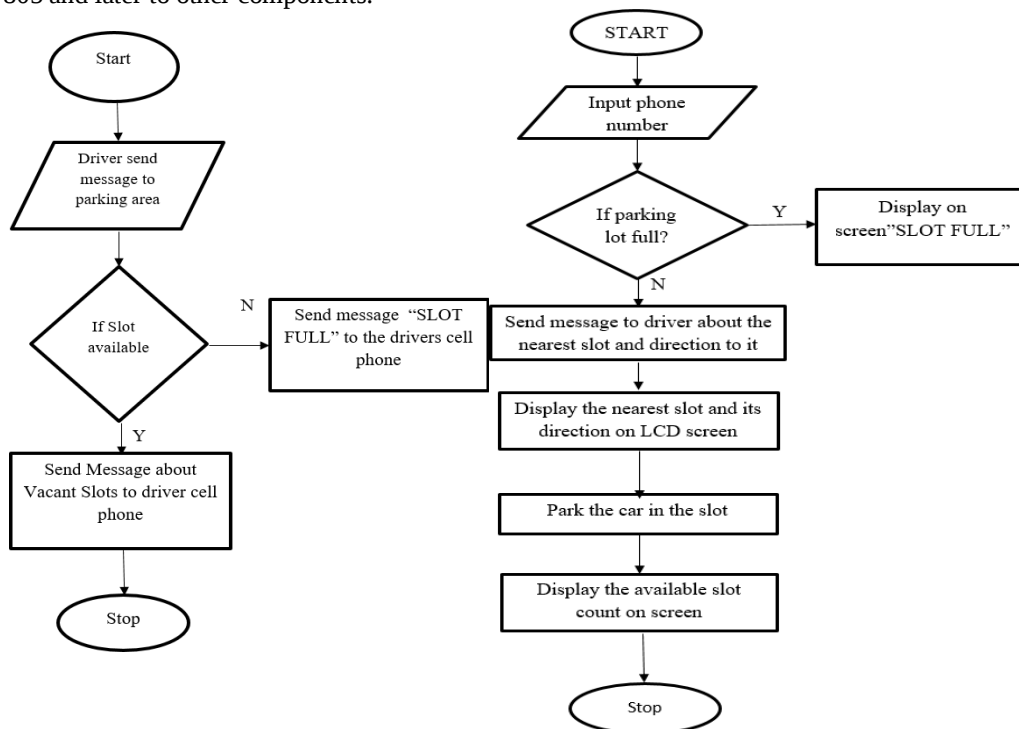


Figure 2: Distant message flowchart Figure 3: Message at the gate flow chart

IV. EXPERIMENTAL RESULTS



Figure 4: Smart car parking model

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The model is tested with the help of a demo car parking area with six parking slots. The hardware section of the system is placed beneath the cardboard. And IR sensors are placed in each slots. Near the entry gate, keypad and LCD screen are placed. The sensors, servo motor, LCD display, keypad have been successfully interfaced with Arduino Mega to give proper functionality of the hardware side of the system.



Figure 5: Available slots at the gate

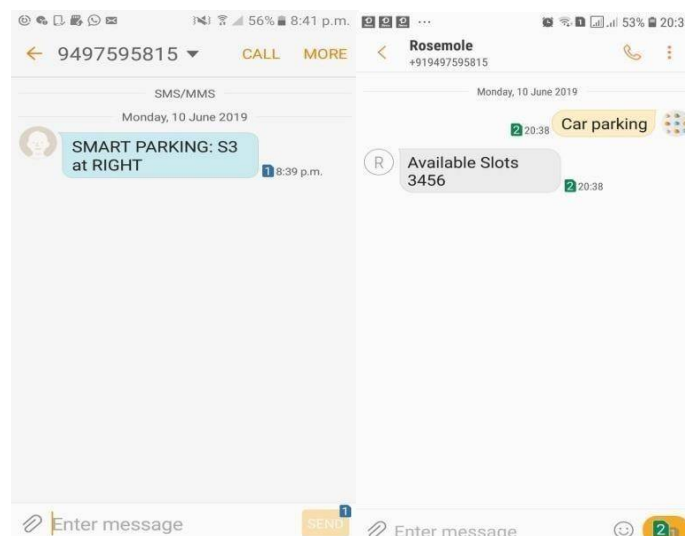


Figure 6: Message at the gate Figure 7: Distant message

The LCD display at the gate first shows the available slots. The user enters his mobile number in the keypad at the entrance of the parking area and then display shows “ENTER MOBILE NUMBER”. After entering the number, the nearest slot is displayed along with directions. The received SMS model is shown in figure 6. The availability of the slots can be checked earlier by sending a message ‘CAR PARKING’ to the particular number of parking area. And the slot availability message will be sent to the corresponding user’s mobile via SMS. It is shown in the figure 7. The gate opens and the car can enter into the respective slot. The GSM then sends the particular slot information to the respective mobile numbers successfully.

V. CONCLUSION

Smart car parking system is a very important factor in the traffic areas. It does not require any human intervention. It reduces the time consumption. So by implementing smart car parking system using IR sensor we can manage our

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time and vehicles can be parked easily and systematically. The proposed system would enable users to find car parking slots. If a driver is able to find a parking slot before reaching the area, it would definitely save a lot of time and energy. Implementation of this solution would help to reduce traffic conjunctions near parking areas and would help users to find slots without driving their vehicle all around the area. Which eventually saves the fuel and reduce pollution due to the toxic gases ejected from vehicle.

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