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Automatic Parking Reservation Application for Smartphone Using IR Sensors

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***Abstract*: As the numbers of vehicles are increasing day by day, the problem related to parking has also increased. Parking vehicles in the malls, corporate offices etc have become tedious due to large and dense parking area. Users and drivers need to search the entire floors and parking lot to park their vehicles. This problem leads to frustration in people along with loss of energy and time. So to overcome this problem a dedicated parking system is required. Based on this, the system could automatically reserve the space, recognize the car or end user mobile phone and navigate the user to reserve space. Such application will be very useful, when the mobile end user wants to find the car on the parking therefore the idea is to help the user analyze area's where parking is available and number of slots free in that area in very efficient manner.**

***Key Words:* IR sensors, arduino kit, Smartphone, vehicle, server, parking system**

I. INTRODUCTION

Parking management has become a crucial task due to the increasing use of vehicles and limited space of parking. In large parking lots, drivers find it hard to know ahead of time whether there will be available parking slots and where they are. It commonly results' more traffic congestion and air pollution by the vehicles. The traffic generated by cars for searching vacant spaces causes up to 40% to 50% of the total traffic. Besides, drivers often spend a lot of time in finding an available parking space for parking their vehicle. Therefore there has to be some system that will overcome this problem and provide easy way to park their vehicle with safety and in an efficient manner by providing the status of parking lot. This could be monitor and also navigate the distance with the appropriate route by providing the Map of the parking lot on user's Smartphone. Hence this system will reduce the problem of congestion and time consumption. Parking system is based on secured wireless network and sensor communication. High parking space utilization with the help fast and easy spot finding of parking place are the result of proposed research. In which driver comes to know about the space availability in the parking lot with the help of android app service. Driver can click the vacant space in order to request new space if the previous one is filled.

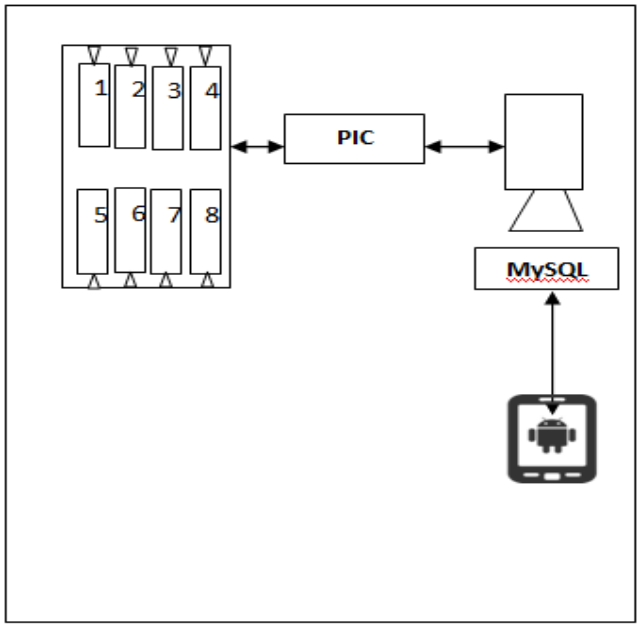

Fig. Architectural diagram

II. RELATED WORK

2.1 " Parking Reservation – application dedicated for car users based on telecommunications APIs" , Piotr Trusiewicz Warsaw University of Technology Faculty of Mathematics and Information Science ul. Koszykowa 75, Jarosław

Legierski Orange Labsul. Obrzeżna 7, 02-691 Warsaw, Poland

This system is based on web application can be hosted in cloud computing environment and offered potential (companies, security agencies) as a service. Because no specific hardware requirements system can be used by everyone and need only mobile phone (smartphone are not necessary) for mobile end user and computer with Internet access for security end user. The implementation telecommunication APIs: Receive USSD, Send SMS and Send USSD in Web Services allowed creating application using standard programming tools[1] .

2.2 "DESIGN AND IMPLEMENTATION OF CAR PARKING SYSTEM ON FPGA" , Ramneet Kaur1 and Balwinder Singh,Academic and Consultancy Services-Division, Centre for Development of Advanced Computing(C-DAC), Mohali, India , International Journal of VLSI design & Communication Systems (VLSICS) Vol.4, No.3, June 2013

In this, parking system is implemented using Finite State Machine modelling. The system has two main modules i.e. identification module and slot checking module. Identification module identifies the visitor. Slot checking module checks the slot status. These modules are modelled in HDL and implemented on FPGA. A prototype of parking system[2].

2.3, "SPARK: A New VANET-based Smart Parking Scheme for Large Parking Lots," in Proceedings of IEEE R. Lu, X. Lin, H. Zhu and X. Shen NFOCOM'07, 2007.

In this document, we described the Smart Parking (SPARK) management system using wireless sensor networks. Based on the requirement analysis for existing car parking management systems, we designed the system architecture and its subsystem level components as part of UCRC project. We implemented a full-fledged prototype model as a proof of concept to realize and understand the real time scenarios in parking management systems. Through our prototype system we demonstrated that the proposed architecture can effectively satisfy the requirements of a car park management system and we believe that wireless sensor networks can be a promising technology to solve future parking hassles[3].

2.4 Smart Parking System Based On Reservation Mohit Patil1, Rahul Sakore2
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In this paper, design and implement a prototype of Smart Parking System based on Reservation (SPSR) that allows drivers to effectively find and reserve the vacant parking spaces. By periodically learning the parking status from the host parking database management in parking lots, the reservation service is affected by the change of physical parking status. The drivers are allowed to access this cyber-physical system with their personal communication devices. Furthermore, we study state-of-the-art parking policies in smart parking systems and compare their performance. The experiment results show that the proposed reservation-based parking policy has the potential to simplify the operations of parking systems, as well as alleviate traffic congestion caused by parking searching[4].

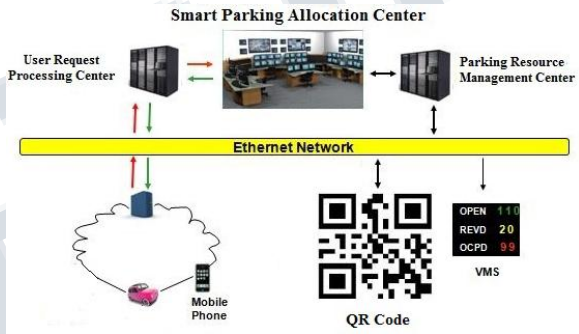


Fig. smart parking using QR code

2.5 Reservation Based Vehicle Parking System Using GSM and RFID Technology K.Sushma, P. Raveendra Babu, J. Nageshwara Reddy, K.Sushma et al. Int. Journal of Engineering Research and Applications www.ijera.com Vol. 3, Issue 5, Sep-Oct 2013, pp.495-498

This system reserves the parking slot in shopping malls, theatres and offices by using short message service (SMS). User reserves the slot by sending a message to GSM modem placed at the parking end. GSM modem gives slot number and a password if the slots are available which is used to allow or deny access to the parking area at the entrance and exit. IR sensor is used for the indication of empty slot with a green LED. User can park the vehicle at the given zone, and this is valid up to a certain grace period only after that the priority will be given to next user. RFID technology is used for entering and exiting parking area and also used to debit the amount for parking charges through RFID tag. The main contribution is the system has more security . Thus users can just reserve the parking slots using the SMS.

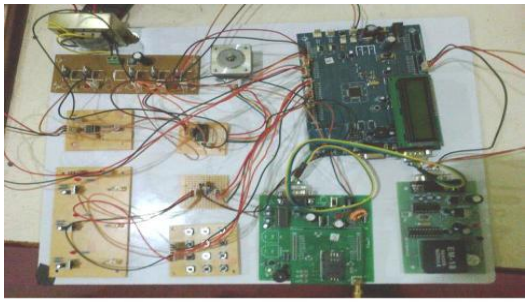


Fig. result of RFID system

III. PROPOSED WORK

The proposed Parking system is based on serial port, arduino, and android and sensor communication. High parking space utilization with the help fast and easy spot finding of parking place are the result of proposed research. In which driver comes to know about the space availability in the parking lot with the help of android app service. Driver can click the vacant space in order to request new space if the previous one is filled. Driver can find nearest space for parking using wireless mobile based car parking system. Results, shows that the system efficiently allocates the slots and utilizes the full parking space.

This project is based on space allocation system and driver guiding system to free space. Urban parking building always a busy place to drivers even if it has free space it is difficult to find that place for a driver. They will have to waste lot of time and fuel to find a free space. Therefore it does the communication with IR sensors which are implemented in each and every parking slot.

The Parking Guidance System Application has to start in android mobile start connection from sever. Once the application process button being press, the counter will start to be functioned and it will count for in and out of the vehicle. The vacant space counter and display which located at the main entrance of the site will show the total vacant spaces as information to the vehicle driver before the vehicle is drive into the site. When the vehicle Driver select the vacant space with the help of vacant space locator used to display vacant locations by showing the vacant space with slot number to the driver. The App will display not only vacant area but also reserved space of your vehicle and gets colour change into red on reserving. After that, when the vehicle is parked into the vacant space, a sensor which is located at the middle of vacant space will start operation. The circuit gets ON when the IR Sensor sense the vehicle bottom of specific vehicle.

Resources

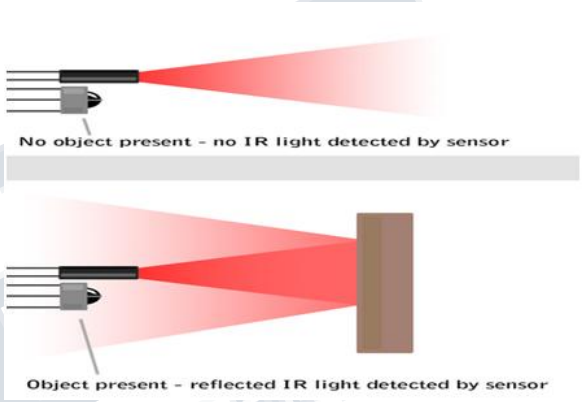
Software Requirement: -

- Operating System:-Windows and Android
- Frontend: - JAVA, ANDROID, SDK
- Backend:-MYSQL1

Hardware Requirement: -

- Computer (Pentium 4)
- An android mobile phone

***IR Sensor*:** IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.



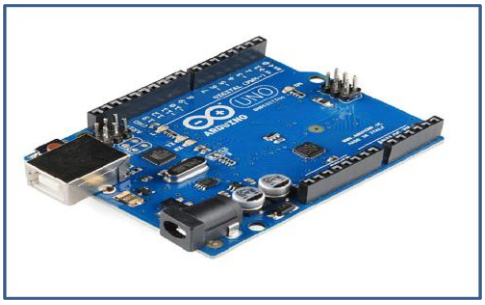
***ARDUINO*:** The Arduino Uno is a microcontroller board based on the ATmega32 It has 14 digital input/output pins (of which 6 can be used as Digital outputs), 6 analog inputs, a 16 MHz crystal oscillator, Rs-232 Interface For Communication, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a RS-232 or power it with a AC-to-DC adapter or battery to get started.

Microcontroller	ATMEGA 32
Operating voltage	5v input voltage (recommended) 7-12v input voltage (limits) 6-20v digital i/o pins 14 (of which 6 provide pwm output) analog input pins 6 dc current per i/o pin 40 ma dc current for 3.3v pin 50 ma
Flash memory	32 kb
Sram	2 kb
Eeprom	1 kb
Clock speed	16 mhz

Arduino has following circuits like:

1) LM 358
2) I2C
3) RS-232

4) 16 MHZ CRYSTAL
5) REGISTER
6) ELECTROLYTIC CAPACITOR
7) MICROCONTROLLLER ATMEGA32



1) LM358: the lm358 is a low power dual operational amplifier integrated circuit originally introduced by national semiconductor. it is used in detector circuits. the abbreviation lm358 indicates an 8-pin integrated circuit, comprising two operational amplifiers at low power. the lm358 is designed for general use as amplifiers , high-pass filters and low , band pass filters and analog adders .

I2C : I²c (inter-integrated circuit) is a multi-master, multi-slave, single-ended, serial computer bus . it is typically used for attaching lower-speed peripheral ics to processors and microcontrollers.

232 serial cable: An RS-232 **serial port** was once a standard feature of a personal computer, used for connections to modems, printers, mice, data storage, uninterruptible power supplies, and other peripheral devices. However, RS-232 is hampered by low transmission speed, large voltage swing, and large standard connectors. A serial cable is a cable used to transfer information between two devices using a serial communication protocol. The form of connectors depends on the particular serial port used. A cable wired for connecting two DTEs directly is known as a null modem cable.

16 mhz Crystal*: A* ***crystal oscillator*** is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.

Circuit Diagrams:-

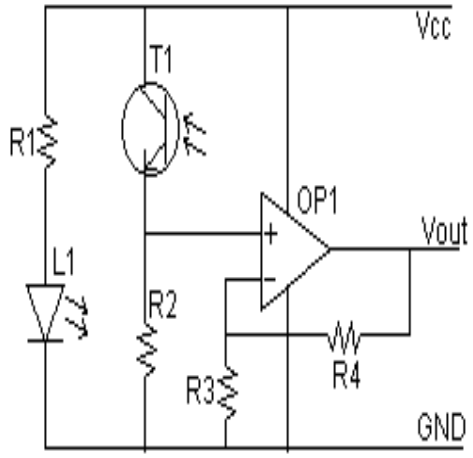


Fig. circuit diagram of IR Sensor

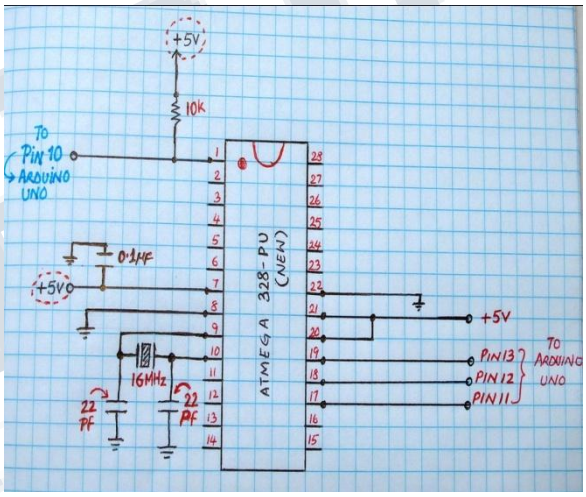


Fig. circuit diagram of Atmega

MODULES:
Module 1: Arduino interfacing with IR Sensors.
Module 2: Interfacing Server via Serial Port.
Module 3: Designing of Android App.
Module 4: Android App Interface with Server Database.

IV. RESULTS

Module 1: Interfacing IR Sensor with Arduino

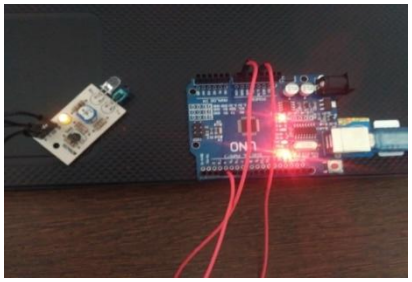


Fig. () Interfacing IR Sensor with Arduino

In this module, first of all we have establishes the connection between IR Sensor and Arduino, connecting the vcc pin to +5v , the GND pin with the GND pin of the arduino's pin , and input port with the arduino's input pin, the whole interfacing is done via RS232 serial port .
This is done by following the steps:
Step 1: Connect GND pin of IR sensor with the GND Arduino.
Step2: Connect power supply pin of IR Sensor to the +5V of Arduino.
Step3: Input pin of IR Sensor to any on any one pin of Arduino number from 2 to 13.
Once the connection is established the IR sensor starts detecting the objects, if there is any obstacle is detected in front of IR Sensor then it will glow the light and displays that the place is parked. And if there is no obstacle then the light remains off and displays that the particular place is vacant.
In such a way the detection is performed

Module 2: Interfacing Server via Serial Port.

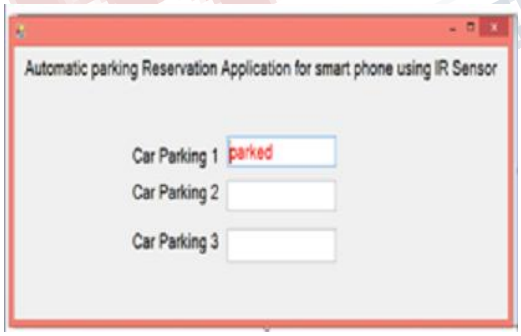


Fig. status of IR Sensors is parked

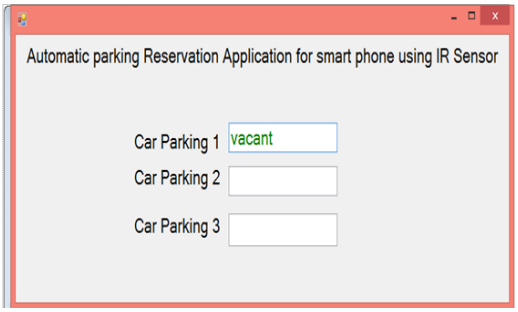


Fig . status of IR Sensor is vacant

The second module named as Interfacing Server via Serial Port , in this module we have done the interface of server via serial port i.e RS 232. In which, as the IR Sensor generates and transmits the signals regarding the parking slots as *1 for parked and #1 for vacant , this transmitted signals are received by the Arduino in which consists of 32 bit microcontroller. It will convert the Analog signal into Digital signal. And hence the status of the parking slots i.e. the status of the sensors are represented .such as shown in fig. () and fig. ().

Module 3: Designing of Android App

We have designed an android app,in that when the user enters in the car parking area user just has to click on start application .in the app shows two floors and user can choose any floor When the user select any one floor in the app shows the yellow color box, red color car and the green Color car.Yellow color box shows the space is vacant, Red color car shows the space is reserved and Green color car shows the car is parked.To reserve the vacant space user just click on to the yellow color box after that one pop up shows that are you want to park the car? Two options are given in the message box that are YES or NO , then according to their choice they are able to make booking of the particular space. Such as If the user clicks on YES button the space will automatically will be reserve and user can park the car on that space.

Module 4: Android App Interface with Server Database.

REFERENCES

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