INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 3 ISSUE 2 (2017) PAGES 1830 - 1840
RECEIVED: 09-03-17 PUBLISHED: 24-03-17.
March 24, 2017

SMART MULTI-LEVEL VEHICLE PARKING SYSTEM ENHANCED WITH WIRELESS TRANSCEIVER

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Abstract

In recent days, some parking lot systems are equipped with sensors and microcontrollers to automatically count the vehicles parked in the lot. However, such a parking system may not indicate for any empty spots. Recently introduced wireless transceiver is a low-cost and low-power wireless communication protocol targeted towards automation and remote control applications. In this work, we are proposing a smart parking system for heavy traffic environments using wireless transceiver modules 'RFID and IR sensors'. IR sensors are used to detect the presence of vehicle in particular slot. Once the vehicle enters the parking area, the parking slot number is send to the central unit through RFM transceiver. The SMS will be sent with detailed status of his parking to the user mobile regarding the parking time.

Keywords: RFID, IR sensors, Parking Slot, PIC Microcontroller, RFM Transceiver, Stepper motor, GSM Technology.

1. INTRODUCTION

In the recent days, some parking lot systems are equipped with sensors and microcontrollers to automatically count the vehicle parked in the lot. However, such a parking system may not indicate any empty spots and nowadays, it has become difficult to find an empty slot for vehicle parking nearing to about 10-30 minutes. In this work, we are proposing a smart parking system for heavy traffic environments using wireless transceiver modules 'RFID and IR sensors'. IR sensors are used to detect the presence of vehicle in particular slot. Once the vehicle enters the parking area, the parking slot number which is available will be send to the central unit through RFM transceiver. The user can park their vehicle in the available slot after booking the slot. If in case a user is up to park his vehicle in an unregistered slot, then the Buzzer is triggered to acknowledge the user about his inappropriate parking. When the user is up for taking his vehicle out, then the stepper motor will automatically rotate the particular slot's base for about 180 degrees and will let the user to take out his vehicle without turning it around any further. If the user wants to know how much time the car has been parked at that particular slot, then he could send his query to the central unit through GSM module. From the central unit, the SMS will be sent with detailed status of his parking to the user mobile regarding the parking time. Thus, easing him to use the parking slot without time loss.

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2. PROPOSED SYSTEM

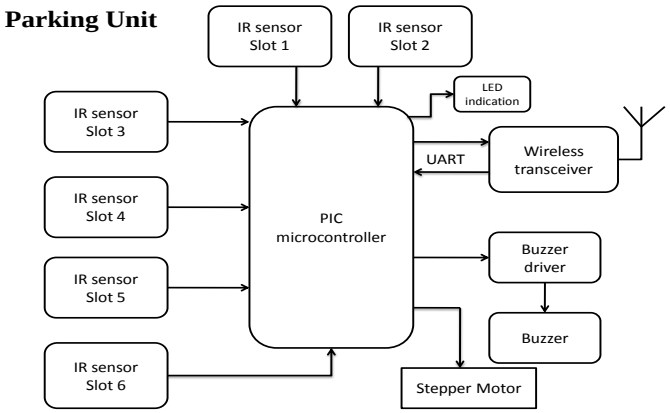

Fig.1 Block diagram of Parking Unit

The proposed system is especially developed for easing the users to park their vehicles in the parking slot system. This proposed system consists of Central unit and Parking unit. The Central unit which is placed in the Central of the parking system consists of microcontroller, RFM transceiver, LCD and Real Time Clock (RTC). The Parking unit comprises of a microcontroller, IR sensors, Stepper motor, Buzzer, and GSM module. It is difficult for users to know the slot, hence LED's are used to tell the exact Slot location. Using the Information displayed on LCD display, the vehicles are parked in prespective slot. The Stepper motor is kept under every slot to rotate the slot for about 180 degrees, to let the user take his car outside of the slot without any difficulties in rotating the vehicle. This system may also use the messaging service to provide the status of the vehicle on regular basis.

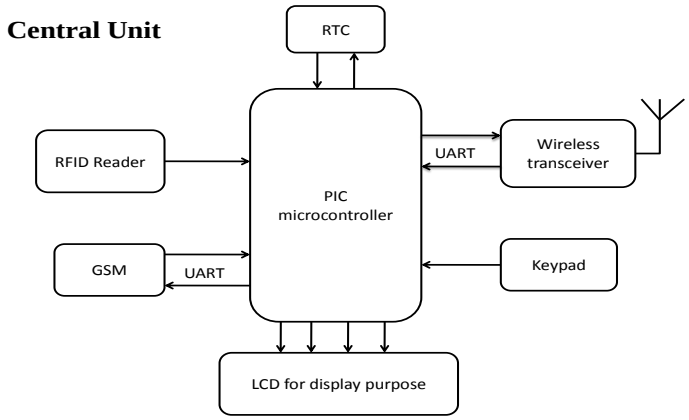

Fig.2 Block diagram of Central unit

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3. HARDWARE IMPLEMENTATION

1. PIC MICROCONTROLLER

Peripheral Interface Controller (PIC) was originally designed by General Instruments. In the late 1970s, GI introduced PIC 1650 and 1655 – RISC with 30 instructions. PIC was sold to Microchip Features: low-cost, self-contained, 8-bit, Harvard structure, pipelined, RISC, single accumulator, with fixed reset and interrupt vectors.

2. REGULATED POWER SUPPLY

Almost all electronic devices used in electronic circuits need a dc source of power to operate. The source of dc power is used to establish the dc operating points (Q-points) for the passive and active electronic devices incorporated in the system. The dc power supply is typically connected to each and every stage in an electronic system. It means that the single requirement, common to all phases of electronics is needed for supplying dc power.

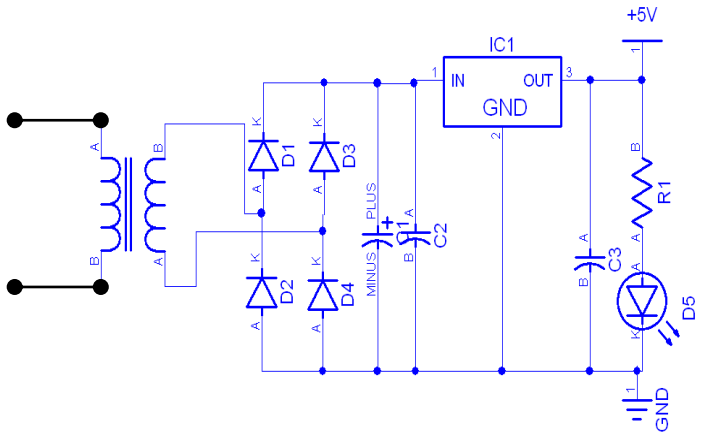

Fig.3. Regulated Power Supply Circuit

3. UART

A Universal asynchronous receiver / transmitter, abbreviated as UART is a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with communication standards. The universal designation indicates that the data format and transmission speeds are configurable. The electric signaling levels and methods (such as differential signaling etc.) are handled by a driver circuit external to the UART. It is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. A dual UART, or DUART, combines two UARTs into a single chip. An octal UART or OCTART combines eight UARTs into one package, an example being the NXP. Many modern ICs now come with a UART that can also communicate synchronously; these devices are called USARTs (universal synchronous / asynchronous receiver/transmitter).

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4. RFM75

RFM75 is a GFSK transceiver operating in the world wide ISM frequency band at 2400-2483.5 MHz. Burst mode transmission and up to 2Mbps air data rate make them suitable for applications requiring ultra-low power consumption. The embedded packet processing engines enable their full operation with a very simple MCU as a radio system. Auto re-transmission and auto acknowledge give reliable link without any MCU interference. RFM75 operates in TDD mode, either as a transmitter or as a receiver. The RF channel frequency determines the center of the channel used by RFM75.

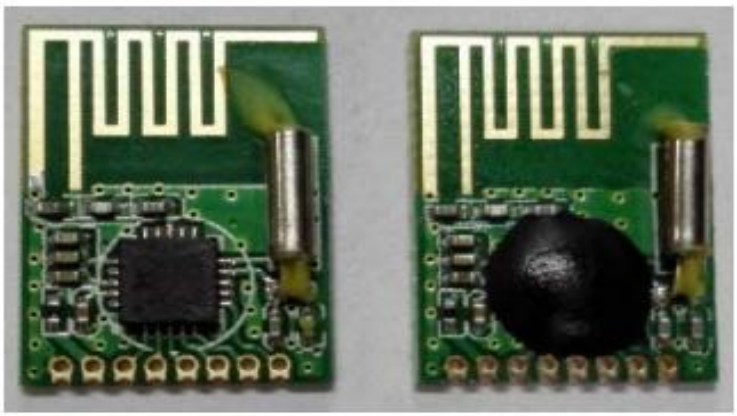

Fig.4. RFM Transmitter & Receiver

5. GSM

GSM is a TDMA based wireless network technology developed in Europe that is used throughout most of the world. GSM phones make use of a SIM card to identify the user's account. The use of the SIM card allows GSM network users to quickly move their phone number from one GSM phone to another by simply moving the SIM card. Currently GSM networks operate on the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands. Devices that support all four bands are called quad-band, with those that support 3 or 2 bands called tri-band and dual-band, respectively. In the United States, Cingular operates on the 850 and 1900MHz bands, while T-Mobile operates only on the 1900MHz band. GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones.

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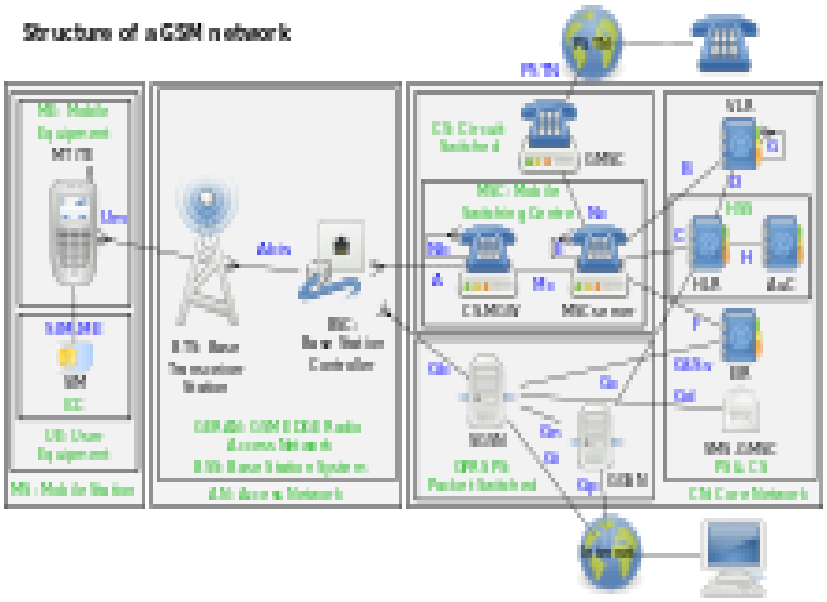

Fig.5. GSM Network Structure

6. RFID

RFID is a technology similar in theory to bar-code identification. With RFID, the electromagnetic or electrostatic coupling in the RF portion of the electromagnetic spectrum is used to transmit signals. RFID systems consists of an antenna and a transceiver, which read the radio frequency and transfer the information to a processing device, and a transponder, or tag, which is an integrated circuit containing the RF circuitry and information to be transmitted.

RFID READER

Radio Frequency Identification (RFID) Card Readers provide a low-cost solution to read passive RFID transponder tags up to 7 cm away. This RFID Card Reader can be used in a wide variety of hobbyist and commercial applications, including access control, automatic identification, robotics navigation, inventory tracking, payment systems, and car immobilization. The RFID card reader read the RFID tag in range and outputs unique identification code of the tag at baud rate of 9600. The data from RFID reader can be interfaced to be read by microcontroller or PC

TAG

Each transponder tag contains a unique identifier (one of 240, or 1,099,511,627,776 possible combinations) that is read by the RFID Card Reader and transmitted to the host via a simple serial interface. It means no two tags are same. Each tag has different value. This value is read by reader.

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Fig.6. RFID Reader

7. INFRARED SENSOR

‘ Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wavelengths, but smaller than microwaves, i.e., the region roughly from 0.75µm to 1000 µm is the infrared region. Infrared waves are invisible to human eyes. The wavelength region of 0.75µm to 3 µm is called near infrared, the region from 3 µm to 6 µm is called mid infrared and the region higher than 6 µm is called far infrared. (The demarcations are not rigid; regions are defined differently by many).

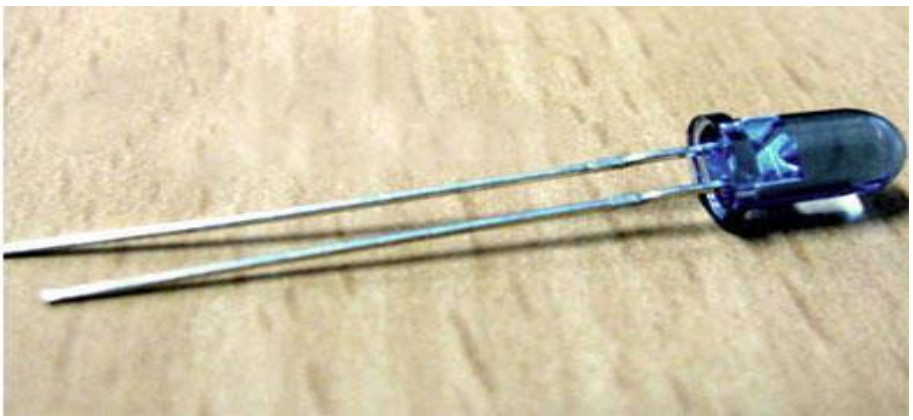

Fig.7. Infra-red Sensor

8. REAL TIME CLOCK [RTC]:

A **Real-time clock** (**RTC**) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. Although the term often refers to the devices in personal computers, server and embedded systems, RTCs are present in almost any electronic

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device which needs to keep accurate time. Real-time clock (RTC) counts seconds, minutes, hours, date of the month, month, day of the week .Low power consumption (important when running from alternate power),Frees the main system for time-critical tasks Sometimes more accurate than other methods.

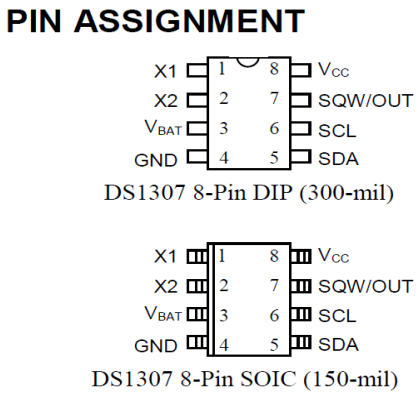

Fig.8. RTC Pin Assignment

9. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

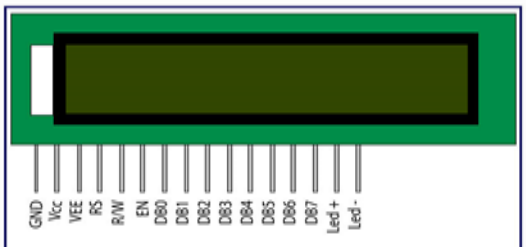

Fig.9. LCD Structure With Pin Configurations

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10. DC MOTOR:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current carrying conductor and an external magnetic field to generate rotational motion.

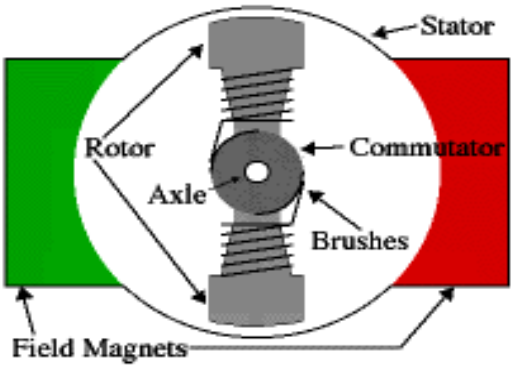

Fig.10. DC Motor – Schematic View

4. SOFTWARE IMPLEMENTATION:

1. CCS SOFTWARE

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language, often having a binary form known as object code). The most common reason for wanting to transform source code is to create an executable program. This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The comp1iler includes built-in functions to access the PIC microcontroller hardware such as READ_ADC to read a value from the A/D converter. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure in C.

2. PROTEUS 7.0 SIMULATION TOOL

Proteus 7.0 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time. This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC,

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switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation -- a product that uses a SPICE3f5 analogue simulator kernel combined with an event-driven digital simulator that allow users to utilize any SPICE model by any manufacturer. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping.

5. SIMULATION RESULT

Circuit Diagram

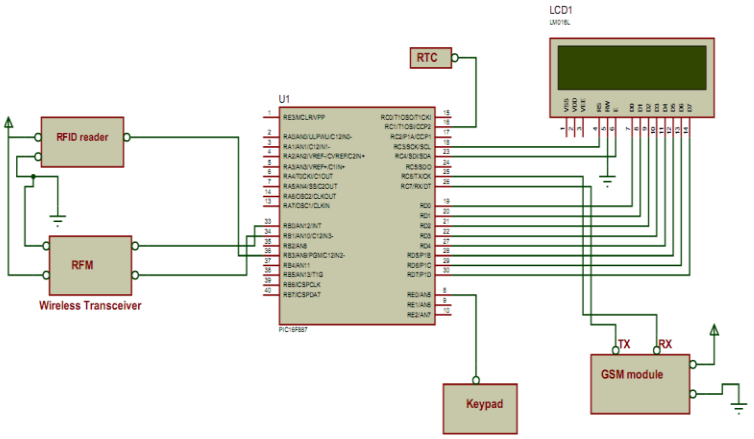

Fig.11. Circuit Diagram Of Central Unit

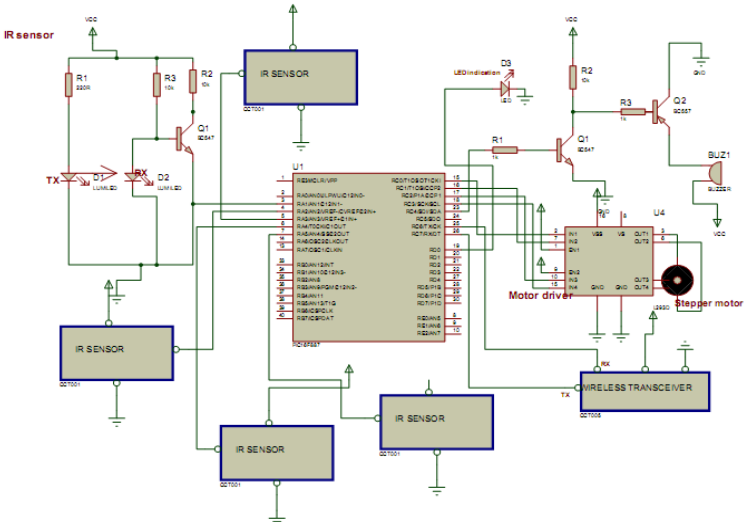

Fig. 12. Circuit Diagram Of Parking Unit

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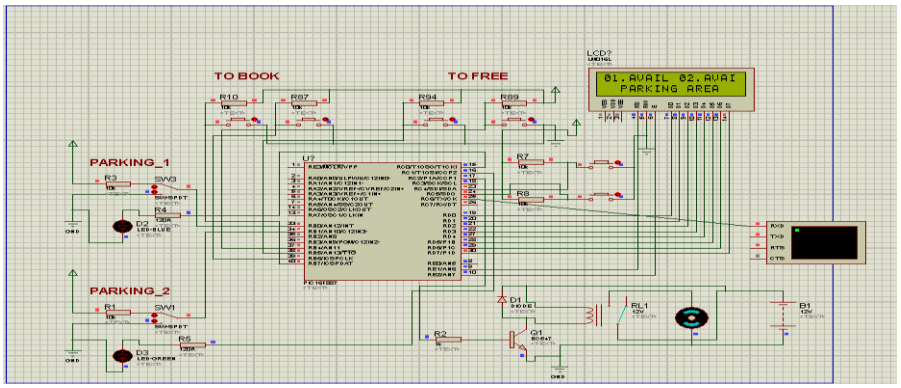
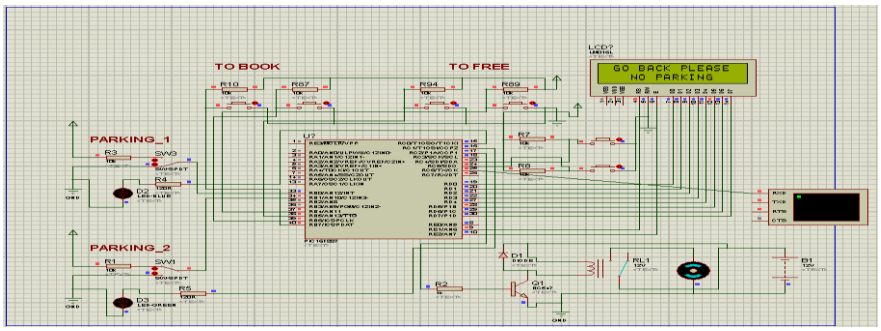
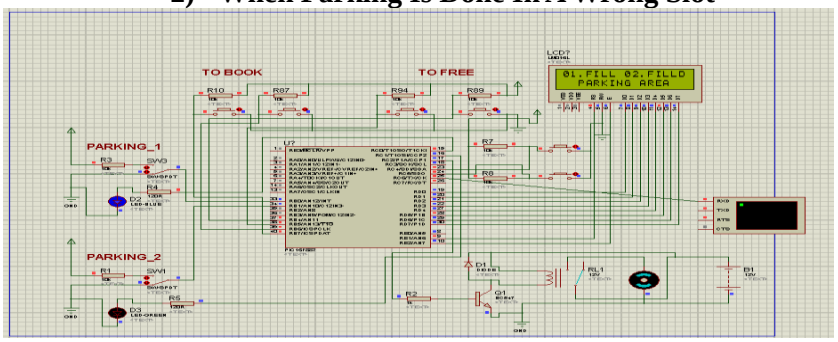
SIMULATION OUTPUT:



1) When All Slots Are Free And Available



2) When Parking Is Done In A Wrong Slot



3) When The Slots Are Filled

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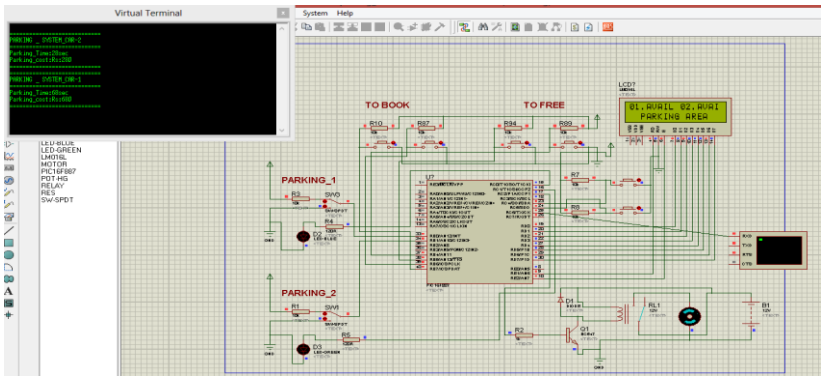

4) When Receiving Vehicle Status Via GSM

CONCLUSION

By the use of our methodology, we can thus park our vehicle in appropriate slot with ease and delicate way. With scheduled and reliable operation in parking slot, one could easily get an impact over this modified technology. In order to ease up the services, the GSM system for Retrieving the status of vehicle remains helpful and user friendly.

REFERENCES:

[1] S.C.Hanche, Pooja Munot,Pranali Bagal, Kirti Sonawane, Pooja Pise, "Automated Vehicle Parking System using RFID", ITSITEEE,ISSN(PRINT) :2320-8945,Volume- 1,Issue-2,2013 .

[2] Sheng-Fuu Lin, Yung-Yao Chen, "A visionbased parking lot management system", 2006 IEEE Conference on Systems, Man, and Cybernetics. Peter. C, pp. 2897- 902, Oct. 2006.

[3] Amin Kianpisheh, Norlia Mustaffa, Pakapan Limtrairut, Pantea Keikhosrokiani, "Smart Parking System(SPS) Architecture using Ultrasonic Detector", International Journal of Software Engineering and Its Applications, Vol.6 ,No.3,July,2012.

[4] M.M.Israfil Shahin Seddiqe, Avizit Basak "Design of an Automated Car Parking System by using Microcontroller",published in Global Journal of Research in Engineering(F)Volume XIII Issue XVI Version I,2013.

[5] Ho Gi Jung, Chi Gun Choi, Pal Joo Yoon, Jaihie Kim "Semi-automatic Parking System Recognizing Parking Lot Markings". Harmeet Singh IJECS Volume 3 Issue 5 may, 2014 Page No.5773-5775 Page 5775

[6] Harsh Kotak, Prithvish Mamtora, Dhruv Mehta, Grishma Vithalani "Automated Car Parking System with NFC access".