SAFETY AND SECURITY IN RFID BASED VEHICLE PARKING SYSTEM USING GSM

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ABSTRACT: This project is to develop a Reservation based vehicle parking system to overcome the problem of unnecessary time consumption in finding parking spot in commercial parking areas. In this proposed system, we reserve 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 access to the parking area at the entrance controlled through a gate. The gate mechanism is controlled through a small DC motor. If there are no parking slots free, or if the password entered is wrong, the gate will not be opened at the entrance and will deny the entry of the vehicle automatically. IR sensors are used for the indication of the slots whether filled or empty to the control unit. This information will be displayed in the digital display by the controller. User can park the vehicle at the given slot. RFID technology is used for entering the parking area and also used to debit the amount for parking charges through RFID tag. RFID is the special type wireless card which has inbuilt the embedded chip along with loop antenna. The inbuilt embedded chip represents the 12 digit card number. RFID reader is the circuit which generates 125 KHZ magnetic signal. This magnetic signal is transmitted by the loop antenna connected along with this circuit which is used to read the RFID card number.

KEYWORDS: Microcontrollers, dc motor, RFID, relays, GSM, IR sensors.

I. INTRODUCTION:

The main objective of the system is to uniquely identify the vehicle. This requires a unique code, which has the capability of distinguishing different vehicles. This is possible by the new emerging technology RFID (Radio Frequency Identification). The main parts of an RFID system are

RFID tag (with unique ID number) and RFID reader (for reading the RFID tag). The microcontroller internal memory is used for storing the details. When the vehicle leaves the parking slot through the exit gate, some amount will be deducted from the RFID tag. So if the vehicle comes to the parking slot again after reservation and the balance in the card is low or nil, the gate at entrance will not be opened and an alarm will be raised as acknowledgement. The main contribution is the system has more security and saves time for the users finding the parking slot. Thus users can just reserve the parking slots using the SMS.

II. LITERATURE REVIEW:

RFID TECHNOLOGY:RFID stands for Radio-Frequency IDentification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information.

Radio-frequency identification (RFID) is a technology to electronically record the presence of an object using radio signals. It is used for inventory control or timing sporting events. RFID is not a replacement for the bar coding, but a complement for distant reading of codes. The technology is used for automatically identifying a person, a package or an item. To do this, it relies on RFID tags. These are small transponders (combined radio receiver and transmitter) that will transmit identity information over a short distance, when asked. The other piece to make use of RFID tags is an RFID tag reader.An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. Most tags carry a plain text inscription and a barcode as complements for direct reading and for cases of any failure of radio frequency electronics.

Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and de-modulating a radio-frequency (RF) signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.There are generally two types of RFID tags: active RFID tags, which contain a battery, and passive RFID tags, which have no battery.

MICROCONTROLLER:

A Micro controller consists of a powerful CPU tightly coupled with memory RAM, ROM or EPROM), various I / O features such as Serial ports, Parallel Ports, Timer/Counters, Interrupt Controller, Data Acquisition interfaces-Analog to Digital Converter (ADC), Digital to Analog Converter (ADC), everything integrated onto a single Silicon Chip.It does not mean that any micro controller should have all the above said features on chip, Depending on the need and area of application for which it is designed, the ON-CHIP features present in it may or may not include all the individual section said above.Any microcomputer system requires memory to store a sequence of instructions making up a program, parallel port or serial port for communicating with an external system, timer / counter for control purposes like generating time delays, Baud rate for the serial port, apart from the controlling unit called the Central Processing Unit.

IR SENSOR SECTION:

In this project work three similar blocks are designed with IR (Infrared) sensors, for detecting the presence of vehicle in the parking area. The IR sensors are arranged in a fashion such that whenever the vehicle parked at that particular parking place, automatically output of the sensing circuit will become high and this high signal is fed to microcontroller directly. In this concept each parking place is required a pair of IR LED's. According to the information produced by the IR sensing blocks, the microcontroller can identify weather that particular parking place is vacant or full and according to that, the controller displays the information on the LCD and transmits the same through WiFi module to all the connected devices. The output of all the three sensing blocks are fed to controller and these blocks generates high / low signals according to the occupancy / non-occupancy of the vehicles, and these signals are very essential for the controller.

The IR sensors are wired with LM567 IC, this is a tone decoder IC also it can generate tone frequency. In each sensing block 2 Infrared LED's are used and both are arranged at specific parking place parallel to each other. Whenever the vehicle is parked between these sensors, automatically output of the sensing circuit will become high. These 2 Infrared LED's are treated as; signal transmitting LED as well as signal receiving LED. The signal transmitting LED radiates the signal in the form of low frequency and it is transmitted in uni-direction, the receiving LED is arranged parallel to the transmitting LED at some distance. The receiving LED is called as optical sensor, as long as it receives signal from transmitting LED, the final output of the circuit remains in zero state, whenever any vehicle is parked between these two sensors, the IR signal is interrupted and final output will become high. The low frequency produced by the 567 IC is radiated through the transmitting LED. The IR signal detector arranged parallel to the transmitter at either side of the parking place is wired with tone decoder section of LM567 IC, which decodes the received signal. As long as the receiving sensor receives signal from the transmitting LED, the output of the IC remains in zero state. Whenever the vehicle occupies the parking place, and due to the occupancy, the vehicle will interrupt the radiating signal, which in turn the IC generates a high signal and the same is fed to microcontroller.

GSM MODEM:

The role of GSM is important here, as described above, the main function of this module is to send the information to the concern mobile by dialing it automatically. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. For this purpose Semen's modem is used.

A GSM Modem is used to transmit or receive the text message sent from the black spot zone or a mobile respectively. This is done by inserting any working SIM card in the GSM Modem and it works like mobile using some commands and send messages which are sent by the Microcontroller to receiver mobile or to the controller from any other mobile phone.GSM Modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that dial-up modems sends and receives data through a fixed telephone line via wireless modem sends and receives data through radio waves.A GSM Modem can be an external device or PC Card / PCMCIA Card. Typically, an external GSM Modem is connected to a computer through a serial cable or USB cable. A GSM Modem is a form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card /PCMCIA Card slots of a laptop computer.Like a GSM mobile phone, a GSM Modem requires a SIM card from a wireless carrier in order to operate.

RELAY SECTION:

A relay is an electromagnetic switch, which can be used to make or break the circuit. Here two relays are connected at the output of the microcontroller to control the DC motor for door/gate opening and closing. The relay used here is having only one set of changing over contact, when this relay is energized normally open contact gets closed and supply is provided to the electrical device. When the same relay is de-energized, normally open contact remains in open condition and supply is disconnected to the device. The contact rating of the relay is 1.5 amps; less than 1.5 amps restrict so current flowing through the contact. If any heavy load device is used, higher rating relay must be selected accordingly. A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. These contacts can be either Normally Open (NO), Normally Closed (NC), or change-over contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier. So a relay can be defined as an automatic electromagnetic/electronic switch, which can be used to make or break the circuit.

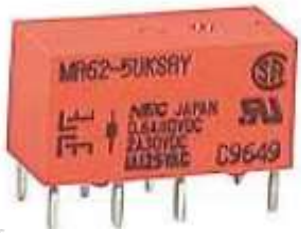

Figure 1:Relay

The relay used in this project work is electromagnetic relay. The electromagnetic relay is basically a switch (or a combination of switches) operated by the magnetic force generated by a current flowing through a coil. Essentially, it consists of four parts an electromagnet comprising a coil and a magnetic circuit, a movable armature, a set of contacts, and a frame to mount all these components. However, very wide ranges of relays have been developed to meet the requirements of the industry. This relay is nothing but a switch, which operates electromagnetically. It opens or closes a circuit when current through the coil is started or stopped. When the coil is energized armature is attracted by the electromagnet and the contacts are closed. That is how the power is applied to the signals (indicators). The construction of the typical relay contains a code surrounded by a coil of copper wire. The core is mounted on a metal frame. The movable part of the relay is called armature. When a voltage is applied to the coil terminals, the current flowing through the coil produces a magnetic field in the core. In other words, the core acts as an electromagnet and attracts the metal armature. When the armature is attracted to the core, the magnetic path is from the core through armature, through the frame, and back to the core. On removing the voltage the spring attached to the armature returns the armature to its original position. In this position, there is a small air-gap in the magnetic path. Hence, more

power is needed to pull in the armature than that needed to keep it held in the attracted position

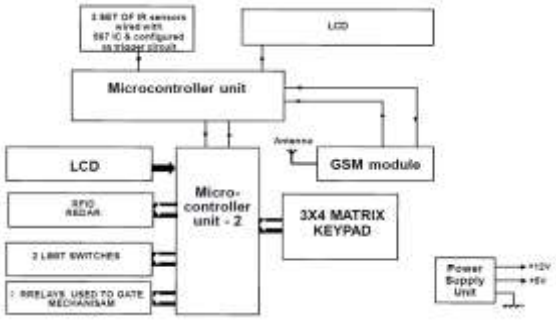

Figure 2: Block diagram

III. HARDWARE DESCRIPTION:

The display section is designed with LCD panel; this panel is interfaced with microcontroller through its output port. This panel is having two rows, and each row contains 16 characters. These panels are capable of display numbers, characters, and graphics. The display contains two internal byte-wide registers, one for commands (RS=0) and the second for characters to be displayed (RS=1), it also contains a user. Programmed RAM area (the character RAM), that can be programmed to generate any desired character can be formed using a dot matrix. To distinguish between these two data areas, the hex command byte 80 will be used to signify that the display RAM address 00h is chosen.

The LCD circuit is constructed with 89C51 microcontroller. The LCD contains 16 pins of which 8 are data pins and 3 are control pins. The microcontroller used in this project work is having 32 I/O lines and 10 I/O lines are interfaced with LCD panel, D0 – D7 of LCD panel are called as 8 – bit data pins and this panel acquires the information from microcontroller through this data pins. The following figure shows how the display unit is interfaced to the Microcontroller.

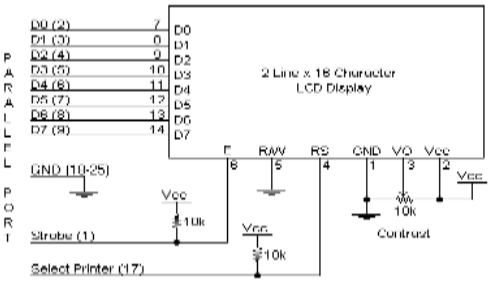

Figure 3: LCD Interfacing

DC MOTORS:

DC motors are widely used, inexpensive, small and poweful for their size. They are most easy to control. One DC motor requires only two singals for its operation. They are non-polarized, means you can reverse the voltage without any damage to motor. DC motors have +ve and –ve leads. Connecting them to a DC voltage source moves motor in one direction (clockwise) and by reversing the polarity, the DC motor will move in opposite direction (counter clockwise). The maximum speed of DC motor is specified in rpm (rotation per minute). It has two rpms: no load and loaded. The rpm is reduces when moving a load or decreases when load increases.

POWER SUPPLY:

The required power supply to drive the wheel chair is derived by 12V, 1.2 AH, rechargeable, lead acid heavy duty battery. Here we required two different DC levels of +5V and +12V. The battery as it is delivering 12V is used to drive the DC motors through the H Bridge IC, where as for the remaining electronic circuitry consists of microcontroller, H – Bridge IC, RF receiver module, etc requires +5V constant source. To generate a stable supply of +5V, 7805 three terminal voltage regulator chip is used which provides constant supply, though the battery terminal voltage falls down to 8V. The DC motors are designed to operate at 12V DC and each motor consumes a maximum current of 150 milli-amps, there by two motors for the wheel chair together consumes 300 milli-amps. Likewise by calculating the current drawn by the entire circuit, the backup time of the battery can be calculated. The relation for calculating the backup time is given as:

The battery backup time = battery rating / consumed energy (current drawn by the entire circuit).

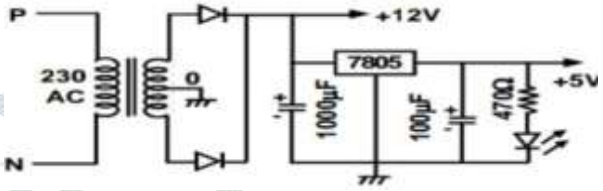

Figure 4: Power supply unit

IV. CONCLUSION:

The project work Titled **"Smart Parking System"** is successfully designed & developed, and a demo unit is fabricated and the results are found to be satisfactory. Since it is a demo module, we have consider for three parking places and according to that LCD panel is selected for displaying the parking status, but when the system is utilized for real applications it should able to display the entire parking lot. The entire parking lot may provide facility for parking hundreds of vehicles, there by the technology has to be enhanced and instead of using LCD panel computer can be used, so that lot of information can be displayed. The computer monitor can be arranged at the entrance of main gate, in which empty places can be displayed for incoming vehicles. As this entire information is transmitted through the GSM module the status of the parking lot can be easily known to the users whoever contacts to this GSM modem. This helps the driver to locate his parking place and without any confusion within less time he can park his vehicle. When the system utilizes computer, many more features can be added for the convenience of parking place owner as well as for the convenience of vehicle owner

VI. FUTURE SCOPE:

This project can be connected with cloud with better efficiency.cloud technology can be used to generate new passwords randomly and we can maitain a large data base.

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