8051 Microcontroller based RFID Car Parking System

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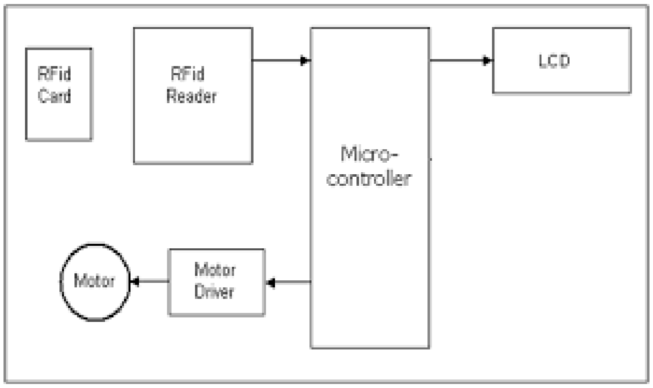
***Abstract* -** The importance of automation is increasing day by day. In this paper we propose a car parking system which uses RFID sensors to check if the person is in the database or not. If the person is in the database, then his/her car will be allowed to enter the car parking and then the motors will rotate clockwise which will mean the opening of the car parking gate, after some time the door will rotate anticlockwise which will mean the closing of the car parking gate.

***Index Terms* -** 8051 Microcontroller, RFID, Motors, Car Parking

INTRODUCTION

Automated car parking is a method of automatically parking and retrieving cars that typically uses a very rigid method. The intention is to compact more cars in the same space, reduce the space needed to park the same number of cars. The issue of car parking has problems like with how to control the number of the car inside it, how to monitor the movement in/out side of the parking lot, how to check whether there is a place inside for more cars or not, safety to park & overcrowding of cars in the parking space. We aim to solve these problems by designing a system to control the parking area using a microcontroller. An Automatic RFID based car parking system is a smart parking system which will play an important role to reduce traffic in the city. Cars parked callously on the streets limit the space. So with a smart parking system this problem can be solved. Moreover, this kind of system will reduce the manual work and save time.

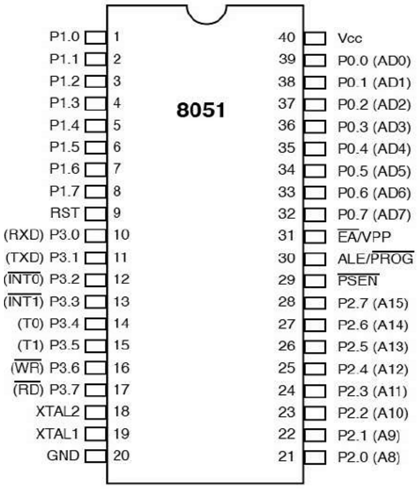
PROPOSED SYSTEM



In this project "RFID based Car Parking System" we have proposed an automatic car parking system. As in the modern world everything is going automatic we have created a system which will scan the user's set password and then allow the person to enter the car parking space. When the person enters his/her password then the microcontroller will search whether the password is available in its database or not, if the password matches with the password the user entered then the motor will rotate clockwise for some time indicating opening of parking gate and then close after some time indicating closing of the parking gate. The LCD is connected to the microcontroller which will display all events happening like opening of door, closing of door, password match confirmation string, password mismatch string.

HARDWARE DETAILS

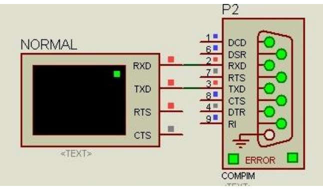
8051 Microcontroller



8051 microcontrollers are designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz.

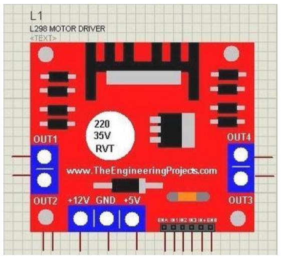
8051 microcontrollers have 4 I/O ports each of 8-bit, which can be configured as input or output. Hence, total 32 input/output pins allow the microcontroller to be connected with the peripheral devices.

Virtual Terminal



Virtual Terminal is a very useful tool available in the Proteus. With the help of Virtual Terminal one can easily simulate the serial communication that he / she use in his / her embedded systems. It is important to note here that almost every microcontroller that is used in the embedded system has integrated UART (Universal Asynchronous Receiver Transmitter) on it which is used to perform serial communication between other hardware used in embedded system that also supports Universal Asynchronous receiving and transmission. So while writing the code for serial transmission and designing the circuit it is required that the code and design should be tested for serial communication, so that any problem in the code or communication can be resolved before implementing the circuit physically. It should have come in the reader’s mind that how we can see the data transmitted to or from the microcontroller serial port in the software. Thus the Virtual Terminal plays the role while simulating the embedded systems that compliance the serial communication through the Universal Asynchronous Receiver or Transmitter. The Virtual Terminal in the Proteus is bi-directional which means that it can send and receive data simultaneously.

L293D Motor Driver

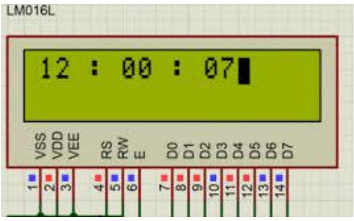


The L293D is a popular 16-Pin **Motor Driver IC**. As the name suggests it is mainly used to drive motors. A single **L293D IC** is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Micron rollers like Arduino, PIC, ARM etc.

All the Ground pins should be grounded. There are two power pins for this IC, one is the Vss(Vcc1) which provides the voltage for the IC to work, this must be connected to +5V. The other is Vs(Vcc2) which provides voltage for the motors to run, based on the specification of your motor you can connect this pin to anywhere between 4.5V to 36V, here I have connected to +12V.

The Enable pins (Enable 1,2 and Enable 3,4) are used to Enable Input pins for Motor 1 and Motor 2 respectively.

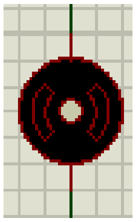
LCD Display



16×2 LCD module is a very common type of LCD module that is used in 8051 based embedded projects. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5×8 dot resolution.

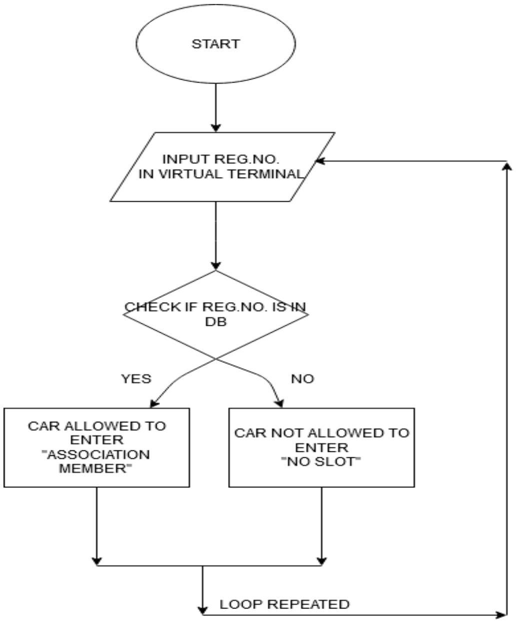
VEE pin is meant for adjusting the contrast of the LCD display and the contrast can be adjusted by varying the voltage at this pin. This is done by connecting one end of a POT to the Vcc (5V), other end to the Ground and connecting the center terminal (wiper) of the POT to the VEE pin. R/W pin is meant for selecting between read and write modes. High level at this pin enables read mode and low level at this pin enables write mode. E pin is for enabling the module. A high to low transition at this pin will enable the module. DB0 to DB7 are the data pins. The data to be displayed and the command instructions are placed on these pins. LED+ is the anode of the back light LED and this pin must be connected to Vcc through a suitable series current limiting resistor. LED- is the cathode of the back light LED and this pin must be connected to ground.

DC Motor



The maximum current that can be sourced or sunk from an 8051 microcontroller is 15 mA at 5v. But a DC Motor need currents very much more than that and it need voltages 6v, 12v, 24v etc., depending upon the type of motor used. Another problem is that the back emf produced by the motor may affect the proper functioning of the microcontroller. Due to these reasons we can’t connect a DC Motor directly to a microcontroller & hence we use a motor driver as a medium.

Project Flowchart



When the project file is executed we see a virtual terminal popping out, while in the LCD we see the welcome text. After some delay the LCD displays the text to enter the password, after the password is entered in the virtual terminal, the 8051 microcontroller checks whether that password is stored in the database or not. If the password matches with the password entered by the user, the motors, which are connected with the output pins of the 8051 microcontroller, rotates clockwise. After some delay the motor rotates anticlockwise indicating closing of gate, simultaneously the LCD displays the strings like “closing door”, “opening door” etc. while the whole operating takes place. If the password doesn’t match with the one entered by the user and in the database, then the motor doesn’t rotate and a string is displayed “No slot for you”.

Code Explanation

The code contains the following part: -

- Input function & variable declarations
- Main function initialization
- Function descriptions

In the first part we declare all the variables and function so that we can use them later in the program. The motor connection is defined in the output’s pins of the 8051 microcontroller using “sbit” which is a function used to access bit addressable SFRs. The LCD functions are declared which includes functions for sending commands to LCD, sending strings to LCD, LCD initialization etc. A delay function is defined which includes the code for generating delay. In the second part of the code we define the main function which contains the function “check()” which is responsible for checking if the user entered password matches with the one present in the database. The third part of the code defines all the functions declared in the first part of the code.

Conclusion

The system can be used at all places starting from domestic to the industrial sectors. The simplicity in the usage of circuit helps it to be used by a large number of people, because people with less knowledge of hardware can also use it without facing any problem. This circuit can be further modified to contain a counter which tells a person coming from outside whether parking space is available or not. The LCD will display all the content which can be easily seen by a user making this hardware very easy to be used by general public.

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