

Study on Automated Car Parking System Based on Microcontroller

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Abstract

This paper has shown the concept of an automatic car parking system. Everything in the modern world is going automatic, we have built a system which can automatically sense the entry and exit of cars through the gate and then display the number of cars in the parking lot. This automated car parking system reduces the time taken to check the space for vehicles by displaying the available spaces for parking on a LCD displayer by using infra red (IR) sensors installed at the entrance and exit. This project is developed using 89c52 microcontroller.

Introduction

Car parking issue has some problems 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 and the safety to park. The aim of this project is to solve these problems by designing a system to control the parking area using a microcontroller. The microcontroller serves as a programming tool to run the whole operation, to reduce the cost in terms of requirement such as job opportunity and to increase security. Moreover, this system is faster, flexible and can meet market needs.

1. Concept and Operation

In the project "Car Parking System" we have shown the concept of an automatic car parking system. As in the modern world everything is going automatic, we have built a system which will automatically sense the entry and exit of cars through the gate and then display the number of cars in the parking lot. Even we can set a maximum capacity of cars by the help of

user interface given in the hardware in the form of switches so that there is no congestion. We have deployed a microcontroller used to sense the movement of cars and check whether there is a capacity for cars to park, then decide the gate either opens or not. It is also possible to open a gate when any car enters in the parking lot or close the door when a car exits from it.

There are two sets of sensors: one is installed on the first gate (entry gate) and the other is installed on another gate (exit gate). when a car arrives at the door, the microcontroller receives the signal from the entry sensors and then checks whether there is a space for the car to be accommodated. Simultaneously, it will display the number of cars present in the parking lot on a LCD screen and opens the gate if there is a space for the car to park. when a car moves out of the parking area, the microcontroller reduces the count displayed on the LCD accordingly and then closes the gate.

The sensing of entry and exit of cars is done through infrared transmitters and receivers. Before the door the infrared transmitter is mounted on one side and the receiver is placed directly against the transmitter across the door. when a car arrives, the infrared beam is blocked by the car and the receiver is devoid of infrared rays and its output changes. This change message is sent to the microcontroller and accordingly it increases the count and opens the door if there is some empty position. The procedure for the exit of cars is much similar to that of entry.

The flow diagram of this project is given in Figure (1). At the beginning of the program, event counter variable Cnt is cleared to zero and the program checks the value of Cnt. If $Cnt \geq 100$, then

the car parking is assumed to be full and message "FULL" is displayed. If $Cnt < 100$, then it is assumed that there are spaces in the parking and message "SPCS" is displayed. The program then checks the ENTRY switch and Cnt is incremented by one when a car enters into the parking lot. Similarly, Cnt is decremented by one when a car leaves. When the parking lot is full, the lock mechanism is activated which stops the ENTRY barrier to open even if a car approaches it. The lock mechanism is disabled so long as spaces are available in the car parking..

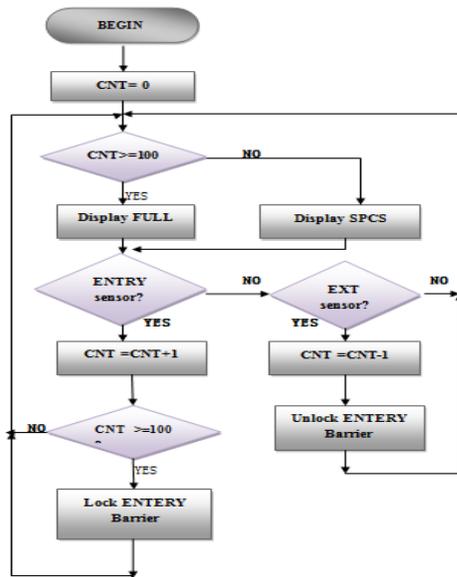


Fig. 1 The flow diagram of the project

2. Hardware design

Our Car parking system is composed of microcontroller (STC89C52), IR sensors, stepper motors, HD44780 20x4 LCD, buzzer,. Ds1302. The detailed hardware composition is shown in figure 2.

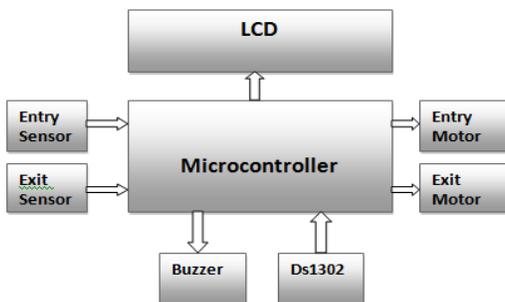


Fig.2 Overall diagram of the system

2.1 Microcontroller

The microcontroller used in the project is STC89c52. This part is the heart of the project. It checks for the entry and exit of car. It continuously polls the pins from where we receive the signal from the sensor.

When it detects the car from the entry gate then it checks whether there is any vacant space in the parking lot. If there is vacant space then it opens the door and increases the overall count in the parking lot by one. And after 3 seconds the door automatically will be closed. And if it detects the car from the exit gate then it decrement the count by one.

2.2 Display unit -LCD

LCD makes this instrument user interface friendly by displaying everything on the display. It is an intelligent LCD module, as it has inbuilt controller which convert the alphabet and digit into its ASCII code and then display, this LCD will display the number of total cars and available car and the time.

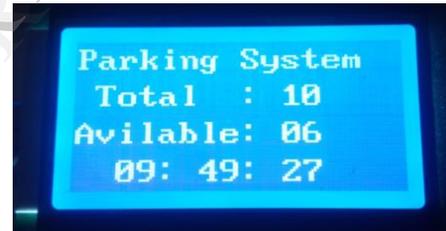


Fig.3 Information displayed on LCD

2.3 Stepper Motor

Stepper motor is used to open and close the door. It is interfaced with microcontroller and takes command from the microcontroller to rotate some particular specified angle.

2.4 Entrance and Exit Detector

The entrance and the exit are detected by using two infrared modules. Each module will contain an IR transmitter and an IR receiver. Before the door the Infrared transmitter is mounted on one side and the receiver is placed directly in front of the transmitter on the other side of door. Infrared transmitter will continuously transmit IR waves and the receiver will continuously receive IR waves. The IR transmitter will use an IR LED.

2.5 Ds1302

The DS1302 Trickle Charge Timekeeping Chip contains a real time clock/calendar and 31 bytes of static RAM. It communicates with a microprocessor via a simple serial interface. The real time clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with an AM/PM indicator.

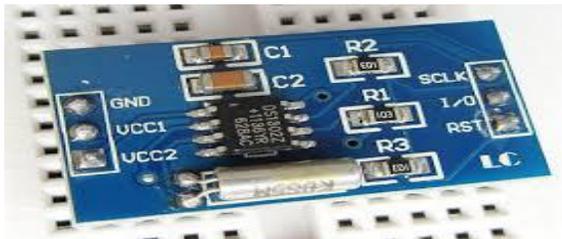
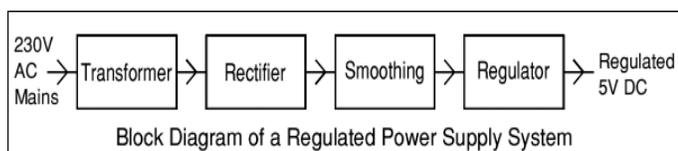


Fig.4 The physical map of our system

2.6 Power supply

Power supplies are designed to convert high voltage AC main to a suitable low voltage supply for electronic circuits and other devices. A power supply can be divided into a series of blocks, each of which executes a specific function.



Each of the block has its own function as described below

- (i) Transformer – steps down high voltage AC mains to low voltage AC.
- (ii) Rectifier – converts AC to DC, but the DC output is varying.
- (iii) Smoothing – smoothes the DC from varying greatly to a small ripple.

- (iv) Regulator – eliminates ripple by setting DC output to a fixed voltage.

3. Significance in the perspective of theory and application

It will enable the drivers at the exit gate to enter if there is any empty space in the parking and disable them to enter when there is no empty space.

It will manage the main parking spaces by alerting the drivers if there are spaces to park in or not.

It will provide an automated system that whenever there is no space no one can access the parking and when there is space drivers can access the parking.

In terms of money, this project has two things in general; namely: It will reduce the number of people needed at the gate to guide drivers.

It will provide a way of getting money for any institution that has this system because it can be put on the market and people use it for their interest like in a commercial sector where an institution has movement of clients that have vehicles and the institution cannot support them at the same time; hence this automated system can be a solution.

4. 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 Automated car parking system enables the parking of vehicles and thus reduces the time taken to check the space to be used by displaying the spot where the space for parking is available on an LCD display by using IR sensors at the entrance

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