



A Microcontroller Based Multi Level Car Parking System

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Abstract

India being the second most populated country with a population of 1.2 billion and counting, the transportation sector is in an alarming position. Parking vehicles is becoming a nuisance each passing day forcing people to park their vehicles on roads, thus becoming the major cause of traffic jams. Automatic multi level car parking system plays a vital role in avoiding this mess and parking of more and more vehicles is made possible in an arranged manner. This project aims at construction and designing of the micro controller based multi level car parking system using IR sensors.

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1. Introduction

Two third of the geographical area on the planet is covered by water and the remaining one third by land, occupied by around billions of people and these billions of people have trillions of vehicles leading to one simple word coming to our mind that is "chaos" and "mismanagement". Born 22 years ago, we have always been a victim of traffic jeopardizes in our lives facing wrath from administrators, officers, leaders, friends as a consequence. The whooping high number of cars on Indian roads has already begun to cause problems to commuters. Long queues of cars across the streets during peak hours are the common sight in any metropolitan city of India. Seeing 'No parking', 'VIP parking', 'reserved parking signs' after every 500 meters on roads (narrow, inefficient, scathered) the people face traffic problems and as a result are a victim of 'so and so' parking which creates chaos, disorder and rule breaking by people. On an average, a total of 933cars are added to the roads of the capital of India on daily basis(survey). According to statistics provided by Indian Motor Vehicles department and a survey conducted by World Health Organization, a total of 100 million vehicles are already out on roads as of 2013 and this number will roll up to 450 million in coming 20 years.

Having said that, we have come up with a congestion free microcontroller based parking system to organize traffic, space in an orderly conduct and check pollution to a certain extent as a result. This work consists of ATMEL AT89S52 microcontroller chip which regulates working of hardware circuitries. The sensors here are used as input and stepper motor, DC gear motor, 7 segment display, buzzers and LEDs are used as output. The lift used carries the vehicles to the vacant space available in the parking bay.

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Table 1. Component Description

S.No	Component Name	Description
1.	Step down transformer	230 to 12 V,1Amp
2.	Diodes	IN-4007
3.	Capacitors	1000microF,10microF
4.	Voltage regulator	7805,1Amp
5.	Transistors	NPN, PNP
6.	Variable resistances	50k, 20k, 1k
7.	LEDs	
8.	IR sensors	
9.	Reed Switch	
10.	Resistors	470 Ohms,10k ohms,4.7k ohm
11.	DC Motors	Stepper, Gear
12.	LCD and 7 segment display	16 by2
13.	Timers and 7 segment ICs	555 Timer and 4026 series
14.	LDR	
15.	Crystal Oscillator	12 MHz
16.	ULN	2003 series
17.	Microcontroller	AT89S52

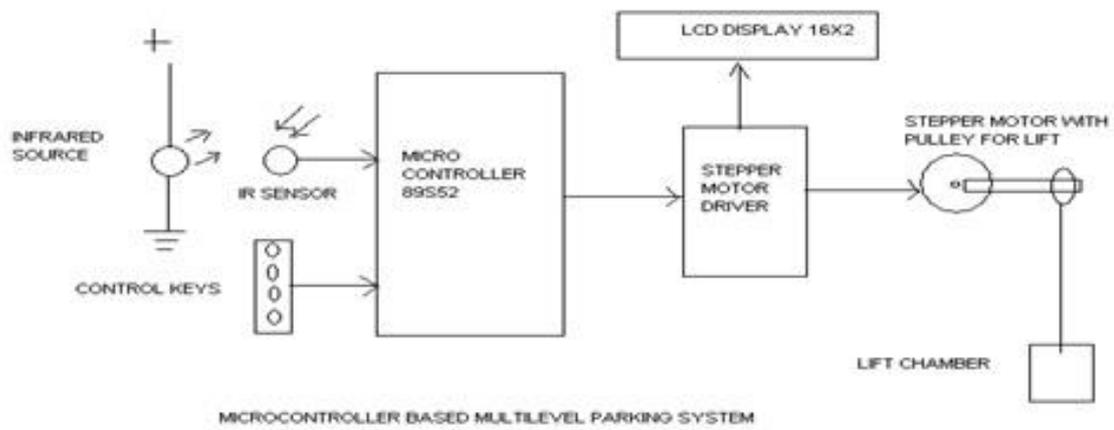


Figure 1. Block Diagram

2. Block Diagram with description

There are following major components involved in developing the automatic car parking system:

i) IR sensors: We use Infra Red transmitters and receivers for controlling the automatic gates on detecting the vehicular entry in the parking lot. The IR receivers are connected to microcontroller. IR rays are obstructed when a car passes through it.

ii) Microcontroller: A microcontroller is a device that reads the information or data coming from the IR at regular intervals through serial interfacing and stores in its memory. Microcontroller will come to know that which slot is empty and which slot is full and chooses the convenient position for parking the incoming vehicle.

iii) Stepper Motor: As the vehicle enters the lift, its presence is detected by the sensors in the lift and they carry the vehicle to the nearest possible vacancy as directed by the microcontroller.ULN2003 IC is responsible for stepper motor rotations with is connected to the pulley regulating the upward/downward movement of the lift.

iv) LCD Display: It displays the number of vehicles parked on each floor and acts as an interface between the user and the microcontroller. When the lift is busy the message "WAIT LIFT BUSY" is displayed on the screen and the buzzer alarm rings.

3. Circuit diagram with Description

This automatic car parking system is mainly classified into hardware operations and software programming. In the hardware operation, the most important task is done by the microcontroller.

In this project, we show the basic elevator system with 3 floors, however this work can be implemented on multiple floors. The lift carries the vehicles to each floor and parks it in the nearest available vacancy.

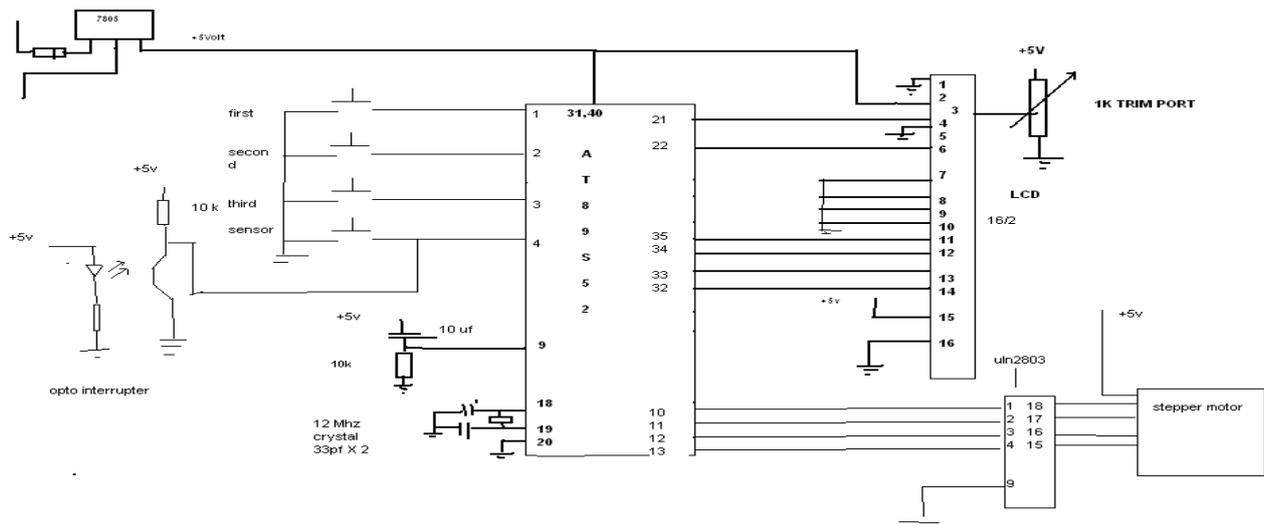


Figure 2. Circuit diagram

This project consists of two IR receiver and transmitter pair that controls the automatic gates and vehicle detection as it passes through it. An LCD displaying the exact number of cars parked in the bay and possible space available is mounted outside the parking gate. If no space is available in the bay, it displays message SPACE NOT AVAILABLE.

When a vehicle enters the parking area, the sensors are activated which open the gate automatically if the lift is free. The second sensor placed in the lift aligns the lift properly on each floor. This sensor output is fed to the microcontroller which controls the lift's vertical and horizontal movement using ULN 2003 and places the incoming vehicle in the first available space. Microcontroller also generates a unique ID number to each car parked in the bay so that its retrieving becomes easy which is otherwise to be done manually using the control keys assigned for each floor. The lift takes the vehicle to the assigned floor and the vehicle is deboarded from the lift section to the assigned parking space in the bay and the empty lift returns to the entry point for assisting other incoming vehicles. In case the lift is busy, a buzzer alarm alerts the customer wanting him to wait till the lift returns back to the ground floor. The seven segment display used gives us the number of vehicles that have entered the parking area.

For car retrieving, the previously generated ID is entered by the customer that alerts the microcontroller about the vehicle location (where it was parked earlier) and automatically operates the lift to retrieve the vehicle from there and is brought to the ground floor where the customer can drive away his car.

4. Future Scope

Automatic parking systems can be employed at the areas where there are fewer parking spaces available but high parking needs like shopping malls, multiplexes, offices, etc.

Sky parks Automatic Parking Systems is already working on this technology at several locations in US, France, Hungary, Australia and Malaysia.

Due to the separate enclosures for VIP cars, this technology can be used at a large scale at locations like stadiums, malls etc.

A completely automated system can be designed as further improvement in which the user can leave the car at the entrance of the parking from where highly efficient machines will move the vehicle to the empty parking space, that's available.

For car retrieving, the customer has to enter his secret code at the 'EXIT' terminal. The system will automatically detect his need and activate its machinery so that the correct car is retrieved at the 'EXIT' terminal.

5. CONCLUSION

This microcontroller based parking system profits the human life by reducing the available territorial land. Besides being cost effective we also induce other benefits from this idea such as:

- Increased rentable Areas
- Customer friendly secure parking
- Undoing mismanagement of resources
- Pollution control

To enhance the available one-third of the land for efficient, limitless and eco-friendly sustenance, this and future modern technology will help the human population from hassle free parking and thumbs down to deforestation (where underground parking can come into use in future).

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