

AUTOMATIC MULTISTORIED CAR PARKING SYSTEM

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Abstract-Now a day’s numbers of cars have increased; because of this car parking is a big issue which in turn causes traffic jam problem. To overcome this problem, “Automatic Multistoried Car Parking System” is best solution.

The system is based on PLC. It consists of one main display at the ground floor which is basically counter that displays number of cars in each floor. In each slot consist IR sensor which indicate that parking space is available or not on that particular slots. There is facility of lift to carry the car to up and down. Movement of lift controlled by motor. At the ground level LED is providing to indicate position of lift. When car is entered at parking system, controller check whether space is available or not. If all spaces are vacant, the lift will park the vehicle on priority basis. After parking the car lift go to original position and controller send the signal to the display that car is parked properly with slot number. For the impark the car operator enter the slot number by the keyboard at the ground level according to that controller send signal to the lift then lift goes to a particular slot and impark the car.

In this system human power is not used therefore error is less also required low space with provides highest security and greatest flexibility. No need for energy intensive ventilating system. Due to this advantage system used in public parking, rail station, airport, hotels, mall.

INTRODUCTION

Automatic multistoried car parking system helps to minimize the car parking area. In the modern world, where parking-space has become a very big problem and in the era of miniaturization, it has become a very crucial necessity to

avoid the wastage of space. By using this model we park more than 50 cars, this system proves to be useful in reducing wastage of space and park the more cars in smallest area. This Automatic Car Parking System enables the parking of vehicles, floor after floor and thus reducing the space used. Here any number of cars can be parked according to the requirement. This makes the system modernized and evens a space-saving one. This idea is developed using PLC.

The earliest known multistoried car park was built in 1918. This system firstly built for the Hotel La Salle in Chicago, IL at 215 West Washington Street in the West Loop area of downtown. It was designed by Halberd and Roche.

Since then bigger parking’s have been made and there is a proper technology to run them. In our project this idea use as basic idea and make fully automated project.

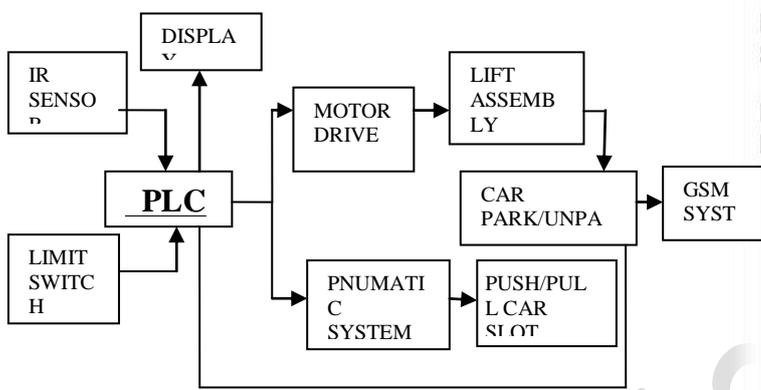
Main sections in this system are -:

1. PLC
2. Display section.
3. Keyboard.
4. Lift & motor section.
5. Sensor section.
6. Pneumatic system

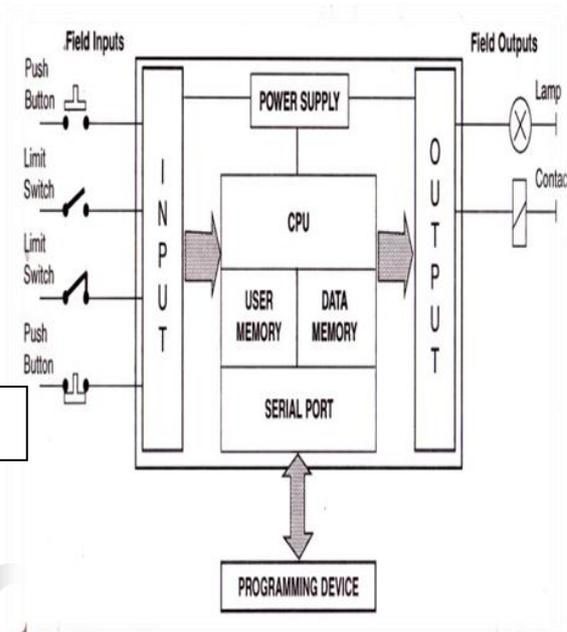
7. GSM Mode

SYSTEM DESIGN

Block diagram:-



1.1 Block diagram of car parking system



1.2 Block diagram of PLC

1. Programmable Logic controller (PLC) :-

- A Programmable Logic controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes.
- The Programmable Logic Controller or PLC is an industrial computer designed to run specific tasks quickly and efficiently.
- PLC is an user friendly microprocessor based specialized computer that carries out control functions of many types and levels of complexity

Advantages of PLC:-

- ✓ Complex control easily possible
- ✓ Flexible logic. Changes are easily possible
- ✓ Very less wiring required
- ✓ Trouble shooting aids provide easy programming & reduce down time
- ✓ Very rare chances of failure
- ✓ Robust for industrial use

PLC – typical hardware configuration:-

- ❖ Rack – This is the rail used to hold all the modules of PLC
- ❖ Power supply – power supply provides required voltage levels for CPU operation

- ❖ Central processing unit (CPU) – This is the brain of the PLC. Ladder program is stored & processed by CPU.
- ❖ Input Modules – Sense the status of input device like sensors or switches in the form of different voltage levels. The status is then conveyed to CPU
- ❖ Output Modules – Used to give command to actuators like solenoids, relays etc. to carry out a particular action.
- ❖ Special Modules – Optional. Used to carry out a special functionality.

General Operation of PLC:-

1. Component sensed signal is given to input module.
2. CPU reads status of component sensor when it enters in “INPUT SCAN” & updates input memory area.
3. After completing INPUT scan CPU enters LOGIC scan
4. CPU solves all the program as per input memory status. More time is required if program length is greater. In this scan, CPU will solve the program logic. Here, depending on component sensor status, corresponding coils is made OFF & output memory is updated. After completing logic solving, CPU exits this scan.
5. CPU enters OUTPUT scan. In this scan, depending on output memory status, output module will make output ON/OFF depending on programming

2. Display section:-

This section displays the floor number along with the number of cars which has been already parked in that particular floor. So whenever a car is ready to either come down or go up, the program either decrements the count or increments the count

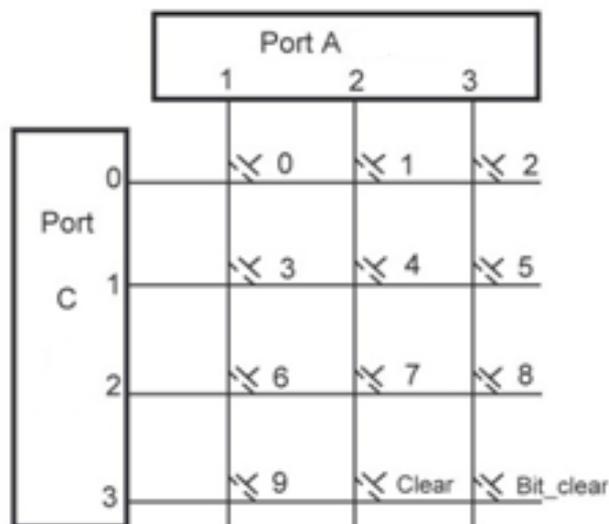
automatically according to the going up or coming down of a car. Display section is done by interfacing with PLC display.

In this project LCD DISPLAY is used to display some messages which are useful to car owners. Here 2X16 LCD (Liquid Crystal Display) is used. This is used to display messages like

1. WELCOME TO CAR PARKING SYSTEM.
2. LIFT IS BUSY PLEASE WAIT.
3. NO VACANCY.

3. Keyboard:-

In this system consist matrix type of keyboard. This keyboard is used to enter the slot and floor no. during impark the car. Keyboard is handling by driver to enter one time use password during impark the car. This keyboard consist 12 buttons.

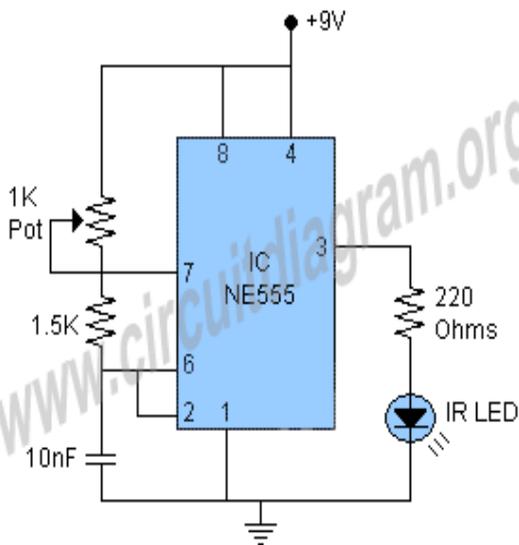


1.3 Keyboard Interface with PLC

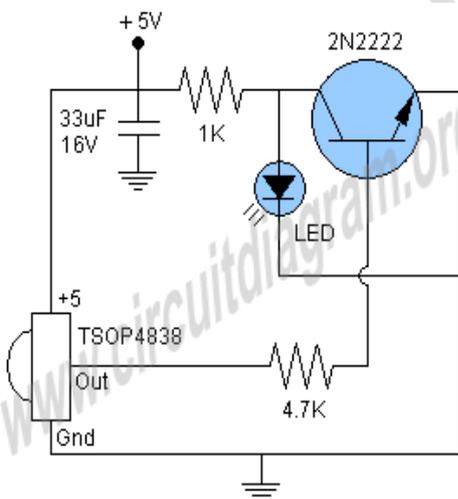
4. Sensor section :-

This system consist IR sensor. This IR sensor connects to the each slot of the system. IR sensor consist transmitter and receiver module. Transmitter send the pulse and receiver

receive the signal. The main workings of sensor are sense the car and according to that send the signal to the microcontroller. After that microcontroller take proper action.



1.4 IR transmitter module



1.5 IR receiver module

Motor section:-

For the system 2 motors are used, DC and stepper motor. PLC interface with both the motor. DC motor control movement of the lift and stepper motor rotate the car lift according to the slot direction. Both motor controls according to the PLC output.

5. GSM/GPRS MODEM

GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a **SIM (Subscriber Identity Module)** card just like mobile phones to activate communication with the network. Also they have **IMEI (International Mobile Equipment Identity)** number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

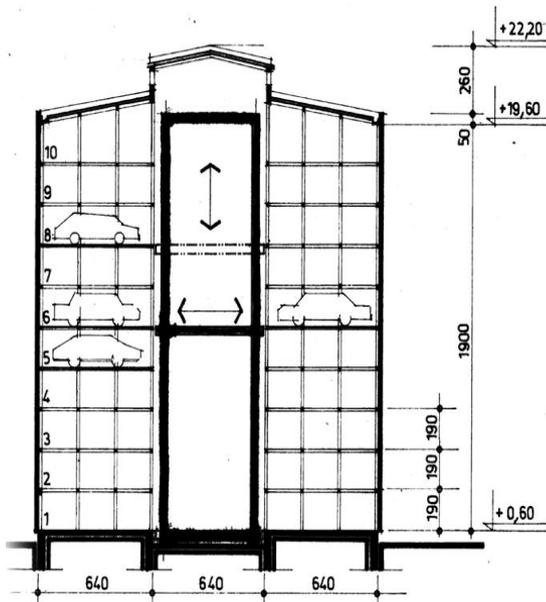
1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

The MODEM needs **AT commands**, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the **GSM and GPRS cellular network**.

ACTUAL WORKING

_A display is provided at the ground floor which is basically a counter that displays number of cars in each floor. It informs whether the floors are fully filled with the cars or is it having place in a particular floor or not. There is facility of lift to carry the car to up and down. Movement of Lift is controlled by DC motor. An indicator with a green and red LED is kept in ground floors to indicate whether the lift is busy or is it ready to take the car up or down. If the red LED glows that means

the lift is already engaged and the person has to wait for the green LED to glow. Storage capacity can be changed according to the requirement. Working steps are as follows



1.6 General view of model

- When car enter in to the gate of system, driver see current states of the LED.
If green LED glow- lift is empty.
If red LED glow-lift is engaged
- According to the LED status driver park the car in the lift and goes back. If vacant position is available and lifts is not busy then PLC starts the lift.
- After that immediately PLC scans all the floors and slots. If the space is available, the lift will start or stop on particular floor, which is displayed in the LCD. If no space is available, the lift stops and displays the message no space.
If all the spaces are vacant, the lift will park the vehicle on priority basis. If vacant position is detected then controller gives signal to the motor driver and motor driver drives DC motor of the lift assembly.

- After lift goes vacant slots then pneumatic system push the car in to the slot properly.
- After parking the car controller display slots number on the LCD. At the same time car slot number and one time use password send to the driver mobile by using GSM Model
- During the impark the car driver enters one time use password on the keyboard which is get during parking the car; output of the keyboard gives to the controller. Controller gives details about car and car slots on display. Then controller scans all floors and slots. After detecting the proper slots controller gives the output to the DC driver, according to that driver drives the DC motor and lift goes to the particular floors and slots.
- After that pneumatic system pull the car in to the lift properly, after that lift goes to ground level.

PERFORMANCE

A city like Delhi has over five million cars and two-wheelers on its roads, but not enough parking spaces. The demand for parking space has, on an average in the main markets of Delhi, outstripped demand by 43 per cent. It is not just a problem of Delhi or Mumbai; all the big cities in India are facing the space crunch. Parking space is fast becoming a major issue in other cities like Kolkata, Bangalore, Hyderabad, Ahmadabad, Chandigarh, Pune and other urban and semi-urban cities.

Automatic multistoried car parks provide lower building cost per parking slot, as they typically require less building volume and less ground area than a conventional facility with the same capacity. However, the cost of the mechanical equipment within the building that is needed to transport cars internally needs to be added to the lower building cost to determine the total costs. Other costs are usually lower too, for example there is no need for an energy intensive ventilating system, since cars are not driven inside and human cashiers or security personnel may not be needed.

A multistoried car parks offer greatest possible flexibility for the realization of optimum parking solution. A fast parking

process in which the driver does not have to maneuver his car or drive backwards, guarantees highest comfort and security. A single lift serves 6 to 12 parking spaces per level taking up a minimum of space. Time-saving vertical and horizontal movements take place simultaneously ensuring fast parking and retrieval times.

Advantages of Multi-storied car parking system:-

- Provide enough parking spaces.
- Provide lower building cost per parking slots.
- Required less building volume and ground.
- Provides highest comfort and security's
- Human error is less.
- Fast and time saving parking with greatest flexibility.

Limitations of a multistoried car parking system:-

There are some limitations of the system are occurs such as

- Slots are pollutant due to the motor oil.
- Challenge for authority to realize need and quickly.
- Estimate cost is high.
- Periodic maintenance is required.
- Provide backup systems during electricity failure.

Application

- Public parking.
- Airports.
- Rail stations.
- Hotels, Malls
- Office buildings.
- Colleges.
- Apartments
- Big industries
- Car industries to stored ready cars
- Carpools areas.

Safety and Security

- ❖ Fire alarms and automatic extinguishers offer safety in case of fire.
- ❖ Liquids spilling from cars (water, oil, snow etc.) are controlled for environmentally friendly removal.
- ❖ Except for maintenance, no people need to enter the facility, thereby guaranteeing safety of cars and drivers.
- ❖ PLC has backup system and emergency power feeds. In case power failure, generators can provide all the necessary electricity.

CONCLUSION

So, we can conclude by using multistoried car parking system we can reduce the traffic problem. We can park more cars in small space. We also reduce time and cost required for conventional parking system with high degree of security.

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