

Online Vehicle Management Systems using PLC and Mobile Application

Shubham Yogi, JK Deshmukh, Tabish Tolkar, Prathamesh Pande, Siddhesh Pawar

(shubhamyogi09@gmail.com ,jkdeshmukh75@gmail.com)

(Department of Instrumentation)

Bharati Vidyapeeth College of Engg., Navi Mumbai, Maharashtra, India

Abstract:

This project work presents the study and design of PLC based Online Vehicle Management System. Online Vehicle management system is the most efficient way of parking as by using this arrangement we can park the greatest number of vehicles in least possible area. Availability of space is detected by Proximity / IR sensors installed in each slot. A moving platform is used to lift the car and park it at respective free slot. A PLC is used for checking vacancies and the control of the moving platform. The proximity sensors installed in the system give PLC information regarding the free space as well as when the moving platform has to stop depending on where the car is to be parked. This system automates the entire process of parking which reduces human error and makes best use of the available space, which in turn results in highest security. Due to these advantages, this system can be used in societies, airports, railway stations or any other place where problems of vehicles is observed.

Keywords: PLC (Programmable Logic Controller), Proximity sensors, LLD (Ladder Logic Diagram), Prototype Model.

INTRODUCTION

Generally, there are two types of parking patterns.

(i). On Street Parking

It includes (a). Parallel Parking, (b) Angle Parking

(ii). Off Street Parking

It includes (a). Surface car parking, (b). multi-storey car parking, (c). Roof parking, (d). Mechanical car parking,

(e). Underground car parking.

There are some characteristics which have impact on parking demands such as:

(i). Parking accumulation - Number of parked vehicle in specified time

(ii). Parking duration - The length of time for which vehicle uses the facility.

(iii). Parking volume - Number of vehicles involved in parking activity is called parking volume.

(iv). Occupancy - Ratio of number of vehicles using parking facility to the number of parking facility available at a specified time.

Research estimates that light_duty vehicles make up 95 percent of that whole, and that that vehicles will shortly cross 1.2 billion themselves.Total

newvehicle sales 84 million last year, but Research suggests that annual sales could go to 120 million by 2025, bringing the global vehicle total to 1.8 billion or more.

In this dynamically growing era people are facing a new problem – lack of sufficient parking space. The parking scenario is falling short of the current requirements in the country by a big margin. The situation is such that on any given working day approximately 40% of the roads in urban areas are taken up for just parking the cars. The problem has been further worsened to the point where the number of families with cars has become much more than what the country is able to manage. As it is, the cities in the world are highly congested and on top of that the parked cars claim a lot of space that could otherwise be used in a better way., that's where our project comes in with complete parking solution which is fully automated and compact in size. This setup works on the most advanced industrial automation system PLC (Programmable Logic Controller) and Mobile application. This car parking has a circular multilevel pattern which is safe and completely driver less. The only thing person needs to do is leave the car at the ramp and then be free as the car will be automatically

lifted and placed at the vacant position in the parking lot. This automated car parking also saves fuel and has minimal chances of accident & damage that arises in the parking area due to manual parking. The mobile based application enables user to check the availability of space and accordingly booked the parking space. This paper is divided into following parts:
 (i)Components used (ii)Working
 (iii)Advantages(iv)Conclusion (v)Reference.

PLC (Programmable Logic Controller)

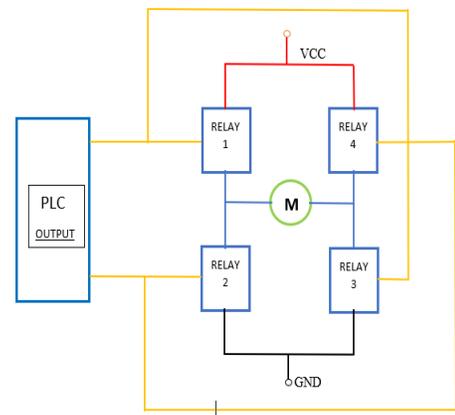
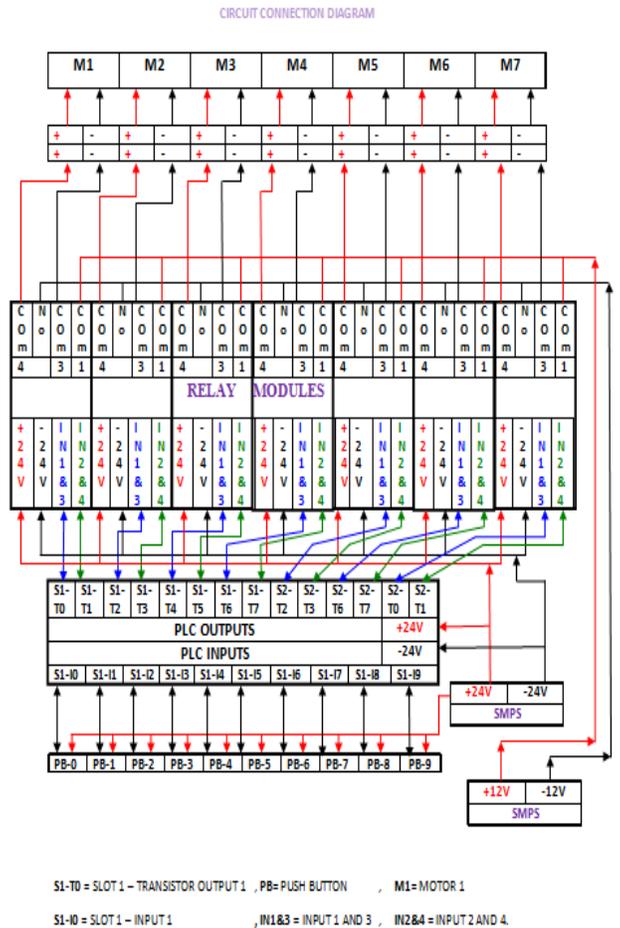
A PLC is a computer device used to control devices machines in the industry. It can operate various processes as, batch control application, utility plant, conveyor belt,chemical processing, food processing machinery.

In control system, all control devices are wired directly to each other according to the system operation. In PLC system, however the PLC replace wiring between the devices. Thus, instead of being wired directly to each other, all the equipment is wired to the PLC. Then the control program inside the PLC provide the wiring connection between the devices. The control program is stored in PLC memory.

ADVANTAGES OF PLC :

- Very fast
- Easy to change logic i.e. flexibility.
- Reliable due to absence of moving parts
- Low power consumption.
- Easy maintenance due to modular assembly.
- Facilities in fault finding and diagnostic.
- Analog signal handling and close loop control programming.
- Counter, timer and comparator can be added.

BLOCK DIAGRAM



HOW TO IMPLEMENT IN REALITY:

we required information about the capacity and use of existing parking facilities. Information about the demand for parking.

We are used motor driver also to provide constant speed for motors even if car weights are different. It will provide equal speed for different vehicles.

Also, for different sizes of vehicles, automatic tracker is provided. Proximity sensor is provided to activate the motors.

Before that study area must be defined. It should include traffic generators and a periphery, all points within an appropriate distance. It also includes any area that might be impacted by the parking modifications. The boundary should be drawn to minimize the number of entrance and exit points.

This study types are listed below and discussed in detail in further paragraph.

- Inventory of the parking facilities.
- Accumulation of counts.
- Duration and turnover of the surveys.
- Information surveys of users.
- Land use method of determining the demand.

Parking Facilities:
Information is collected on the current condition of parking's. It includes:

- Number of parking spaces, type, condition, and the location.
- Parking rates. It depends on trip generation or other land use considerations.
- Hours of availability, time limits and other restrictions.
- Layout of space: geometry, city services and other features.
- ownership of the off-street facilities.

Accumulation Count:

It is conducted to get a data on the number of vehicles parked in a area during a period of time. Firstly, number of vehicles parked in that area are counted. Then the number of vehicles coming in and going out during that specified period are noted, and added or subtracted to accumulated number. Accumulation data is generally summarized by time period for the area.

FEATURES:

SELEC PLC: FL-RL-DI04-PS-24V

Operating voltage 24 V DC.

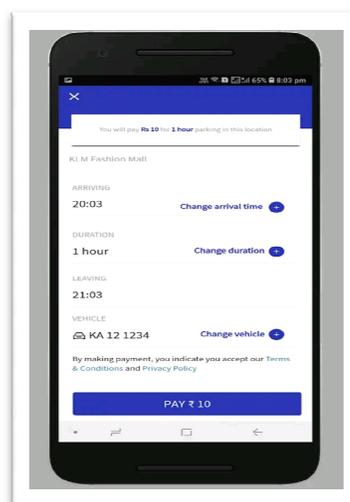
Digital Input: 20

Digital Output: 16

7 segment display

MOBILE APPLICATION

It also allows the customers/drivers to view the parking status at that people's park



Today finding parking space in India is major issue. We are creating a solution where people can find nearby pay and park services on google maps. User can compare prices of different services. user can book a slot on hourly basis. User can view how many parking slots are available in various parking areas. There will be option for scheduled bookings so that they can get quarterly or yearly pass. Payment can be done online so that they don't have to wait in Long queues.

This is android application developed using Android Studio.

Language: java, xml, json

software: android studio

Database: No SQL

- -front end is developed using XML and Java.
- -for database Firebase NO SQL database is used

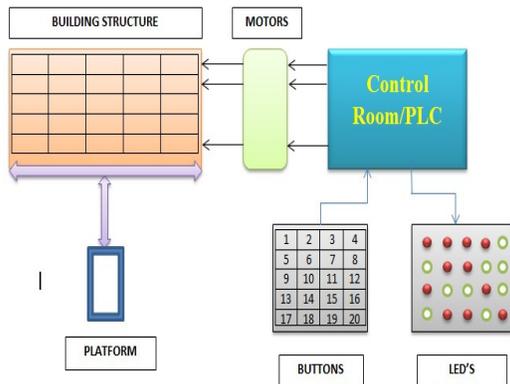
- -for user authentication (sign in) Firebase Authentication is used.
- -For sending data and receiving data JSON is used.

FLOWCHART:



IMPLEMENTATION:

As the car comes on platform, we have to press a button in order to give instruction that the car has arrived for the parking. Then the rotation of the platforms starts.



Then dc motor which is there for lifting the ramp will start and car will start moving up, at each level of the parking area we have proximity sensors which will provide information about the level of the ramp i.e. position of car. When platform reaches to the top most sensor rotation of the lifting dc motor stop then the ramp will open up due to forward motion of dc motor with the gear assembly. Right after opening of the platform lift starts but this time in anticlockwise

direction that means lift goes downwards. While moving in the downward direction it drops the car in the space so provided for the parking. This completes the parking of the car. Afterwards ramp will be closed again and lift goes down to its initial position to take another car for parking. Mobile application is used for advance booking of parking and to check the availability of the parking space and accordingly allows the user to book the parking.

ADVANTAGES

- Requirement of area for storing the same amount of cars is reduced to approximately half as compared to what is needed for conventional parking.
- Cars are accessible only by the owner i.e. highly secured.
- No fuel is used during the parking process as it is fully automated.

CONCLUSION

The implementation of system on a large scale will definitely result in better utilization of land, less or no thefts and solves many traffic problems. The use of „Programmable Logic Controller“ makes the system reliable, easy to maintain, future proof and can be proved cost effective in long run. By increasing the number of input outputs and relays coupled together with more sensors we can create a parking for as many vehicles as required

REFERENCES

[1] B. L. Theraja, A. K. Theraja, “A Textbook of Electrical Technology”, Sultan Chand & Sons, 1st Multicolour Edition, Volume II, 2005, ISBN 8121-92437-5

[2] http://www.ehow.com/howdoes_5575225_pneumaticcylinderwork.html

[3] <http://www.selec.com.tw/product/em/control/plc/download/manual/SS%20Instruction%20Sheet-English-20060505>

[4] M. A. Venkataramanan, Marc Bornstein, “A decision support system for parking space assignment,” Mathl. Comput. Modelling Vol.15, No. 8, PP. 71-76.