Parking Vacancy Monitoring System with Automatic Vehicle Parking

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\textbf{ABSTRACT}

The aim of this project is to design and build a prototype of a parking vacancy monitoring and automated parking system which will automatically park and get back the vehicle without the driver and also display the parking vacancy. The driver will park his vehicle on a plate at the platform of the car park. Then the sensor will detect the available empty parking spaces and display them on the SCADA. The PLC selects the desired parking space and displays it on SCADA, the vehicle will be transported to that parking space. In order to retrieve the vehicle, the driver will enter the password or token number. The system will retrieve the vehicle from the parking space and send it back to the original position where the driver is waiting.

\textbf{Keywords:} PLC(DVP14 S82), Stepper motor, DC motor, SSR, Limit switch, SCADA.

I. \textbf{INTRODUCTION}

In early days the need of parking space, traffic lack of available land for parking is the big problem in cities. for working people traffic and parking as well as to find the vacant space for parking is also a big problem. So, the ideal solution for parking is automatic parking system which would be multilevel. So, it will take less space and this system also monitors the vacant space so it is a time saving system for working people\cite{4}.

Therefore, from what that is understood, automated parking system is a group of self acting or self moving machine, things or parts that work together in a relation without attention to build up a place where vehicles can be left for a certain period of time and as we are introducing SCADA, which monitors the vacant space available for parking.

Our demonstration facility presents a miniature model of an automated car parking system that regulates the number of cars that can be parked in a given space at any given time based on the parking space availability.

SCADA indicate whether a car is currently in the process of entering or leaving the parking space. You can also find and detect faults within the system with the help of SCADA. After the initial installation, the system requires no manual control.

It requires no attendants, is more cost-effective than conventional garages, and allows more cars to be parked in less space. The automation technology is used to typically double to triple the capacity of conventional parking garages\cite{3}.

II. \textbf{BLOCK DIAGRAM}

Fig. Shows the blockdiagram of the system. The main part of this system is PLC. PLC is programmable logic controller which is mainly used for automation. SCADA shows the vacant space. If the car is parked then the SCADA indicates the green light & if the block is vacant then it will shows the red light. This is how monitoring take place.

- **PLC**

The programmable logic controller (PLC) is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, control of amusement rides, or control of lighting fixtures.

PLC is really an industrial computer as its hardware and software have been specifically adapted to the industrial environment now a days. It is an electronic microprocessor based control system that monitors input signals to detect changes from devices such as limit switches, push buttons and sensors. Based on the status of input signals, PLC will react by producing output signals to drive output devices like motors, relays, alarm and contactors to on or off state. This is done with a control application program stored within the PLC memory. The program will execute according to pre defined sequence of operations\cite{1}.

PLC is widely used in the industrial sector as it has some major advantages. First of all, the wiring of PLC is much less compared to conventional relay control system. Modification can be quite difficult with all these wiring in the conventional control panel. But in PLC, modification of control sequence or application can easily be done by programming through the console of PLC or computer software without the need to change the wiring if no additional input or output...
devices required. Besides that, the complicated wiring in conventional system may also cause the troubleshooting to be quite troublesome. In comparison, the PLC self diagnostic functions enable easy and fast troubleshooting of the system.

**Figure 1. Block Diagram of System**

- **Relay**
  Relay is an electrically operated switch. There are three contact of relay NO, NC and common. In this system relay is used to give 12v to dc motor and it also connects the DC motor to PLC.

- **Limit switch**
  In electrical engineering a limit switch is a switch operated by the motion of a machine part or presence of an object. They are used for control of a machine, as safety interlocks, or to count objects passing a point.

  Standardized limit switches are industrial control components manufactured with a variety of operator types, including lever, roller plunger, and whisker type. Limit switches may be directly mechanically operated by the motion of the operating lever. A reed switch may be used to indicate proximity of a magnet mounted on some moving part. Proximity switches operate by the disturbance of an electromagnetic field, by capacitance, or by sensing a magnetic field.

  Rarely, a final operating device such as a lamp or solenoid valve will be directly controlled by the contacts of an industrial limit switch, but more typically the limit switch will be wired through a control relay, a motor contactor control circuit, or as an input to a programmable logic controller.

- **Power supply**
  As power supply, SMPS is used. The main reason to use SMPS is PLC works on 24 DC volt so SMPS converts the AC voltage into 24DC volt. Supply is given to all component using connector. Connector provides supply from SMPS to all components.

**III. CIRCUIT DIAGRAM**

This basic circuit diagram shows how we connect the inputs and outputs to the PLC.

- **PLC inputs**
  
  - X0: Home limit Switch
  - X1: End Limite Switch
  - X2: Up Limite Switch
  - X3: Down Limite Switch

**Figure 2. Input Connection**
PLC outputs:

- **PLC outputs:**
  - UP
  - ZP
  - Y0
  - Y1
  - Y2
  - Y3
  - Y4
  - Y5

  ![Diagram of PLC outputs](image)

**Expansion Module:**

- C0
- Y0
- Y1

  ![Diagram of Expansion Module](image)

**Figure 3. Output Connection**

- R1 (Relay-1): Motor Up
- R2 (Relay-2): Motor Down
- R3 (Relay-3): Motor Stop
- R4 (Relay-4): CD-ROM

**VI. CONCLUSION**

Our Parking vacancy System model is designed for this modern world where efficiency and effectiveness along with the proper security and time management is necessary. This system is thus most user friendly that can be easily applied. Analysis of the model has to be done when developing a life size model. As the life cycle model involves huge money, proper design and advanced methods are to be used to meet the requirements of the customers. Although we are developing working model of the original one, we tried maximum to develop a replica of original one combining our ideas into it. We have compromised only in those stages where the work cannot be completed by assuming or neglecting few factors.

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REFERENCES