

Design and Fabrication of Automated Multi-level Car Parking

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Abstract— In the today situation, where parking of four wheeler vehicle is very severe problem in urban region for offices and malls. As it takes lot of time is taking to search for free space in urban areas, as the no of vehicles are increasing day by day and making difficult for the public. In this paper, the basic multi-level car parking system with three floors is considered to show the use of control systems in parking systems. The control system will play a major role in organizing the entry to and exit from the parking lots. It also presents the design of multi-level parking lots which occupies less need on the ground and contains the large number of cars.

Key words: Arduino, DC Motor, Keypad, Multi-level parking

I. INTRODUCTION

Control engineering is one of the aspects which have been given a great deal by many researchers. It became to a great useful resource in many areas such as industry, agriculture, medicine, education and infrastructure. This paper is devoted to the use of control systems in parking systems. The control system will play a major role in organizing the entry to and exit from the parking lots. It also presents the design of multi-level parking lots which occupies less area on the ground and contains the large number of cars. Automatic multilevel car parking system helps to minimize the car parking area of companies and apartments etc. There are two types of car parking systems:

A. Manual and Automated

In the long term, automated car parking systems are likely to be more cost effective when compared to manual parking garages. A multi-level car parking is basically a building with number of floors or layers for the cars to be parked. An automated car parking has mechanized lift which transport the car to the different floor at a certain position. Therefore, these car parks need less building volume and less ground space and thus save on the cost of the building. This system proves to be useful in reducing wastage of space where more numbers of cars need to be parked. This 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. These makes the systems modernized and even a space-saving one. Multi-level car parks provides a fast parking process in which the driver does not have to manually drive his car on each level. It also does away with the need for employing too many personnel to monitor the place. The elevator carries the car to each floor under control of Arduino microcontroller and even places it to the required slot position with the guidance of the controller.

The main objectives of the car parking system are- to design and fabricate a multilevel car parking system and to design and fabricate a cost-effective model, to develop a

fully automated control system and to prevent illegally parked vehicles.

II. EXPERIMENTAL SETUP

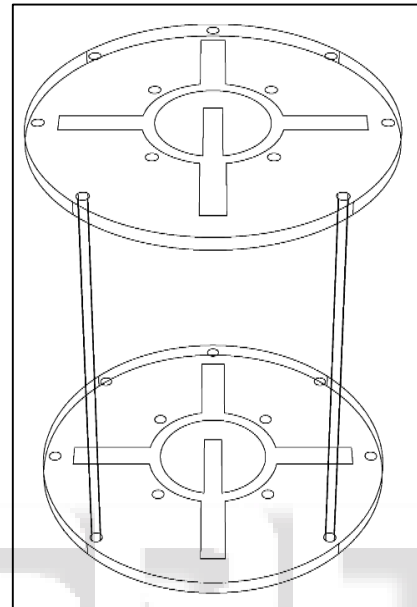


Fig. 1: Basic design

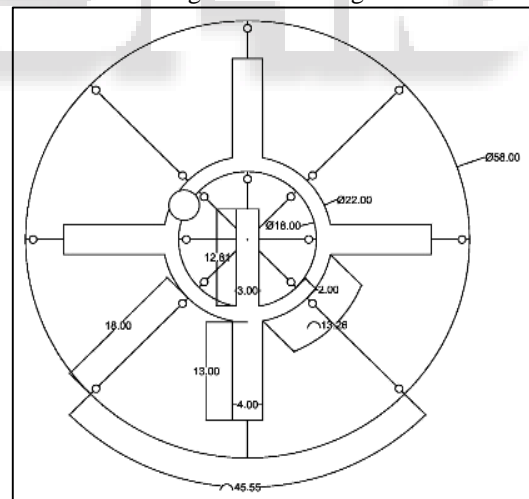


Fig. 2: Top view of structure



Fig. 3: Final structure design

In this paper, a circular parking system prototype has been designed and made for car parking comprising three floors, executing the entry and exit of vehicles through elevator. The layout of the multi-level car parking system is shown above.

The prototype is made up of wood and pillar are metal rods for support of the structure. The lift is made up of wood and the lift cable is a metallic chain.

III. CONSTRUCTION OF SETUP

The elements which we used in this project are as follows:

- 1) Dc motor
- 2) Keypad
- 3) Arduino UNO
- 4) Motor drivers

A. DC motor

DC motors have been used in industrial applications for years. Coupled with a DC drive, DC motors provide very precise control. DC motors can be used with conveyors, elevators, extruders, marine applications, material handling, paper, plastics, rubber, steel, and textile applications. It is important to understand the electrical characteristics of the main field windings known as the stator and the rotating windings known as the armature. Understandings of these two components will help with the understanding of various functions of a DC Drive. Field windings are mounted on pole pieces to form electromagnets.

B. Keypad

For the user who wants to park or retrieve the car a keypad is used. Firstly, at the entry point the user will have to enter his mobile number and register his vehicle to a vacant parking slot. Now to retrieve a vehicle the user will have to enter his mobile number to get back his car at the exit.

C. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

D. Motor drivers

A motor driver is a little current amplifier; the function of a motor driver is to take low current control signal and then turn it into a high current signal that can drive the motor. There are many different kinds of motor drivers present and are categorized depending upon maximum supply voltage, maximum output current, rated power dissipation, load voltage, packaging type and numbers of outputs. The number of output can be between 1 to 12 but most commonly used is 1, 2 or 4 output.

Motor driver can be found in a wide array of applications including stepping motor, relay and solenoid switching, automotive applications and pc peripherals and car audio.

IV. MECHANISM

In this prototype parking system for the movement of the lift, we have used 3 DC motor for movement.

The operation of motor used are:

- 1) Pulley mechanism
- 2) Rack and pinion mechanism
- 3) Rotary mechanism

A. Pulley Mechanism

This mechanism is used for lifting purpose of lift. the DC motor is connected to pulley so as the supply is given to motor, it rotates pulley winding or unwinding the chain and in that way moving the lift from one floor to another.

B. Rack and Pinion Mechanism

This mechanism is a gear and rack mechanism used for placing and removing purpose. In this mechanism the motor is connected to the pinion gear which is placed on rack, so as the gear rotates the rack moves forward and backward.

C. Rotary Mechanism

The mechanism is used for rotation here the DC motor is connected to the base of the lift. so as the dc rotates in turn help in turning the lift so that all the parking slot are being utilize for parking purpose. In our project there are four slot used so the motor has to turn the lift initial position to four angle degree they are 0 degree, 90 degree, 180 degree, 270 degree.

V. CONCLUSION

The mechanical model has been designed and the software as well as the control circuit has been implemented. The size and number of floors can be customized according to the needs and capacity of the organization or garage space availability.

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