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AUTOMATIC VERTICAL ROTARY CAR PARKING SYSTEM

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ABSTRACT

Absence of room accessibility has dependably been an issue in urban zones and urban communities and to add to it there are autos stopped coldly on street that further breaking point spaces. Keeping in mind the end goal to deal with the issue of stopping in occupied spots different kinds of vehicle stopping frameworks are utilized overall specifically Multi-level Automated Car Parking, Volkswagen Car Parking and the sky is the limit from there. This paper manages arrangement with respect to the stopping framework. In Rotary Parking System 6-9 autos can be stopped at the space of 2-3 autos. It is an amalgamation of the effectively created stopping frameworks with the additional favorable position of lessened space inhabitance by the outline of a more straightforward and conservative stopping framework that is turning and involves vertical parking spot. This report is really a 1:32 scale model of the genuine rotating stopping with all the security includes in it. The stopping works when a man first adds his biometric security to a specific stage and when the client needs to really get to the stage for setting his/her auto. He simply needs to put his finger to get to the stage and the stopping will pivot and the individual will have the capacity to assume the auto or position it on the stage

Keywords: *Vertical Parking, Arduino, Fingerprint Sensor, Design Automation, Rotary Parking System.*

I. INTRODUCTION

Parking has progress toward becoming a major issue today in India. With the increasing number of vehicles that are being purchased especially the 4 wheelers there is also a need to accommodate those vehicles. There is stopping available yet individuals don't want to park their vehicles there because it is excessively costly, making it impossible to park their vehicles there and also farther away. That's the reason cars remain unused on the roads for long leading to the shortage of space and traffic jams.This also leads to anger and frustration in individuals as well as wasting their opportunity. So it was necessary to generate a answer for the same. This paper deals with answer for the issue of the same. The paper is about the automated rotary vertical parking. In this sort of parking frameworks 6-9 cars can be parked at the space of 2-3 cars. This report is actually of a 1:32 scale model of the actual rotary parking with all the security features in it. The parking works when a individual first adds his biometric security to a particular platform and when the client wants to actually access the platform for placing his/her car. He only has to put his finger to access the platform and the parking will rotate and the individual will be able to take the car or place it on the platform.

The answer for the issue is by making a vertical rotary parking as appeared in the figure 1, in this sort of parking the cars are parked in platforms that are aligned like the Ferry wheel and are rotated. At the point when the individual has to park his car he/she can place the car on the discharge platform and when he/she has to take the car back he/she can do it by squeezing a catch and the parking will rotate and the car will descend and he/she can take it without any hesitation. For security reason we can select the client's unique mark and a particular platform that is enlisted to the client will automatically come and the client can take or put the car on the predetermined platform.

II.   AUTOMATED CAR PARKING SYSTEM

This system parking system needs less land and incresases efficiency and also increases the profits ability. These parking systems operate uses PLC that require low human power. Drivers enjoy the amenity and safety of this parking.

Fig. 1 Traditional Parking v/s Automated Parking

Advantages of Automated Parking System:
- Safe Secure Modernization.
- Save time, money and fuel Environment-friendly Systematic Valuable investment.

III.   ROTATORY CAR PARKING SYSTEM

In the space of 2-3 cars you can park upto 6-12 cars. It adapts rotary mechanism so that the noise and vibration are reduced. There is a Flexible operation and is PLC controlled. No watchman is needed. It is a pure automated operation. It has higher safety, and is very stable. It is easy to operate.

Fig. 2 Rotary Parking System

The automated parking system was basically used in the Europe, United States and Japan and was developed with the incorporation of advanced technologies and researches from various academic disciplines. Now-a-days, there is a rapid growth in parking system. Some of the notable work done in this field is summarized below:

Hamada et al. [1] developed a vision based car parking system which uses two types of images (positive and negative) to detect free parking slot. The Object classifier detects positive images containing the images of cars from various angles while the negative images do not contain any cars. The pre-specified co-ordinates of parking lots are used as input to detect the presence of cars in the region.

Geng et al. [2] presented a smart parking that includes Driver Request Processing Centre (DRPC) and a Smart Parking Allocation Centre (SPAC). The Parking Resource Management Centre (PRMC) collects and updates all

real-time parking information and circulate it via internet. The DRPC gathers driver parking requests and real time information like the car location to keep track of driver allocation status and send the assignment result back to the driver. The Smart Parking Allocation center makes assignment decisions and allocates and reserve parking spots for driver.

Sarkar et al. [3] also presented a prototype of the proposed smart parking systems that obtain information about available parking spaces, process it and then place the car at that position. The effective circular design was introduced having rack-pinion special mechanism which was used to lift and place the car in certain position.

Rashid et al. [4] built up a programmed stopping framework and an electronic stopping expense gathering in light of the vehicle number plate acknowledgment. This framework has less collaboration of people. A stopping direction framework show and guide client towards a parking spot. Utilizing picture handling method, number plates was perceived and charging was finished.

Yusnita et al. [5] Presented a clever framework for the parking spot recognition in view of the picture handling strategy that catch and process the darker adjusted picture drawn at parking area and deliver the data of the unfilled auto parking spots

Bonde et al. [6] introduced a scaled model of a robotized auto stopping framework. It can control and oversee number of autos in given space and time in light of the accessibility of stopping opening. With the assistance of sensor, the entering and leaving of auto is summoned by an android application.Patel et al. [7] discussed a system where microcontroller 89S51 has been used. In this system, the user was given a unique ID corresponding to the trolley being allocated to him/her. The basic idea is to park and move cars with no disturbance to the already parked cars. Some paper discussed a system using some digital key along with some robotic technique.

IV.   SYSTEM DESCRIPTION AND MAJOR COMPONENTS

A. System Layout
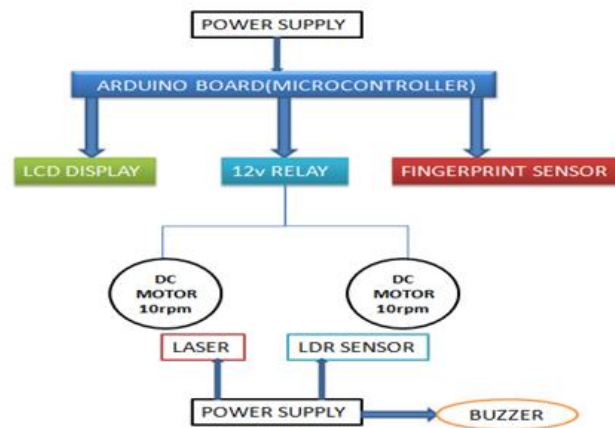The general layout of the system is shown in figure:

Fig. 3 Block Diagram of the System

This system consists of a DC motor driven Ferris wheel with passenger cabin being replaced by parking platform. The user can access the parking platform with fingerprint sensor. For this the user has to enrol his/her fingerprint for a particular platform. When the user puts his finger on the fingerprint sensor, it detects the user and his platform comes down so that the car can be parked or exit. In addition to that there is also a laser security with buzzer, so that if anyone tries to steal or trespass the parking system the buzzer will set off.

B. Major Components

1) DC Motor: DC geared motor is used to power the main parking and helps in the rotating mechanism of the parking by rotating the platforms.

2) *Arduino Uno Board:* The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital I/O pins, 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It consists of all the things in a microcontroller which can run by an adapter or simply plugging to the adapter.

3) *LCD Display:* It is used to display all necessary information occurring at the parking.

4) *Fingerprint Scanner:* The fingerprint scanner is used to detect the fingerprint of the owner of the particular car. This system is used in the model to give the security in parking system.It is used to input/enrol the users' biometrics into the Arduino board. It operates at 5V.

Fig. 4 Fingerprint Scanner

5) *LASER Module and LDR Circuit:* To detect a laser, a light dependent resistor (LDR) is needed. An LDR is a device which has a resistance that varies according to the amount of light falling on its surface. A typical LDR can be seen pictured below, along with its circuit diagram symbol.

Fig. 5 LDR Circuit and LASER Module

6) *12V Relay:* It is used to boost the voltage coming from Arduino board at 5v to 12v for driving the DC.

7) *Sprockets and Chains:* The sprockets and chain are used to drive the platforms by taking energy from the DC motors. 6 sprockets are used in total with 2 chain attachment.

8) *Wood for the Structure:* The wood is used for making the structure. As wood is easily available and also light in weight and it is a cheap alternative for steel structure.

V.   FABRICATION AND TESTING

A. Fabrication

Fabrication was done in two steps:
i)   Fabrication of Mechanical part, and
ii) Fabrication of Electronics part.

1) Fabrication of Mechanical Part: It is done in following steps:

- Wooden board (2 boards) was cut in 4 X 3 feet to make the supporting structure. Slots were made for mounting DC motor and sprockets. These boards are arranged in parallel in vertical position.
- Sprockets were fixed at desired position and chain was mounted.
- Dc motor is coupled to one sprocket and motioned was tested.
- Trolleys (6 in number) were made with GI sheets.
- Trolleys were mounted on the sprocket with the help of chain as shown in the following figure:

Fig. 5 Mechanical Assembly front view and side view

2) Fabrication of Electronics part: It was done in the following steps:

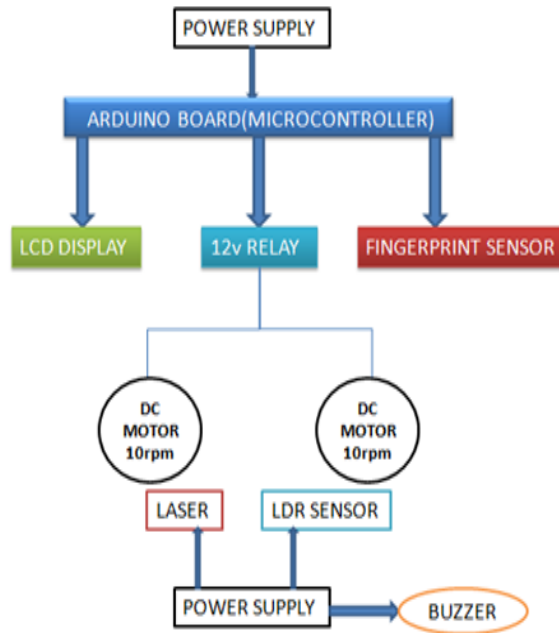- Circuit design: The block diagram of the circuit is shown ing the following figure:

Fig. 6 Circuit Block Diagram

- *Arduino Programming:* IC was burned with the following program: Enrolling Fingerprint.

3) *Final Assembly:* Final Assembly is shown in the following figure:
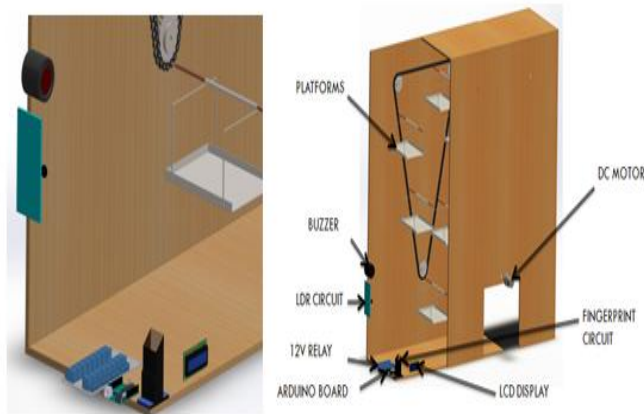

Fig. 7 Electronic Assembly (side view) and Final Assembly

B. Testing

The testing is done using following steps:

Step 1: When power is supplied to the Arduino board, the initial display on the LCD is 'YOU ARE WELCOME's

Step 2: First the user needs to enrol his/her fingerprint to the board. Once the fingerprint is stored it remains in the memory until deleted

Step 3: A specific platform is allotted to the user for his/her fingerprint.

Step 4: When the user puts the finger the board runs the program of driving the motor in the clockwise direction with a number of if else statements to check the platform before the specified one and the board rotates the motor to a specific distance only.
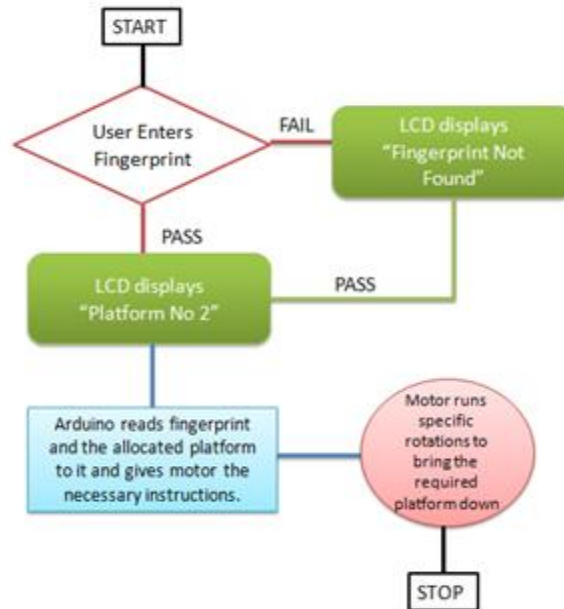
Fig. 8 Flowchart Depicting Test Procedure

VI.   CONCLUSION

 The main advantages of using this system are:
1.   Easy to use and requires no special training equipment.
2.   Fingerprint is unique for every person it cannot be imitated or fabricated. It is not same in the case of twins also.
3.   High accuracy in terms of security.
4.   No manual , false intrusions
5.   Errors.

Vertical parking is an efficient way to park cars and also save space and time. In addition, it is also a secure and easy to use system. The biometric for the platform allocation and the alarm in case of trespassing makes it very safer solution to the other types of parking present now.

VII.   FUTURE WORK

•   We can put additional biometric like iris scanner for more security, we can also do a mobile secure entry in which as soon as someone tries to bypass the lock or try to sneak to your platform you get an alert message
•   We can connect the parking with a smart card or an app so that if the user comes to the parking the user's platform comes down automatically so that the user doesn't has to wait for the car to come down
•   We can provide a conveyor belt mechanism so that the user doesn't has to park and take out the car by himself; it can be done by the conveyor itself.

VIII.   ACKNOWLEDGEMENT

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