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CAR ELEVATOR PLATFORM USING ARDUINO-UNO

Sanket Gosavi[1], Pratik Jambhulkar[2]

[1,2]*Students, Dept. of Mechanical Engineering, P.E.S's Modern College of Engineering, Pune, Maharashtra, India*

Abstract - *This paper aims to explain the application of mechatronics in the development of an Arduino-Uno based car elevator platform. A mechanism to elevate the car/vehicle to a desired level has been proposed. The proposed system assists to transport the cars/vehicles to and from over-ground parking spaces while minimizing the land usage. Such a system will help in accommodating several vehicles at two different floors in a building. It can be efficiently implemented in residential as well as commercial buildings.*

Key Words: **Elevator Platform, Arduino Uno, Infrared Sensor, L298N Motor Driver, 12 V Dc Motor, Rack and Pinion.**

1. INTRODUCTION

In modern world, where parking space has become a very big problem, it has become very essential to circumvent this particular problem by implementing mechatronics system. Nowadays parking systems are equipped with sensors and microcontrollers which makes the task a lot easier. The system being designed can be used in a parking tower at its entry points and exit points. The proposed system will help avoid the tedious driving efforts required to reach the different floors in a building that has circular roadways progressing towards the top. Hence the automated platform will thus be very advantageous to take the vehicles at different floors.

2. LITERATURE REVIEW

Khin Nan Aye et.al.[1] designed an automated car parking system by using RFID and passcode technologies. In this system, a parking tower with three floors and two slots per floor on either side of the central lift was implemented. RFID is a wireless technology to identify and track tags attached to objects via radio waves. In this system, RFID identifies the vacant parking slots and updates it in the database. An elevator is used to store the vehicles in the vacant parking slots identified by RFID. The system consists of steeper motor for moving elevator, servo motor for turning the pallet to desired position and DC motor for placing the vehicles in the specified parking slot. The paper concludes by minimizing car parking area and thus saving time.

Mohmmed Ahmed et.al.[2] described the concept of an automatic car parking system. In this system, the entry and exit of cars through the gate is sensed automatically by using infrared (IR) sensors. The available spaces for parking are displayed on an LCD displayer. This project is developed using 89c52 microcontroller. When a car arrives at the gate, it is detected by the IR sensor installed at entry gate. The microcontroller receives this signal, checks for vacant spaces in the parking and displays the count of cars in parking on the LCD display. If there is a vacant space for parking, the entry gate opens. Similarly, the system works for exit of cars. Finally, the paper concludes by reducing manual work and saving time.

3. PROBLEM STATEMENT

The goal is to manufacture a prototype for an automated car elevator platform while taking into account the size (5cm*5cm*2cm) and weight (20g) of a miniature car model as the design parameter.

4. COMPONENTS USED

4.1 Arduino Uno

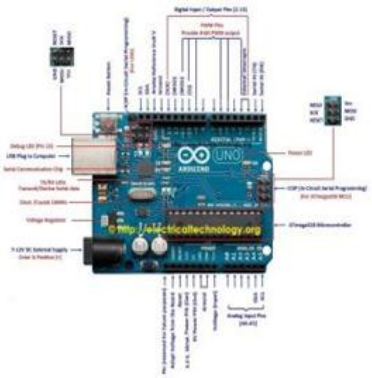

Fig -1: Arduino-Uno

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12 V
- Input Voltage (limits): 6-20 V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

4.2 IR Sensor

Fig -2: IR Sensor

Pin No	Function	Name
1	Supply voltage (5V)	VCC
2	Output voltage (0-5V)	Output
3	Ground (0V)	Ground

4.3 L298N Motor Driver

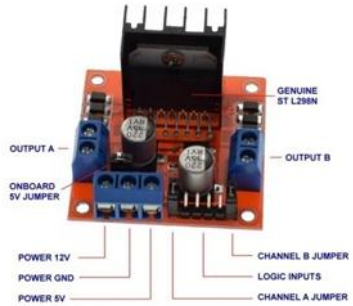

Fig -3: L298N Motor Driver

Pin No.	Pin Name	Pin Type
1	IN1	Input 1
2	IN 2	Input 2
3	IN 3	Input 3
4	IN 4	Input 4
5	EN A	Enable
6	EN B	Enable
7	OUTPUT A	Motor 1
8	OUTPUT B	Motor 2

4.4 3-12 V DC Motor

Fig -4: 12 V DC Motor

- 60 RPM BO Motor – Straight
- Low density: lightweight, low inertia.
- Operating Voltage (VDC): 3~12
- Shaft Length (mm): 8.5
- Shaft Diameter (mm): 5.5 (Double D-type)
- No Load Current: 40-180mA.
- Rated Speed (After Reduction): 60 RPM
- Rated Torque: 1 Kg-cm

4.5 Rack & Pinion

Fig -5: Rack & Pinion

- High quality
- ABS plastic gear rack set
- Used for movement of elevator platform in vertical direction.

4.6 12 V Battery

Fig -6: 12 V Battery

- Lithium polymer battery (LiPo)
- Output Voltage: 11.1 V
- Capacity (mAh): 360
- Weight (gm): 45g

- Dimensions: 12*30*55 (mm)
- Max Continuous Discharge: 30C (10.5A)
- Max Burst Discharge: 60C (21A)

4.7 MDF

Fig -7: MDF

- Medium density fibre-board (MDF)
- High internal bond strength
- Thickness: 3mm
- Used for making elevator platform, ground floor and second floor

4.8 Wooden Base

Fig -8: Wooden Base

- High Tensile Strength.
- Used as base or supporting frame for the system.

5. CONSTRUCTION

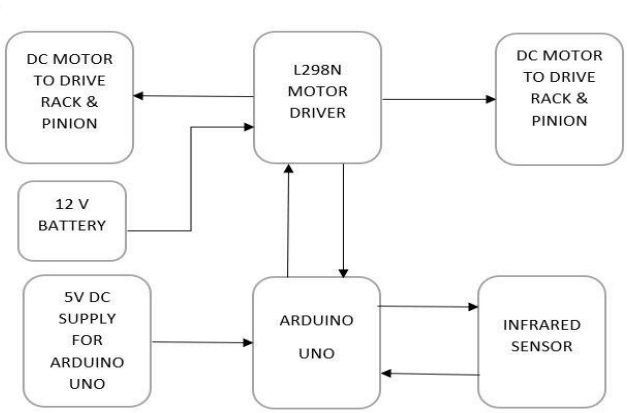

Fig -9: Block diagram for the system

- In this system, 2 DC Motors are connected to the L298N Motor Driver.
- The L298N Motor Driver is supplied with a 12V Battery and is connected to Arduino UNO.
- Infrared (IR) Sensor is connected to Arduino UNO.
- The Arduino UNO is supplied with a 5V DC Power Supply.

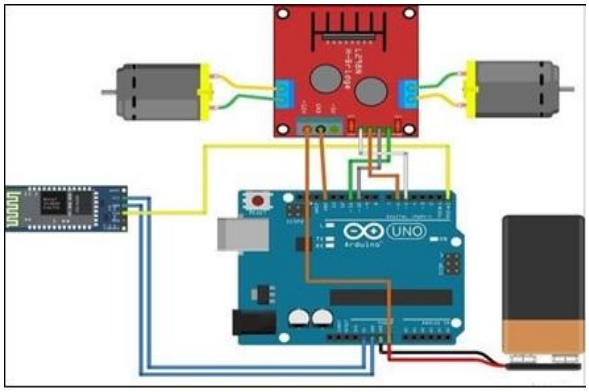

Fig -10: Circuit diagram for the system

- A wooden base is selected onto which an MDF is mounted to create a ground level for the entry point of the elevator platform. Even the floor on the second level is made up of MDF.
- The platform is also made of MDF and it is attached to the two racks fitted inside the guideways.
- The shafts of two 12V DC motors are coupled to pinions which are meshed with the respective racks on either side.
- An infrared sensor is mounted at the edge of the platform to detect the car.
- Arduino board is placed at the bottom in the wooden base.

6. WORKING

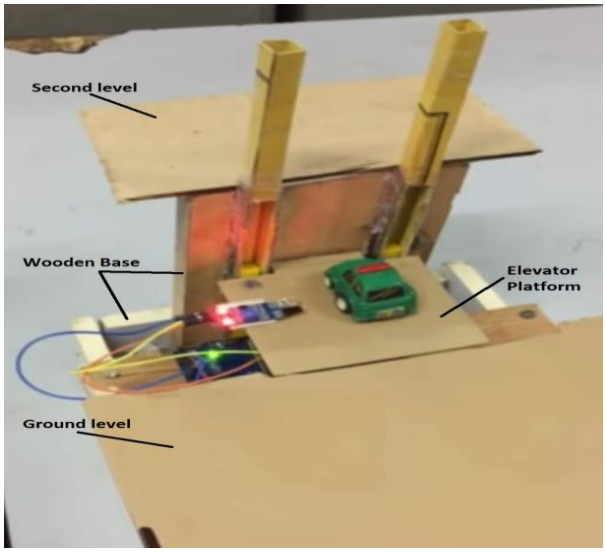

Fig -11: Elevator platform at ground level

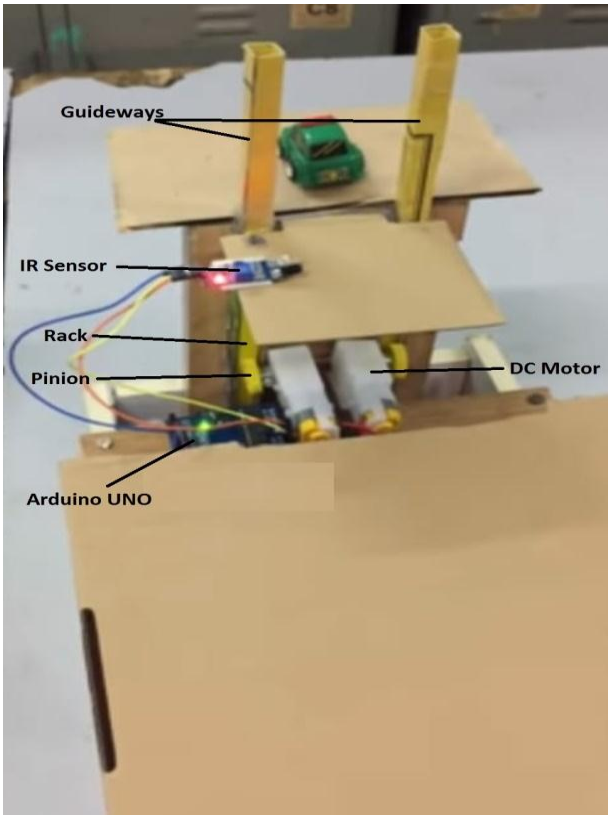

Fig -12: Elevator platform at second level

- The coding for the system is done by using Arduino IDE software.
- The range of detection of the infrared sensor can be adjusted using the software.
- The moment the car arrives at the platform, it gets detected by the infrared sensor which then sends the signal to the microcontroller Arduino.
- The microcontroller then activates both of the DC motors in counter-clockwise direction since the platform is to be lifted up from the bottom position. The speed of the motors is set to 60 rpm and the platform reaches the second level within 5 seconds and motors stop.
- Now, when the car exits from the platform onto the second level, the infrared sensor reads 0 value and a delay of 2 seconds has been given to the motors to restart in clock-wise direction and hence the platform will descend back to its initial bottom position.
- Similarly, another platform can be used at the exit side of the parking such that the initial position of that platform would be at the top i.e. second level in order to bring down the car.
- The range of infrared sensor is up to 7cm which is why it is used in this prototype else for long range sensing, inductive or capacitive proximity sensors can be used in actual industrial application.

7. CONCLUSION

In this paper, concept of automatic car parking is explained with the help of a prototype which transports the car from initial level to the desired level for parking purpose. The system can be used for both entry and exit purposes of the parking. As this system is a prototype, advancements in this system will make it beneficial for industrial applications. Ultrasonic Sensors can be used instead of Infrared Sensors to increase the detecting range. Implementation of this system in industries will avoid consuming large parking areas, reducing manual work and thus saving time.

8. FUTURE SCOPE

Developments in this system will make it applicable for multi-storied buildings. Along with the car parking application, this system can be designed for transporting heavy goods from ground/underground levels in stock inventories of manufacturing industries as well as in mines.

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BIOGRAPHIES

SANKET GOSAVI
Student at P.E.S's Modern College Of Engineering, Pune.
Branch: Mechanical Engineering

PRATIK JAMBHULKAR
Student at P.E.S's Modern College Of Engineering, Pune.
Branch: Mechanical Engineering