

Simulation and Design of Automatic Underground Car Parking System

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Abstract: In today's modern life, most people use vehicles to go anywhere. This is why the use of cars has increased, and this has created parking problems. To overcome this problem, we need a better design of the parking management system. So, we have provided a simulation design of an automated underground car parking system in software. We have used two software's: proteus and Arduino. In this, we have provided a complete design of the operation of an automatic underground car parking system. In this design, Arduino is used as a controller of the automated system. Dc motors are used to up and down movement of the underground system. In a method for providing parking space for the appropriate car by servo motor. The virtual Terminal scope is used to display the access given or not for the right vehicle to parking. We have provided an RFID output switch to Arduino for the identification of the authorized car. This design will be helped to reduce the problems which are arising due to the unavailability of a reliable, efficient, and modern parking system. It saves more time and more space-consuming for car parking.

Index Terms - Arduino, Proteus simulation, automatic underground car parking system.

I. INTRODUCTION

In today's modern life, most peoples are used vehicles to go anywhere. That's why their use of cars has increased, which has created parking problems. Because of that makes a massive problem like we do not get parking space quickly to park our car. In India, due to the increased population, the rate of vehicles is increased. Still, parking space is reduced, so vehicles are parked improperly anywhere, and due to these accidents, social interaction problems are created.

In India, parking facilities are available, but it is more complicated and time-consuming, and extensive in construction, so it is inefficient. In this parking system, cars are parked outside in the garage, so it is not more secure from car hunters. So, we required a design of efficient parking system. So, we are providing a simulation design of the Automatic Underground Car Parking System.

This design will be helped to reduce the parking-related problems. It helped to build modern parking technology. It saves more time and more space-consuming for car parking.

II. LITERATURE REVIEW

In today's metro city vehicles has been increased and parking area is less or limited, so cars park at the side of the road. So due to narrow road traffic conjunction is occurred. To manage this traffic problem, they have provided a dynamic simulation approach. In this width of the parking area, analyze and improve parking capacity. [1]

Another research paper discussed the development and implementation of an automatic car parking system. This paper used a PIC microcontroller for car parking automatically, and Proteus software is used to design its simulation. Their project discusses the automatic entry and exit of the car in the parking area according to parking space availability. [2] Another research paper provided information on different parking management or parking facilities. This review the various parking services and their economic analysis and provides information about intelligent parking systems. [3]

In this paper, they have discussed the concept of an automatic parking system. It provided information about automatic car entry and exit through the gate, and an LCD is used to determine the parking slot's availability to park the car. [4].

The paper has discussed information about multistorey parking. An Infra-Red sensor is used to determine Car entry and exit in the multistorey parking in this system. [5] One more paper discusses the parking guidance system. IoT sensors are used to perform the parking system in this system, and to control these sensors software algorithm is used. [6]. These research papers helped us to build our design.

III. DESIGN MODEL OF UNDERGROUND CAR PARKING SYSTEM

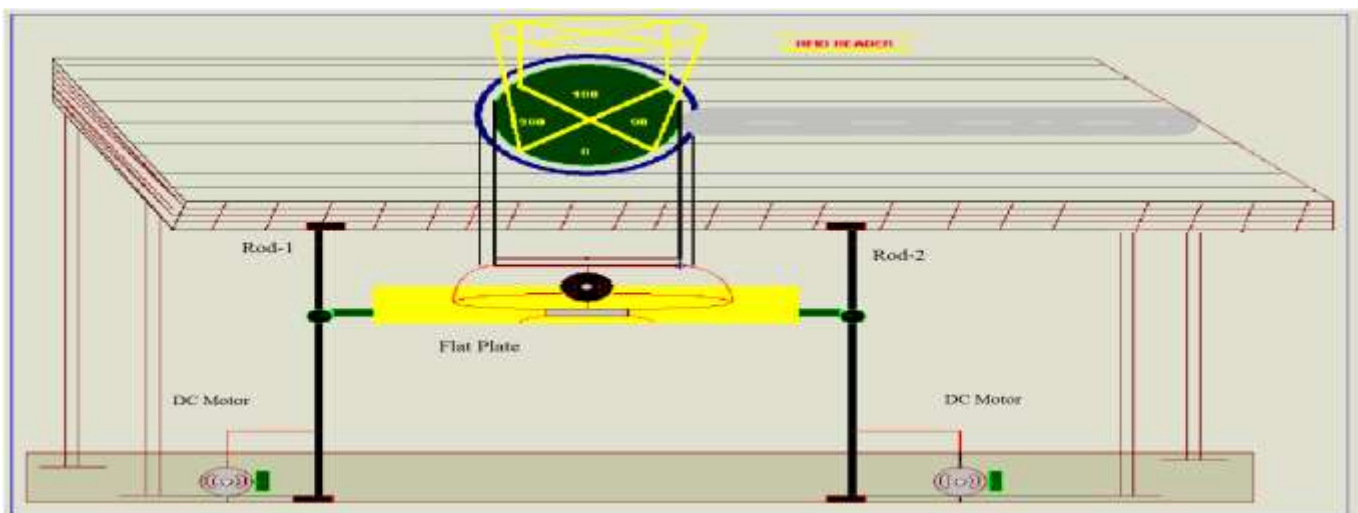


Fig. 1. Model of underground car parking system

The design model of the underground parking system consists of a circular disk with some mechanical assembly. The circular disk has used to park cars. This disk provided separate parking slots to park more cars separately. We have used servo motor to provide a specified parking slot for parking of specific vehicles. This system is underground, so DC motors are used to up-down the system. Rods are provided on both sides of the circular disk. And also, it is connected to the shaft of the DC motor. A flat plate balances the disc, and this flat plate is attached to rods for support.

IV. BLOCK DIAGRAM AND PROGRAM EXECUTION

4.1 Block Diagram:

Fig 2 shows the block diagram of the operation of underground car parking. In this, we have used Arduino Uno as a controller. 5v dc supply is given to that Arduino and display, and 12v dc supply is provided to the DC motor. We have used motor driver L293D to control our dc motor by Arduino. We have provided two DC motors to control the up-down movement of the underground system by forward and reverse action according to input1 and input2. Servo motor is directly connected to the Arduino it is used to provide specified parking space according to output from RFID. RFID is the Radio Frequency identification device. Here we have used it to identify an authorized parking person to park the car and give output to Arduino. To display the result, which is authorized access or access denied display is used.

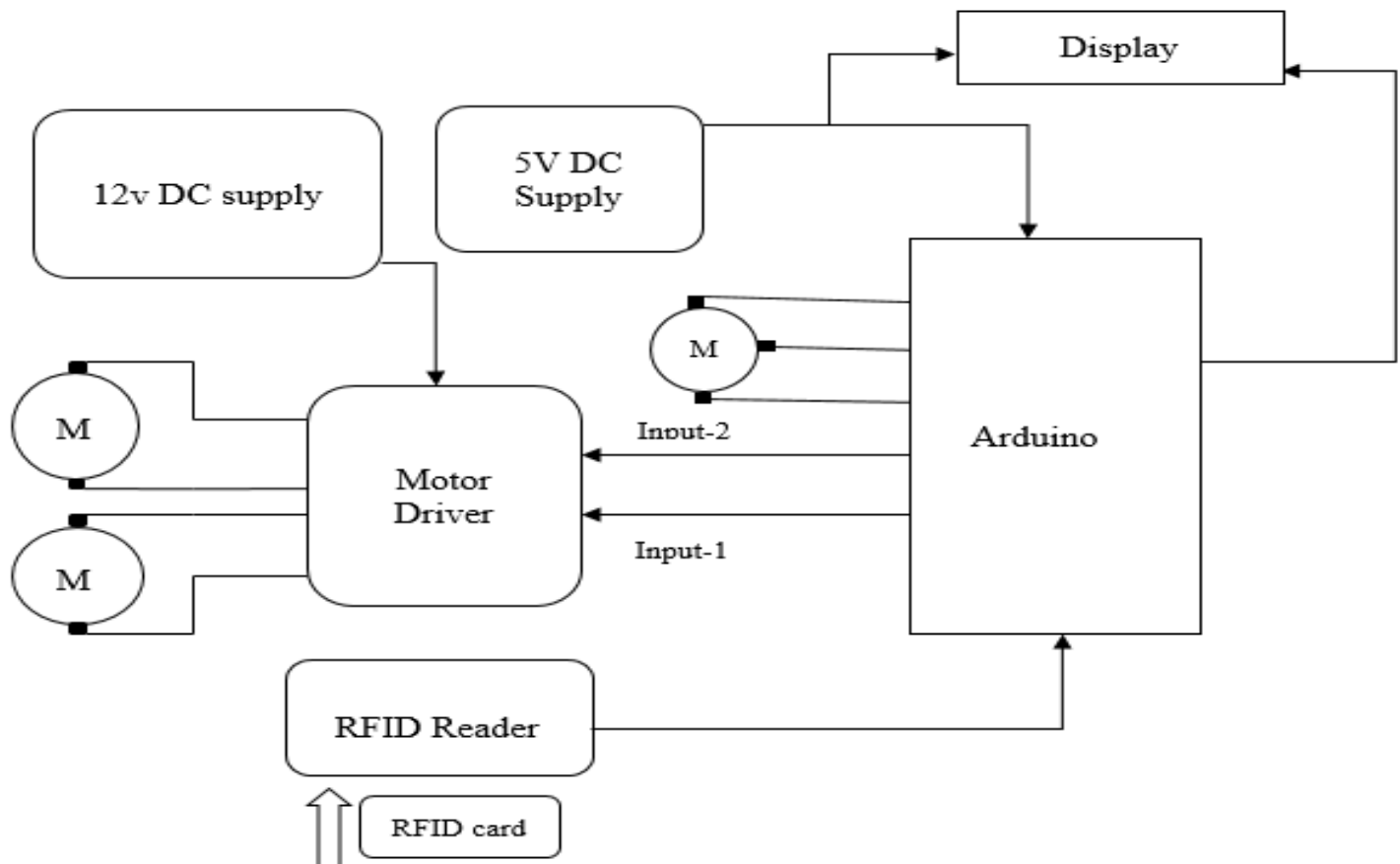


Fig.2 Block Diagram

4.2 Program Execution:

Fig 3 shows a flowchart of the operation of simulation. To start the parking system, firstly, swipe the RFID card on the RFID reader. Then RFID reader checks the input from the RFID card and gives a signal to the Arduino Uno. The second action is for Arduino to review the information from an RFID reader. If the card matches, then for that condition we have considered in simulation, input from the RFID reader is zero. And if the card does not match, then for that condition, we have to believe that simulation input from the RFID reader is one(+5ve).

If zero input is given to the Arduino, then start the system by displaying the authorized access on display, and dc motors start in the forward direction by Arduino input-1. It takes some delay and stops. So, in practicality, this underground action system goes up to the ground floor to park the car. Then Servo motor rotates at some angle according to the input of the RFID card. Then due to this action of servo motor, the system gives the parking space to park the car. The procedure takes some delay to park the car. Then DC motors rotate in the reverse direction by Arduino input 2. It takes some hold and stops it to turn. Then servo motor rotates at its reverse angle means it regains its original position and stops the system. This process is repeated continuously according to different RFID cards.

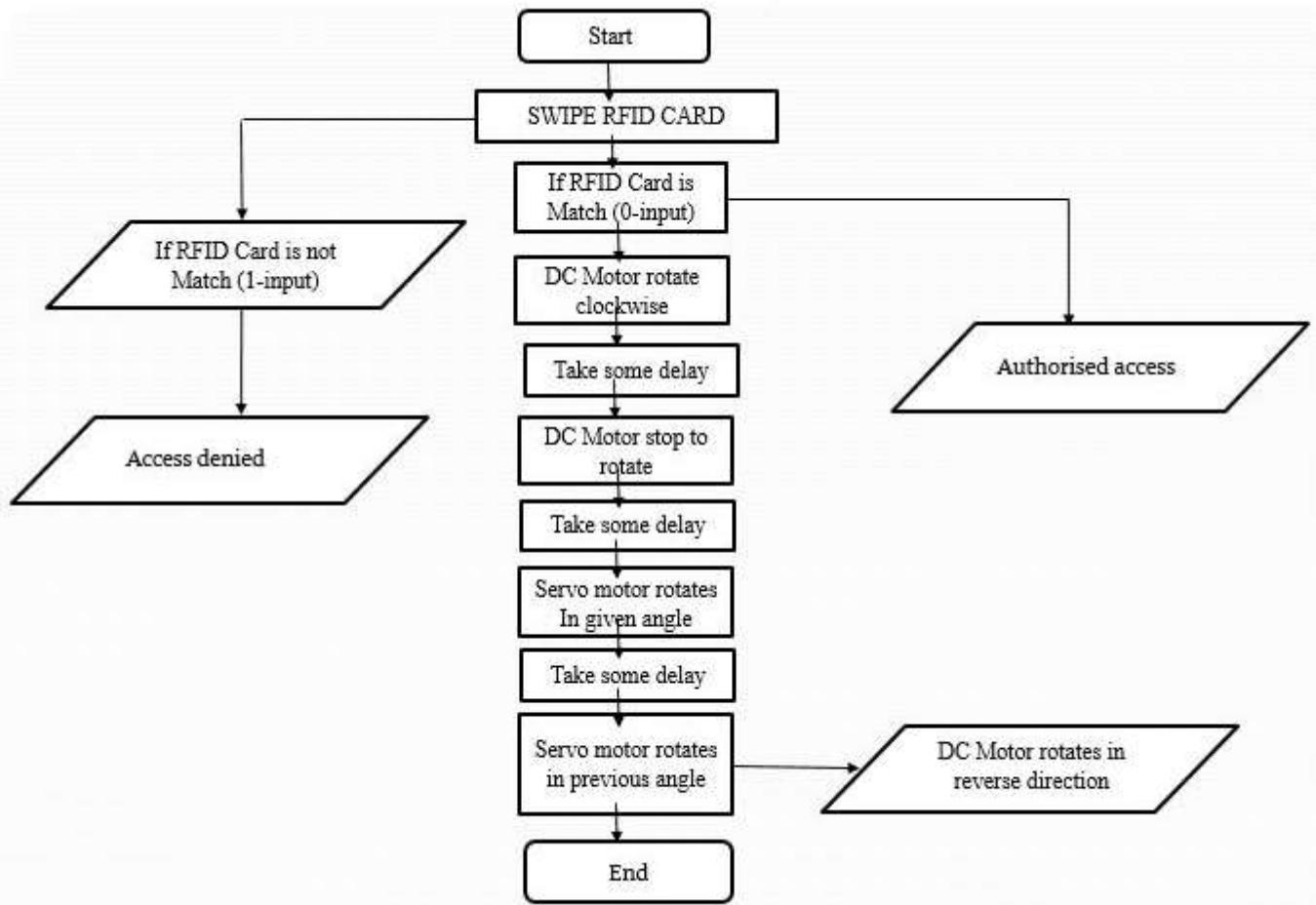


Fig.3 Flow chart of simulation

V. SIMULATION DESIGN

In this simulation, we present simulation work done by our group regarding our project. The progressive process we have designed our project operation on an Arduino in Proteus Simulator Software as shown in the below figure. In Arduino, pin four is used as an input, and pin six, pin seven, and pin eight are used as an output.

Here pin four is considered as an output of the RFID reader (EM-18). DC Motors is provided with an L293D Motor driver, which is connected to the Arduino. The Servo motor is connected to the Arduino. A virtual terminal is used to display the result of the response of the system.

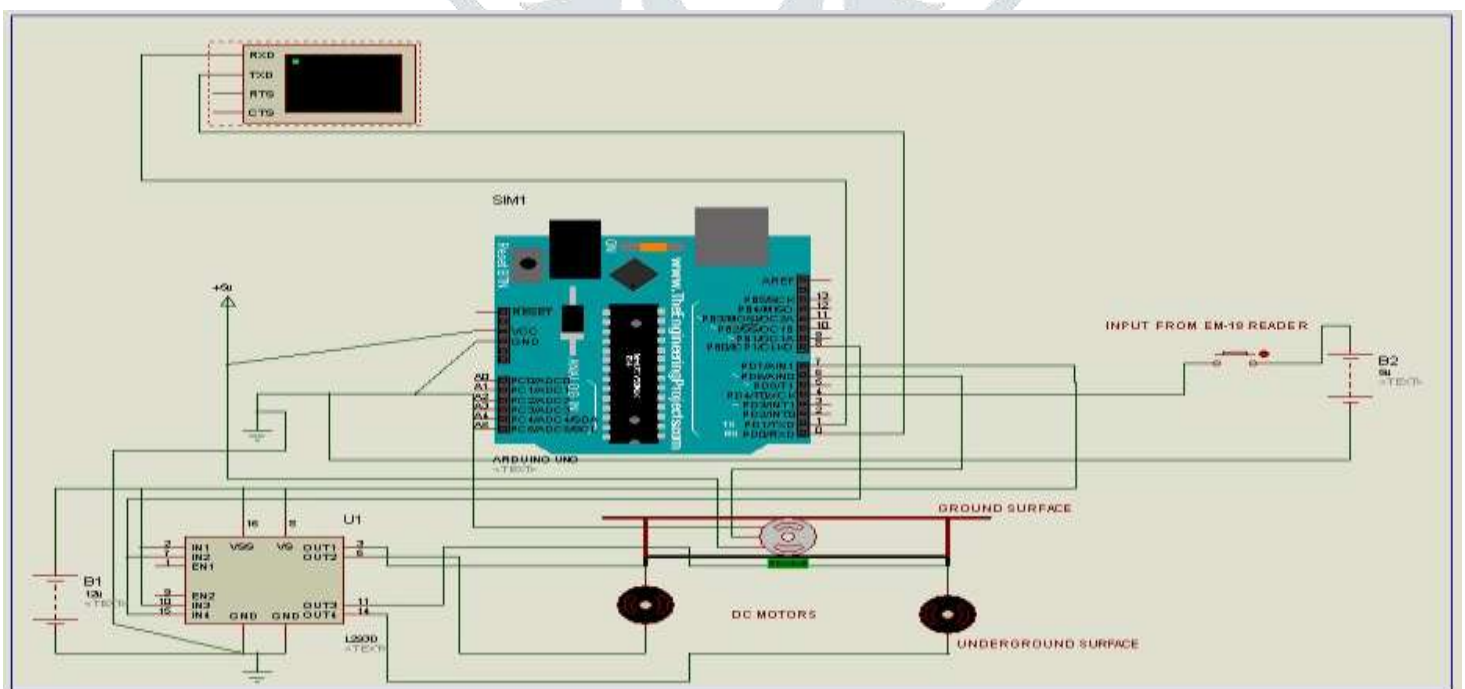


Fig.4 Simulation Design

VI. RESULTS AND DISCUSSION

6.1 Case 1: Authorized access -For RFID card 1:

In Case1: We can see here that if the input switch connected at pin 4 of Arduino is off, zero input signal is obtained at pin 4. Then the card is correctly considered, and the system gave the authorized access, which is displayed on display. The Dc motor rotates in the forward direction for some delay. Then the system goes up from underground, and the servo motor rotates at some angle. After that system takes some uncertainty, and the system automatically goes in underground. Then Servo motor rotates at its reverse grade.

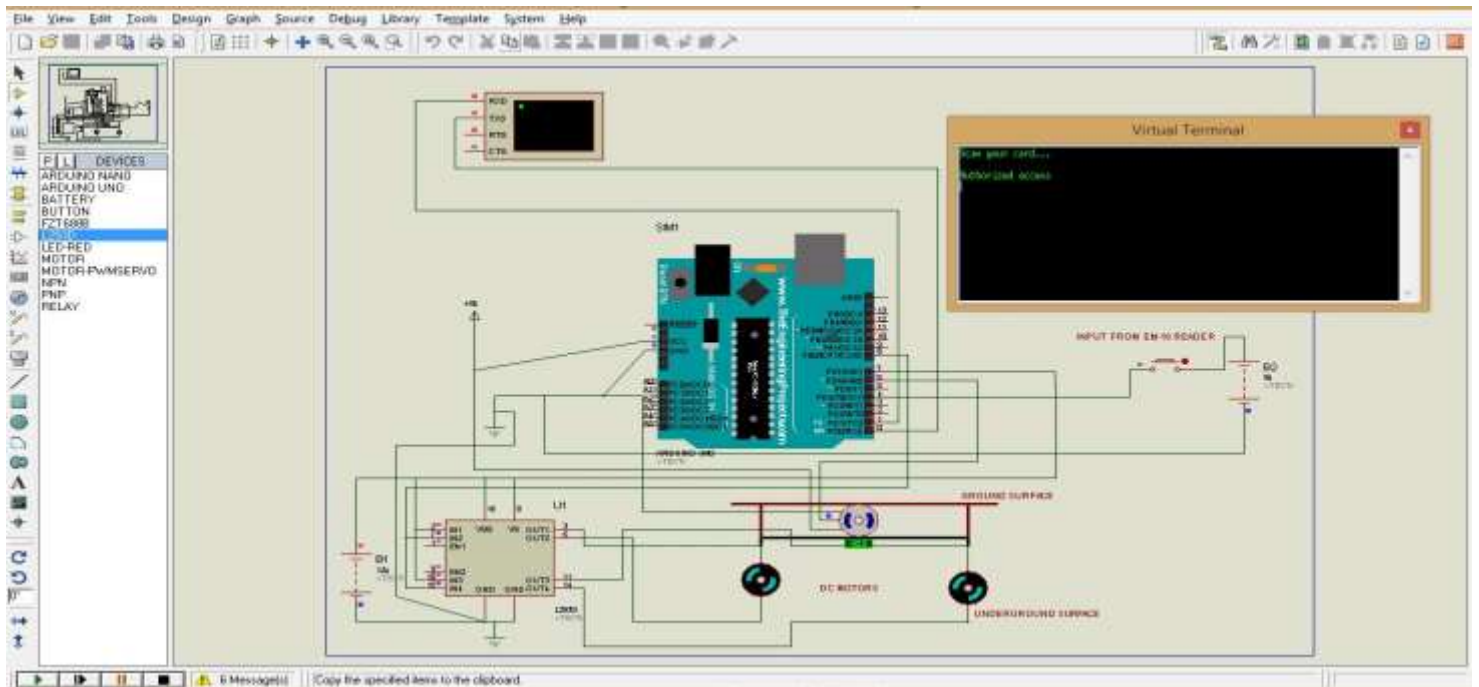


Figure 5. DC motor and servo motor operation for RFID card 1

6.2 Case2: Access denied- For RFID card 2:

In Case 2: When the input of pin 4 of Arduino is one (+5v), then we considered the wrong card entered, then the system does not respond and indicates that display access is denied. We have considered two cases, and for that cases, finally, results have been declared in the result table as shown in Table 6.3.

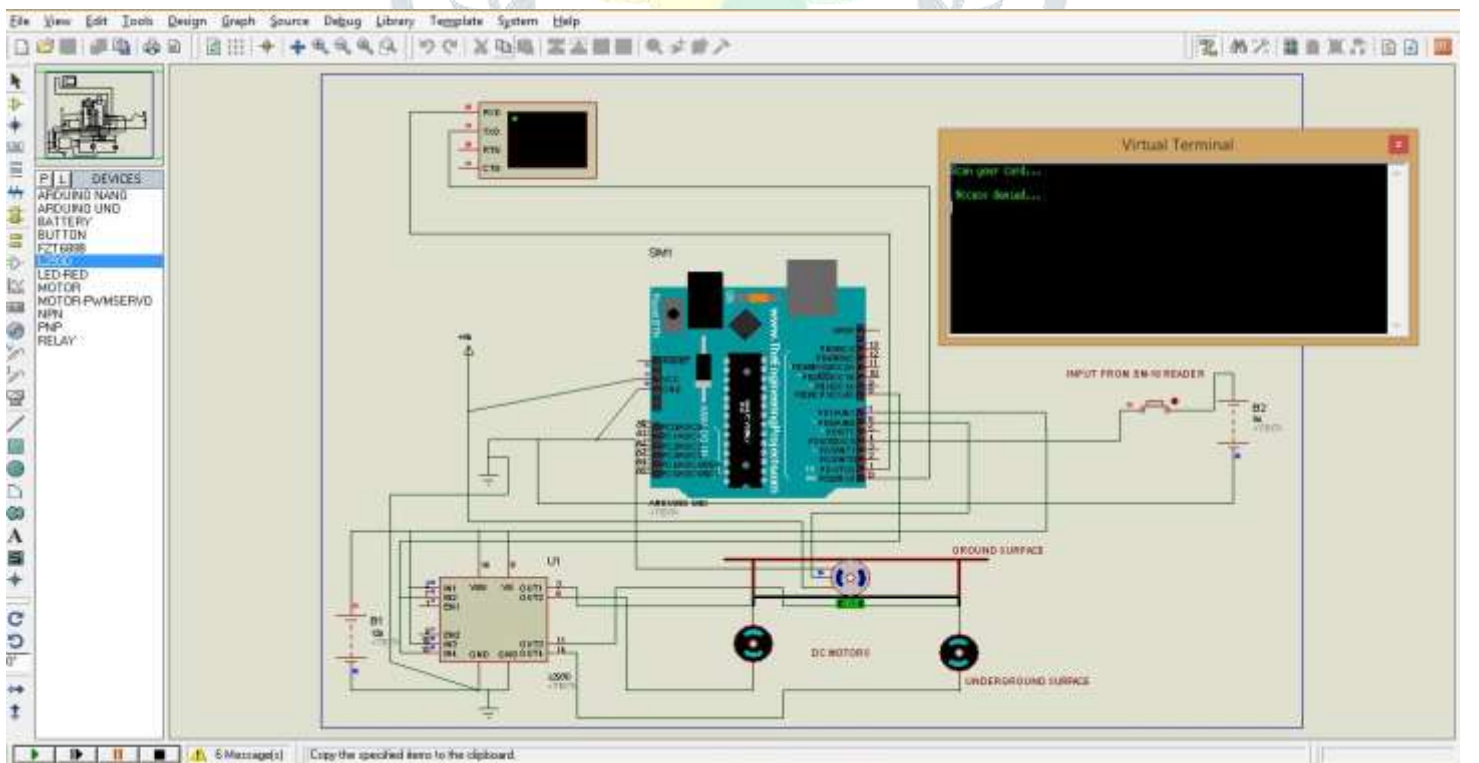


Figure 6. DC motor and servo motor operation for RFID card 2

6.3 Result Table:

Table 6.3: Simulation Operation for RFID Card-1 and RFID Card-2

Case No	Case	Action	
Case1	Authorized access for RFID Card 1	Card is correct	DC Motor rotates in the forward direction to up the system; Servo Motor takes some angle
Case 2	Access Denied for RFID Card 2	Card is wrong	The system does not give a response

VII. CONCLUSION

In this project, we designed the Simulation and design of an automatic Car Parking System. This shows that our project is economical cheap, quick, and easy to operate depending on Arduino. It will help to reduce rising parking problems. Simple in design, the automatic operation saves more time which is required for parking. The concept of the project is designed in Proteus Simulator Software with the help of Arduino. This report shows all operating conditions of the project in a Simulator.

VIII. ACKNOWLEDGMENT

We are pleased to bring you the "Simulation and Design of Automatic Underground Car Parking System" project". We are thankful to our project guide, Prof. **A. A. Patil** madam, Principal **Prof. (Dr.) A.C. Bhagali**, sir, our HOD, **Mr D.S. Bhangari** sir, and we take this opportunity to thank all those who supported us for this project. We have used various research papers and books as a reference, so thank you to all the authors in it.

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