A
Project Report
on

"CAR PARKING ASSISTANT"

Submitted By

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ABSTRACT

This paper has been designed to build a Automatic Car Parking System using IR sensor and Arduino for efficient parking system. Is based on Arduino UNO. The car entering and exiting is detected by IR sensors and action is taken automatically for closing and opening door using servo motor. The status of parking system will be displayed on 16x2 LCD. Hence it is easy to find parking area in multi-cooperated cities and crowded places.

ACKNOWLEDGEMENT

We wish to express our profound and deep sense of gratitude to Mr. S. B. Ruikar sir, Project Guide, Department of Electronics Engineering for sparing his valuable time to extend help in every step of our project work.

We are mainly indebted to the authors of many references and articles which were used as the reference.

Last but not the least we would like to thank our friends and family for their help in every way for the success of this project report.

CHAPTER 1

1. Introduction

Car parking issue has some problems with how to control the number of the car inside it, how to monitor the movement in/outside of the parking lot, how to check whether there is a place inside for more cars or not and the safety to park. The aim of this project is to solve these problems by designing a system to control the parking area using a microcontroller. The microcontroller serves as a programming tool to run the whole operation, to reduce the cost in terms of requirement such as job opportunity and to increase security. Moreover, this system is faster, flexible and can meet market needs.

1.1. Background

As technology becomes increasingly important in today's world, it is invaluable to not only learn how to use technology, but also to understand how to create it. Since being an engineer, one should have sound knowledge of the other discipline. Most of the projects have limited scope to only specific disciplines. This would limit one's innovation and creativity. This project inspires to make connections across several disciplines rather than learning topics in isolation as it combines mechanical, electronic, electrical and programming skills.

1.2. Motivation

Following are reasons due to which we find this project important:

- Increasing number of vehicles
- Difficult to find parking area in crowded places like malls, theatres, religious places, historical places and many more
- Disappointment faced by drivers and passengers
- Wastage of time

1.3. Problem Description

In day-to-day life, the problems associated with vehicle parking are increasing day by day. Trouble in Finding Vacant Spaces, quickly finding an empty space in a multi- level parking garage is troublesome if not unthinkable, particularly on ends of the week or open occasions. Discovering spaces amid ends of the week or open occasions can take over 10 minutes for around 66% of guests. Stadiums or shopping centers are swarmed at pinnacle periods, and trouble in finding empty openings at these spots is a noteworthy issue for clients. Inadequate car parking space prompt activity blockage and driver disappointment.

1.4. Objectives

The objectives of the project are:

- To design and build up a model of an automated car park system.
- To learn how to control a system for automated parking.
- To acknowledge how to program Arduino and make it work on any system.

CHAPTER 2

2. Technology and Literature Survey

- **Literature: Mohmmed Ahmed and Wang Wei, Tianjin university technology and education, Tianjin:**

Everything in the modern world is going automatic. We have built a system which can automatically sense the entry and exit of cars through the gate and then display the number of cars in the parking lot. This automated car parking system reduces the time taken to check the space for vehicles by displaying the available spaces for parking on an LCD display by using infrared (IR) sensors installed at the entrance and exit.

- **By Techtronic, Arduino Project Hub, GitHub:**

In the light of the current scenario the problems associated with vehicle parking are increasing day by day. In this article, we are going to make an automatic car parking system project using Arduino UNO. For detecting the movement of vehicles, we are using the IR sensors and to display the parking status we are using a 16×2 LCD. You can read the full article with a brief explanation on our website.

2.1. Block Diagram

The car parking assistant project is divided in to following blocks:

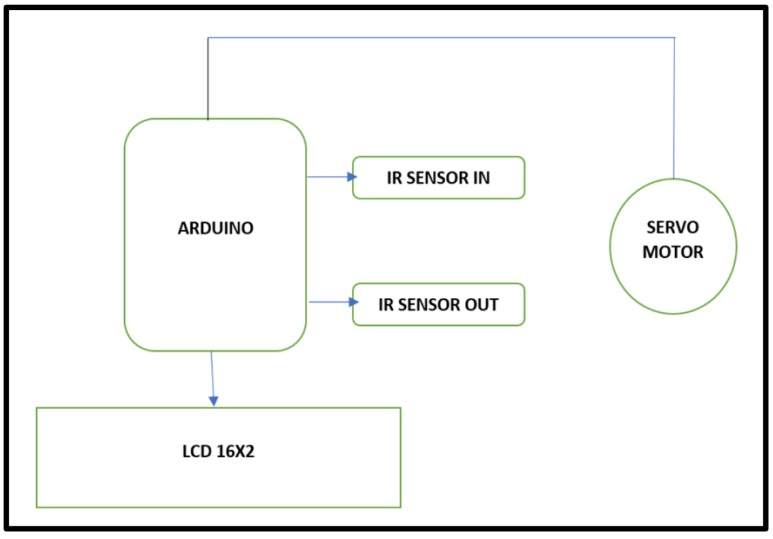

Figure 2.1: Block Diagram of Car Parking System

2.2. Hardware Required

2.3.1. Arduino UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board and IDE that runs on your computer, used to write and upload computer code to the physical board. The Arduino IDE uses a simplified version of C++, making it easier to learn to program.

- Processor: 16 MHz ATmega328
- Flash memory: 32 KB
- Ram: 2kb
- Operating Voltage: 5V
- Input Voltage: 7-12 V
- Number of analog inputs: 6
- Number of digital I/O: 14 (6 of them pwm)

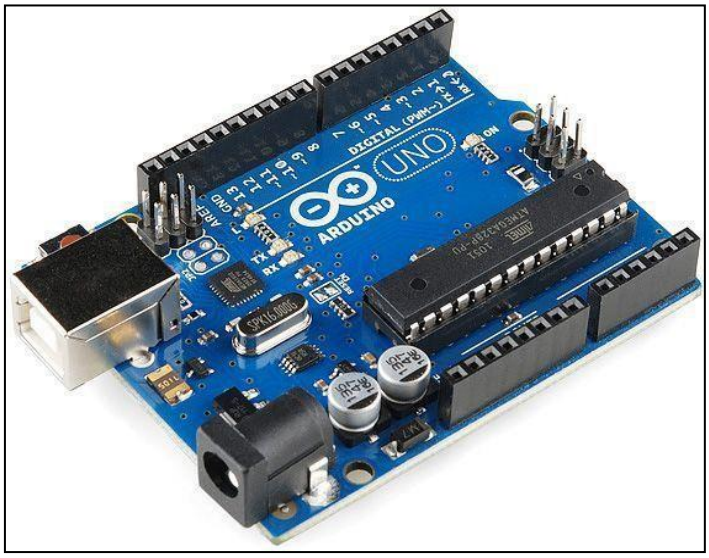

Figure 2.2: Arduino UNO

2.3.1. Servo Motor

The motors are small, have built-in control circuitry. Through the servo motors are small in size they are extremely powerful. A normal servo is used to control an angular motion of 0 to 180 degrees. It is mechanically not capable of turning any farther due to a mechanical stop built on to the main output gear. The servo motor is placed at the entry and exit gate that is used to open and close the gates. It is interfaced with Arduino and takes command from the Arduino to rotate some particular specified angle.

Figure 2.3: Servo Motor

2.3.2. IR Sensor

IR sensor is nothing but an infrared sensor which is a radiation-sensitive component of our project. Two IR sensors are used to detect the entry and exit of vehicles on the gate of the parking area. Active infrared sensors both emit and detect infrared radiation. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Before the door the Infrared transmitter is mounted on one side and the receiver is placed directly in front of the transmitter on the other side of the door. Infrared transmitter will continuously transmit IR waves and the receiver will continuously receive IR waves. The IR transmitter will use an IR LED.

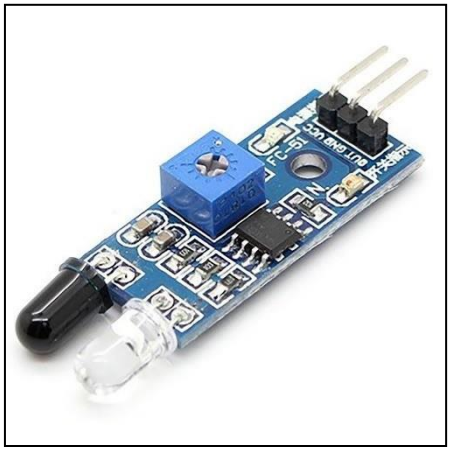

Figure 2.4: IR Sensor

2.3. Software Required

For the simulation of the circuit, Proteus software is used. For coding and uploading the sketch, the Arduino IDE is used.

2.4. Flow Chart

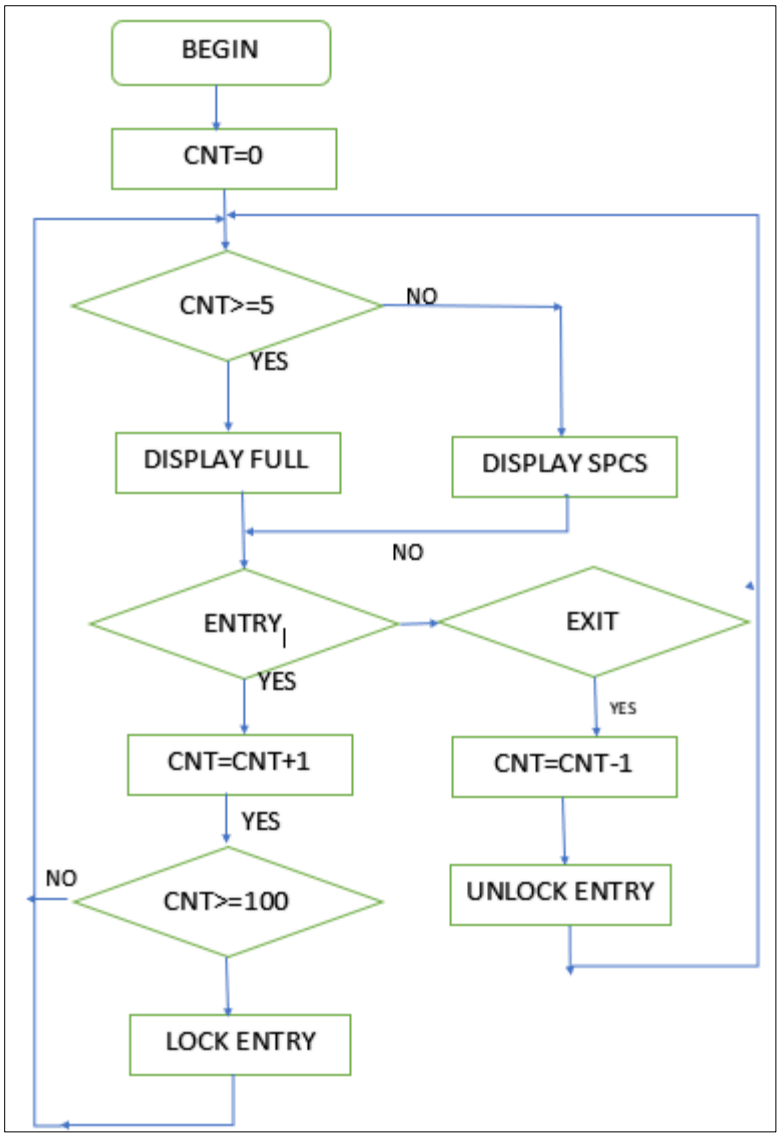

Figure 2.5: Flow Chart of Project

CHAPTER 3

3. Design and Implementation

3.1. Schematic

The schematic of the "Car Parking Assistant" is shown in the figure. The main component is the Arduino Uno. Schematic is drawn by using Proteus. The main features incorporated into the hardware are given below:

- Arduino Uno.
- IR sensor.
- LCD 16X2 Display
- Servo Motor
- Connectors to join the different boards to form one functional device. Each of the hardware is dissected and was designed/implemented separately for their functional and later incorporated as one whole application. This helped in the debugging processes.

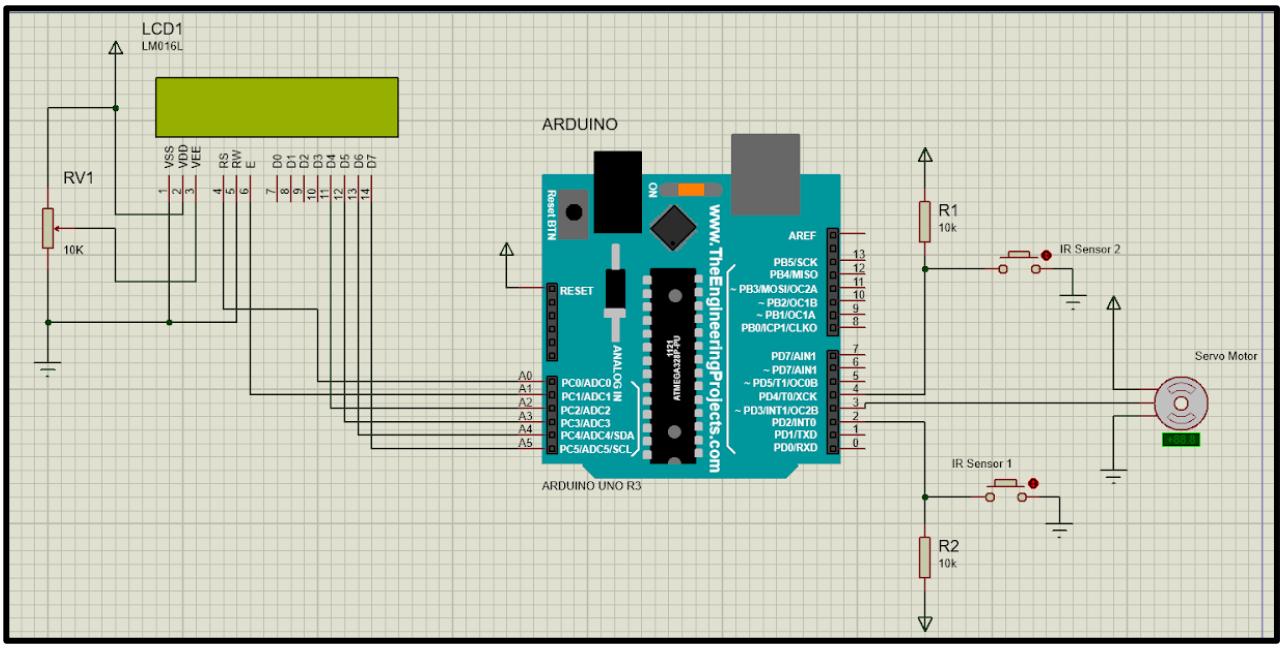

Figure 3.1: Circuit Diagram

3.2. Circuit Explanation

The whole Car Parking Assistant can be divided into 3 sections: sensor section, control section and display section.

3.2.1. Sensor section and Control Section:

This section contains two IR sensors. IR sensors are used to sense objects/cars and provide this signal to the Arduino. Arduino is used for controlling the whole process of parking assistant. The two IR sensors are connected to the pin1 and pin 2 of Arduino. Arduino reads these signals and sends commands to the servo motor.

3.2.2. Driver section:

In this section LCD is used to display the data sent by the Arduino. LCD is connected to the analog pins A0 to A5 as follows:

1. RS E pins of the LCD are connected to A0 to A1 pins respectively.
2. D4 to D7 are connected to the A2 to A5 pins of the Arduino serially.

Pin no 3 (VEE) of the LCD is connected to the potentiometer and RW pin is connected to the ground.

3.3. Working of Car Parking Assistant

- Working as a Parking Assistant is very interesting. If the slot is empty in the automated car parking the new vehicles are allowed to enter the parking, else the entrance is blocked by using the servo barrier.
- In case no empty slot is found by the system. The visitors can see the status for the availability of the free space outside the parking on a 16×2 LCD. When a car is entered in the parking place, then the number of spaces available is decreased by 1. When a car comes out from the parking place, when it passes from IR sensor 2 the gate is opened and when it passes from IR sensor 1 the gate will be closed. After that the number of spaces available is increased by 1.
- For opening and closing the gate servo motor is used. Initially the barrier is closed so that the angle of the servo motor is set to 100 and when the barrier is open at that time the angle is 0.
- The LCD display initially shows the message of project name and then shows the total space available and the empty space available inside the parking area at that time and if there is no space then it will show “sorry not space available” message.
- The different conditions are showed in the table below:

Sr. No	Condition	Servo Motor	LCD display
1	When car Enter the gate	IR sensor 1 -> Barrier open. IR sensor 2-> Barrier closes.	Total space: Empty space: (Decrease by one)
2	When car Exit the gate	IR sensor 2-> Barrier open. IR sensor 1-> Barrier closes.	Total space: Empty space: (Increases by one)
3	When there is no space	Barrier closes.	(Sorry not space is available)

Table 3.1: Expected Outcomes

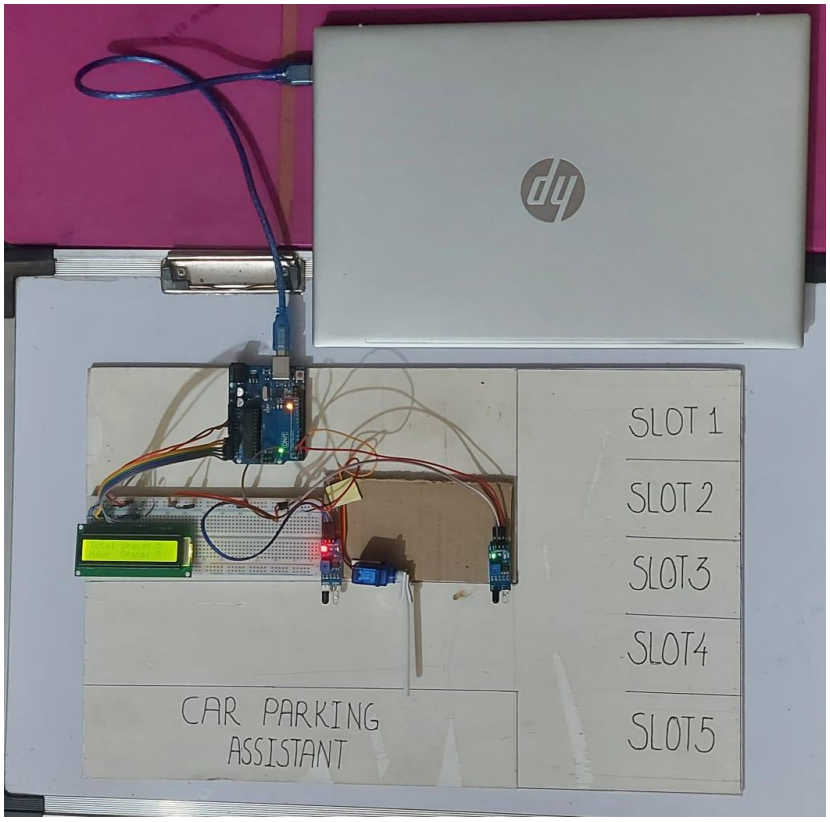

Fig 3.2 Hardware of Project

CHAPTER 4

4.1. Applications

- This parking model can be installed in big hotels, airports, banks, cinema halls and crowded places where space for parking is less.
- Owners can directly calculate income from parking on daily bases by counting the number of cars parked.

4.2. Advantages

- It will enable the drivers at the exit gate to enter if there is any empty space in the parking and disable them to enter when there is no empty space.
- It will manage the main parking spaces by alerting the drivers if there are spaces to park in or not.
- It will provide a way of getting money for any institution that has this system because it can be put on the market and people use it for their interest like in a commercial sector where an institution has movement of clients that have vehicles and the institution cannot support them at the same time; hence this automated system can be a solution.

4.3. Disadvantages

- Requires Regular Maintenance. The parking system is usually automated, but it requires regular maintenance to ensure everything is working smoothly.
- The IR sensors can be affected by environmental conditions such as rain, fog, dust, pollution, sunlight, smoke, etc.

4.4. Conclusion

The Car Parking Assistant project challenged the group to cooperate, communicate, and expand understanding of electronics, mechanical systems, and their integration with programming. The successful completion of every task demonstrated the potential of mechatronic systems and a positive group dynamic.

COST ESTIMATION

Sr. No.	Name of Component	Quantity	Price Rs.
1)	Arduino	1	**550**
2)	IR sensor	2	**35x2**
3)	Servo motor	1	**92**
4)	Potentiometer	1	**30**
5)	16x2 LCD	1	**130**
6)	Jumper wire	10	**30**
		Total Rs.	**902/-**

Table 2: Cost of Project

APPENDICES

Program:

```
// initialise the library with the numbers of the interface pins

#include <LiquidCrystal.h>

LiquidCrystal lcd(A0, A1, A2, A3, A4, A5);

#include <Servo.h> //includes the servo library

Servo myservo1;


int ir_s1 = 2;

int ir_s2 = 4;


int Total = 5;

int Space=0;


int flag1 = 0;

int flag2 = 0;


void setup()

{

lcd.clear();

pinMode(ir_s1, INPUT);

pinMode(ir_s2, INPUT);

myservo1.attach(3);

myservo1.write(100);
```

```
lcd.begin(16, 2);
lcd.setCursor (0,0);
lcd.print("  Car  Parking  ");
lcd.setCursor (0,1);
lcd.print("     System     ");
delay (2000);
lcd.clear();
Space = Total;
}

void loop(){

if(digitalRead (ir_s1) == LOW && flag1==0)
{
  if(Space>0)
  {
    flag1=1;
    if(flag2==0)
    {
      myservo1.write(0);
      Space = Space - 1;
    }else
    {
      myservo1.write(100);
     }
  }
```

```
else
  {
    lcd.setCursor (0,0);
    lcd.print(" Sorry not Space ");
    lcd.setCursor (0,1);
    lcd.print("    Available    ");
    delay (1000);
    lcd.clear();
  }
}

if(digitalRead (ir_s2) == LOW && flag2==0)
{
  flag2=1;
  if(flag1==0)
  {
    myservo1.write(0);
    if(Space<Total)
    Space = Space+1;
  }else
  {
    myservo1.write(100);
  }
}
```

```
if(flag1==1 && flag2==1)
{
  delay (1000);
  myservo1.write(100);
  flag1=0, flag2=0;
}

lcd.setCursor (0,0);
lcd.print("Total Space: ");
lcd.print(Total);

lcd.setCursor (0,1);
lcd.print("Empty Space: ");
lcd.print(Space);
}
```

References

1. Suvarna Nandyal, Sabiya Sultana, Sadaf Anjum.," Smart Car Parking System using Arduino UNO" International Journal of Computer Applications (0975 – 8887) Volume 169 – No.1, July 2017

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1. https://www.elprocus.com/atmega328-arduino-uno-board-working-and-its-applications/#:~:text=The%20Arduino%20Uno%20ATmega328%20offers,being%20broadcasted%20through%20the%20USB.

2. https://www.fierceelectronics.com/