

SMART CAR PARKING SYSTEM USING LCD DISPLAY

BY

Md. Rasheduzzaman

ID: 182-15-11563

Sajeeb Roy

ID: 182-15-11564

Fokhrul Islam

ID: 182-15-11602

This Report Presented in Partial Fulfillment of the Requirements
for the Degree of Bachelor of Science in Computer Science and
Engineering

Supervised By

Ms. Nazmun Nessa Moon

Assistant Professor

Department of CSE

Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY

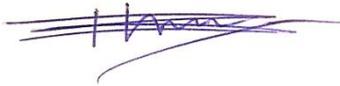
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APPROVAL

This Project titled “SMART CAR PARKING SYSTEM USING LCD DISPLAY”, submitted by Md. Rasheduzzaman, ID: 182-15-11563, Sajeeb Roy, ID: 182-15-11564, Fokhrul Islam, ID: 182-15-11602 to the Department of CSE, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in CSE and affirmed concerning its style and substance. The presentation has been held on 31st May 2021.

BOARD OF EXAMINERS



Dr. Touhid Bhuiyan

Chairman

Professor and Head

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University



Gazi Zahirul Islam

Internal Examiner

Assistant Professor

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

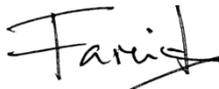


Raja Tariqul Hasan Tusher

Internal Examiner

Senior Lecturer

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University



Dr. Dewan Md. Farid

External Examiner

Associate Professor

Department of Computer Science and Engineering
United International University
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We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:



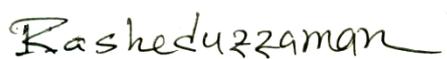
Ms. Nazmun Nessa Moon

Assistant Professor

Department of CSE

Daffodil International University

Submitted by:



Md. Rasheduzzaman

ID: 182-15-11563

Department of CSE

Daffodil International University



Sajeeb Roy

ID: 182-15-11564

Department of CSE

Daffodil International University



Fokhrul Islam

ID: 182-15-11602

Department of CSE

Daffodil International University

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ABSTRACT

This project titled “SMART CAR PARKING SYSTEM USING LCD DISPLAY” which is built for the solution of the problems these happened for vehicle parking at our country. This project is mainly focused to these parking spaces which are not use for park because of maintain problems or the vehicle owners do not have information of them. Also, this system can ensure the safety of the vehicles. This project aims at achieving the clear parking solution, no rent problems between the vehicle owners and the parking lot owners, traffic problems these are happened for wrong parking and the problem these happened for parking the vehicles at no parking areas. This system is more useful in our country at the shopping mall areas, cinema hall areas, auditorium areas etc. People can make themselves a parking system like these for their home very easily.

TABLE OF CONTENTS

CONTENTS	PAGE
Approval	i
Declaration	ii
Acknowledgement	iii
Abstract	iv
CHAPTER 1: INTRODUCTION	1-2
1.1 Introduction	1
1.2 Motivation	1
1.3 Objectives	1
1.4 Expected Outcome	2
1.5 Report Layout	2
CHAPTER 2: BACKGROUND	3-5
2.1 Introduction	3
2.2 Related Works	3
2.3 Comparative Studies	4
2.4 Scope of the problem	4
2.4 Challenges	5
CHAPTER 3: REQUIREMENT SPECIFICATION	6-8
3.1 Business Process Modeling	6
3.2 Requirement Collection and Analysis	6
3.3 Use Case Modeling and Description	7
3.4 Logical Data Model	7
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3.6 Design Requirements	8
CHAPTER 4: DESIGN SPECIFICATION	10-16
4.1 Front-End Design	10
4.1.1 Hardware Component	10
4.2 Back-End Design	14
4.2.1 Block Diagram & Working Procedure of the System	15
4.2.2 Back-End Works	15
4.3 Interaction Design and UX	16
4.4 Implementation Requirements	16
CHAPTER 5: TESTING AND RESULT DISCUSSION	17-19
5.1 Connection Test	17
5.2 Vehicle Entry Test	17
5.3 Vehicle Exit Test	18
5.4 No Space Available Test	19
5.5 Final System Analysis and Result	19
CHAPTER 6: CONCLUSIOO AND FUTURE SCOPE	20
6.1 Conclusion	20
6.2 Future Scope	20
REFERENCES	21
APPENDIX	22-24
Appendix: Project Arduino 1.8.13 Code Documentation Reflection	22

LIST OF FIGURES

NO	FIGURE NAME	PAGE
Figure 3.1	Business process model of Our System	6
Figure 3.2	Use Case Diagram of Our System	7
Figure 3.3	Logical data model of Our System	8
Figure 4.1	Arduino Uno R3	10
Figure 4.2	Breadboard	11
Figure 4.3	LCD Display 16X2	11
Figure 4.4	IR Obstacle Sensor	12
Figure 4.5	Servo Motor SG-90	12
Figure 4.6	100R Resistor	12
Figure 4.7	4.7k Resistor	13
Figure 4.8	1k Resistor	13
Figure 4.9	Male 2 Male Jumper Wire	13
Figure 4.10	18650 battery cell 3.7v	13
Figure 4.11	18650 Battery Holder–2 Cell	14
Figure 4.12	Simple Front-End Design Test	14
Figure 4.13	Block Diagram of Our System	15
Figure 4.14	Arduino 1.8.13 Application Interface	15
Figure 4.15	ISIS 7 Professional Application Interface of Proteus 7 Professional	16

LIST OF TABLES

NO	TABLE NAME	PAGE
Table 5.1	Vehicle Entry Test	17
Table 5.2	Vehicle Exit Test	18
Table 5.3	No Space Available Test	19

CHAPTER 1

INTRODUCTION

1.1 Introduction

According to the Bangladesh Road Transport Authority (BRTA), the number of registered cars in Dhaka up to May 2013 was 185,619 (BRTA, 2013). These cars had been use only for private purpose and constituted almost 25% of all motorized vehicles registered within Dhaka city. Among all other vehicles, private cars create nuisance in various aspects. It has been found that for 95% of their time on road, cars remain stationary – which means that most of the time they are parked which consumes large amount of road space (Bari & Efroymsen, 2006) [1]. This was the equation of 2013 but now it is 2021 the problem is bigger than that. Lots of parking lots are available now but most of people can't find them or confused about the availability of slots. So, we build our system with a display which gives them information of parking by a display. We can use these people parking lot that have more than one car parking area at their apartment but don't have more the one vehicle. The main objective of this project is to us that we work for reduce the traffic problems of our country what we have for unplanned vehicle parking or illegal vehicle parking, reduce the people's tension about vehicle parking, reduce the traffic of the commercial areas, shopping mall areas, auditorium areas etc.

1.2 Motivation

For our project, we get motivated by the sectors. All are discussed below:

- 1) **Automatic Door Open System:** At lots of shopping malls, hospitals, supper shops we can see the automatic doors these open automatically when people come near of them for in or out.
- 2) **Automatic Garage at Video Games:** Lots of time we played the open world game like GTA (Grand Theft Auto) the garages are automatically open when we come to the door of garages. This is the one big point what is inspiring so much for us.
- 3) **Illegal or Wrong Parking:** Illegal or wrong parking is the very common things at our cities because of this the environment of roads become complex and most of time the traffic problems are happened.

1.3 Objectives

- ❖ To introduce a smart parking system to all people.
- ❖ To decrease the traffic problems.
- ❖ To make a clean road environment for our country.
- ❖ To make easy the parking system for people.
- ❖ To develop an automatic parking system for a home or business that can be installed at a very low cost.
- ❖ To give the facility of this system which anyone can easily build and use.
- ❖ To ensure the people that they have parking system nearby them.

1.4 Expected Output

- ❖ To develop a faster vehicle parking system.
- ❖ To make a responsive vehicle parking system to ensure people that their vehicle are safe.
- ❖ To preference safety of parked vehicle.
- ❖ To make a usable system that is budget-friendly.
- ❖ To decrease of illegal and wrong parking.
- ❖ To help people park vehicle easily.
- ❖ To maintain a smooth traffic without parking problems.

1.5 Report Layout

Chapter 1: In this chapter we discussed about the primary introduction, initial motivation, targeted objectives and expected output of the project.

Chapter 2: This chapter we have described the background introduction, comparative studies, related work, scopes of the problems, challenges these we faced and the challenges that have to face when the system will be upgrade.

Chapter 3: In this chapter we basically discussed about Business Process Modeling (VPM), Use Case Diagram, Logical Data Model and Design requirement.

Chapter 4: In this chapter all about the design of the utility, background design, system interaction and the requirements these needed at future.

Chapter 5: This chapter contains the testing implementation, testing result analysis.

Chapter 6: Contains final result summery or the conclusion of our system, the future scope for the development of this system.

CHAPTER 2

BACKGROUND

2.1 Introduction

This part depicts the foundation of SMART CAR PARKING SYSTEM USING LCD DISPLAY and likewise talks about a couple of comparative related works. The ideal result of the venture has been talked about here successfully.

In the new world, innovation is getting extremely more brilliant than previously. People groups are accomplishing such a great deal incomprehensible work which they thought in past time. They are exploring for concocting new things with a more prominent yield. So which nation has the most interest in a venture they have the more noteworthy yield. Since when an authority puts resources into an undertaking then the yield should be exceptionally more intelligent in light of the fact that they contribute the huge sum for the most recent hardware. Along these lines they can get the most advanced systems which make their work so basic. So SMART CAR PARKING SYSTEM USING LCD DISPLAY is a high level type of innovation that can be utilized for doing such developments. So there are numerous things which have effectively imagined before by numerous analysts and engineers. So as we are dealing with some sort of this task so we need to know a portion of these works. By which we can think about our work as our need that it's really can satisfy our objectives and how much our work standard like different works.

So, people can park their vehicles easily.

2.2 Related Works

In this part examined about some comparable related works with this project

1. Most doors are controlled by persons with the use of keys, security cards, password or pattern to open the door. The aim of this paper is to help users for improvement of the door security of sensitive locations by using face detection and recognition [2].
2. Aiming at enhancing the reliability of the automatic door operation, S7-200 programmable logic controller (PLC) was used as the core of the automatic door system. The principle of control system was analyzed with description of the control system hardware [3].

3. Dams are typically constructed with a drain or similar mechanism to control water levels in an impoundment for normal maintenance or emergency purposes. By definition, a disaster is any event that causes great harm or damage, serious or sudden misfortune. Dam failures clearly fit this definition. In this paper we use the microcontroller of common 8 bit Atmel microcontroller AT89s8253. It is a low-power, high performance CMOS 8-bit microcontroller with 12K bytes of In-System Programmable (ISP) Flash program memory and 2K bytes of EEPROM data memory. It has 32 programmable input output lines [4].

2.3 Comparative Studies

From the past conversation, we saw that all the research and project has done in numerous areas. In any case, they're the most engaged region is to screen the entire framework by utilizing their project. They have a few impediments on the primary center point. The greater part of the project has the status see alternative. They simply screen their working environment or want spot and work physically. Or then again they simply do the switch on-off.

In our project, we have attempted to cover the entirety of the spaces for the ideal utilization of our project. In our project we have two IR Obstacle Sensor modules. When anyone comes to park a vehicle the first sensor will detect the vehicle and the door will be opened which for we used a SG90 9G Servo Motor. After crossing the door the second sensor will detect the vehicle and the door will be closed automatically. So this is an incredible component which we have in our project. So these highlights make our project not the same as the above projects.

2.4 Scope of the Problem

After all we try our best for this project but we can't claim that this is the project with any bug. Maybe an expert can tell us about the bugs of our system. And in our point of view the scope of the problem are can be the bad persons (like theft or others) will trying disturbed our system and harmed our components and sensor. So, at future if we have any opportunity to work with this project we will focus on these areas specially.

2.5 Challenges

The challenges that we faced when we build we had to gain the knowledge about the hardware headers in programming language. These headers have build-in library for easily work with the components like LCD display, Servo Motor, Sensor, etc. And our future challenges will be like: People our country not wants to accept the digital things. They actually fear to use the new technologies. Somewhere in our country the illegal parking is business for the dishonest persons this will be a big problem for us.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

The business process model is a process for displaying the work process of a particular framework. By means of business process model can show the information stream of this framework. At first, a user who wants to park the car in our system has to come at our garage. When he/she will reach the door of the garage the first sensor will detect the vehicle and the door will be open. After crossing the door the second sensor confirm the vehicle in then the door will be closed if the garage full then when he/she come to the door first sensor detect the vehicle and the door will not be open and he can show the message at the display “Sorry, no space available”. And when a user wants to take out his/her then first the second sensor detect the vehicle and the door will be open after the vehicle cross the door the first sensor detect the vehicle gets out the door will be closed. Thusly, the entire interaction will end which has appeared in Figure 3.1.

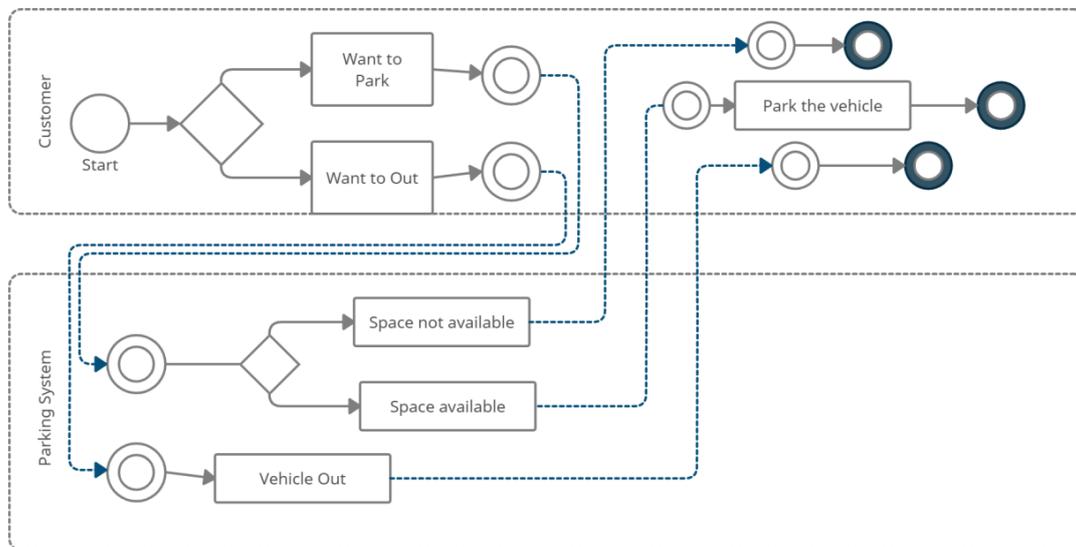


Figure 3.1: Business process model of Our System

3.2 Requirement Collection and Analysis

Requirement collection and analysis will be the primary discussion about requirement components and their works.

So, we use two IR Obstacle Sensor modules as switch for door open and close. An Arduino Uno R3 for functional work. A display for showing the output of the system

which is information output for the users. We have to find few good electronics shops these have the Arduino Uno R3 and our necessary components.

3.3 Use Case Modeling and Description

So, the Use Case Diagram of our system shows that when a customer needs to park his vehicle he has to come at our system with the vehicle and needs to be our member. Our management provides him the parking slot.

We also try to add surveillance or IoT for monitoring the vehicles but our knowledge limitation of these areas stop us at these ways.

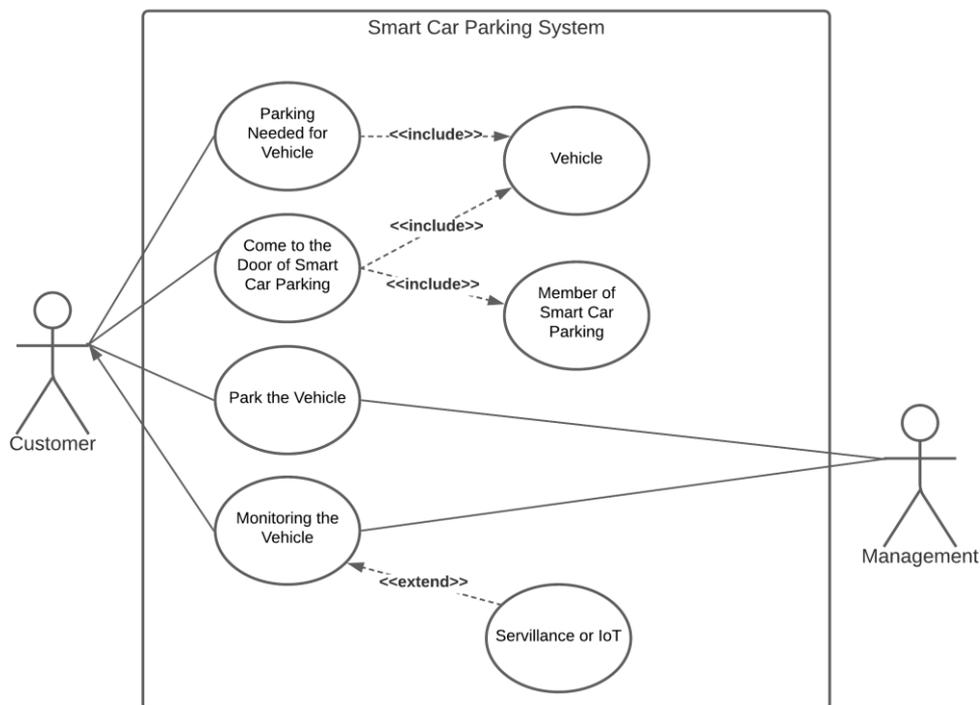


Figure 3.2: Use Case Diagram of Our System

3.4 Logical Data Model

So, in this Logical Data Model we can see that it has three entities Customer, Car and Parking System. Customer has a Primary Key (PK) Customer ID and two Foreign Keys (FK) Car Number and Car Model & Color. Car has Primary Key Car Number and two Foreign Keys Car Model & Color and Parking Slot Number. And finally, Parking System has a Primary Key Parking Slot Number and two Foreign Keys Customer ID and Car Number.

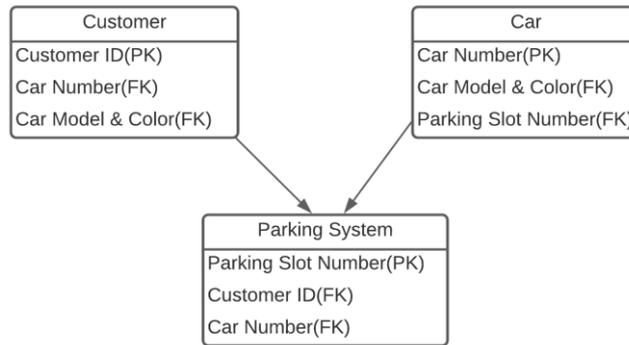


Figure 3.3: Logical data model of Our System

3.5 Design Requirements

In this part, we will portray the plan necessities of this framework which will be hardware prerequisites and software necessities.

In this framework, the hardware necessities are the main piece of the primary execution of this venture. In view of the hardware, we built up the entire framework.

The hardware prerequisite rundown has given beneath:

Hardware Requirements:

1. Arduino Uno R3.
2. Breadboard (400/320P).
3. LCD Display 16X2.
4. IR Obstacle Sensor.
5. Servo Motor SG-90.
6. 100R Resistor.
7. 4.7k Resistor.
8. 1k Resistor.
9. Male 2 Male Jumper Wire.
10. 18650 battery cell 3.7v.
11. 18650 Battery Holder–2 Cell.

In this framework, the software necessities are the most significant piece of building up the task. By the software, we planned the framework cycle and how the application and framework will associate. Likewise, the execution of the venture has been planning by the software. The software prerequisite rundown has given underneath:

Software requirements:

- Arduino 1.8.13

- Proteus 7 Professional with ISIS 7 Professional

In this part we just examined about the necessity rundown of the hardware and software prerequisites

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-End Design

In past conversation we depicted about the necessity of the framework and its rundown. So in this part we will examine about the all prerequisites.

4.1.1 Hardware Component

In this conversation we will examine about the hardware components which will require for making the project model.

1. **Arduino Uno R3:** The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno [5]. Our current-day hardware is strongly dependent on it which is appeared in Figure 4.1.

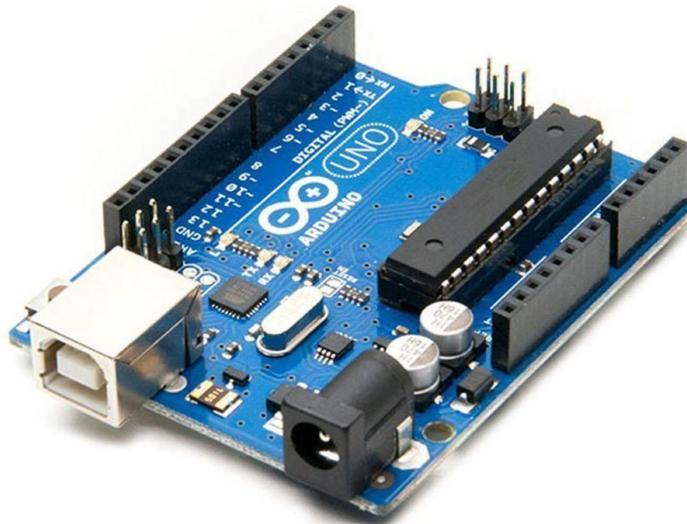


Figure 4.1: Arduino Uno R3

2. **Breadboard:** A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting

diode). To learn more about individual electronic components [6]. A breadboard looks like Figure 4.2.

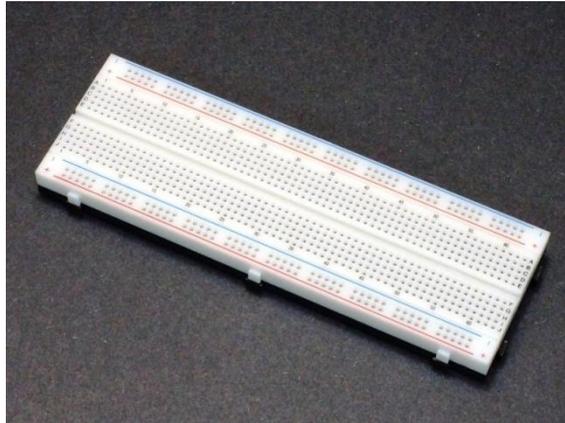


Figure 4.2: Breadboard

- 3. LCD Display 16X2:** An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines [7]. Which is shown in Figure 4.3.

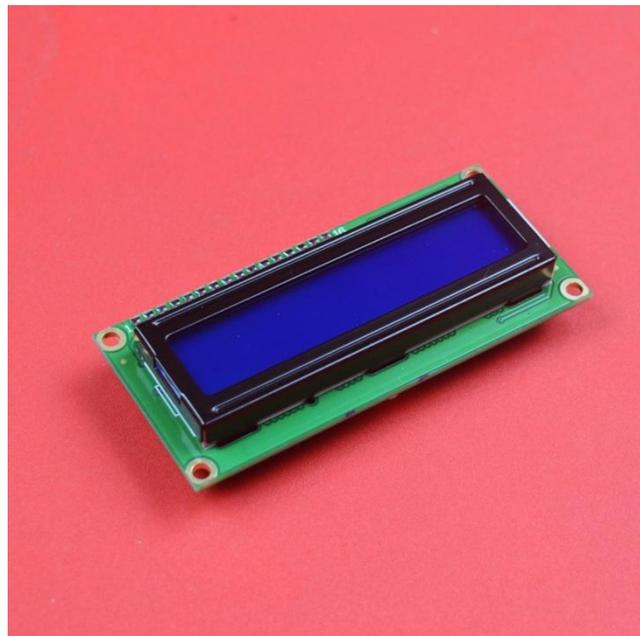


Figure 4.3: LCD Display 16X2

- 4. IR Obstacle Sensor:** An infrared (IR) sensor emits and/or detects infrared radiation to sense its surroundings. The basic concept of an Infrared Sensor which is used as Obstacle detector is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver [8]. IR Sensor is shown in Figure 4.4.

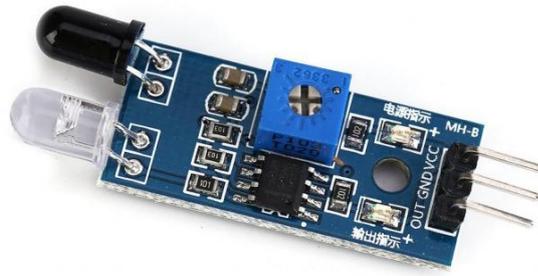


Figure 4.4: IR Obstacle Sensor

- Servo Motor SG-90:** Servo Motor SG90 is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos [9]. Servo Motor SG-90 is shown in Figure 4.5.



Figure 4.5: Servo Motor SG-90

- 100R Resistor:** The R is sometimes used as a decimal point. So 100R is 100 Ohms [10]. Commonly used in breadboards and other prototyping applications, these 100 ohm resistors make excellent pull-ups, pull-downs and current limiters [11].



Figure 4.6: 100R Resistor

7. **4.7k Resistor:** The definition is same as 100R resistor and 4.7k means 4700 ohm which is shown in Figure 4.7.



Figure 4.7: 4.7k Resistor

8. **1k Resistor:** It is easy to define it from 100R resistor and 4.7k resistor which is shown in Figure 4.8.



Figure 4.8: Crystal Oscillator

9. **Male 2 Male Jumper Wire:** Jumper Wire male to male These are Jumper wire male to male, used in connecting female header pin of any development board (like Arduino) to other development board or breadboard [12]. which is shown in Figure 4.9.



Figure 4.9: Male 2 Male Jumper Wire

10. **18650 battery cell 3.7v:** The power equipment we need for our system, these are rechargeable which is shown in Figure 4.10.



Figure 4.10: 18650 battery cell 3.7v

11. 18650 Battery Holder – 2 Cell: This equipment help us to hold our batteries.

Figure 4.11.



Figure 4.11: 18650 Battery Holder–2 Cell

So, we do not have apartment for complete the Front-End Design but try our best.

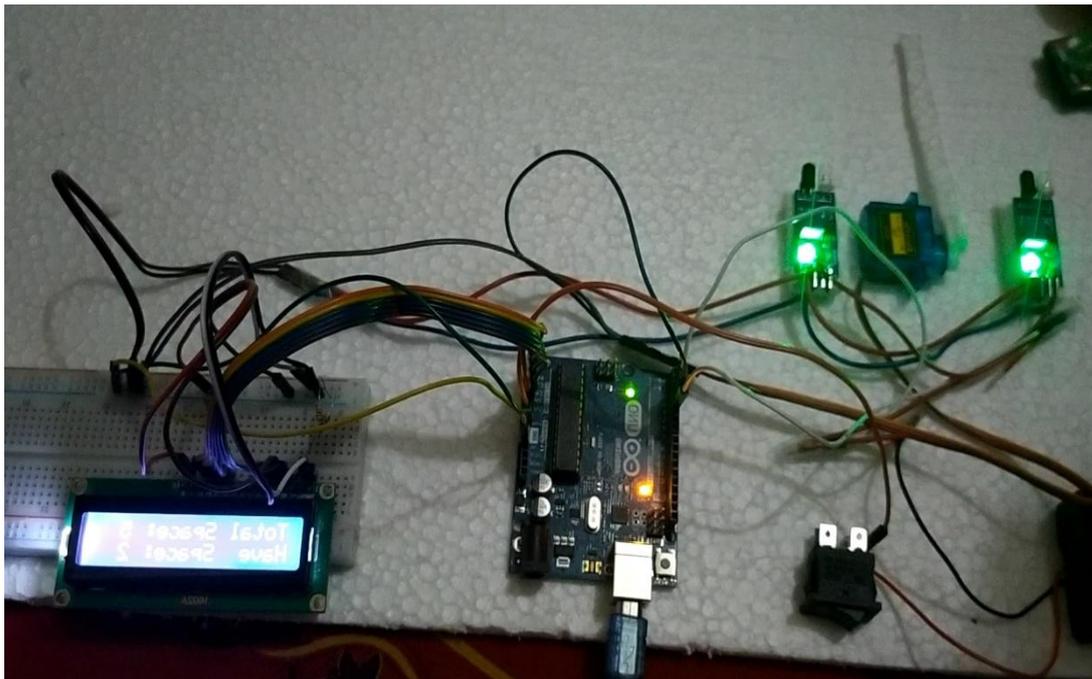


Figure 4.12: Simple Front-End Design Test

4.2 Back-End Design

In this conversation we will examine about the back-end design of this project. Generally we will conversation about the block diagram and the back-end works of this project.

4.2.1 Block Diagram & Working Procedure of the System

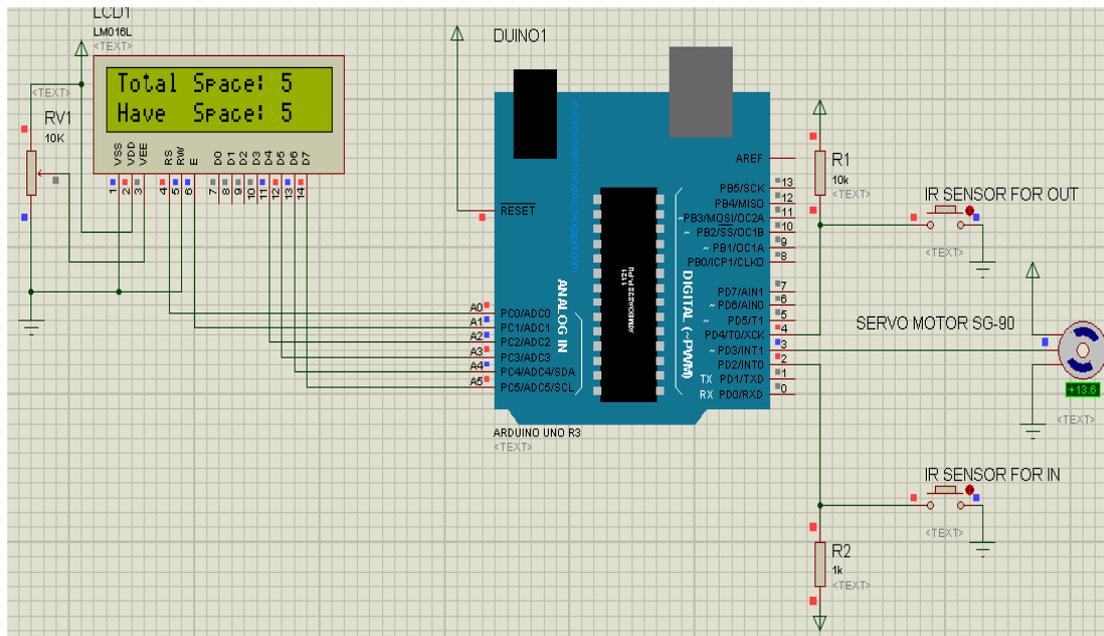


Figure 4.13: Block Diagram of Our System

So, At Figure 4.13 is our system's block diagram. We connect all equipment with the Arduino UNO R3 like the block diagram and install the program inside of Arduino UNO R3. The IR sensors work as switches for open and close the door. For the door we use a Servo motor SG-90 and our system and on the LCD display we can see all outcome of our project.

4.2.2 Back-End Works

At first our program that we have to install in the Arduino Uno R3. For that we have to use Arduino 1.8.13 Application.

```

Car_Parking_System | Arduino 1.8.13
File Edit Sketch Tools Help
Car_Parking_System
#include <LiquidCrystal.h> // initialize the library with the numbers of the interface pins
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;

int flag1 = 0;
int flag2 = 0;

void setup() {
  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();
}

```

Figure 4.14: Arduino 1.8.13 Application Interface

And this is really hard to collect all hardware equipment at once. So, for testing our system and program we use Proteus 7 Professional with ISIS 7 Professional, it is good simulation software.

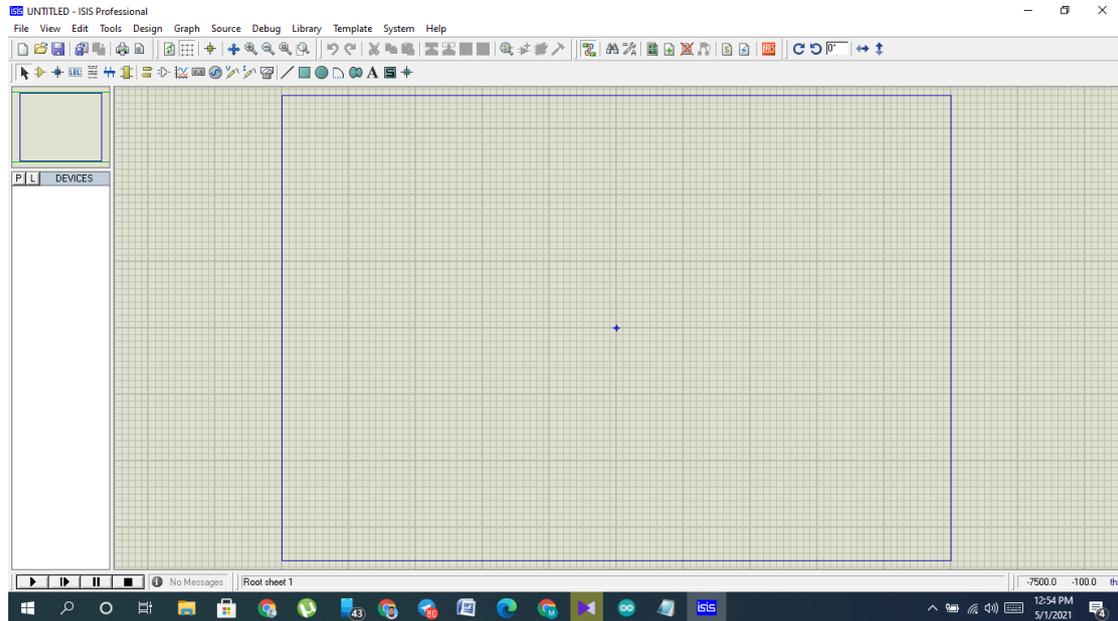


Figure 4.15: ISIS 7 Professional Application Interface of Proteus 7 Professional

4.3 Interaction Design and UX

Actually, we discuss our interaction design indirectly many time, now let us explain again. For interaction with users we have a LCD display where they can see the status of the parking slot. For open the door automatically we have two sensors and a servo motor for the door.

For UX or user experience we share a video with our classmates and they share lots of good feedback with us.

4.4 Implementation Requirement

For Implementation the system can be install any parking lot like business parking lot or personal parking lot. As requirement has to use all these hardware and need to done the works like install the program in Arduino UNO or any kind of hardware which can take program inside of it, install the hardware, simulation the program etc.

CHAPTER 5

TESTING AND RESULT DISCUSSION

5.1 Connection Test

After install all hardware we supply the power to the system our all equipment become lights on and we ensure that our all hardware work without problems.

5.2 Vehicle Entry Test

Our system has five parking slots. We present the vehicle entry test at Table 5.1.

Table 5.1: Vehicle Entry Test

First Sensor	Second Sensor	Display
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	

Detect vehicle and door open	Detect vehicle and door close	
------------------------------	-------------------------------	--

5.3 Vehicle Exit Test

For exit the second sensor will detect the vehicle first which is shown in table 5.2.

Table 5.2: Vehicle Exit Test

Second Sensor	First Sensor	Display
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	
Detect vehicle and door open	Detect vehicle and door close	

Detect vehicle and door open	Detect vehicle and door close	
------------------------------	-------------------------------	--

5.4 No Space Available Test

We test the system when 0 space for parking which is shown in table 5.3.

Table 5.3: No Space Available Test

First Sensor	Second Sensor	Display
Detect vehicle and door not open	Nothing to do.	

5.5 Final System Analysis and Result

The final system is looking good. The Result as accepted that we can see from Table 5.1, 5.2, 5.3.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

The hardware equipments and software these we discuss before. For program we use in Arduino 1.8.13 that is a C program and Arduino software has build-in library files for different kind of hardware by these we easily make the program. And all things we discuss before.

6.2 Future Scope

There are many things we planned for our system's future:

1. Create a web-based online parking server.
2. Make notification alerts for timeout.
3. Make a safety system for the cars.
4. Add smart card system of customers.
5. Develop the system with car monitoring surveillance or IoT.
6. Add a pre-booked parking system.

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APPENDIX

Appendix: Project Arduino 1.8.13 Reflection

This is the documentation of Arduino code. We should introduce the appropriate library for doing this code area. After that we need to follow the configuration of code. So by following the code design we can plan our longing code in Arduino 1.8.13 and upload it in Arduino UNO R3.

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```
#include <LiquidCrystal.h>
```

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

```
Servo myservo1;
```

```
int ir_s1 = 2;
```

```
int ir_s2 = 4;
```

```
int Total = 5;
```

```
int Space;
```

```
int flag1 = 0;
```

```
int flag2 = 0;
```

```
void setup() {
```

```
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{  
lcd.setCursor (0,0);  
lcd.print(" Sorry no 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); Space = Space+1;}  
}
```

```
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("Have Space: ");  
lcd.print(Space);  
}
```

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