Design and Development of an IoT Based Automated Car Parking System

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A Final Year Design Project submitted to the Department of Electrical and Electronic Engineering in partial fulfillment of the requirements for the degree of
B.Sc. in Electrical and Electronic Engineering

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Declaration

It is hereby declared that

1. The Final Year Design Project submitted is my/our own original work while completing degree at Brac University.
2. The Final Year Design Project does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The Final Year Design Project does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

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Approval

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of FALL, 2022 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of B.Sc. in Electrical and Electronic Engineering on 15th December, 2022.

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Ethics Statement

The project “Design and Development of an IoT Based Automated Car Parking System” is committed to moral principles and ethical principles. We followed the IEEE standard for ethical considerations when designing, creating, and deploying our system, as well as the suggestions offered by the chair and members of our esteemed ATC panel. When gathering and using data, we place a high importance on security, privacy, and openness. We also respect the rights of the individuals and communities the system affects. We promote automated parking systems and aim to lessen traffic congestion. We value the significant advice and assistance that the chair and members of our ATC panel contributed to ensure that the project complies with these ethical standards.

Abstract/ Executive Summary

An IoT based smart parking system, also known as a connected parking system, is a centralized management system that allows drivers to use a smartphone app to search for and reserve a parking spot. The system's hardware features sensors that detect available parking slots and communicate this information to all drivers in the area. This data is updated in real-time, which means drivers never have to worry about not finding an available space. In addition to helping drivers find a spot, the system also sends alerts about peak times and peak prices. The goal of these alerts is to help save drivers money while also reducing congestion. Parking systems are installed on the outside of buildings or inside of buildings. When a vehicle enters the space, sensors detect its presence and calculate available parking slots. This information is then sent to the driver's phone via an app.The smart parking system also has real-time data on occupancy rates, which can be found on the app. This data is collected from each sensor and is updated every five minutes. Keywords: IoT, Sensor, Automatic, Online, Payment, Booking, Alert service.

Acknowledgement

Dr. AKM Abdul Malek Azad, the head of our ATC, has our warmest gratitude for his excellent guidance and assistance during the project's development, Design and Development of an IoT Based Automated Car Parking System. The insightful remarks and dedication to sustaining the project's ethical standards demonstrated by Afrida Malik and Mohammad Imran Thushar, members of our ATC panel, are likewise acknowledged and appreciated. We want to thank the ATC panel for their guidance, expertise, and support, all of which were essential to the project's success.

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Chapter 1: Introduction

1.1 Introduction

Due to the recent growth in the economy and the availability of low-priced cars in the market, every average middle-class individual can afford a car, which is increasing the number of private vehicles. The consequences of this increasing number of vehicles are heavy traffic jams, pollution, less availability of roads and spots to drive a motor car. One of the critical issues that must be addressed is the issue of parking those vehicles. Though we have a minimum number of parking spots, so much time is wasted in finding that exact parking spot, resulting in the drivers parking their cars at the roadside or in any other illegal spots. This affects both economic and social activities and costs.

1.1.1 Problem Statement:

The parking management problem can be viewed from several angles. Limited number of parking lots, drivers not knowing where parking lots are, drivers not sure if parking lots have enough space and a tendency to park illegally on the roads. Every person who has ever driven about cities in frustration looking for parking has hoped for a solution that could take them right to that elusive place. According to a recent study, a driver needs about 8 minutes to park since he spends more time looking for a spot in the parking lot. Thirty to forty percent of the traffic is caused by this searching. In order to increase parking revenues through technologically enabled solutions, this issue attracted strategic investments from specialized industry sectors. New technologies that enable cities to minimize traffic congestion and carbon emissions are revolutionizing the parking market.

Currently, the most common method of finding a parking space is manual, in which the driver searches for a space in the street by chance and experience. This process takes time and effort, and in the worst-case scenario, the driver may not be able to find a parking space if they are driving in a city with a high vehicle density. The alternative is to locate a predefined high-capacity parking lot. However, this is not an ideal solution because the car park is often located far from the user's destination.

Navigating the congested streets of Dhaka on a daily basis is a tiring experience that drains all energy from one's body and is a topic that is very prevalent among individuals who fall victim to it. However, our underlying inspiration came from a conversation regarding the future prospects of IoT and cloud computing in Bangladesh. To date, technological developments have not been implemented in parking management systems. With the vision of 'Digital Bangladesh' in mind and all of the resources at our available, we intend to develop an effective smart parking system that dramatically decreases traffic congestion.

1.1.2 Background Study:

According to the survey-based World Traffic Index-2020, implemented and published in January by a research organization called NUMBEO, Dhaka has ranked 10th in terms of worst traffic among the world’s 228 cities studied [1]. One of the major reasons behind that is the unplanned traffic management system and parking management. When visiting someone’s house in Dhaka by personal vehicle, city people often find themselves in an awkward situation as they realize that the residence does not allow visitors to park. People often face a similar situation while visiting shopping malls, markets, offices, educational institutions, financial institutions, and hospitals with their personal vehicles, as most of these places in Dhaka do not have any designated parking space for visitors, or in some cases, do not provide any parking facilities for visitors. According to the Dhaka Tribune, the

Total number of registered vehicles in Dhaka is around 15,000, but we have just 64 registered parking spaces for both DNCC and

DSCC [2]. But most of the people in our country don't have any idea of where these parking spots are. As a result, they need to park their vehicles at the roadside, which causes congestion at the roadside and increased traffic jams.

In Dhaka city, especially large shopping centers, attract huge amounts of traffic. Inadequate parking provisions in these shopping centers contribute to the problems in traffic movement. There are around 3,000 roadside shopping centers in Dhaka, and most of them do not have adequate provisions for parking [3]. Mirpur Road, being one of the major arterial roads, consists of numerous shopping centers along its route, and there has been an increase in the parking of cars on the roadside [3]. Among the numerous shopping centers along Mirpur Road, New Market is the oldest and busiest one. This open-air shopping complex attracts a huge amount of traffic, a major portion of which are cars that are parked on-street when the market is open for six days a week. Moreover, the designated space for on-street parking proved to be inapt as the surrounding road is overburdened with parked cars, which creates traffic congestion.

1.1.3 Literature Gap

Utilizing a website, the Smart Parking system based on Slot Booking is implemented. We have a plane to implement our smart parking system by mobile application. We can reserve our own, cheapest parking space using the slot allocation procedure. It is effective at resolving parking issues and provides automatic billing in addition to reducing traffic congestion. Utilizing a multilayer parking technique, this work could be further developed into a completely automated system. It is also possible to design safety features like tracking the vehicle's number, driver face recognition to prevent theft, and automatic payment. The "Smart Parking" technology will be available to consumers in their mobile devices as we increase the testing in a real-world setting. The gadget can be connected to a home automation system for domestic and residential parking systems, which can operate different home appliances by detecting when a user is leaving or entering a parking space.

1.1.4 Relevance to current and future Industry

A Wireless Sensor Network is made up of a number of low-cost sensor nodes (WSN) [4]. They set themselves up to create an Ad-hoc network using the wireless communication modules on the nodes [1]. Each node contains a variety of sensors, processing units, and storage devices [6]. The functioning sections allow the sensors to be rapidly and readily installed for data collection, processing, and transmission [1][6]. Furthermore, the contemporary GPS-based vehicle navigation system provides drivers with information regarding the location and availability of a parking place near the destination [7]. [1] provides information on the present state of the parking facility. Furthermore, in large cities, the parking control and revenue system rely on technologies such as coins or token-based parking meters, which necessitate precise change and manpower to monitor parking lots, making it unattractive. As a result, we provide a more efficient solution for an automated parking meter and driver assistance. It is linked to a centralized traffic control authority, which collects all fees and ensures that parking rules are followed [8]. An Ad-hoc subsystem, a parking gateway subsystem, a vehicle detection subsystem, and a video image processor sensor subsystem are all part of a vision-based system [9]. It needs to employ a video sensor in the wireless sensor-based system, which is

very expensive, and this system also has to utilize a number of sensors, which generate a lot of data at times, and whose transmission over the wireless network is hectic [10].

Other researchers have designed architecture for parking management in smart cities [6]. They proposed intelligent parking assistant (IPA) architecture aimed at overcoming current public parking management solutions. This architecture provides drivers with information about on-street parking stall availability and allow drivers to reserve the most convenient parking stall at their destination before their departure. They use RFID technology in this system. When a car parks or leaves the IPA parking spot, the RFID reader and the magnetic loop detect the action and send this information to the unit controller to update the information on the car park status. This study uses only some simple mathematical equations for the system architecture and does not create a large- scale parking system.

1.2.1. Objectives

- **Reducing Illegal Parking:**
  In Dhaka city, there are a lot of risks for cars to park anywhere. By using this smart car parking system, the risk of transportation for the passenger will be reduced.

- **Reducing Traffic:**
  By designing this project, we can implement a standard car parking system and as a result, the passenger over c will be reduced at the same time it will be very helpful for traffic control, besides the illegal car parking on the road will be reduced.

- **Organized Parking System**:
  Implanting a serial-wise parking system to ensure passengers follow the queue beside the system will make parking less of a hassle. Monitoring System for Updates: Installing a smart monitoring system to alert the public about the latest updates of incoming and outgoing cars in the lobby. People can know about the available spots in the display from the outside of the lobby.

- **Security:** The system can save all the information of any car for finding any criminal issues or anything.
- **Savings:** the system will help to find a parking spot in a short time at the same time the system will save money and time also.

1.2.2. Specifications

Requirements and specifications are very important components in the development of our project. Requirements analysis is the first step in the design process, where the user's requirements should be clarified and documented to generate the corresponding specifications. The table below includes all the requirements, the components to fulfill the requirements, and the components' specifications.

Requirements	Specifications	Components
Detect free and booked parking spaces	Sensor for collecting data	IR sensors, Motion sensors
Can connect to the Wi-Fi or internet use	It has inbuilt support for Wi-Fi to connect to the internet	ESP9266, GSM module
Able to gather information from sensors and take a decision	To gather information from sensors, process data, and take decisions accordingly	Arduino UNO, Arduino Mega
Display the free and booked parking spaces	Display for visualization	Mobile application, 16*2 display
Keep count of parking times	A car can park for a maximum of 4 hours in a slot	IR sensors, Motion sensors

Fig01: Table for Specifications, Requirements, Component

1.2.3 Components Specification:

Component	Model	Technical Specification	Component Description
Arduino Mega	2560 R3	54 Digital I/O terminals (14 of which have programmable PWM outputs). 16 Analog Inputs. 4 UARTs (hardware serial ports). 16 MHz crystal clock. Operating voltage: 6 ~ 12v. Dimensions: 110 x 53 x 15 mm.	This is used here for processing data and signals
ESP8266 chip	Tensilica Diamond Standard 106Micro	802.11 b/g/n protocol Wi-Fi Direct (P2P), soft-AP Integrated TCP/IP protocol tack	Used here for wireless data transmission
CLOUD Server			The server is used for savings data

GSM Module	Chip: SIM800L	Voltage: 3.7-4.2V Support networks: China Mobile, China Unicom, and the global quad band network Module size: 2.5cmx2.3cm	The module is used for parsing and receiving data through a mobile network
IR infrared Sensor Module Obstacle Avoidance	Comparator chip: LM393	Detection distance: 2 ~ 60cm Detection angle: 35 °	The sensor is used to detect the objects
Servo Motor	Motor Type: 3-pole	Torque:4.8V: 1.8 Kgcm 6V 2.2Kg-cm Speed: 4.8V: 0.10 sec/60° Dimensions: Length: 0.91 in (23.1 mm) Width:0.48 in (12.2 mm) Height:1.14 in (29.0 mm)	The motor used for opening and closing the gates

Motion sensor	PIR HC-SR501	Detection distance: 3 to 7m Detection angle:<140°	The sensor is used to detect the objects
Arduino UNO	Microcontroller: ATmega328P Operating	Voltage: 5V FLASH Memory: 32 KB of which 0.5 KB used by bootloader SRAM: 2KB EEPROM: 1KB Clock Speed: 16MHz	This is used here for processing data and signals
16*2 LCD Display	Liquid Crystal Display A2	Size:85.0 x 29.5 x 13.5mm Viewing area: 64.5 x16.4 mm Dot size:0.56 x 0.61 mm Character size: 3.00 x5.23 mm Weight:35 g	This is used here for showing the information about the space
Battery	OLYMPIC HD.aa	Voltage: 12 Volts Capacity: 7.5A	This is used here for backup electricity
12c module	Interface: I2CI2C Address: 0x27	Pin Definition: VCC、 GND、 SDA、 SCL Backlit (Green with white char color)	
ESP32-CAM	Module Development Board ESP32 With Camera Module OV2640	Flash LED off: 180mA @ 5V. Flash LED on to maximum brightness: 310mA @ 5V. Deep-sleep: 6mA @ 5V min. Modem-sleep: 20mA @ 5V min. Light-sleep: 6.7mA @ 5V min.	This camera will used for capturing car pic at the parking gate

Fig02: Table for Components Specification

1.2.4 System level specification:

First and foremost, the parking lobby's capacity is crucial. In other words, the lobby can only accommodate 30 vehicles at once. There are various other categories as well, like motorbikes, jeeps, cars, and heavy cars, that are permitted to park in the lobby. Buses, trains, and other large vehicles are not permitted to park in the lobby. After then, the weight range for the vehicle should be 1200–2100kg. Parking in the lobby is completely prohibited for vehicles up to 2100 kg. Another crucial point is that the system is intended to be installed on the ground level or the roof of buildings that are no higher than the third floor. If it is installed underground, however, the system may experience serious network problems. Moreover, the subterranean parking lobby's fire exit will be difficult to use.

Furthermore, the size of the vehicles is another crucial factor. In other words, a vehicle's length should fall between 6 and 10 meters; otherwise, its size cannot be adjusted because a vehicle's space is fixed. Vehicles should have a wide range of 2.5 to 4 meters when parked together, otherwise it will take up a lot of space and make it difficult for other vehicles to park. Similarly, the vehicles' height range should be 3 to 6 meters in order for them to access the lobby.

Time management is also a crucial component of the system, to sum up. To put it another way, each vehicle has a set amount of time to park. One car may park in the lobby for a maximum of five hours. The technology will automatically alert the driver after 5 hours. The driver must then park once more for 0 to 5 hours.

1.2.5. Functional and Non-Functional Requirements

The functional requirements are the requirements that the end used specifically demands as basic facilities that the system should offer. All these functionalities need to e necessarily incorporated into the system as a part of the contract. These are represented or stated in form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike nonfunctional requirements. On the other hand, Non-functional requirements are basically the quality constraints that the system must satisfy according to the product contract. The priority or extent to which these factors are implemented varies from one project to another.

Requirement	System-level
	Website based system
	Showing data in LCD

Website-based	Parking spot
	Specific car size
	Parking booking system
Non-Functional	CCTV Camera
	SMS alert service
	Barricade of the parking lobby

Fig03: Table for Function and Non-Functional Requirement

1.2.6 Technical and Non-technical consideration and constraints in the design process

Technical consideration

1. The project needs a 24/7 power supply.

2. Good internet connectivity is very essential. **3.** Need to specify the parking lot area's length, width, and also car size.

Non-Technical consideration

1. Parking time over notification sending SMS system.

2. Fire alert notification sending SMS system. **3.** Online payment system.

Constraints:

1. **Network and connectivity issue**:

Our country's mobile network is not so strong, so sometimes we will face difficulty connecting with mobile or cloud services. Finding a mobile or Wi-Fi network in the underground parking area will be a hassle and disturbing.

2. Server traffic:
Occasionally, on special days, the parking lobby may be crowded, and many people will attempt to enter the server simultaneously, which is why the server may stall for a short period of time. It is one of the most significant constraints on the system. External storage is required to resolve this, and it is also expensive.

3. No memory safety checks
An Arduino sketch can read and write pretty much every piece of memory on the Arduino board. There is no function to stop a sketch from reading particular parts of memory. Unsafe memory use in a sketch can cause an Arduino to crash.

1.2.4. Applicable compliance, standards, and codes:

Name	Standard No	Definition	How it affects the solution
Wireless local area network	IEEE802.11	IEEE 802.11 refers to the set of standards that define communication for wireless LANs. The technology behind 802.11 is branded to consumers as Wi-Fi. As the name implies, IEEE 802.11 is overseen by the IEEE, specifically the IEEE LAN/MAN Standards Committee (IEEE 802). The current version of the standard is IEEE 802.11-2007.	This process appears to follow the guidelines to ensure the continuous network issue in the parking area.

Rechargeable battery systems	IEEE1625	This standard establishes criteria for design analysis for qualification, quality, and reliability of rechargeable battery systems for portable computing. It also provides methods for quantifying the operational performance of these batteries and their associated management and control systems, including considerations for end-user notification.	This code purposes for continuous electricity by generator or including battery system in the computer device or in tech devices which are used in the project area.
Developing system requirements specifications	IEEE1233	This guide will be used for developing a system requirements specification. A System is a set of interconnected elements constituted to achieve defined objectives by performing specified functions. Development includes the thought process involved in the collection, analysis, and organization of the requirements.	This document will serve as a guide for defining functional, performance and interface requirements for smart car parking system. This guide will recommend methods for specifying the requirements and capabilities for this system.

1.3 Systematic Overview/summary of the proposed project

The automation of the smart car parking technology is an IoT based used to monitor and maintain a suitable environment for the system. However, the first design would benefit smart car parking operators the most due to its efficiency.

1) Collecting Data from sensors:

In this way, the main motive is to collect data from the parking space or project area using the appropriate sensors like IR. These sensor data are collected and forwarded by the factor of a microcontroller Arduino.

2) Storing & Comparing Data:

Using a Wi-Fi module, the data are now transmitted from the Arduino to the cloud server. As a result, the user can access and manage all of the data on the cloud server using a mobile device. At this point, data comparisons with the threshold value are also conducted.

3) Controlling the system:

As this is a fully automated system so this system is controlled without human touch. After the comparison phase is complete, commands are now delivered from the cloud server via the Wi-Fi module to the Node information. Here, the system's control relies heavily on node sensors. By doing this, the automobile parking system is kept up automatically without human assistance.

1.4 Conclusion:

A lot-based method to monitor and maintain a proper environment for the system is used in the automation of the Hole technology. The parking operators, however, stand to gain the most from the first plan because of its effectiveness ability and maintenance potential When this project is finished, the parking system will be automatically monitored.

Chapter 2: Project Design Approach

2.1 Introduction

We conduct extensive research to identify suitable approaches for our city. There are various techniques for creating a smart car parking system. However, a lot of them contrast with the circumstances in our city. We discover two approaches that will work for our cities after researching every possible approach. These two strategies are an IoT-based smart parking system and an additional smart parking system that uses a keypad.

2.2 Identify multiple design approach

This approach is an IoT based smart barking system where user can see free and booked parking space with the help of website. Moreover, user can book a specific parking spot with the help of websites. To book a parking spots user need to give a suitable time and make payment by using mobile banking. With the help of this approach's user don't need to come in front of parking spaces to see the available parking spot. User can see all the necessary information at any place by browsing website.

Fig01- Flow chart of First Approach

2.2.3 Second Approach

The second approach is an LCD-based smart car parking system that allows users to view and book available parking slots with help of an LCD display and make payments according to their parking time.

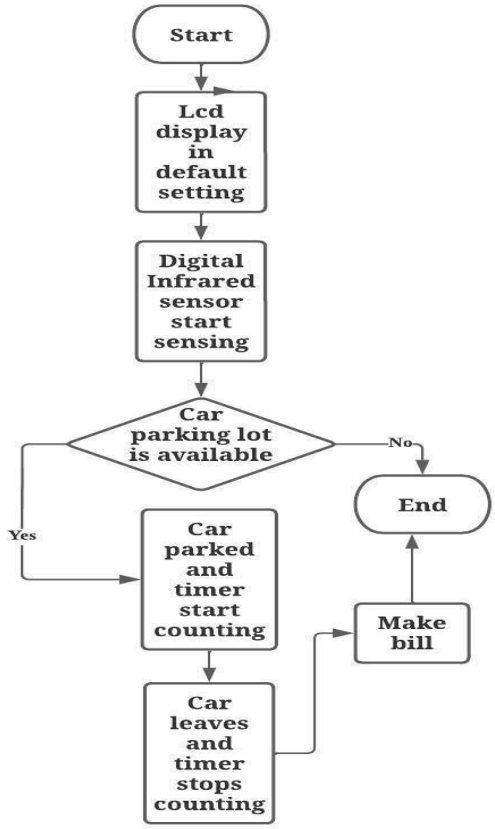


Fig02- Flow chart of Second Approach

2.2.4 Describe multiple designs approaches

2.2.4.1 First Approach:

The first approach is a website-based IoT-based smart parking system that allows users to view available and reserved parking spaces. In addition, users can reserve parking spaces through a dedicated website.

With the help of this concept which is shown in fig-01, the drivers can check available parking spots near them without going to the parking spots. They just need to enter the website to check the vacant and available parking spots. Below are the steps that a driver needs to follow in order to park his car using our parking system.

- Step 1: Browse the website on a mobile device or any other device.

- Step 2: With the help of the website search for an available parking spot
- Step 3:Browse through the various parking slots available in that parking area.
- Step 4: Select a particular parking slot.
- Step 5: Select the amount of time (in hours) for which drivers would like to park their car.
- Step 6: Pay the parking charges either with mobile banking.
- Step 7: A confirmation message will send to the user's cell phone.
- Step8: After ending the given time a warning message sends to the user.

We also installed infrared sensors on the parking system to distinguish between free and reservedspots. We will send a warning notification to the driver and the parking attendant before the designatedparking time expires. When drivers leave the area, the IR sensor detects that it is vacant and sends the data to the cloud server via the ESP9266 chip. Additionally, we used some LEDs that change color fromgreen to red depending on whether the slot is reserved or not. A servo motor will open a gate after reserving a slot on a website for a short period of time, and after entering the vehicle, the gate will close.Until the payment for the selected spaces is finished, the spots on the website seem unoccupied. The webpage shows that parking is allowed when the allotted time has passed and the LED light turns green.

2.2.4.2 Second Approach:

The system is capable of locating accessible unoccupied parking places on its own. The user will arrive at the parking lot and glance at the 16*2 LCD displays in this system. With the help of a Motion sensor, the display will show the number of unoccupied slots. The data from the Motion sensor will be sent to the Arduino UNO, which will then transport it to the LCD panel. The monitor will then display all filled and empty spaces, allowing the user to quickly decide which lot he wishes to park his car in. In front of the parking lot, servo barriers are used. A motion sensor is built inside servo barriers. When a car enters the parking lot, the servo barriers use a motion sensor to detect the automobile's presence, and the barricade automatically opens. A timer will begin counting and reading the parking time once the automobile is parked in its allotted spot. When the user leaves the location, the timer will stop counting and generate a fee based on the amount of time spent parking. Online banking such as BKash, will be used to finish the payment procedure.

2.3 Analysis of multiple design approach:

We analyze various aspects of our approaches and here we showed the analysis of our approaches which also help us to find out optimal one for our project.

	Design 1	Design 2
Detecting Free Spots	IR sensors Sensor	Motion Sensor (PIR)
Processing and Control Mechanism	Arduino Mega 2560	Arduino Uno Rev2.0

Showing Information	User can see available and booked spots in website	User can see the parking spots status on LCD display
Notification to Driver	In case the driver overshoots parking time a notification would be sent to the User's mobile number	If the driver overshoots parking time a red light will start glowing
Booking Procedure	User can book a parking spot through website from any places	User must be present at the parking lot to ensure parking spaces
Saving time	User don't need to wait in front of parking spots to ensure parking spots	User need to wait some while to ensure parking spots
Security system	After opening gate esp32 camera will capture the picture of the car and number plate. Fire detection alarm available	No security system available here
Sensor effectiveness	IR sensor detects whether the light by the transmitter is emitted by an object so there is no chance of letting off a false alarm.	PIR sensor may let off a false alarm due to the change in energy like airflow
Payment system	Through mobile banking	Manual payment system in front of parking gates

2.4 Conclusion:

All of the elements from the above table are taken into account to determine the most appropriate and superior design. The most appropriate strategy, taking into account all the variables, is Design 1, and its execution will be more solidly based and have remarkable serviceability

Chapter 3: Use of Modern Engineering and IT Tool:

3.1 Introduction:

We employed various contemporary engineering and IT tools to design, build, and validate the solution for the project's prototype. According to the specifications of our prototype, we chose these tools.

3.2 Select appropriate engineering and IT tools:

Hardware tools	Software tools
Arduino Mega	Porteous 8 professional
Arduino Uno Rev2.0	Arduino IDE
LCD Display	
IR Sensor	
Motion Sensor	
ESP32 Camera	

Fig03- Table about the selection of appropriate engineering and IT tools

3.3 Use of modern engineering and IT Tools:

Arduino Mega:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, and a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller by simply connecting it to a computer with a USB cable or powering it with an AC to DC adaptor or battery to get started.

Proteus:

This software integrates circuit simulation, PCB design, and single-chip simulation. By providing the best real-time display effects, it also supports the compiling, editing, and source level of the assembly language of the microcontroller, with built-in assembly compilers of 8051, AVR, PIC, etc. However, insufficient data calculation of the circuit is the limitation of it. As it is more compatible than any other software for us, we've selected this Proteus software for our project simulation.

Arduino Uno Rev2.0:

This particular model of the microcontroller is available and comes at a cheaper price in comparison to the competing MCUs and has the codes needed to set up this module is available

on the internet and is mostly open source. With online forums greater than any other MCU this module is both budget-friendly and easy to use.

LCD Display:

The output data is displayed on the LCD monitor. Basically, after the calculation is completed in the MCU, the data is transferred to the LCD, which displays the processed data output.

IR Sensor:

The IR sensor is used to detect the absence or presence of a car when it enters the parking slot, and the LCD screen is then used to display the vacant parking slot to the driver. The parking slots are continuously monitored, and the data.

Motion Sensor:

A Motion sensor is an electronic device that is designed to detect and measure movement. It is used to detect empty and occupied parking spaces. Furthermore, it is used to detect the presence and absence of a car when it enters the parking lot.

ESP32 Camera:

The ESP32 CAM WIFI Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition features a competitive small-size camera module that can run independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is extensively utilized in IoT applications. It's good for smart home devices, industrial wireless control, wireless monitoring, and other IoT uses. This module's DIP packaging allows for speedy product manufacture and provides a high-reliability connection option for IoT device terminals. ESP's 2 high-performance 32-bit LX6 CPUs and 7-stage pipeline architecture incorporate WIFI, Bluetooth, and BLE Beacon. It has on-chip sensors, a Hall sensor, a temperature sensor, and more

3.4 Conclusion:

In this chapter, we have discussed the modern engineering and IT tools utilized in the prototype of this project. Additionally, every tool we select for the prototype is IEEE-recommended and appropriate for putting it into practice and producing the necessary outcomes.

Chapter 4: Optimization of Multiple Designs and Finding the Optimal Solution [CO7]

4.1 Introduction

To accomplish the intended outcome, two designs have been developed. Although the two designs operate in different ways the outcome is the same. The first approach is IoT based smart car parking system and the second approach is LCD display-based smart car parking system.

4.2 Optimization of multiple design approach

Design 1

A Proteus simulation design of an IoT-based smart automobile parking system is displayed in Fig.4. We have six parking spaces here. We used 6 IR sensors for 6 parking places to detect free and reserved spots. We utilize the Arduino microcontroller to gather data from sensors and make judgments. To show available and reserved spots, we also use LCD displays. Additionally, the LCD panel will display the number of cars (Fig-8.2). One green and one red LED are kept for each parking space. When the spot is available, the LED will become green; however, if the spot is reserved, it will change to red. Furthermore, we uploaded data to the website using a Wi-Fi module.

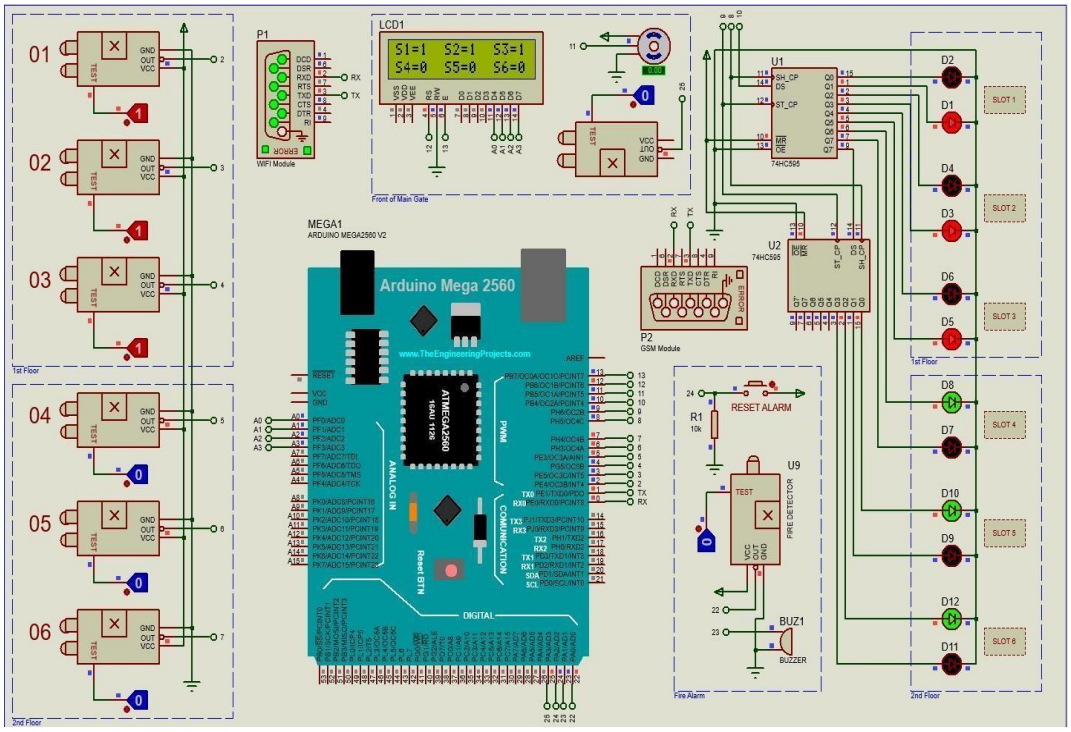


Figure-04: Proteus simulation for IoT- based parking system

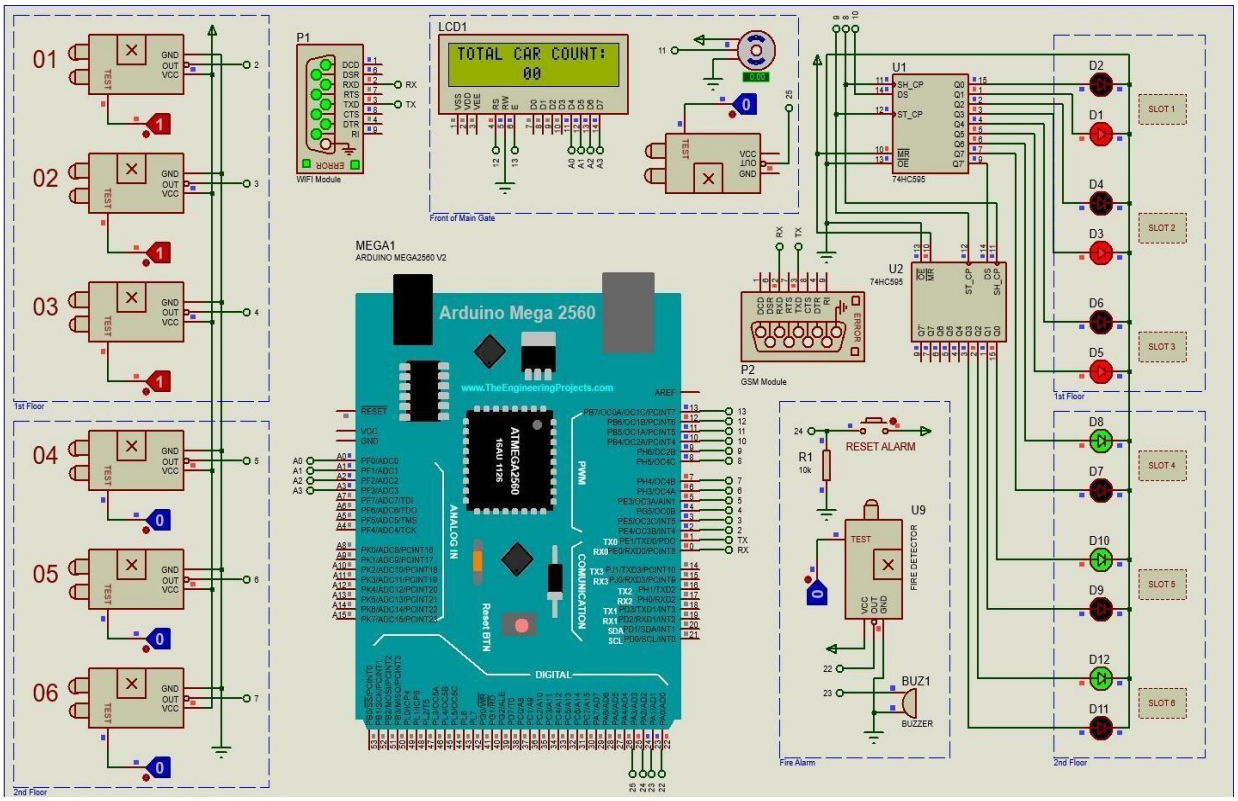


Figure-05: Proteus simulation for IoT- based parking system

There are 6 parking spaces in the simulation shown in Figure5, of which 3 are reserved and the other 3 are free. This information is visible on the LCD screen. "1" indicates a reserved spot, whereas “0" indicates a vacant one. LED lights for spots 1, 2, and 3 are also becoming red. However, the LED for slots 4,5, and 6 is now green because they are available for reservations.

Additionally, the websites allow us to view the parking situation. Figure 6 indicates that slots 1, 2, and 3 are full and cannot be booked, while the remaining slots are available for booking. The user must visit the website and register by providing their user ID and password in order to reserve a parking space. If a person hasn't already registered, he must do so before he can log in. After that, he can look for open parking spaces. Figure 6 shows that there are three open slots (4,5,6). To reserve one of these slots, users must enter the desired time using the "+" or "-" buttons. The user must then click the book now option to reserve the specific slot. Let's say we want to reserve spot 4. When you select slot 4 a checkout window will appear (fig 7). The user must enter his TrxID on this page, which he can find after making a BKash payment. When this happens, slot 4's LED will turn red and its LCD display will indicate that the slot is reserved. Additionally, slot 4 on the website indicates that it is already occupied and that no one can reserve it until the allotted time has passed.

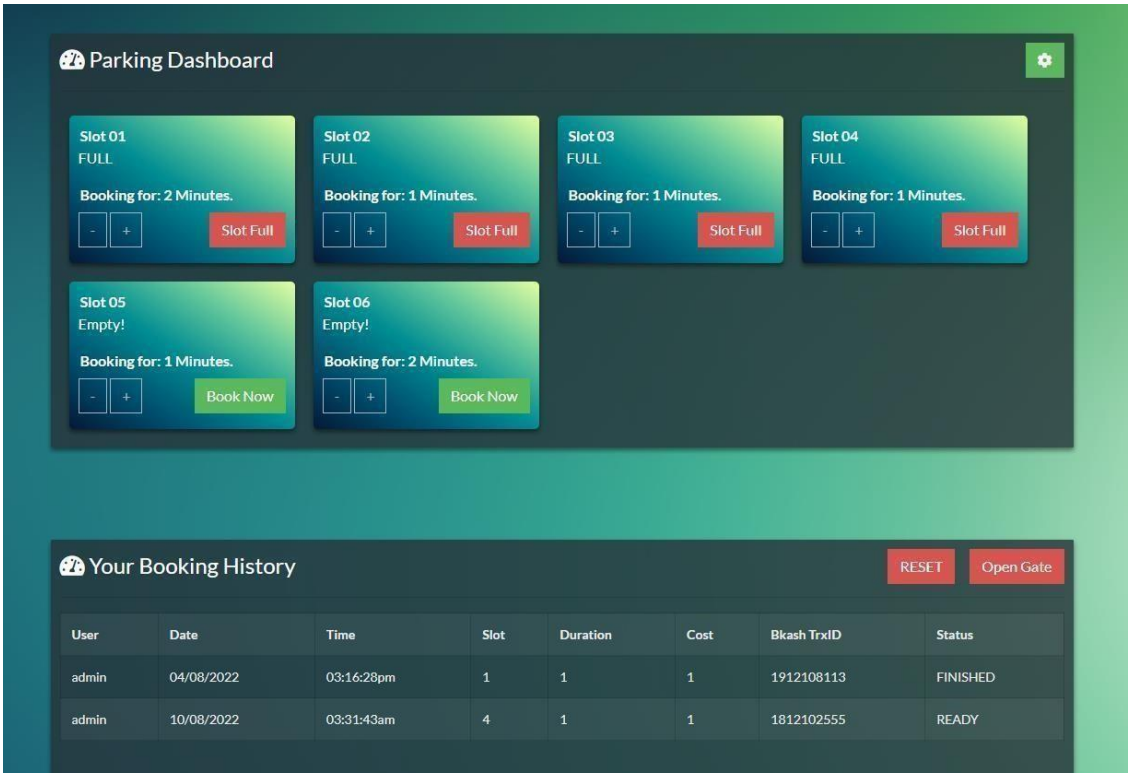


Figure-06: Website for IOT-based smart parking system

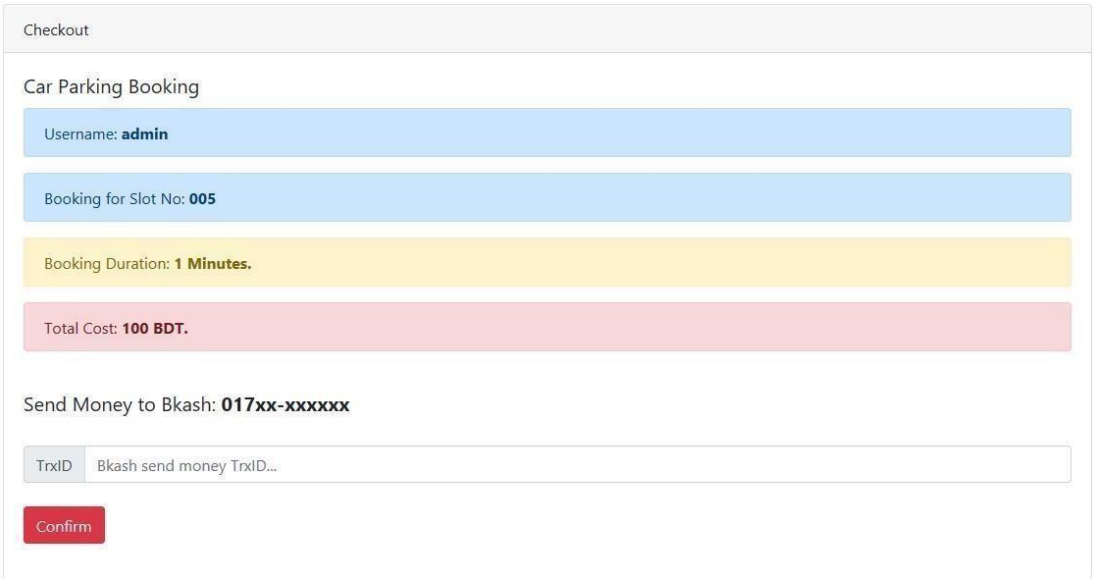


Figure-07: Checkout page for IoT-based smart parking system

An SMS with the user's booking confirmation will be sent to his phone after the payment has been made (Fig 8). Following that, a button labeled "Open Gate" will show up on the user's account (Fig-8). When the button is pressed, the gate in front of the parking place opens, and when an IR sensor detects the car, an ESP32 camera opens, taking an image of the vehicle that can be used to record the car's number and other relevant data. An alert message will be sent to the user's mobile

device to remove his automobile from the site once the allotted time has expired. Additionally, a warning alarm will sound, and it won't go off until the automobile leaves the location in question.

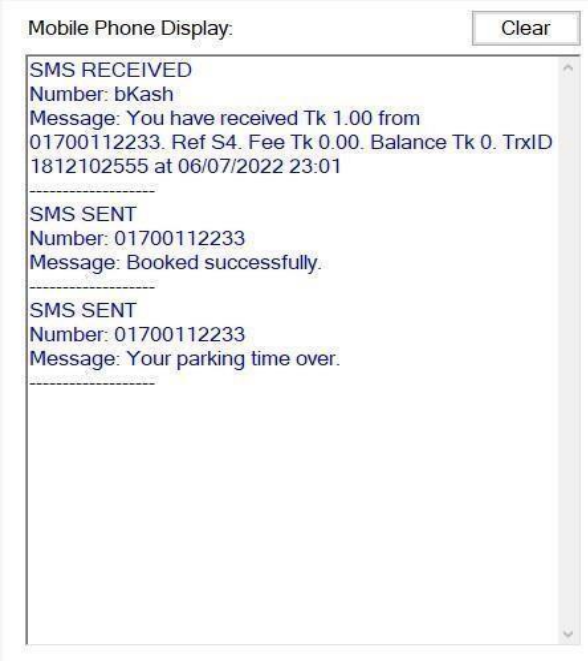


Figure 08: Camera view at the parking gate

If there is any fire detected in the parking place, then a warning message sends to the user which is notified about the fire. And also, a fire alarm will turn on which has to stop manually after taking the necessary steps to stop the fire.

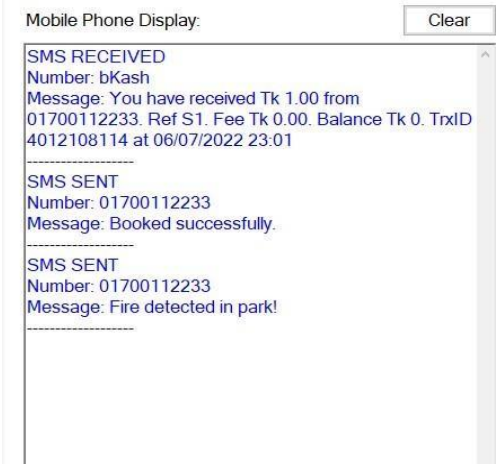


Figure-09: Fire detection warning to the user

Design 2

In this design, we have used 6 Motion sensors,1 LCD display, 1 Arduino Uno, 1 keypad, 1 servo motor, and 12 LEDs. There are 6 parking slots which will be shown on the display. Empty and occupied slots will be shown with the help of Motion sensors and Arduino Uno. There will be a counter to keep the counting of the car numbers. The keypad will be used to book the slots by clicking some numbers and the alphabet. The Servo motor will work as a gate for opening and closing the parking lot. It has an inbuilt motion sensor that will sense the car's presence and will open the gate automatically. There will be a passcode to book the slot which will be given after the payment.

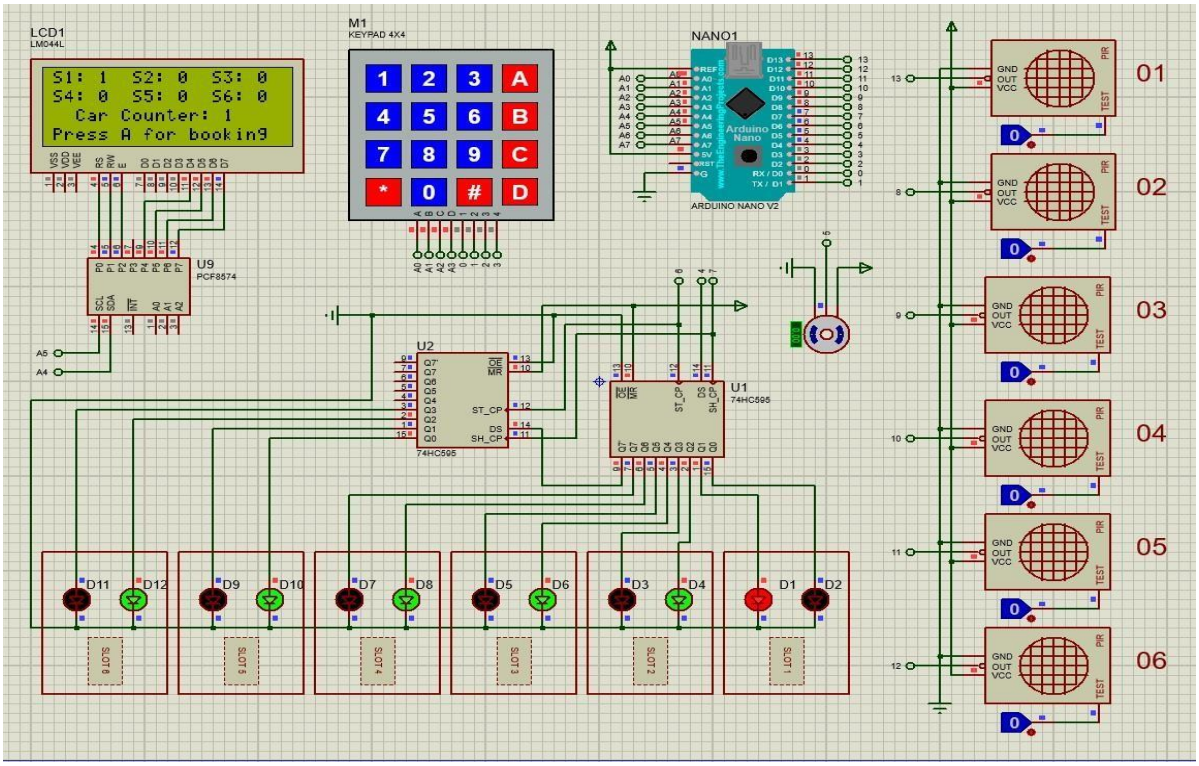
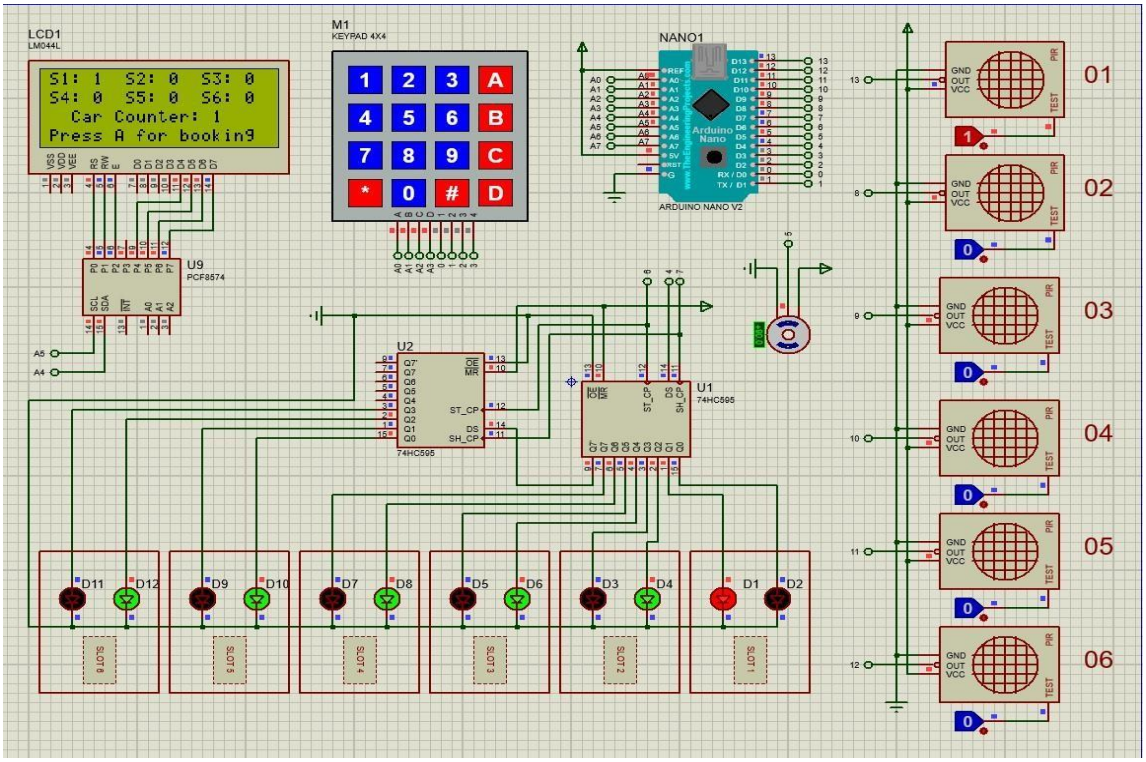


Figure-10: Proteus simulation for LCD-based parking system

In fig 10 we can see after user booked the slot 1 the LCD will show that slot s1 is 1 and the other slots are 0. The counter will also show the count of the car as 1. The slots which are booked will be shown in red and the slots which are not occupied will be shown in green. So, slot 1 will be shown red and the other slots will be shown green. The user will use the keypad to book the slot and will click the buttons which will be shown to click in the LCD.



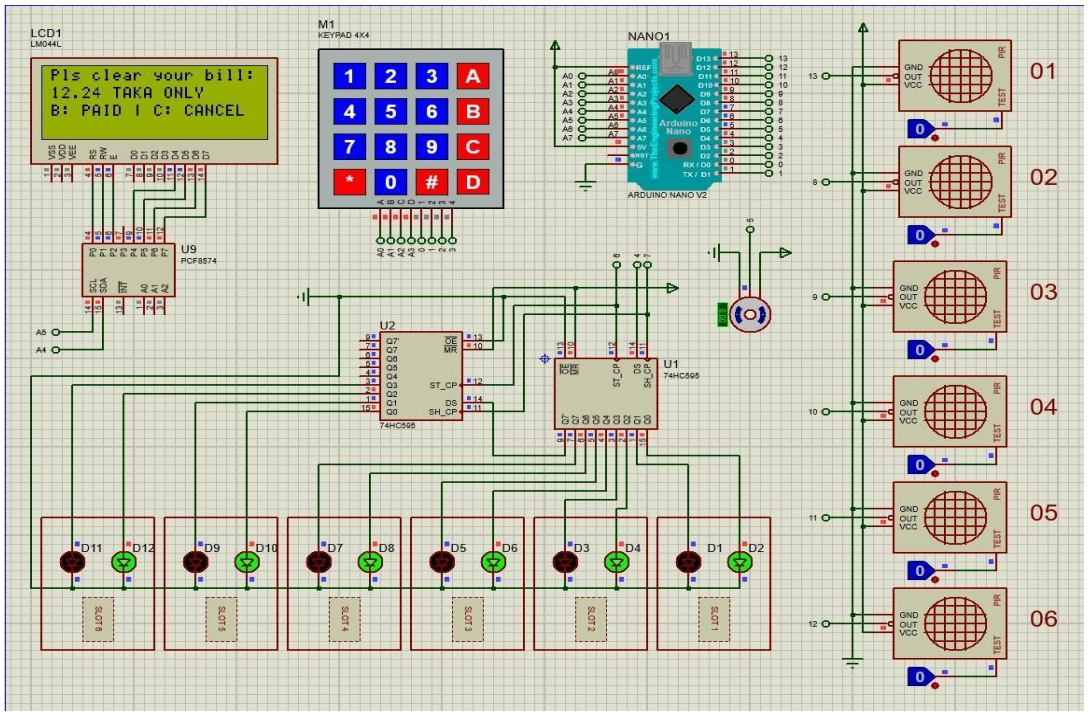


Figure-11: Proteus simulation for LCD-based parking system

In this simulation, we have a keypad where we put the pin code to book our parking slots. There are 6 slots in our design. As there are six slots in our design, we have 6 unique IDs that must contain 6 digits because we put a 6-digit password in our code. To book any of the 6 slots we must put in the unique IDs to confirm a particular slot for parking the car. The unique IDs for booking the slots are 123456, 234567, 345678, 456789, and 567890 for slot 1, slot2, slot3, slot4, slot5, and slot6. In the LCD display, we have the information on the 6 slots and counter for counting the total number of cars in the parking lot. To book the slot we need to press A on the keypad. As we have 6 slots in the design if we press 7 on the keypad it will show an invalid slot. Now if we want to book slot 1, we will press 1 on the keypad, and on the LCD display, it will show to put an access code. We know the access code for slot 1 is ‘’123456’’. So, if we put the access code in the keypad it will show to select the duration of parking time. After selecting the duration of parking time, the display will show the payment and there will be an option showing YES or NO to proceed with the payment. After selecting YES, the slot will be booked. After booking the slot the car counter will display 1. There is a servo motor and after booking the slot the servo motor will open for 10 seconds and it will close automatically. We can also book the remaining 5 slots in the same way.

4.3 Identify optimal design approach

In this section, we have performed a SWOT analysis and comparison between 2 designs to` determine our optimal design approach.

Comparison between Multiple Designs:

This comparison of Design 1 and Design 2 will offer all the necessary understanding that need to select the most effective solution for the problem. In order to determine which design is better, we compare many characteristics of both designs to one another.

	Design 1	**Design 2**
Detecting Free Spots	IR sensors Sensor	Motion Sensor (PIR)
Processing and Control Mechanism	Arduino Mega 2560	Arduino Uno Rev2.0
Showing Information	Users can see available and booked spots on the website	Users can see the parking spots status on the LCD display
Notification to Driver	In case of the driver overshoots parking time, a notification would be sent to the User’s mobile number	If the driver overshoots parking time a red light will start glowing

Booking Procedure	Users can book a parking spot through the website from any places	User must be present at the parking lot to ensure parking spaces
Saving time	Users don't need to wait in front of parking spots to ensure parking spots	Users need to wait some while to ensure parking spots
Security system	After the opening gate, the esp32 camera will capture a picture of the car and the number plate. Fire detection alarm available	No security system is available here
Sensor effectiveness	IR sensor detects whether the light by the transmitter is emitted by an object so there is no chance of letting off a false alarm.	PIR sensor may let off a false alarm due to the change in energy like airflow
Payment system	Through mobile banking	The manual payment system in front of the parking gates
Budget	BDT. 6000	BDT. 5400

SWOT Analysis of Design 1:

Strengths:

- **Automation.** The general idea of IoT involves direct communication between separate devices, apparatuses, and other hardware without human interference.

- **Connectivity.** Enhanced connections within one network on a worldwide scale provide easy access to various information.

- **Improved productivity of staff and reduced human labor:** Thanks to IoT solutions, many tasks can be done automatically, so human resources may be transferred to more complex tasks that require personal skills, especially out-of-the-box thinking. This way, the number of workers can be minimized, which results in reduced costs of business operations.

Weakness:

- **Increased unemployment**: Unskilled workers or even skilled ones are at a high risk of losing their jobs, leading to high unemployment rates. Smart surveillance cameras, robots, smart ironing systems, smart washing machines, and other facilities are replacing the humans who would earlier do these works
- **High dependency on the internet:** They rely heavily on the internet and cannot function effectively without it.

Opportunities:

- **Efficient operation management:** Another significant benefit offered by the interconnection of smart devices is automated control over multiple operation areas, including, among others, inventory management, shipping tracking, and fuel and spare parts management. For example, this approach involves using RFID tags and a corresponding network of sensors to track the location of equipment and goods.

- **Cost-effective operation:** Due to the reduced downtime periods, ensured by automatically scheduled and controlled maintenance, supply of raw materials, and other manufacturing requirements, the equipment may have a higher production rate resulting in bigger profits. Again, IoT devices greatly facilitate management within individual departments and across the whole enterprise structure

- **Thorough marketing and business development:** Smart devices that are situated at homes, especially voice assistants and other appliances that can directly communicate with end-users on a regular basis, provide invaluable source information for business analysis. IoT helps enterprises by gathering large volumes of user-specific data employed for developing business strategies, targeted advertising, fine-tuning price policy, and other marketing and management activities.
- **Improved customer service and retention:** The abovementioned collection of user-specific data achieved by using smart devices also helps businesses to understand the expectations and behavior of customers better. IoT also improves customer service by facilitating follow-ups after sales such as automatic tracking and reminding the customers about required maintenance of purchased equipment after its predefined period of use, the ending of warranty periods, etc.

Threats:

- **DNS threats:** Many organizations use IoT to collect data from older machines that weren't always designed with more recent security standards. When organizations combine legacy devices with IoT, it can expose the network to older device vulnerabilities. IoT device connections often rely on DNS, a 1980s decentralized naming system, which might not handle the scale of IoT deployments that can grow to thousands of devices. Hackers can use DNS vulnerabilities in DDoS attacks and DNS tunneling to get data or introduce malware.

- **IoT ransomware:** As the number of unsecured devices connected to corporate networks increases, so do IoT ransomware attacks. Hackers infect devices with malware to turn them into botnets that probe access points or search for valid credentials in device firmware that they can use to enter the network.

SWOT Analysis of Design 2:

Strengths:

1. It can detect available parking spots.
2. Drivers can easily find parking spots by looking at the LCD display.
3. Reduces illegal parking.
4. Cost of design 2 is less than design 1.

Weakness:

1. Continuous need for electric supply.
2. Need lots of connections wire and also code for running Arduino.
3. Need lots of Arduino and Motion sensors for setting up the design.
4. If the car is more than the parking lot, managing the extra car slots will be difficult.

Opportunities:

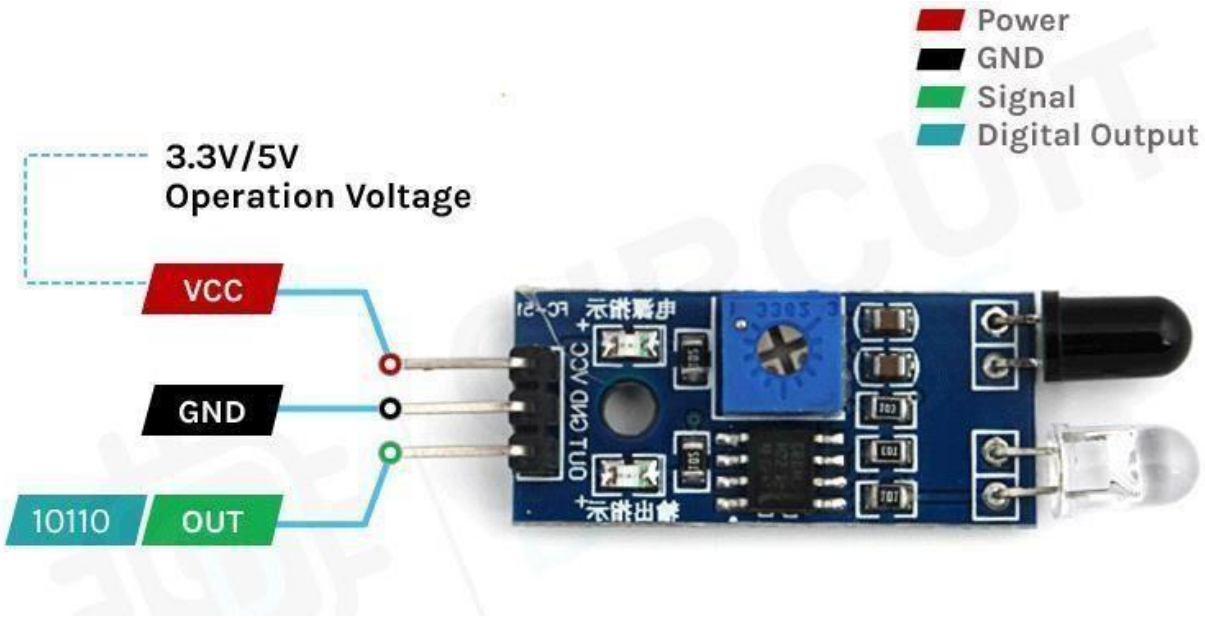
1. A new system in the Bangladeshi market so no competitors.
2. people will want to use the system to stop illegal parking and to keep their vehicles secure.
3. A new business opportunity will be opened as new job opportunities.

4.4 Performance evaluation of solutions:

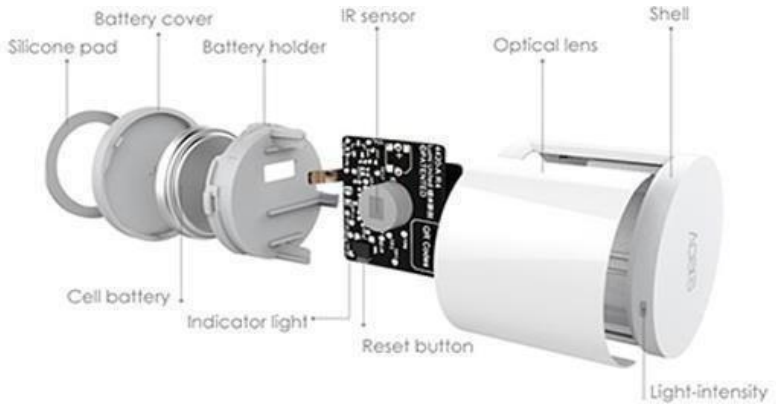
IR sensor: An IR sensor is a radiation-sensitive optoelectronic component with spectral sensitivity in the infrared wavelength range of 780 nm to 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests. In a defined angle range, the sensor elements detect the heat radiation (infrared radiation) that changes over time and space due to the movement of people. Such infrared sensors only have to meet relatively low requirements and are low-cost mass-produced items.

Item	Value	Result
Operating voltage	3.3 ~ 5 VDC	Checked

Distance measuring range	2 ~ 30 cm	Checked
Dimensions	48 X 14 X 8 mm	Checked
Weight	14 gm	Checked
Accuracy	Sharp	Checked
Pin	3 (VCC, GND, OUT)	Checked



Motion sensor: A motion sensor (or motion detector) is an electronic device that is designed to detect and measure movement. Motion sensors are used primarily in home and business security systems, but they can also be found in phones, paper towel dispensers, game consoles, and virtual reality systems. Unlike many other types of sensors (which can be handheld and isolated), motion sensors are typically embedded systems with three major components: a sensor unit, an embedded computer, and hardware (or the mechanical component). These three parts vary in size and configuration, as motion sensors can be customized to perform highly specific functions.



Item	Value	Result
Input voltage	DC 4.5 ~ 20 V	Checked
Static Current	<50 uA	Checked
Output signal	0V / 3V (Output high when motion detected)	Checked
Sensing Range	7 meters	Checked
Delay time	8s ~ 200s (adjustable)	Checked
Dimensions	24mm*32mm*25mm	Checked
Weight	6.6gm	Checked

Conclusion:

From the SWOT analysis, we have found that design-1 is the optimal solution, which meets all the objectives of our project by keeping the system efficient, Therefore, we have analyzed all the factors and our optimal design is design-1.

Chapter 5: Complementation of Final Design and Validation

5.1 Introduction

In the previous chapter, we simulated both of our proposed designs and we selected design 1 as our optimal design. In this chapter, we have implemented our optimal design prototype.

5.2 Completion of the final design

In the figure 12, we can see the simulation schematic of our prototype.

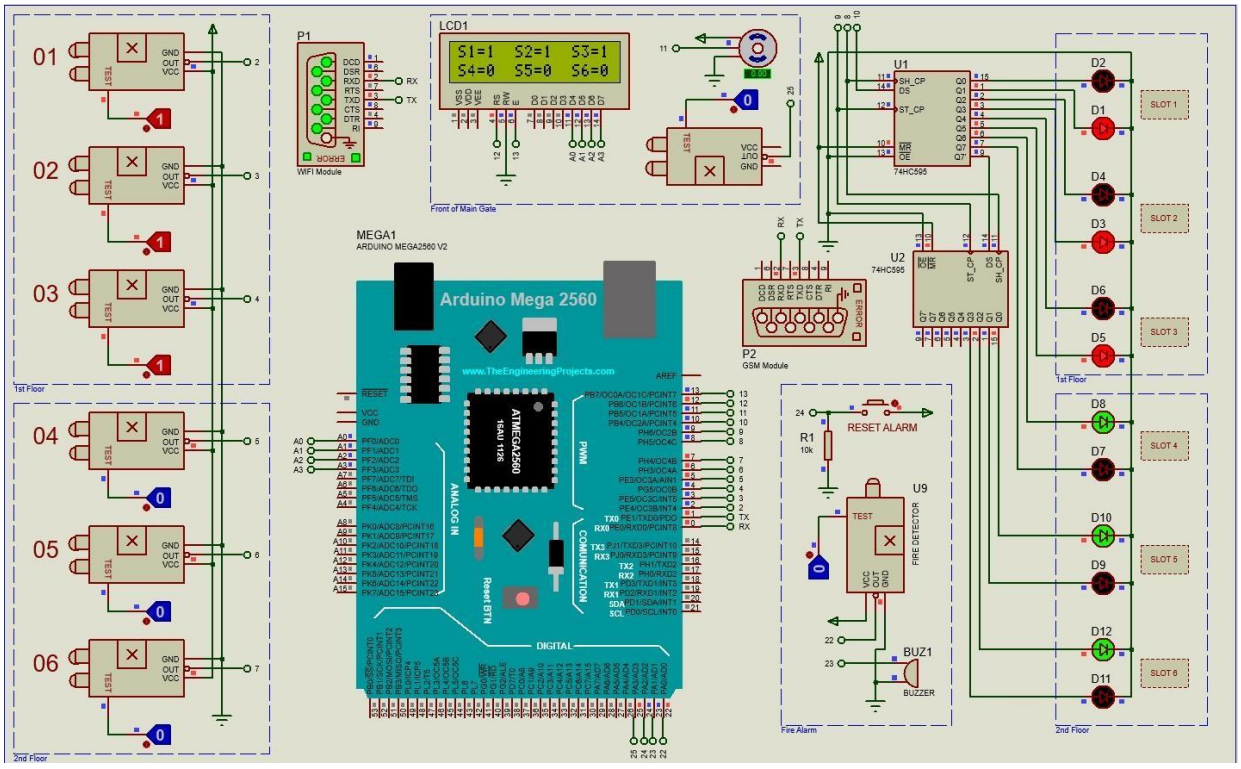


Figure12: Simulation of our optimal design

For our prototype, we divided our system into three sub-systems. Firstly, the website, the sensors, and the breadboard model. First, we built our breadboard model and tested the IR sensors reading to validate our readings. At first, we got some unusual reading but after fine-tuning, we got our desired reading. We can see our sensor subsection in Figures 13 and 14. After that, we created an electric powering system to power up our sensor subsystem. Furthermore, to show real-time data we have built a website for our prototype which can be seen in figure 15. In the subsystem, the Arduino UNO is used to collect the sensor data and it is sent to the server with the help of the Wi-Fi module. After collecting all the data in the server, we can see the real-time data on our website. After we were able to complete our website design and the sensors were working properly, we move to our PCB design. We can see our PCB design in figure 16.

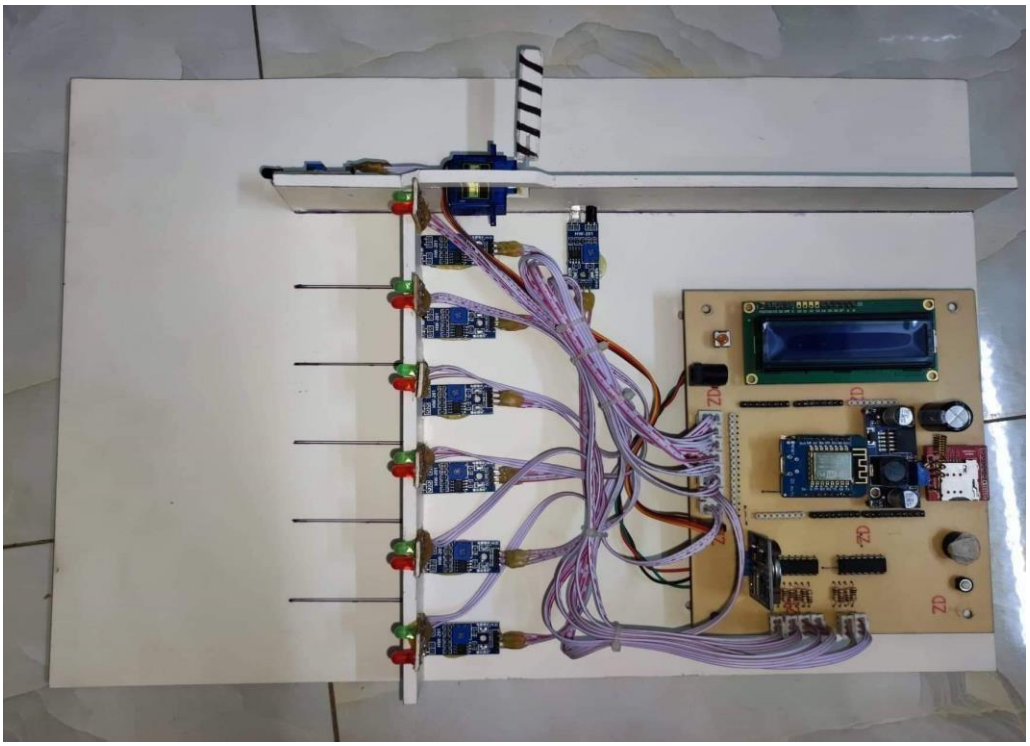


Figure 13: sensor section of our design project

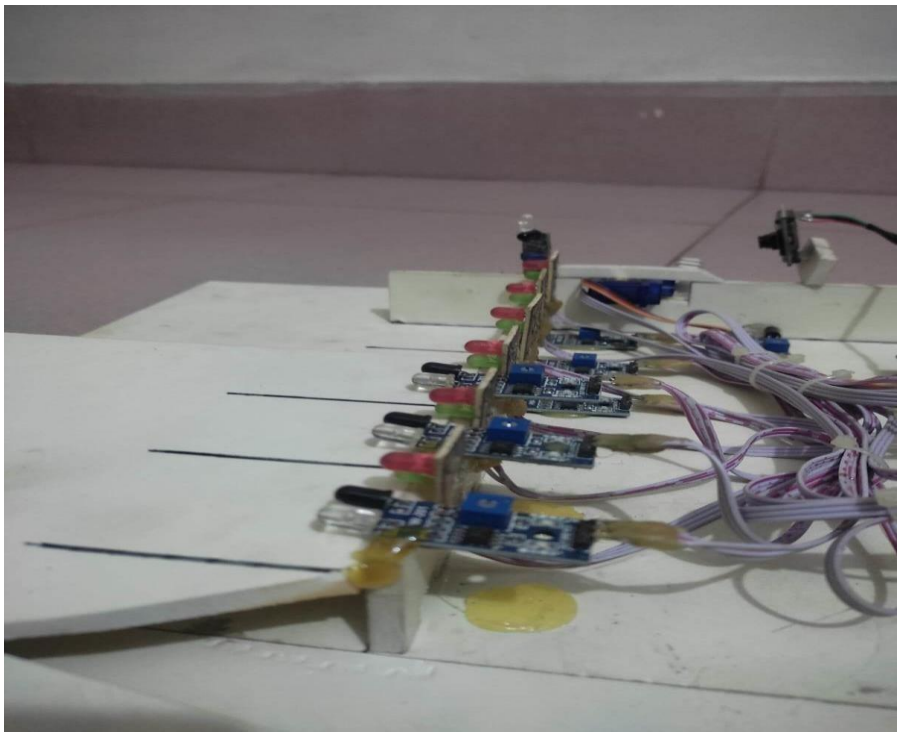


Figure 14: sensor section of our design project

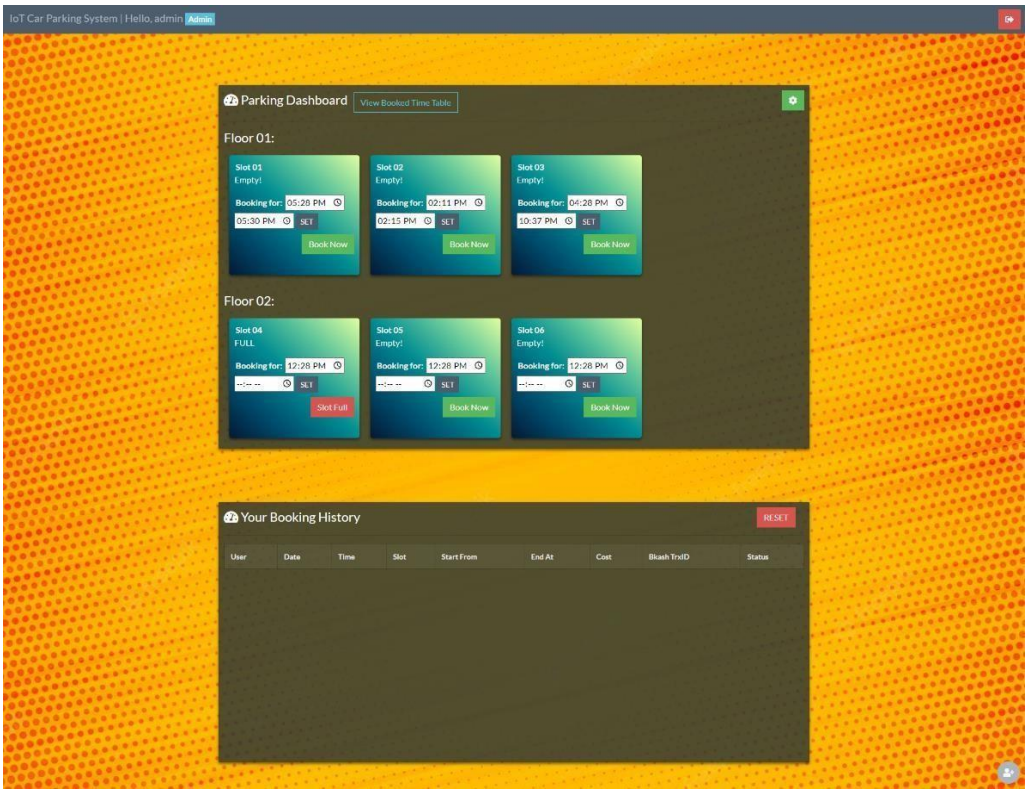


Figure 15: Website for real-time data showing

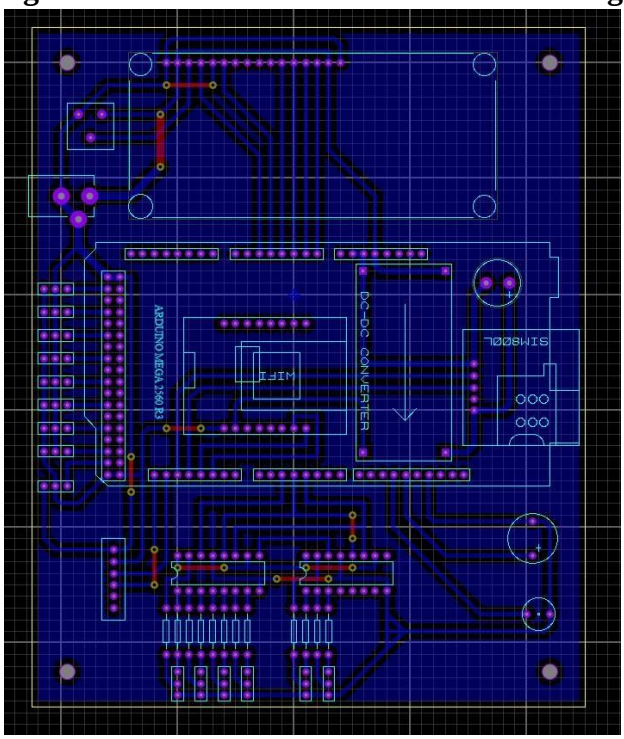


Figure 16: PCB design for our prototype

In our prototype design, we also used an ESP32 camera in front of the parking lot beside the servo gate. It will capture the user's car number plate and the user's picture for security purposes. All of the information will be sent to designated mail.

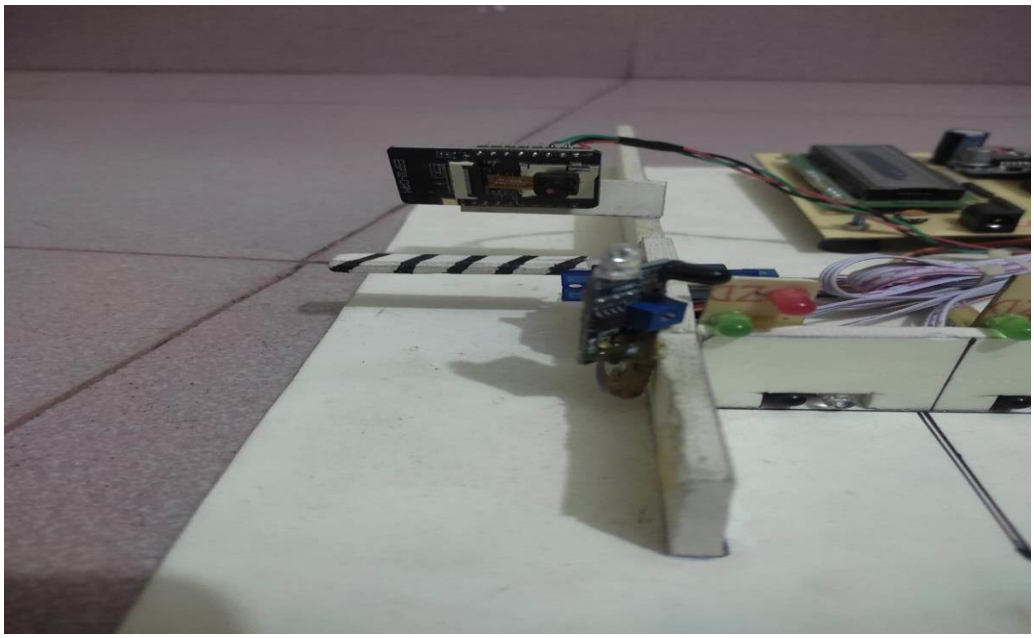


Figure17: ESP32 camera for capturing number plate and car photo

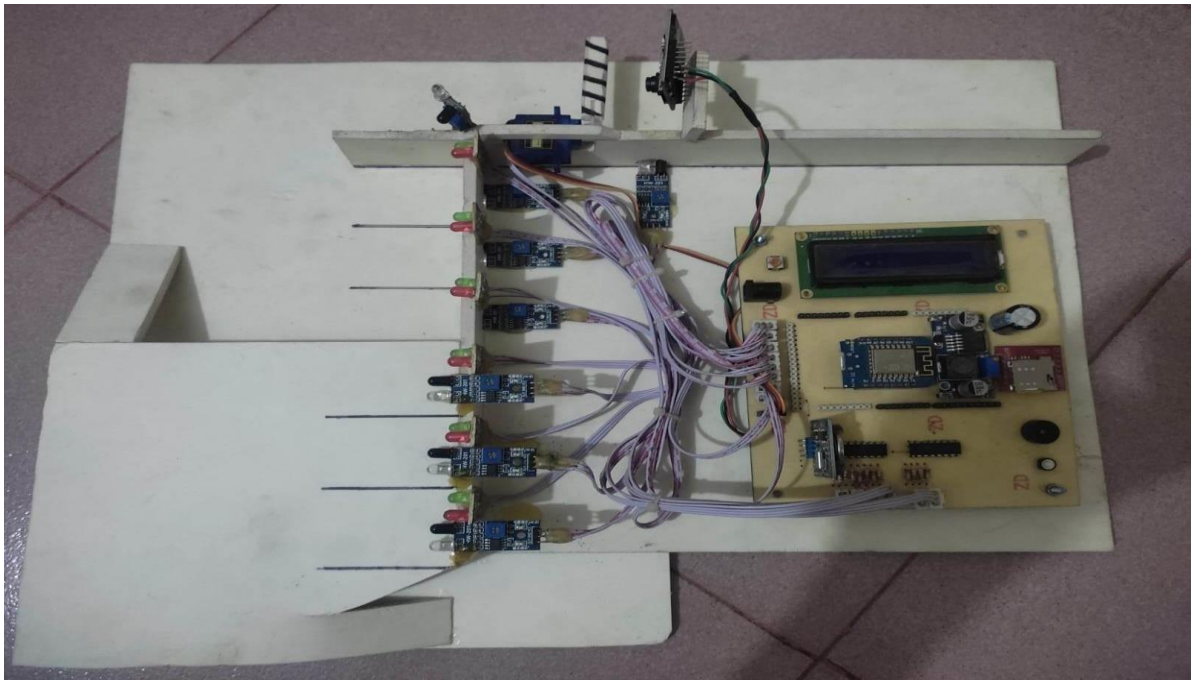


Figure 18: Implementation of our design prototype

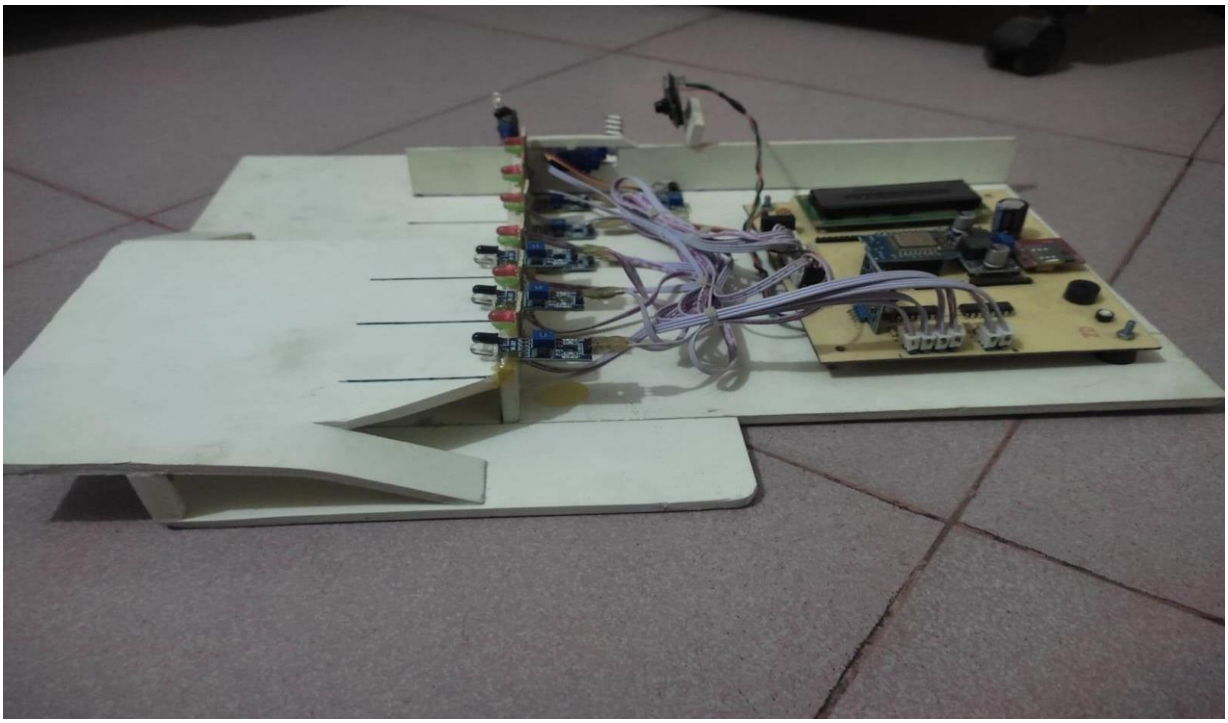


Figure 19: Implementation of our design prototype

Here we have used a 16*2 LCD display and 8 IR sensors for our prototype. Here, 6 IR sensors are used for detecting empty and occupied spaces and 1 IR sensor is used for the fire alarm system and another is used for ESP 32 camera detection. We have used a servo gate in front of the parking lot for automatic gate opening and closing. We have also used a dc-dc converter because we have 5v power but we need a 4v power supply. We used a buck converter to convert the 5v power supply to a 4v power supply to run the SIM80L module. We have also used a GSM module to notify the users about any fire detection in the parking lot and also about their parking time over notification. All components are controlled by Arduino Mega which will receive all the data and it will send it to the server with the help of a Wi-Fi module. After that, we can see real-time data on the website from our electronic devices.

5.3 Evaluate the solution to meet desired need

The main objective of our project that user can see available parking spot with the help of website. Here we are using IoT technique to show the real time update to the website. Moreover, another objective was the user can book a parking spot with the help of websites. So that user doesn't need to go to the parking spots to reserved his/her parking spots. They can book their parking spot from any place with the help of website. Also, we add some security features. First of all, vehicles can only enter to the parking spots if they booked a place from the website. Because there is a servo gate at the parking gate and that gate will only open by pressing a button "Open gate". While a car will go through the parking gate after opening the servo gate, an IR sensor detect the car and ESP32 camera will capture the picture of the car.

Checking Available parking spots

User can see the available parking spaces with the help of a website. They don't need to come to the parking spaces to check the available spots, they just need to go to the website and can check the available.

Also, user can check the available parking spots at the LCD display which is installed with parking spaces

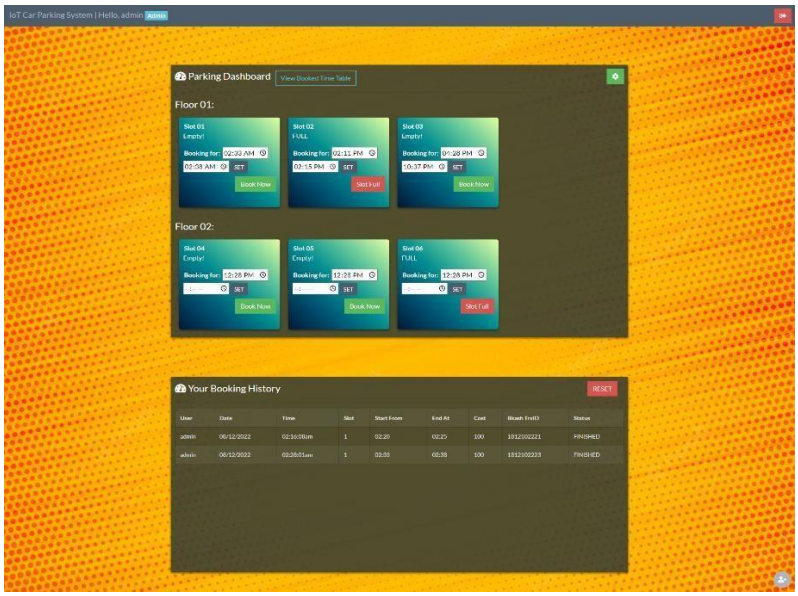


Figure 20: Checking Available Parking spots at the website and LCD display

In figure 20, we can see that there are two cars at slot 2 and slot 6 so that the LED light of those slot turn into red and the other slot are at green which means they are available for booking. And also, at the website it shows that slot 2 are slot 6 are full and there is no option for booking anymore. On the other LCD display shows the S2 and S6 are booked by showing "1".

Booking Procedure:

At first user need to go to the website to check vacant and booked spaces. If the spaces are available then it shows "Book Now" button. User need to go through following steps to book a particular space.

- User need to go to "View booked Time Table" option to see the available time slot for booking otherwise it will show a conflict message if any other user booked at the same time (figure 21).

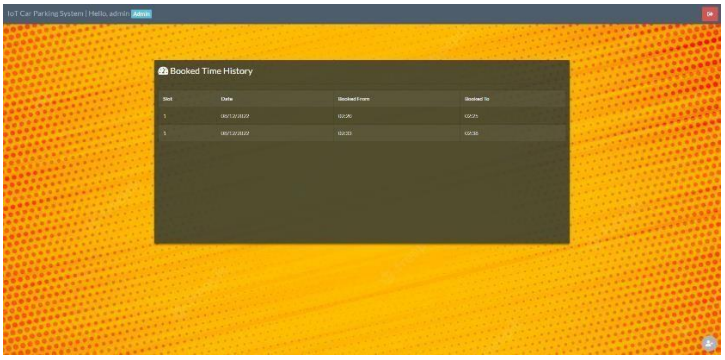


Figure 21: View booked Time Table

- After checking the booking time table, user can find out free time for his parking. User need to give a time from where he/she will be parking the car and when he/she will end his/her parking time. After setting up the time user need to press "SET" button.

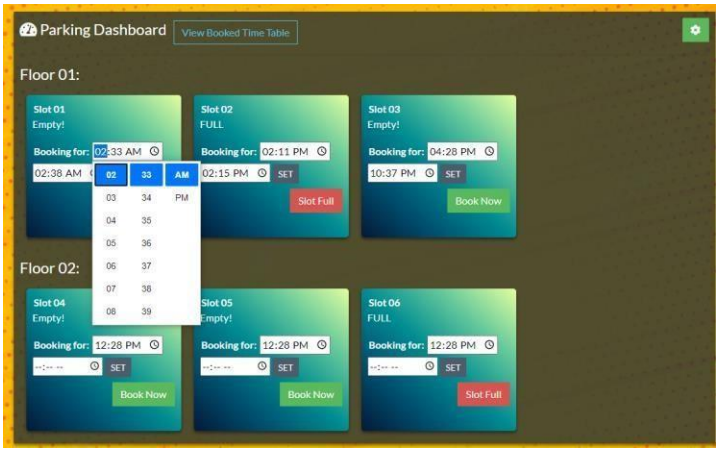


Figure 22: Setting up the parking time • Then user need to click the "Book Now" button and a checkout page will come where user can see all of the necessary information. Where user can find out the cost for his parking spaces. After the payment, user have to type his Transection ID to confirm his booking.

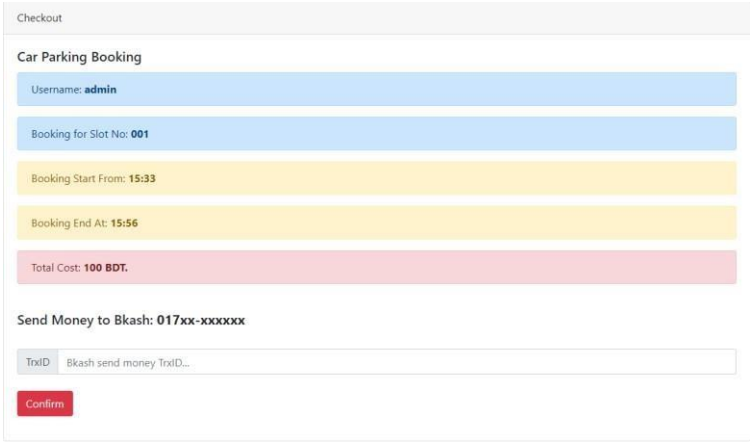


Figure 23: Checkout Page for the parking

After completing the following steps, the parking slot will be booked. Then a confirmation message will send to the user mobile number with the help of GSM module.

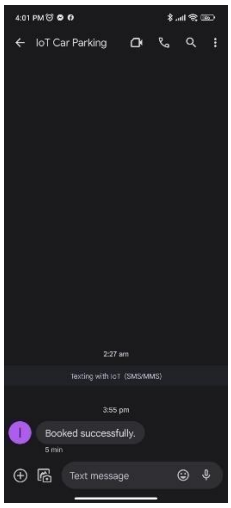


Figure 24: Confirmation message send to the user mobile phone

When the given time comes then the website will show the place is full and also the red LED will turn on even if the car is not there at that moment.

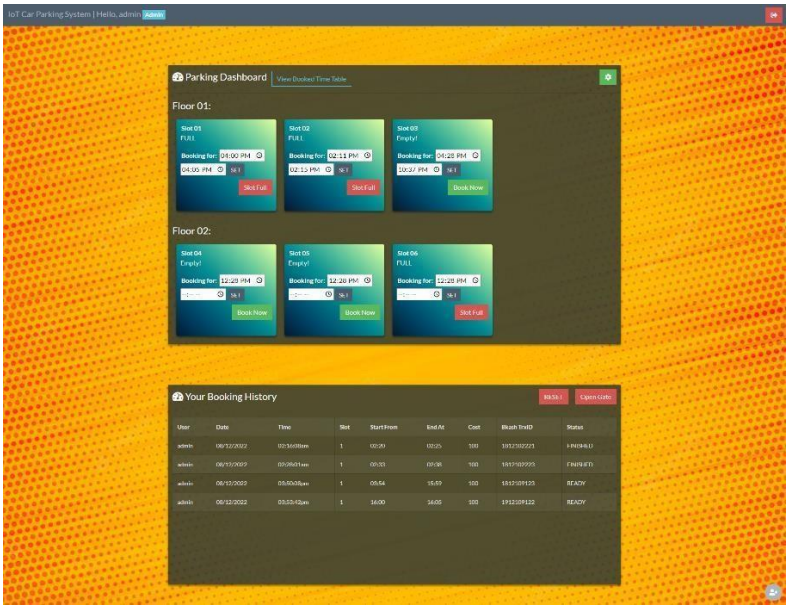
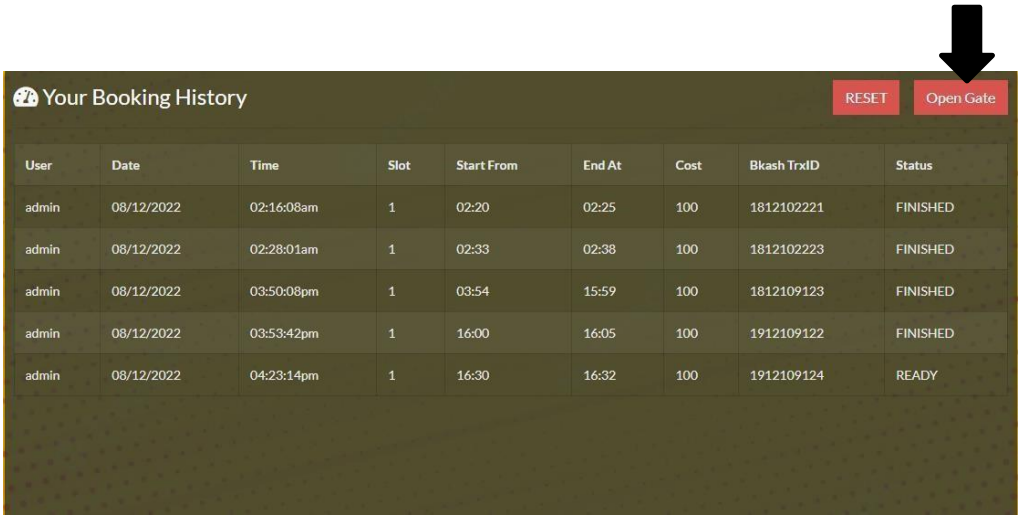


Figure 25: LED turn red at the booking spot & the website shows the slot is full

Open Gate procedure:

After completing the payment successfully an open gate button will appear. Pressing the open gate button, the gate in front of the parking gate will open. When a car goes through the car an IR sensor detect the car and an ESP32 camera will capture the picture.



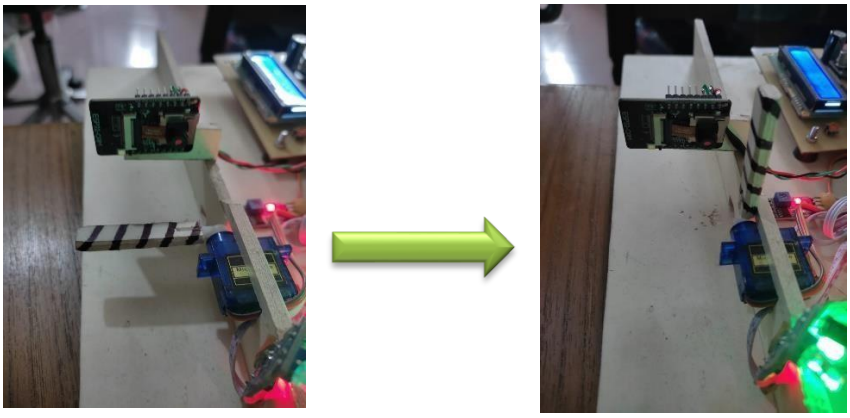
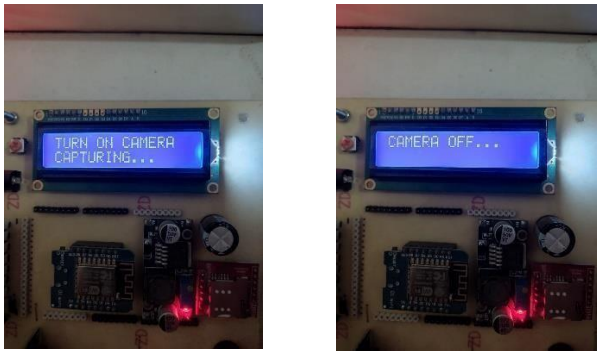


Figure 25: Opening gate After pressing open gate button



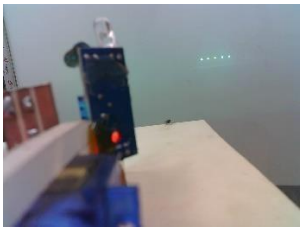


Figure 26: Capturing Picture with ESP32 camera

Ending of Parking Time

After ending the given time, a confirmation message sends to the user to warn about the time. And a warning alarm will turn on to the parking spots. After leaving the parking space the spots LED turn into green and the site will show that the spots is now available for another parking.

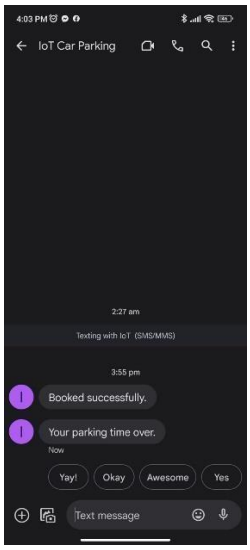


Figure 26: Warning Message to User phone

5.3 Conclusion

We have to go through a lot of modification to come to the final result. Though it's a prototype design we can't show the real payment method here. We used a fake payment system to show how it will work at the real time. To make it real payment we need a BKash merchant account which is not possible for the prototype design and also it will make the system more costly.

Chapter 6: Impact Analysis and Project Sustainability

6.1 Introduction:

Whether a product will be well-received by stakeholders and the wider public is a constant source of worry. This is dependent on the product's sustainability and effect on the auto parking infrastructure. The needs of the stakeholders must be maintained while balancing other priorities including social effect, safety, and impact optimization.

6.2 Assess the impact of the solution:

- **Constant system monitoring:** constantly gathering information from the parking lot system using different sensors.
- **Data Comparison:** Real-time sensor data will be compared with threshold values in the cloud server.
- **Real time data analysis:** The sensors will be connected to a specific cloud server that will be gathering real-time data, allowing users to examine the system's operation in the parking lot area at any time.
- **Alerting user during abnormality:** Any worrisome problem, such as a fire or another problem, will notify the system management authorities.
- **Greater profit:** As a result of the parking system's automation technology, labor costs will go down. Over time, this will result in increased earnings.
- **Entrepreneurship:** This can be a brand-new venture for business owners.

6.3 Evaluate sustainability:

Future upgradable with less budget. In this project, we are implementing it in such a way that we can further upgrade our system in the future with a minimum budget. Backup battery for power failure. Solar power in the system in case of load shedding is a problem. To cure this problem, we can use a solar panel. Here is the strength that low power consumption and smart traffic control management. Weaknesses such as server traffic and network connectivity issues. There is one big opportunity such as there are no competitors, and this will make it easy to grab the attention. Everyone longs for a happier existence. As a result of our project, which ushers in a new age for Bangladesh's car parking system, the public will perceive societal progress. Since enough information about available spots will be displayed, there won't be any chance of congestion. This system is organized well. The entertainment will draw spectators to the parking lot, where he can leave his car if there is room. He can also book the parking space using an app before going to park the car to avoid more hassle. Therefore, it won't be a difficult situation if we spend a lot of time looking for a parking spot for our cars.

Our approach will, because there isn't a suitable parking management system in place, have a huge influence. Excellent impact Drivers who reserve a parking space will pull up and park with a sign indicating their reservation. Details. They'll have ample time to park the automobile appropriately. There will therefore be no safety. Concerns. We will take all legal requirements seriously to prevent any violations of laws. The entire system will go through proper testing to ensure that it performs as planned. Thorough examination. both within acceptable safety tolerances and standards. We'll pick a good parking

spot site. a system that won't interfere with the mechanisms and won't obstruct the way for oncoming traffic plus, persons. Thus, our solution would provide users with a comfortable experience while still helping them. By using cutting-edge technologies, our solution will help yet another industry transition to autonomous operation while providing users with a comfortable experience. We consequently believe that this project will have a big impact on how they live in the modern world.

6.4 Conclusion:

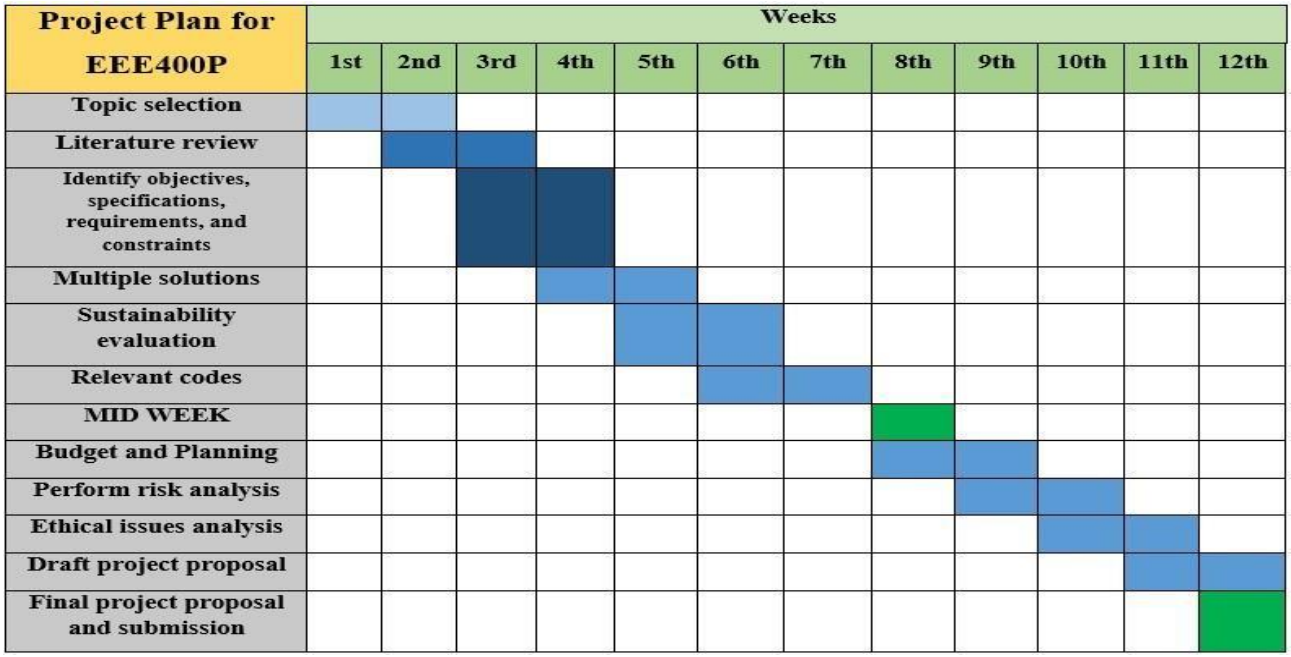
One of the most important problems we face today is finding a suitable parking spot. One can easily buy a car with the recent economic expansion and the low cost of cars, but the amount of parking space has not expanded significantly. So, locate a suitable parking location. A car is a major hassle and wastes our precious time. To save time and to find. We have created a project where users can learn about parking spaces quickly. Using a smartphone app, locate the best parking spot. They can reserve a parking space by using a smartphone app, anywhere without having to enter a parking lot. It'll help you save a ton of money. It will help us save a great deal of time and make it simple for the user to find a parking spot.

Chapter 7: Engineering Project Management:

7.1 Introduction

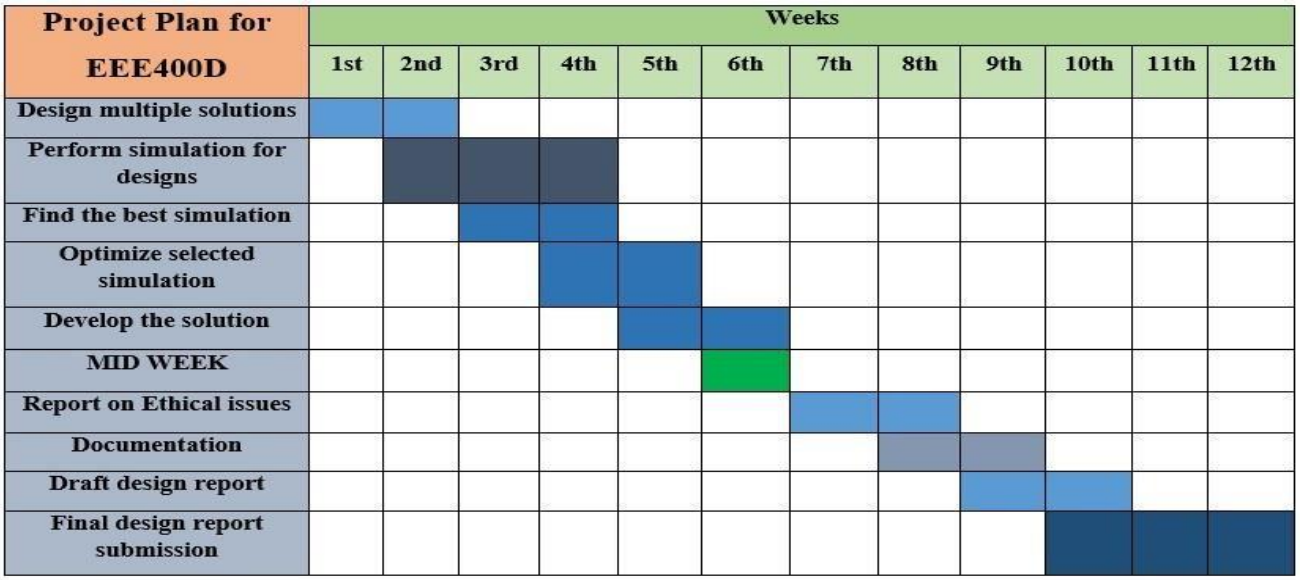
Project Management is often defined as an important facet to define the plan, process, goals, and deliverables of a project. To succeed, we need to define the project and scope and maintain and update the project timeline regularly. In addition, we need to access the resources and the project plan. Moreover, making sure efficient communication between the team members and the persons involved is vital. Finally, we should also prepare contingency plans if any emergency arises.

7.2 Define, Plan and manage engineering project

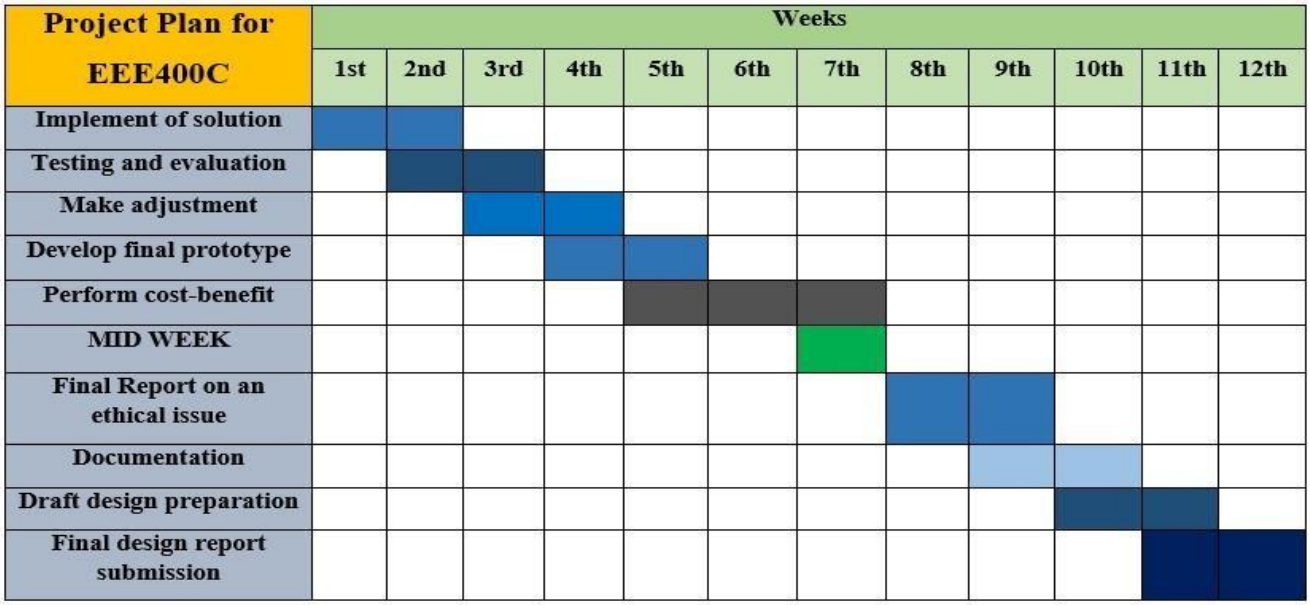


Tasks FYDP P	Start time	End time	Duration
Topic selection	03.02.2022	10.02.2022	7 days
Literature review	10.02.2022	17.02.2022	7 days

Identify objectives, Specifications, requirements, and constraints	17.02.2022	24.02.2022	7 days
Research multiple solutions	24.02.2022	03.03.2022	7 days
The impact of the solution and evaluate the sustainability	03.03.2022	10.03.2022	7 days
Identify relevant codes	10.03.2022	17.03.2022	7 days
MID WEEK			
Budget and Planning	17.03.2022	24.03.2022	7 days
Risk analysis	24.03.2022	31.03.2022	7 days
Ethical issues and professional responsibilities	31.03.2022	07.04.2022	7 days
Draft project proposal	07.04.2022	14.04.2022	7 days
Final project proposal submission and final presentation	14.04.2022	21.04.2022	7 days



Tasks FYDP D	Start Time	End Time	Duration
Design multiple alternative solution	05.05.2022	12.05.2022	7 days
Simulation of alternative solution	12.05.2022	19.05.2022	7 days
Analyze and find the best solution simulation	19.05.2022	26.05.2022	7 days
Optimize selected solution design	26.05.2022	02.06.2022	7 days
Develop the solution using the appropriate tools	02.06.2022	09.06.2022	7 days
MIDWEEK			
Report on ethical issues and professional responsibilities to the project	09.06.2022	16.06.2022	7 days
Documentation	16.06.2022	30.06.2022	14 days
Draft design report preparation	30.06.2022	07.06.2022	7 days
Final design report submission and final presentation	07.06.2022	14.06.2022	7 days



Tasks FYDP C	Start Time	End Time	Duration
Implementation of selected solution	04.08.2022	11.08.2022	7 days
Testing and evaluation	11.08.2022	18.08.2022	7 days
Make adjustments according to the evaluation	18.08.2022	25.08.2022	7 days
Develop and validate the final prototype using IT tools	25.08.2022	01.09.2022	7 days
Perform cost-benefit and economic analysis	01.09.2022	08.09.2022	7 days
MIDWEEK			
Report on ethical issues and professional responsibilities to the project	15.09.2022	22.09.2022	7 days
Documentation	22.09.2022	06.10.2022	14 days
Draft design report preparation	06.10.2022	20.10.2022	14 days
Final design report submission and final presentation	20.10.2022	03.11.2022	14 days

Chapter 8: Economical Analysis:

8.1 Introduction:

Economic analysis is necessary to assess a project's costs and advantages. Economic analysis helps us determine how financially viable a project is. However, the primary goal of such a study is to comprehend the type of reaction a product is receiving, such as revenue generation. Additionally, economic analysis is a very helpful tool for a better understanding of any business outcome.

8.2 Economic analysis:

Economic analysis gives us advice on how to effectively allocate resources to produce more money from any product. We can determine how effective a product or business is by applying economic analysis to acquire a better grasp of how much profit a business or product is making. Since car parking systems are now operated manually, all parties involved in this industry rely largely on it. In comparison to the current manual system, our system includes a solution for automatically monitoring and controlling the system. Our system will be more cost-effective if it has a broad scope.

8.3 Cost benefit analysis:

An examination of costs and benefits is used to determine whether a project is feasible. A cost benefit analysis, which is a component of economic analysis, has the advantage of providing a trustworthy, quantitative guide for decisions connected to the future of the product if done correctly and with accurate assumptions. To be cost-effective, the project does not have to be finished for the absolute lowest price. The project's components and sensors' efficacy, performance, and durability are the most crucial aspects. The market offered a wide range of components and sensors for the completion of the prototype design, making it difficult to choose the best option in terms of price and performance. The most effective and cost-efficient components must be chosen if we want to get the finest results. Although each of the components chosen for the prototype design has certain pros and cons. This governance procedure is crucial if the product is to guarantee consumer pleasure. Data from the sensors is processed by the CPU of the system in Design 1 using an Arduino microcontroller.

Components	price	Strength	Weakness
Arduino Mega	2000	1.Easily swappable 2.Can handle more components than Arduino UNO	1.Can’t get connected with internet directly. 2.More expensive comparing to Arduino UNO
ESP32 Camera	990	1. Connect to firebase database. 2.Easily swappable.	1.Low power processing.
Servo motor	600	1. High output power relative to motor size and weight. 2. Encoder determines accuracy and resolution.	1. Servos Motors requires tuning to stabilize the feedback loop.

			2. Servo Motor will become unpredictable when something breaks. So, safety circuits are required.
GSM Module	450	1. More suitable network with robust features. 2. Worldwide connectivity and extensive coverage.	1. Bandwidth lag because of multiple users shares the same bandwidth so the transmission can encounter interface. 2. It provided limited data rate capability so for high data rate advanced version of GSM devices are used.
IR Infrared Obstacle Avoidance Sensor Module	50	1. It provides secured communication due to line of sight or point-to-point mode of communication. 2. They are physically smaller in size and are more affordable.	1. Infrared waves at high power can damage eyes. 2. It supports lower data rate transmission compare to wired transmission.

8.4 Evaluate economic and financial aspects:

As we will be able to manufacture this system in line with the needs of any stakeholders in smart auto parking, this project will be advantageous from an economic and financial standpoint. A reasonable fund will be needed to set up the commercial system for any given field, and this funding will assist us enhance the system for greater performance. Our economy will steadily benefit from the construction and development of IOT-based smart parking system monitoring and maintenance systems in our nation. The following budget is allocated for the implementation of a prototype:

Budget for prototype Design:

Component	Approx. Price (BDT)	Quantity	Link
Arduino Mega	2000	01	https://store.roboticsbd.com/arduinobangladesh/9arduino-mega-2560r3roboticsbangladesh

16*2 LCD	200	01	https://store.roboticsbd.com/home/1167-
			raspberry-pi-7inchhdmi-touchscreenlcd-with-caseroboticsbangladesh.html
IR Infrared Obstacle Avoidance Sensor Module	50	08	https://store.roboticsbd.com/sensors/685-irinfrared-obstacleavoidance-sensormodule-roboticsbangladesh.html
Servo motor	600	01	https://store.roboticsb d.com/133-servomotor
USB cable	150		https://www.daraz.co m.bd/other-phonetablet-accessories/
GSM Module	450	01	https://www.electroni cs.com.bd/gps-gsmgprsmodules
ESP32 Camera	990	01	https://store.roboticsbd.com/arduinobangladesh/1407esp32-cam-wifibluetooth-cameramodule-developmentboard-esp32-withcamera-moduleov2640-roboticsbangladesh.html
Miscellaneous	1000		
Total	5790		

8.5 Conclusion:

An economic and financial point of view is necessary to comprehend how the project will perform in the future. Whereas financial analysis determines the required resources, economic analysis aids in project maintenance and sustainability. Only the systems' productivity and performance fall short of what is required for a project to be viable for a long-term viable.

Chapter 9: Ethics and Professional Responsibilities

9.1 Introduction

In order to develop a feasible and helpful engineering project for our users it is important to contemplate the ethical and professional responsibilities of the project. focusing on those we can understand our project's social, economic, and ethical values. It will help us to design our project considering all the humanitarian aspects and professional responsibilities.

9.2 Identify ethical issues and professional responsibilities

Our project focuses on designing and implementing a smart car parking system using the internet of things. Our project will make our user's life easier by finding available parking spots easily without wasting our valuable time. Throughout the establishment of our project, we have considered ethical issues and professional responsibilities.

- Our project is environment-friendly. We have taken necessary cautions so that we do not use any kind of equipment that can harm our environment.
- We will ensure cyber security so that our users' data will not get compromised. We will ensure our user's privacy.
- Our parking spots will not hamper the pedestrian and sidewalks.
- Our parking lots will be made abiding by all the laws and considering the public interest.

9.3 Apply ethical issues and Professional Responsibility

Environmental Safety:

We are maintaining all necessary protocols and avoiding all kinds of equipment which can be harmful to our environment. We have talked with environmental activists regarding it.

Managing Quality:

We will try to ensure the best service for our users so that they do not face any problems booking the parking slot. We will take extra measures during the holidays if the server gets crowded when people will try to visit the website simultaneously.

Server Security:

We will have a special team of IT experts who will continuously monitor our cyber security. They will ensure that our system will not get attacked by a security breach or IoT ransomware.

Government laws and People's interest: We will talk with a lawyer so that we develop our project considering all laws of our country. We will also take the necessary precaution before selecting a parking lot location considering people's benefits and safety.

9.4 Conclusion:

Our project will make our life easier and will save a lot of our valuable time. We have considered all the ethical issues and professional responsibilities so that our project will have a great impact socially,

Economically, and ethically. We have also considered all the professional responsibilities so that our project ensures the best service to our users.

Chapter 10: Conclusion and Future Work.

10.1 Project Summary

Finding an appropriate parking place is one of the most critical issues that we have nowadays. With the recent growth in the economy and the low price of cars one can easily afford a car but the parking space has not been increased that much. So, finding an appropriate place for parking a car is much of a hassle and it kills our valuable time. So, to save our valuable time and to find a parking space easily we have devised a project in which users may obtain information about the appropriate parking space with the help of a mobile app. they can book the parking slot from anywhere by the mobile app without even coming the parking lot. It will save a lot of our valuable time and the user can easily find his parking space without hassle. In the project, we are showing two designs for solving the problem. Design 1 is IoT based design and Design 2 is LCD based. According to the Components and system level Specifications and functional and non-functional requirements with Proteus simulation, our best option for a smart car parking system is Design 1, which is an IoT-based system. Design 2 is far more reliant on human labor; a guard must be stationed in front of the gate to take payment and provide the user with the access code for admission. However, design 1 doesn't require much human work because the entire system is automated and based on IoT. Here, users can pay through mobile banking, eliminating the need for a guard to collect payments. There is no need to provide an access code in design 1 because the user can confirm his parking space by providing the transit ID. However, there is no method to check a reserved or free parking space in design 2. In order to examine the available and reserved slots, users must approach the gate. However, in design 1, a user can browse a website to view available and reserved slots before visiting a parking area. Additionally, in design 2, the user must provide all required information and make payment in front of the parking gate. Such that there will likely be a long line in front of the parking places, which might be very problematic.
However, in design 1, users can enter all required information and make payments online, preventing lines from forming in front of parking gates and promoting system discipline. In design 2, there is no guarantee that the user will be able to find a parking space for a vehicle. Due to the fact that we can only confirm your parking spot once you arrive at the parking area. However, in design 1, users can reserve their parking places online before entering the parking area. In design 1 we used an IR sensor to detect the car’s presence on t, on the other hand, we used a motion sensor for design 2. There is no risk of setting off a false alarm because the IR sensor determines whether the light from the transmitter is being emitted by an object. PIR sensor may trigger a false alarm in response to an energy change, such as airflow. Taking into consideration all the arguments, we determine that Design 1, an IoT-based smart parking system, is the best option for our project to develop a smart car parking system.

10.2 Future work

There are huge opportunities for developing the project in the future. First of all, we can update the identification system. In other words, now we are using Cameras to identify, in the future, we can update it by using finger sensors to do more specific identification of the user. In addition, we will work on system response. To illustrate, now our system is responding at a regular speed but whenever we build it for 3000+ cars we have to update our system response speed. Finally, we will work on communication. In

other words, now our cameras and sensors only send us logos but we cannot send any data to the user through the camera this is one-way communication. However, we will work on both-way communication for emergency moments such as we will update our cameras into IP-Mic cameras so that from the control panel we can directly communicate with the user for solving any emergency issues like any other developing country.

Chapter 11: Identification of Complex Engineering Problems and Activities

11.1 : Identify the attribute of complex engineering problem (EP)

A. Attributes of Complex Engineering Problems (EP)

	Attributes	**Put tick (√) as appropriate**
P1	Depth of knowledge required	√
P2	Range of conflicting requirements	
P3	Depth of analysis required	√
P4	Familiarity of issues	√
P5	Extent of applicable codes	√
P6	Extent of stakeholder involvement and needs	√
P7	Interdependence	

11.2 : Provide reasoning how the project address selected attribute (EP)

- **P1: Depth of knowledge:** We collected several papers and carefully examined them. We gained knowledge of our specifications and the details of our project. Additionally, by analyzing those papers, we discovered that there may be certain disadvantages to the project's implementation and that we will be able to find the best solution in a timelier and fair manner. Finally, by gaining a thorough understanding of the publications we have researched, we can envisage the project's consequences. We will then be able to select the ideal option for the challenging technical problem we have been working on.

- **P3: Depth of analysis required:** We read several research papers for this project to gain a thorough understanding of the analysis. Then, we searched for suitable parts to include in the design of our system, so we developed two distinct design philosophies. The depth of investigation is crucial to our project as a result.

- **P4: Familiarity with the issue:** In our day-to-day lives, car parking is one of the most important issues. We have the most alarming issue that the public face is that they frequently experience insufficient space for parking in our cities area. As a result, this type of unexpected problem is extremely inconvenient for consumers. Our project can be a solution to this type of problem.

- **P5: Extent of applicable codes:** The project that we will be working on consists of numerous modules, components, and other parts. Here, we will consider all applicable laws, regulations, and restrictions issued by the many entities that are involved in our project. We will therefore employ the proper components to prevent any potential inconsistencies with the relevant codes.

- **P6: Extent of stakeholder involvement:** Our project's main objective is to alert users about their car parking. We have been considering adding extra features but doing so will require significant input from the project's stakeholders.

11.3 Identify the attribute of complex engineering activities (EA)

B. Attributes of Complex Engineering Activities (EA)

	Attributes	**Put tick (√) as appropriate**
A1	Range of resource	√
A2	Level of interaction	√
A3	Innovation	
A4	Consequences for society and the environment	√
A5	Familiarity	√

11.4 Provide reasoning how the project address selected attribute (EA)

- **A1: Range of resources:** We looked at a few research papers, books, and journals to figure out how we might put our project together. These articles gave us a variety of alternatives for how we might construct our project, and we came up with two design trajectories from which we would select the most effective one to construct it.

- **A2: Level of interaction:** In this initiative, the volume of interactive activity is seen as crucial. To gather data and information from the project's stakeholders, we have created a Google form and personally met with some of the users.

- **A4: Consequences for society and the environment:** Our project plays a crucial role in educating the public to be more honest about parking by providing notifications from our system. Additionally, there will be fewer warnings to customers about unnecessary parking here and there. Therefore, it will have a favorable effect on society.

- **A5: Familiarity:** In our day-to-day lives, car parking is one of the most important issues we have. The most alarming issue that the public face is that they frequently experience insufficient space for parking in our cities area. As a result, this type of unexpected problem is extremely inconvenient for consumers. Our project can be a solution to this type of problem.

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FYDP (P) Spring 2022 Summary of Team Log Book/ Journal

	Final Year Design Project (P) Summer 2021	
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Date/Time /Place	Attendance	Summary of Meeting Minutes	Responsible	Comment by ATC
10.02.2022 FYDP Class	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Lecture 2: Introduction to Engineering Design Process Speaker: Dr. Md. Mosaddequr Rahman, Professor, and Chairperson, Department of EEE, Brac University.		
12.02.2022 (All fydp committee and students) ATC Meeting 01	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul 5. Prof.Dr.AKM Abdul Malek Azad 6. Md. Nahid Haq Shazon 7. Afrida Malik	Introductory session of EEE400(P)		N/A as it was an introductory meeting.
16.02.2022 (10.00 11.30pm) Group meeting - 1	1.Abir 2.Arik 3.Abu Bokor 4.Nayemul	1. Share ideas 2. gather information 3. identify the problem	**Task 1:** Abir Ahmed Nayemul hasan **Task 2:** **A**bu Bokor Siddique , Arik Rahman	
17.02.2022 FYDP Class	1.Abir 2.Arik 3.Abu Bokor 4.Nayemul	Lecture 3: How to Identify a Complex Engineering Design Project Speaker: Dr. Abu S. M. Mohsin, Assistant Professor, Department of EEE, Brac University.		

19.02.2022 11.30-12.40p m ATC meeting -02	1.Abir 2.Arik 3.AbuBokor 4.Nayemul 5.Prof.Dr. AKM Abdul Malek Azad 6.Md. Nahid Haque Shazon 7.Afrida Malik	1.Project selection (smart car parking system) 2.deadline for submitting concept notes within 26.02.2022 3.discussion about the alternative design approach		From the 2 proposed projects, Sir selected Smart Car Parking System and also discussed an alternative design approach

20.02.2022 Group meeting 02 10-11.30pm	1. Abir 2. Arik 3. Abu Bokor 4.Nayemul	1. Discussion about multiple design approaches and implementation of a smart car parking system	1. Researching multiple The design approach, studying literature review 2. Gather new ideas about smart car parking system	
24.02.2022 FYDP Class	1. Abir 2. Arik 3. Abu Bokor 4.Nayemul	Lecture 4: Complex engineering problem identification Speaker: Dr. Abu S. M. Mohsin, Assistant Professor, Department of EEE, Brac University.		
24.02.2022 Group meeting-03 10.30-12 am	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	1. Selecting two different multiple approaches	**Task 1: (Approach 1)** Abir Arik **Task 2: (Approach 2)** Abu bokor Nayemul	**Task 1:** Completed **Task 2:** Completed

25.02.2022 Group meeting-04 8.00 - 11.15	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	1. Completing Concept note	**Task-1 Approach 1(Arduino based)** Abir, Arik **Task-2 Approach-02(IOT based)** Abu bokor **Approach-03 (Close Circuit camera-based)** Nayemul	

27.02.2022 Group meeting -05 9.00-11.00pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemu	1.Discussion about revised concept note 2. Find out errors in the concept note	**Task 1: Works with project specification** Abir, Abu bokor Arik **Task 2: Introduction and conclusion part** Abu bokor, Nayemul, Abir	**Comments from ATC:** 1. Avoid irrelevant and unprofessional phrasing 2. contains grammatical errors 3. Modify the format of the block diagram 4. Comparison between multiple approaches **Task 1:** Completed **Task 2:** Partially completed
28.02.2022, Group meeting -6 1.00-2.00 pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	1. Fixed all the errors 2. More discussion about project specification	**Task: Revised concept notes** Abir, Arik, Abu Bokor, Nayemul	**Task 1:** Completed **Task 2:** Completed

1.03.2022, Group meeting -7 1.00-2.00 pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	1. Final revision about concept note		
04.03.2022 FYDP Class	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Lecture 5: Project Proposal Preparation Speaker: Mohai menul Islam, Lecturer Department of EEE, Brac University.		
05.03.2022 Group meeting-8 11:00-1:00pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Worked on Progress Presentation	**Task 1: introduction, objective, approach 01** Abu Bokor **Task 2: (Approach2, Constraints)** Arik **Task 3: (Specification, requirements, comparison)** Abir **Task 4: (Approach3, Standard codes)** Nayemul	Gave us the deadline for submitting the presentation slide by 6 marches so that they can give us feedback

08.03.2022 Group meeting-09 11-12:30pm	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	Prepared slides and divided speech		**Task 1:** Completed **Task 2:** Completed **Task 3:** Completed

09.03.2022 Group meeting-10 9-11pm	1.Abir 2.Arik 3.Abu Bokor 4.Nayemul	Worked on feedback and revised slide accordingly	**Task 1: introduction, objective, approach 01** Abu Bokor **Task 2: (Approach2, Constraints)** Arik **Task 3: (Specification, requirements, comparison)** Abir **Task 4: (Approach3, Standard codes)** Nayemul	Comments on the presentation slide: 1. Include student IDs on the title page. 2. Try to avoid the red color in each and every title. 3comparison three design approaches are missing. 4. Add a thank you slide at the end.
10.03.2022 Progress Presentation 9:36-9:48 am	1.Abir 2.Arik 3.Abu Bokor 4.Nayemul	Progress Presentation	**Task 1: introduction, objective, approach 01** Abu Bokor **Task 2: (Approach2, Constraints)** Arik **Task 3: (Specification, requirements, comparison)** Abir **Task 4: (Approach3, Standard codes)** Nayemul	Comments from ATC: 1. Avoid naming component-based design approach 2. Need to modify the specification and requirements 3. Suggested us to be careful with underground internet connectivity issue
24.03.2022 FYDP Class	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	Lecture 6: Report writing and Presentation Techniques Speaker: Rakibul Hasan, Lecturer, Department of EEE, Brac University.		

02.04.2022 11.30 - 12.40 pm ATC meeting -03	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul 5. Prof. Dr. AKM Abdul Malek Azad 6.Md. Nahid Haq Shazon 7. Afrida Malik	Discussion about project proposal draft Discussed the logbook correction Suggestions for working with 2 approaches Take good knowledge of multiple approaches to simulation		The deadline for submitting some topics on the project proposal draft that are similar to the concept note is the 4th of April
03.02.2022 Group meeting-11 9-11pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Divided work accordingly	**Task 1**- Approach1, Specifications, Requirements, Constraints (Abir, Arik) **Task 2**-Introduction, Approach2, Objective (Abu Bokor) **Task 3**-Comparison between approaches 1 and 2(Nayemul)	
04.02.2022	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Submitted the project proposal draft		Comments from ATC: 1. Correction of spelling and grammatical mistakes 2. Update the date 3. Add background research 4. Comparison needs to be in tabular format 4. Block diagram needs to be enhanced 5. Use title case 6. The requirement part is not included. 5. There is no figure number, no indication of those figures inside the text, and no

				caption of those figures
03.02.2022 Group meeting-12 9-11pm	1.Abir 2.Arik 3.Abu Bokor 4. Nayemul	Revised the progress proposal draft and works on feedback	**Task 1**- (Corre1ction of spelling and grammatical mistakes Update the date, add background research, spacing, organizing & correction of alignment in the logbook) Abu Bokor **Task 2**- (works on the requirement, update logbook) Abir, Arik **Task 3**- (Comparison in tabular) Nayemul	
07.04.2022 FYDP Class	1. Abir 2. Arik	Lecture 7 Project Safety, Sustainability, and Environmental Impact Speaker: Mohaimenul Islam, Lecturer Department of EEE, Brac University and: Dr. Abu S. M. Mohsin, Assistant Professor, Department of EEE, Brac University.		
15.04.2022	1.Abir 2.Arik 3.nayemul 4.Abu Bokor	Submitted draft project proposal	**Task 1** (Specification requirements, methodology 2, impact sustainability) – abir **Task 2** (Scopes and objectives,	Comments from the ATC Told us to review our title and also gave us some suggestions of it

			comparisons, project plan, budget, safety consideration) – nirob **Task 3** (Ethical consideration, risk management, standard codes, design approach 2) - Arik **Task4**(problem statement and Background research, design approach 1, methodology 1,safety consideration) Abu bokor	
16.04.2022 Group meeting – 13	1. Abir 2. Abu bokor 3. Arik 4. Nayemul	Divided presentation slides work accordingly	**Task 1**(Specification requirements, methodology 2, impact sustainability) – abir **Task 2**(Scopes and objectives, comparisons, project plan, budget, safety consideration) – nirob **Task 3** (Ethical consideration, risk management, standard codes, design approach 2) - Arik **Task 4**(problem statement and Background research, design approach 1, methodology 1, safety consideration) Abu bokor	**Task 1**-completed **Task 2**-completed **Task 3**-completed **Task 4**-completed

18.04.2022	1.Abir 2.Arik 3.Abu bokor 4.Nayemul	Submitted the PowerPoint slide		Comments from ATC 1. add an image to the problem statement 2. bring specifications and requirements slide before multiple design approaches 3. check for Grammatical errors 4. Add the duration of each task in the Gantt chart
19.04.2022 Group meeting - 14	1.Abir 2.Arik 3.Abu bokor 4.Nayemul	Revise our PowerPoint slide according to the comments	**Task 1**(add images) – completed **Task 2**(bring slide up) – completed **Task 3**(check for Grammatical error) – completed **Task 4**(add duration of each task in Gantt chart) – completed	**Task 1**-completed **Task 2**-completed **Task 3**-completed **Task 4**-completed
20.04.2022 Group meeting – 15(9-11pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Divided speech accordingly	**Task 1** (Specification requirements, methodology 2, impact sustainability) – Abir **Task 2** (Scopes and objectives, comparisons, project plan, budget, safety consideration) – Nirob **Task 3** (Ethical consideration, risk management, standard codes, design approach 2) - Arik **Task 4**(problem statement and Background research, design approach 1, methodology 1, safety consideration) – Abu bokor	**Task 1**-completed **Task 2**-completed **Task 3**-completed **Task 4**-completed

21.04.2022	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Submitted the draft project proposal		Comments from ATC 1. Should start from page 01 2. Stop using the plural word like they, we, etc. 3. Add figure no in the design 2 4. Project plan should be more clear. 5. Must include fydp D and C in the project plan 6. Add the total to the budget 7. Include SWOT analysis 8. References formatting issue
22.04.2022 Group meeting – 16(9-12pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Prepared for the mock presentation		
23.04.2022 (10.30 - 11.30 am) ATC meeting -04	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul 5. Prof. Dr. AKM Abdul Malek Azad 6.Md. Nahid Haq Shazon 7. Afrida Malik	Gave the mock presentation		Comments from ATC 1. Presentation should not take more than 10 minutes 2. Every person should complete his full speech and do not come back and fourth 3. Abu Bokor should speak slowly 4. Abir and Nayemul should prepare more

24.04.2022 Group meeting - 16	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Discussed the comments from ATC and divided work accordingly	**Task 1**(correct page no and add figure no, Reference format)-Abir, Abu Bokor **Task 2**(project plan clear and add fydp -d, c) -Nayemul **Task 3**(include SWOT Analysis)-Arik, Nayemul	**Task 1**-completed **Task 2**-completed **Task 3**-completed
25.04.2022 Group meeting – 17(9-12 pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Work on the comments from the mock presentation	**Task 1** (problem statement, scope, and objective, specification and requirements, design approach 1)-Abu Bokor **Task 2** (Design approach 2, comparison, methodology1)-Abir **Task 3 (**methodology2, project plan, Budget, expected outcome)-Nayemul **Task 4** (Impact, sustainability, ethical consideration, risk management, safety consideration, standard codes)-Arik	**Task 1**-completed **Task 2**-completed **Task 3**-completed **Task 4**-completed
26.04.2022 Group meeting – 18(10:30-12 pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Worked on the final presentation and final draft proposal	**Task 1** (problem statement, scope, and objective, specification and requirements, design approach 1)-Abu Bokor **Task 2** (Design approach 2, comparison, methodology1)-Abir	**Task 1**-completed **Task 2**-completed **Task 3**-completed **Task 4**-completed

			Task 3 **(**methodology2, project plan, Budget, expected outcome)-Nayemul **Task 4** (Impact, sustainability, ethical consideration, risk management, safety consideration, standard codes)-Arik	
27.04.2022 Group meeting – 19(10:30-12 pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	The demo presentation was given by ourselves and finished within 12 minutes		
28.04.2022 Final Presentation (10:15-10:30 am)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Gave the final presentation		Comments from ATC 1. Add more IR sensors 2. Correction in budget
28.04.2022 Group meeting – 20(10:30-12 pm)	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Corrected the budget and add components and revised our project proposal draft	**Task 1** correct budget(all)	**Task 1** - completed
29.04.2022	1. Abir 2. Arik 3. Abu bokor 4. Nayemul	Submitted the draft proposal and PowerPoint presentation slide and the logbook		

FYDP D Spring 2022 Summary of Team LogBook

	Final Year Design Project D		
Student Details	**NAME & ID**	**EMAIL ADDRESS**	**PHONE**
Member 1	Abir Ahmed (18121031)	abir.ahmed1@bracu.ac.bd	01310433888
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Member 3	Abu Bokor Siddique Majumder (18121081)	abu.bokor.siddiqe.mujumder@g.bracu.ac.bd	01628035726
Member 4	Md. Nayemul Hasan (21121014)	md.nayemul.hasan@g.bracu.ac.bd	01768240680
ATC Details:			
ATC 3			
Chair	Prof.Dr. AKM Abdul Malek Azad	a.azad@bracu.ac.bd	
Member 1	Afrida Malik	Afrida.malik@bracu.ac.bd	
Member 2	Imran Tushar	thushar.imran@bracu.ac.bd	

Date/Time/Place	Attendee	Summary of Meeting Minutes	Responsible	Comment byATC
02.06.2022 FYDP Class	1. Abir	Guidelines for FYDP-D and some instructions for the fydp-d		
09.06.2022 ATC meeting -01	**ATC panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. Discussed our project and its simulation approaches. 2. Showed us a sample of the fydp-d report to get a brief idea. 3. Talked about the timing of our consultation. 4. Talked about the parts which are same to fydp-p.		**Comments fromATC:** 1. Keep thecamera on 2. Start preparingthe design report 3. Find some appropriate research papers with some simulation to getthe necessary ideas.
13.06.2022 Group meeting -01	1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. Discussed the fydp-d report and also divided the work. **Task 1**: **IOT tools** details and **simulation** of design 1 **Task2**: **SWOT analysis** for design 1 **Task3**: **IoT tools** details for design 2 and impact of the ultimate approach and **SOWT analysis** for design 2 **Task4: Ethical consideration** and **risk management**	**Task 1**-Abu Bakar Siddique **Task 2**-Nayemul Hasan **Task 3**-Abir Ahmed **Task 4**-Arik Rahman **Task 1**-completed **Task 2**-completed **Task 3**-completed **Task4**-completed	
20.06.2022 Group meeting -02	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Divided more work for our fydp-d report **Task 1: Simulation** of design 2 **Task 2: Simulation** of design 1 **Task 3: Budget** of design 2	**Task 1**-Abir **Task 2**-Nirob andAbu Bakar **Task 3**-Arik **Task 1** -partially completed **Task 2**-partially completed **Task3**-not completed	

23.06.2022 ATC meeting -02	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. Discussed more simulation approaches. 2. More literature papers with simulations. 3. the progress report presentation is on 30th June… 4. need to make a table with system design specifications and stakeholders 5, talked Specifications and requirements, components table. .	**Task 1:** All **Task 2:** All **Task 3:** All **Task 4:** Abir, Abu Bokor **Task 5:** Nirob, Arik **Task 1** -partially completed **Task 2**-completed **Task3**- completed **Task 4**- completed **Task 5**- completed	.1. We Need to find 4 literature papers with appropriate simulations. 2. we need to submit the progress report presentation slide on 27th June 3. need to make a table with system design specifications and stakeholders. 4.Need to rearrange the table.
28.06.2022 Group meeting -03	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	1.Talked about presentation slide and divided the work accordingly. **Task 1**: problem statement, objective, specification (Abu bokor) **Task 2**: multiple design approaches, selection of IT tools, functional verification (Abir) **Task 3**: comparison, swat analysis, project plan, budget (Nirob) **Task 4**: impact, ethical consideration, risk management (Arik)	**Task 1:** Abu bokor **Task 2:** Abir **Task 3:** Nirob **Task 4:** Arik **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	
29.06.2022	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Mailed our presentation slide. **Task1**- correct font size. **Task2**- add some images. **Task3**- bold the titles **Task4**- add thank you in the end **Task5**- prepare a speech for 8 minutes **Task6**- add slide numbers		1. correct font size. 2. add some images. 3. bold the titles 4. add thank you in the end 5. prepare a speech for 8 minutes 6. add slide numbers
29.06.2022 Group meeting -04	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Corrected our presentation slides according to the ATC comments. **Task1**- correct font size. **Task2**- add some images.	**Task 1**-Abu bokor **Task 2**-Abir **Task 3**- Arik **Task 4**-Nirob	

		Task3- bold the titles **Task4**- add thank you in the end **Task5**- prepare a speech for 8 minutes **Task6**- add slide numbers	**Task 5**-All **Task 6**-All **Task 1**- completed **Task 2**- completed **Task3**- completed **Task 4**- completed **Task 5**-completed **Task 6**- completed	
30.06.2022 Room 50404 12:12-12.24pm	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Gave our progress presentation		1. need to make our approaches more complex 2. add some more features to make our project more complex.
04.07.2022	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Discussed our final year design proposal. **Task 1** – Multiple design approaches(CO5) **Task 2** - Budget of both designs separately **Task 1** - Abir, Abu Bakar, Nirob **Task 2** – Arik	**Task 1** - Abir, Abu Bakar, Nirob **Task 2** – Arik **Task 1** –completed **Task 2** - completed	
07.07.2022 ATC meeting -03 7.07.2022	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Imran Tushar **Student** 1. Abir 2. Nayemul Absence – Abu Bokor siddiqe,Arik (for sickness)	1. Need to go through the paper with LabVIEW 2. Need to explain some before design 1 and design 2 flow charts. 3. detailed comparison between approaches 1 and 2. 4. Risk management matrix. 5. budget with component finding link. 6. Optimal solution 7. reconstruct the table with a model, technical specification, component, and component description.	**Task 1**- All **Task 2**- Abu Bokor, Abir **Task 3** - Nirob **Task 4**- Arik **Task 5** – Arik **Task6**- Abu bokor**Task 7**- Nirob **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- completed **Task 6**- completed **Task 7**- completed	1. need to find some research paper with an appropriate simulation 2. comparison needs to be more detailed. 3. risk management must be in matrix form 3. all specification and component description needs to be in one table 4. must show progress.
Group meeting-05 09.07.2022	1.Abir 2.Arik 3.AbuBokor	1. Discussed about the how to increase about the complexity of both design		

	4.Nayemul	2. Create some idea to make the design complex like adding gate, timing, payment **Task 1 –** Make ideas for complexity **Task 2-** add new features **Task 3-** go through some papers	**Task 1-** abu bokor & nirob **Task 2-** Arik and Abir **Task 3**- All **Task 1- c**ompleted **Task2- co**mpleted **Task 3**- completed	
Group meeting-06 12.07.2022	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	1. Creating the simulation design 2. Discussing about code 3. Discussed about the simulation design and component 4. Talk to another expert about IOT based system **Task 1**- complete simulation for design 1,2 **Task 2-** find the code for the simulation **Task 3-** appropriate component finding for simulation in proteus **Task 4-** talk with an IT expert about website making	**Task 1-** Abir, Abu bokor **Task 2-** Nirob, Arik **Task 3-** All **Task 4-** All **Task 1**- completed **Task 2-** completed **Task 3-** completed **Task4-** completed	
Group meeting-07 15.07.2022	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	1. Show the simulation 2. Check some error 3. Create ideas about how to solve these errors 4. Do some research about creating a website **Task 1-** complete both simulations **Task 2-** check the errors **Task 3-** solve the errors **Task 4-** website creating research	**Task 1-** Abir, Abu bokor **Task 2-** Nirob, Arik **Task 3-** All **Task 4-** All **Task 1-** completed **Task 2-** completed **Task 3-** not completed **Task4 –** completed	
Group meeting-08 17.07.2022	1.Abir 2.Arik 3.Abu Bokor 4.Nayemul	1. Discussed with an expert about some errors 2. Go through some videos to solve the errors	**Task 1**- Abu Bokor**,** Arik **Task 2-** Nirob, Arik **Task 3-** All	

		3. Design a website for a Iot based **Task 1-** solve the errors **Task 2**- website design for simulation 1 **Task 3-** discussed with IT expert about website creating	**Task 1-** completed **Task 2-** completed **Task 3-** completed	
19.07.2022 Group meeting -04	1. Abir 2. Arik 3. Abu Bokor 4. Nayemul	1. Discussed both simulations. 2. divided work accordingly **Task 1** – go through the LabVIEW paper. **Task 2**- Risk management and budget **Task 3**- reconstruct the table	**Task 1** – All **Task 2** – Bokor &nirob **Task 3** – Abir & Arik **Task 1** – completed **Task 2**- completed **Task 3**- completed	
21.07.2022 ATC meeting -04	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Imran Tushar **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. correct the alignment on scope and objective 2. have to increase visualization for schematic 1 and 2 3. some description in design 2 schematic 4. project plan table has to complete 5. summary and complete attributes 6. have to use the Citation part for unused paper in the introduction 7. write the address in the link part. 8. take brief idea about the codes	**Task 1**- Abu Bokor **Task2-** Abir, Abu bokor **Task 3**- Abir **Task4**- Nirob **Task 5-** Abir, Arik**Task 6-** Abu bokor**Task 7-** Arik **Task 8**- All **Task 1**- completed **Task 2-** completed **Task 3-** completed **Task 4 –**completed **Task 5-** completed **Task 6-** completed **Task 7-** completed **Task 8-** completed	1. simulation screenshots need to be clearer. 2. complete the remaining parts of the design report 3. last 3 papers citations needs to be addressed in the design report 4. did not add the component address link in the budget 5. take complete idea about the codes of both designs. 6. add more features in the simulation.
26.07.2022 Group meeting -05	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Discussed about ATC comments and divided work accordingly. **Task 1**- increase schematic visualization **Task 2**-some description in design 2 **Task 3**-complete project plan **Task4**- write the link address in the linked part	**Task 1**- Abir, Abu bokor **Task 2**- Abir **Task 3**- Nirob **Task4**- Arik **Task 1**- completed **Task 2-** completed **Task 3-** completed **Task 4 -**completed	

28.07.2022 ATC meeting -05	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Imran Tushar 3. Afrida Malik **Student** 1. Abir 2.AbuBokor 3. Nayemul **Absence** Arik(family issue)	1. basic difference between raspberry pie and Arduino UNO 2. need to solve the issue with the servo motor gate. 3. need to keep the multi-stair parking option in the simulation 4. find other sensors besides IR sensors and compare them.	**Task 1**- Abir, Abu bokor **Task 2**- All **Task 3**- All **Task 4**- Arik, Nirob **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- incomplete	1. send project report and logbook before Thursday 2. must send the report in the pdf format. 3. what happens when the driver goes half an hour late after booking time? How servo motor will work then? 4. if the parking lot is multi-stair what happens then. 5. visit a parking lot to get all necessary information and ideas, pictures(stakeholder)
31.07.2022 Group meeting -06	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	Discussed about ATC comments and divided work accordingly. **Task 1**- basic difference between raspberry pie and Arduino UNO **Task 2**- solve the issue with the servo motor gate opening **Task 3**- add the multi-stair parking lot option in simulation **Task 4**- find other sensors besides IR sensors and compare them	**Task 1**- all **Task 2**- Abir, Nirob **Task 3**- Abu Bokor, Arik **Task 4**- Abir, abu bokor **Task 1**- not completed **Task 2**- not completed **Task 3**- not completed **Task 4**- incomplete	
02.08.2022 Group meeting -07	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	**Task 1**- basic difference between raspberry pie and Arduino UNO **Task 2**- solve the issue with the servo motor gate opening **Task 3**- add the multi-stair parking lot option in simulation **Task 4**- find other sensors besides IR sensors and compare them	**Task 1**- all **Task 2**- Abir, Nirob **Task 3**- Abu Bokor, Arik **Task 4**- Abir, abu bokor **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- incomplete	

04.08.2022 ATC meeting -06	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. maintain reference sequence in the introduction. 2. constraint alignment should be corrected. 3. table should be up before the explanation of the attributes. 4. alignment should be corrected in the attributes. 5. reference should be put on a new page and do not need to number it. 6. naming after the pictures should be same for all pictures. 7. reference should be done serial wise. 8.complete the project plan table(FYDP-C) 9. description for risk management matrix.	**Task 1**- Abu bokor **Task 2**- Abir **Task 3**- Abir **Task 4**- Abu bokor **Task 5**- Nirob, Arik **Task 6**- Abir **Task 7**- Abu Bokor **Task 8**- Nirob **Task 9**- Arik **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- completed **Task 6**- completed **Task 7**- completed **Task 8**- completed **Task 9**- completed	1. have to complete the sensors comparison. 2. all alignments should be corrected in constraints and attributes. 3. table should be put before attributes. 4. reference should be put in the new page and don not need to number it. 5. put the reference in the introduction serially. 6. look for more research papers.
06.08.2022 Group meeting -08	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	Discussed about ATC comments and divided work accordingly. **Task 1**- correct the reference sequence in the introduction. **Task 2**- put the table before the attributes explanation and the alignment of the explanation. **Task 3**- complete the project plan table(FYDP-C) **Task 4**- correct the figure naming (all should be the same). **Task 5**- look more papers for new ideas that can be implemented in design 1. **Task 6**- put another sensor(motion) in design 2 and compare it with design 1. **Task 7**- description for risk management matrix.	**Task 1**- Abu Bokor **Task 2**- Abir **Task 3**- Nirob **Task 4**- Arik **Task 5**- All **Task 6**- Abir,Abu Bokor **Task 7**- Arik **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- completed **Task 6**- completed **Task 7**- completed	
08.08.2022 Group meeting -09	1. Abir 2. Arik 3. AbuBokor 4 .Nayemul	Discussed ATC comments and divided work accordingly. **Task 1**- correct the reference sequence in the introduction.	**Task 1**- Abu Bokor **Task 2**- Abir **Task 3**- Nirob **Task 4**- Arik **Task 5**- All	

		Task 2- put the table before the attributes explanation and the alignment of the explanation. **Task 3**- complete the project plan table(FYDP-C) **Task 4**- correct the figure naming (all should be the same). **Task 5**- look for more papers for new ideas that can be implemented in design 1. **Task 6**- put another sensor(motion) in design 2 and compare it with design 1. **Task 7**- description of risk management matrix.	**Task 6**- Abir,Abu Bokor **Task 7**- Arik **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- completed **Task 6**- completed **Task 7**- completed	
11.08.2022 ATC meeting -07	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. must mention task in responsibility section 2. Find some features to add to design 1	**Task 1**- Abir **Task 2**- All **Task 1**-completed **Task 2**- completed	1. research some more papers so we can get some more features we can add. 2. mention task in the responsibility section so that ATC panel can easily understand which tasks have been completed.
12.08.2022 Group meeting -10	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	Discussed ATC comments and divided work accordingly. **Task 1**- research for some more papers. **Task 2**- correct the logbook (mention the task assigned in the responsibility section)	**Task 1**- All **Task 2**- Abir **Task 1**- completed **Task 2**- completed	
14.08.2022 Group meeting -11	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	Discussed ATC comments and divided work accordingly. **Task 1**- research for some more papers. **Task 2**- correct the logbook (mention task in the responsibility section) **Task 3**- add a feature (car number scan and save in the entry log)	**Task 1**- All **Task 2**- Abir **Task 3**- Abir, Abubokor **Task 1**-completed **Task 2**- completed **Task 3**- not completed	

15.08.2022 Group meeting -12	1. Abir 2. Arik 3. AbuBokor 4. Nayemul	**Task 1-** Talked with an IT expert regarding task 3.	**Task 1-** all **Task 1-** completed	
17.08.2022 Group meeting -13	1.Abir 2.Arik 3.AbuBokor 4.Nayemul	Discussed more among ourselves about task 3 and how to do it. **Task 1-** add car number scan and save it in the data entry	**Task 1-** All **Task 1-** completed	
25.08.2022 ATC meeting -08	**ATC Panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	1. Prepare the slide and send it by Saturday 2. Correct the logbook and send it by Saturday 3. Correct the alignment and page transition in the design report. 4. Make a transition in the ethical consideration part. 5. Make a simulation video and send it to ATC by tonight	**Task 1-** All **Task 2-** Abir **Task 3-** Abu Bokor **Task 4-** Arik **Task 5-** Abu bokor **Task 1-** completed **Task 2-** completed **Task 3-** completed **Task 4-** completed **Task 5-** completed	1. Take good preparation and manage the time accordingly for the presentation 2. compare both designs very briefly so that everyone can easily understand 3. make a simulation video and embedded it with a slide.
27.08.2022 Group meeting -14	1. Abir 2. Arik 3.AbuBokor 4. Nayemul	Discussed ATC comments and divided the work accordingly. **Task 1**- Prepare the slide and send it by Saturday **Task 2**- Correct the logbook and send it by Saturday **Task 3**- Correct the alignment and page transition in the design report. **Task 4**- Make a transition in the ethical consideration part. **Task 5**- Make a simulation video and send it to ATC by tonight	**Task 1-** All **Task 2-** Abir **Task 3-** Abu Bokor **Task 4-** Arik **Task 5-** Abu bokor **Task 1-** completed **Task 2-** completed **Task 3-** completed **Task 4-** completed **Task 5-** completed	
01.09.2022 Room 50303 12:36-12.56pm	**Student** 1. Abir 2. Arik 3.AbuBokor 4. Nayemul	Gave our final presentation		1. need to make our project simpler. 2. It would be better to modify the booking time feature.

FYDP (C) Fall 2022 Summary of Team Logbook

Group-19

Project Title:

Design and Development of an IoT Based Automated Car Parking System

	Final Year Design Project(C) Fall 2022		
Student Details	**NAME & ID**	**EMAIL ADDRESS**	**PHONE**
Member 1	Abir Ahmed (18121031)	abir.ahmed1@bracu.ac.bd	01310433888
Member 2	Arik Rahman Chowdhury (18121083)	arik.rahman.chowdhury@g.bracu.ac.bd	01729129719
Member 3	Abu Bokor Siddique Mujumdar (18121081)	abu.bokor.siddiqe.mujumder@g.bracu.ac.bd	01628035726
Member 4	Md Nayemul Hasan (21121014)	md.nayemul.hasan@g.bracu.ac.bd	01768240680
ATC Details:			
ATC 3			
Chair	Prof.Dr. AKM Abdul Malek Azad	a.azad@bracu.ac.bd	01556528695
Member 1	Afrida Malik	Afrida.malik@bracu.ac.bd	
Member 2	Imran Tushar	thushar.imran@bracu.ac.bd	

Date/Time /Place	Attendee	Summary of Meeting Minutes	Responsible	Comment by ATC
02.09.2022 FYDP C introductor y class	**ATC panel** Dr. Abu S.M Mohsin **Student** 1. Abir 2. Arik 3.Abu Bokor	Guidelines for FYDPC and some instructions for the FYDP-C		
06.10.2022 ATC meeting- 01	**ATC panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Students** 1. Abir 2.Abu Bokor **Absent** 1. Arik (went to Rajshahi) 2. Nirob (sick/ hospital)	1. Discussed our new timing for the ATC meeting		**Commens** Postponed the meeting.
13.10.2022 ATC meeting- 02	**ATC panel** 1. Prof. Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Tushar **Students** 1. Abir 2. Arik 3. Abu Bokor **Absent** Nirob - (hospital)	1. Need to correct the logbook. 2. Start working on the project design report. 3. Start working on getting the equipment for our design project.	**Task 1-** Abir **Task 2-** All **Task 3-** All **Task 1-** completed **Task 2-** completed **Task 3** -not completed	**Comments** 1. Need to work hard. 2. need to make more communication among ourselves.

14.10.2022 Group meeting -01	1. Abir 2. Arik 3. AbuBokor 4. Nirob	Discussed the FYDP-C report and divided the work. **Task 1**- Chapter 1 (Introduction) **Task 2-** Chapter 2 (Project Design Approach) **Task 3-** Chapter 3 (Use of Modern Engineering and IT Tool.) **Task 4-** correction of Logbook **Task 5**- getting the equipment	**Task 1**- All **Task 2**- Abir, Abu Bokor **Task 3**- Arik **Task 4**- Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- not completed	
15.10.2022 Group meeting -02	1. Abir 2. Arik 3.AbuBokor 4. Nirob	**Task 1**- Chapter 1 (Introduction) **Task 2-** Chapter 2 (Project Design Approach) **Task 3-** Chapter 3 (Use of Modern Engineering and IT Tool.) **Task 4-** correction of Logbook **Task 5**- getting the equipment	**Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed **Task 5**- not completed	
17.10.2022 Group meeting -03	1. Abir 2. Arik 3. AbuBokor 4. Nirob	Divided more tasks among ourselves for our design report. **Task 6**- Chapter 4 (Optimization of Multiple Designs and Finding the Optimal Solution.) **Task 7**- Chapter 6 (Impact Analysis and Project Sustainability.)	**Task 6**- Abir, Nirob, Abu bokor **Task 7**- Arik **Task 6**- completed **Task 7**- completed	

23.10.2022 ATC meeting- 03	**ATC panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Imran Thushar **Students** 1. Abir 2. Arik 3. Abu Bokor 4. Nirob	1. Must buy equipment by 27October. 2. start taking preparation for theprogress presentation. 3. correct the logbook. 4. correct the design reportaccording to the feedback.	**Task 1**- Nirob, Arik **Task 2**- All **Task 3**- Abir **Task 4**-All **Task 1**- completed **Task 2**- partially completed **Task 3**completed **Task 4**- partially completed	**Comments** 1. Must show progress.

24.10.2022 Group meeting - 04	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Discussed the commentsand divided work accordingly. **Task 1**- Getting the equipment **Task 2**- correct the logbook **Task 3**- correctthe design report	**Task 1**- Nirob, Arik **Task 2**- Abir **Task 3**- All **Task 1**- completed **Task 2**- completed **Task 3**- partially completed	
27.10.2022 ATC meeting- 04	**ATC panel** 1. Prof.Dr. AKM Abdul Malek Azad 2. Afrida Malik **Students** 1. Abir 2.Abu Bokor 3. Nirob **Absent** **1.** Arik (family urgent work)	1. Submit the progresspresentation slide by 31 October. 2. Correct the design report. According to the feedback. 3. Start working on theprototype. 4. Start working on theremaining chapters of the design report.	**Task 1**- All **Task 2**- All **Task 3**-All **Task 4**- All **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- not completed	**Comments** 1. presentation slide needs to be precise. 2. Need to submit the full design report by 10th November. 3. Need to complete the prototype by 10th November. 4. Try to finish all the tasks and take them as a challenge.

29.10.2022 Group meetin g -05	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Discussed our progress presentation slide and divided work accordingly. **Task 1**- introduction, problem statement, objective, constraints, consideration, requirements, background study, literature gap **Task 2**- methodology, optimal design overview, system integration breadboard model, components overview. **Task3**-impact, sustainability, Gantt chart, risk management, ethical, consideration attributes, conclusion	**Task 1**- Nirob **Task 2**- Abir, abu Bokor **Task 3**- Arik **Task 1**- completed **Task 2**- completed **Task 3**- completed	
02.11.2022 Group meeting - 06	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Submitted our progress presentation slide.		

03.11.2022 FYDP-C Committee 3.30-3.45 pm	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Gave our progress presentation		1.Make an overvie w of the system design 2.did some IR sensor test cases.
05.11.2022 Group meeting - 07	1. Abir 2. Arik 3. Abu Bokor 4. Nirob	Worked on our project prototype.		

09.11.2022 Group meeting - 08	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Discussed our design report and start working on it. **Task 1**- Chapter 5 (Completion of Final Design and Validation.) **Task 2**- Chapter 7 (Engineering Project Management.) **Task 3**- Chapter 8 (Economical Analysis.) **Task 4**- Chapter 9 (Ethics and Professional Responsibilities)	**Task 1**- Abu Bakar **Task 2**- Nirob **Task 3**- Arik **Task 4**- Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	
13.11.2022 ATC meeting-05 (Rescheduled meeting)	**ATC panel** 1. Prof. Dr. AKM Abdul Malek Azad 2. AfridaMalik 3. Imran Tushar **Students** 1. Abir 2.Abu Bokor 3.Nirob Absent: 1. Arik (Medical Condition)	**1.** Add a table of contents in the design report. **2.** Make a video demonstration of our project prototype. **3.** Finish the remaining chapters Chapter 10 (Conclusion and Future Work.) Chapter 11 (Identification of Complex Engineering Problems and Activities.) correct the logbook according to the feedback.	**Task 1**- Nayemul **Task 2**- Abu Bokor **Task 3**- All **Task 4**- Abir **Task 1**- completed **Task 2**- completed **Task 3**- incomplete **Task 4**- completed	1. Visit the Fidela and try to work on the prototype there. Try to get some ideas about how to make it multi staired.

14.11.2022 Group meeting -09	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Separate work between groupmates Task1 – Work on prototype about GSM error Task2 – Finding out the problem in booking system Task 3 – Check our code andfind out error	**Task 1**- Abu Bakar **Task 2**-Nirob, Abu Bakar**Task 3**- Arik, Abir **Task 4**- Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	

16.11.2022 Group meeting -10	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	Task 1 – check the error of design report and attach all of the individual work Task 2- GSM error check Task3 – Find a alternative solution for GSM	**Task 1**- Abu Bakar **Task 2**- Nirob, Abu Bakar **Task 3**- Arik, Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed	
17.11.2022 ATC meeting-06	**ATC panel** 1. Prof Dr. AKM Abdul Malek Azad 2. Afrida Malik 3. Imran Thushar **Students** 1. Abir 2. Abu Bokor 3. Arik **Absent** Nirob (medical condition)	1. fix the bug of the hardware 2. Show the hardware prototype to ATC member 3. Finish all the prototype design and design report. 4. Complete remaining chapter of the design report	**Task 1**- Abu Bakar **Task 2**- Nirob, Abu Bakar **Task 3**- All **Task 4** - All **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	1. Didn't send the design report 2. Check the error on log book 3. Show the prototype to the ATC member 4. Try to find a way to make it multi-staired parking system

18.11.2022 Group meeting -11	1.Abir 2.Arik 3.Abu Bokor 4. Nirob	1.Check the error on GSM and try to find a new way without GSM 2.Fix some bug of the project 3.Work on design report	**Task 1**- All **Task 2**- All **Task 3**- Arik, Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed	
20.11.2022 Group meeting -12	1.Abir 2.Arik 3.Abu Bokor 4. Nirob	1.check IR sensor 2.Detect the rang and functionality of IR sensor 3.Attaching Servo Gate, and Make it multi staired	**Task 1**- Abu Bakar **Task 2**- Nirob, Abu Bakar **Task 3**- Arik, Abir **Task 1**- completed **Task 2**- completed **Task 3**- completed	
24.11.2022 ATC meeting 07		Meeting was cancelled		
26.11.2022 Group meeting - 14	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	1. Work on prototype 2. Find out a new way instead of using GSM 3. Work on Multi-Staired system 4. update website	**Task 1**- All **Task 2**- All **Task 3**- All **Task 4** – Abu bokor	
28.11.2022 Group meeting - 15	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	1. Work on prototype 2. Find out a new way instead of using GSM 3. Work on Multi-Staired system 4. update website	**Task 1**- All **Task 2**- All **Task 3**- All **Task 4** – Abu bokor **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	

01.12.2022 ATC meeting 08	**ATC panel** 1. Prof Dr. AKM Abdul Malek Azad 2. Afrida Malik **3.** Imran Thushar **Students** 1. Abir 2. Abu Bokor 3. Arik 4.Nirob	1.Works on video demonstration 2. Complete The full chapter5 3. 3.Complete PowerPoint slide for final presentation 4. Prepare for mock presentation	**Task 1 –** Abu Bokor **Task2 –** Abu bokor &Abir **Task 3 –** ALL **Task 4 –** All **Task 1**- completed **Task 2**- completed **Task 3**- completed **Task 4**- completed	1.Make a perfect video demonstration to show it how to work properly 2. Fix the error of the logbook and design report

02.12.2022 Group meeting – 16	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	1. Complete design report 2. work on power point slide 3. Check the project to verify its functionality	**Task 1 –** Abu Bokor & Abir **Task2 –** All **Task 3 –** Abu bokor **Task 1**- completed **Task 2**- completed **Task 3**- completed	
04.12.2022 Group meeting - 17	1. Abir 2. Arik 3.Abu Bokor 4. Nirob	1. Make a video demonstration of our project	**Task 1 –** All **Task 1**- completed	
07.12.2022 ATC meeting 08	**ATC panel** 1.Prof Dr. AKM Abdul Malek Azad 2.Afrida Malik **3.**Imran Thushar **Students** 1.Abir 2.Abu Bokor siddiqe Mujumder 3.Arik 4.Nirob	1. Gave mock presentation 2. show the video demonstration	**Task 1 –** All	1. Do works on video part 2. Some issueon slide 3. Make an informative video 4. Clear idea on video 5. Work on some point of power point slide

10.12.2022 Group meeting - 18	1.Abir 2.Arik 3.Abu Bokor 4. Nirob	1. Work on video shoot 2. Work on Video editing 3. Works on PowerPoint slide	**Task 1 –** Abu Bokor & Abir **Task2 –** Nirob & Abu bokor **Task 3 –** ALL **Task 1 –** Complete **Task2-** Complete **Task3-** Complete	
14.12.2022 Group meeting - 19	1.Abir 2.Arik 3.Abu Bokor 4. Nirob	1. Rehearsal on our final presentation	**Task 1 –** All **Task 1 –** Complete	
14.12.2022 FYDP Final presentation	1.Abir 2.Arik 3.Abu Bokor 4. Nirob	1. Gave our final Presentation		