An Innovative Smart Parking system

BY

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FINAL YEAR DESIGN PROJECT REPORT

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

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DHAKA, BANGLADESH

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APPROVAL

This Project titled "**An Innovative Smart Parking system** ", submitted by **Md Minhajul Abedin Faysal, ID: 161-15-7343** to the Department of Computer science & Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer science & Engineering and approved as to its style and contents. The presentation has been held on 13 January 2025.

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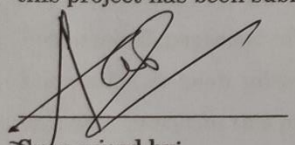
DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. Arif Mahmud (AM), Associate Professor, Department of CSE,** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.



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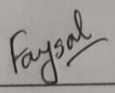

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Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Complete details of my concept, "**An Innovative Smart Parking system**," may be obtained in the accompanying results. This paper goes into great detail on the processes that helped transform the plan into a working website. Administrators, parking attendants, and automobile owners are the three modules into which people can be categorized inside the system. An intelligent parking system for reservation that offers consumers a straightforward online parking space reservation procedure is the notion that has been proposed. It eliminates the need to spend time looking for parking at places of business. In order to allow users to park their automobiles and contact the administration, this project offers a web-based booking system. The automobiles that are supposed to be parked in the lot are tracked by this initiative. An additional benefit provided by this system is the opportunity to cancel a car reservation. Users can cancel their book space at any time, according to the administrator. Additionally, users have the option to pay fees that the administrator has determined. After making the debit payment, users receive a parking out message along with their unique parking ID. Users and the administrator can quickly update their different data. Additionally, printed parking recites for the admin, user, and parking attendant modules are included. In the admin dashboard, you may add a parking attendant, search for a new parking spot, and change all the data. Additionally, users have the ability to submit parking requests to the parking attendant and administrator. Additionally, parking attendants can accept or reject requests. Our online application is developed in HTML for user interfaces, CSS for web page layout, and PHP with a reliable MYSQL database backend that uses XAMMP. All that is required for systems to establish up our system applications are desktop computers and online access; costly software and hardware elements are not required. If you have the right login information, you may utilize our infrastructure as a worldwide repository and as easily accessible apps from anywhere. With a typical internet-accessible network, almost every user may use our platform-independent solution at any time and from any location. And we could change our system to meet certain needs.

Keywords: Smart parking, attendants, parking, web application.

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CHAPTER 1

Introduction

1.1 Introduction

A system is a multi-level framework that shows how several applications are connected and communicate with one another. Programs, programming links, and tools for system management are all included under the "System" tab on computers. Regardless of the context, the word "system" may mean different things, but the idea is basically the same. A complete framework is created by the "Smart Parking System" through the integration of several components. This structure is made up of several modules that impose the limits established for each system. Every module has a variety of systems.

All facets of parking system administration will be easier for users and attendants to manage thanks to the "Smart Parking Booking System" project. Parking spots are quite important anywhere, but in a country's capital, they are more crucial. An enormous amount of time is spent each day by hundreds of automobiles trying to find a parking space. As a result, urban areas experience a rise in crime, which exacerbates drivers and contributes to traffic congestion. Addressing this issue would involve the implementation of a smart parking reservation system for parking space management inside this metropolis. Fundamentally, the goal of our implementation is to simplify intricate manual procedures, which is precisely what systems are intended to accomplish. The needs of the user dictate how the system is set up; for example, a manufacturing company may build up a facility to automate manual tasks. To automate the human registration process, we have turned to computer programming. Our lives have drastically changed as a result of computer advancement. Computers might assist us save time and energy, learn new skills, protect our personal information, and get the information we need when we need it.

1.2 Motivation

Customers' ways of acquiring goods and services have changed significantly as a result of the rise in smartphone use, web browsing, and e-commerce websites. Because these systems offer efficiency, precision, and enhanced departmental communication, they are essential for handling the parking system's many and varied operations. the growing intricacy of administrative duties within the technical framework of the smart car parking system.

Early structures were frequently specialized and confined, like parking request systems. The majority of skill-development online parking systems are made to help users become more tech-savvy. A variety of factors have been taken into account by this online parking system, including the request system, add parking, and add attendant.

1.3 Objectives

The goal of the current project is to create an online smart auto parking system that parks automobiles in a highly intelligent way by utilizing technology. This project includes three dashboards for intelligent parking distribution: admin, attendant park, and users. It manages every aspect of the parking area, including the exact location of the place. The attendant continues with parking-related details. The computerization of both parking databases is one goal of this suggested web application system:

- To automate databases for users, admins, attendants, and parking bookings.
- To preserve the integrity and consistency of data.
- Automate the registration process to eliminate the need for in-person communication.
- The technology allows the user to ask for permission to utilize a parking spot.
- The parking attendant will either grant or deny users' requests for authorization.
- The system displays the remaining slot, printing, and slot payment.
- Every record has been made, and the administrator can see every system record.

1.4 Methodology

The goal of the present project is to develop an online smart vehicle parking system that parks automobiles by cleverly utilizing technology. Three dashboards are included in this project for intelligent park allocation: administrators, attendant park, and customers. It has total authority over the parking space and the precise location. The attendant goes on to provide further parking-related information. The best online parking management system in the world sends requests to my system, which aids in system improvement and troubleshooting.

The study's methodology, application specifics, evaluation findings, and conclusions will all be covered in greater detail in later sections of this report. The purpose of this study is to provide a thorough examination of the smart parking online platform that has been established and investigate how student-specific feature preferences might revolutionize the way higher parks technology is delivered.

1.5 Project Outcome

The main objective of the smart parking request system is to decrease customer wait times and human labor. All that is required of the customer is to register on the web page, log in, and then look for available slots. The customer then confirms the time slot by supplying their name, address, time, and date. The customer had an easy experience since, after the reservation procedure was complete, they only needed to go to the parking spot. Because it is automated, the full process may be completed online.

- To automate databases for parking reservations, users, administrators, and attendants.
- To maintain data consistency and integrity.
- To do away with face-to-face interaction, automate the registration procedure.

- The technology enables the user to request authorization before using a parking space.
- Users' requests for authorization will either be approved or denied by the parking attendant.
- The system shows the printing, slot payment, and remaining slot.
- Every system record has been created and is visible to the administrator.

1.6 Organization of the report

In Chapter 1, the study's aims, concerns, objectives, and anticipated results were described. The report's overall structure is also covered in this section.

Chapter 2 contains all of the previous studies conducted in this area. In the next section, they give an illustration of the breadth that arises from their refining this study topic. The main challenges or obstacles to this inquiry were the subject of the most recent conversation. This chapter includes parts on relevant research summaries and studies and talks about the challenges faced during the project's development.

Chapter 3 define project methodology, also has use case, data flow, sequence all diagram has been shows in this section. All detailed design and methodology has been clear in this part.

The performance evaluation, results discussion, and experimental results are presented in Chapter 4. This section includes a few test images to help with the project's execution. An examination of the parking system's applications concludes this section.

Chapters 5 and 6 contained an overview of the research, Engineering Standards and Design Challenges, standard compliance, financial analysis, engineering problem, information on next activities, and a question about the results. To show whether the given report satisfies all requirements, this chapter offers an

authorized example. Impacts on the Group as a Whole and the Environment: This chapter's last part outlines the flaws in my current efforts that might have an impact on future employees with comparable goals.

CHAPTER 2

Background

2.1 Introduction

The admin, parking user, and parking attendant concepts are defined in this section. Examine the accompanying relevant works as well.

2.2 Literature Review

The intended idea is an online parking management tool that facilitates user reservations. It eliminates the tedious problem of needing to look for parking at places of business. In order to enable customers to browse various parking lots and select a place to verify whether it is available, this project offers a web-based reservation system. If there are still openings, he may schedule it for a specific time frame.

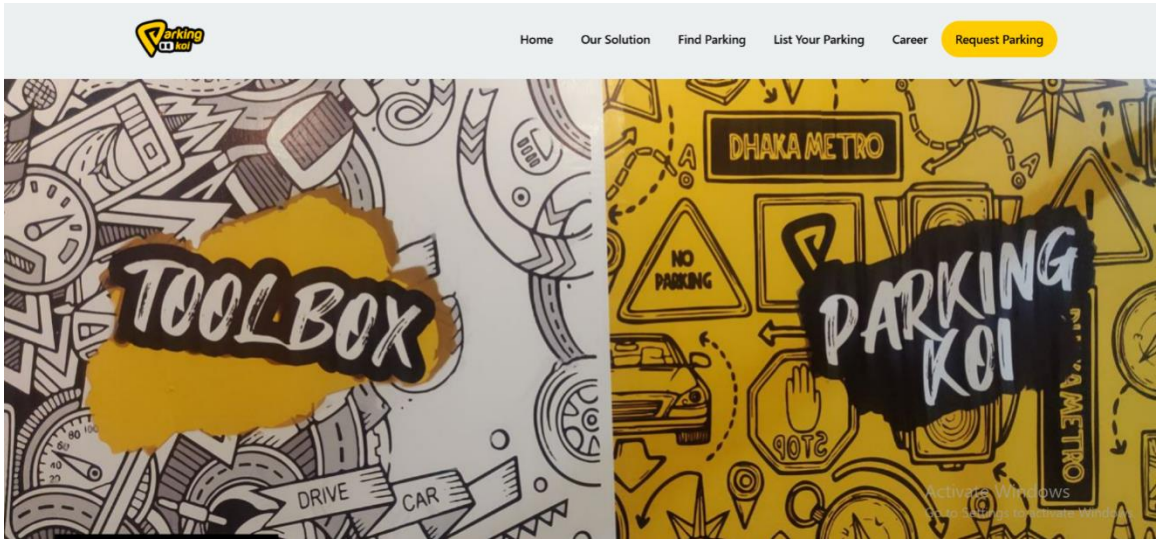


Fig 2.1: Parking Koi

Fig 2.2: Yes Parking

HTML: Web pages can be created using markup languages like HTML. HTML files may be seen and understood by web browsers. The core of any website is made up of HTML components. allows you to create engaging content by allowing the usage of images and HTML components. It may also produce lists, quotes, titles, chapters, links, and more in [2].

CSS: We can further style the material on our webpage by using CSS to change the fonts, colors, and layouts. This improves the consistency and aesthetics of our website. Consequently, it makes the website more aesthetically pleasing.[2]

PHP: PHP is an open-source programming language for servers. We can use this to make dynamic websites. Databases built with MySQL may be linked to websites that use PHP. It is a widely used scripting language. [3]

MySQL Database: A typical instance of an open-source database is MySQL. Performance, usefulness, and dependability of the MySQL database. This is utilized in the development of well-known web applications like as Twitter, YouTube, Facebook, and Yahoo.[3]

JavaScript: One well-known example of an open-source database is MySQL. Performance, usefulness, and dependability of the MySQL database. This is utilized in the development of well-known web applications like as Twitter, YouTube, Facebook, and Yahoo.[3]

Bootstrap 4: Bootstrap 4.0 is currently in use. HTML, CSS, and JavaScript are all included in Bootstrap 4 so that responsive websites may be made. I consequently made user accounts on my website.[5].

2.2.1 Similar applications

The departing mechanism is very difficult to run in a parking system as all occurrences are handled manually. Client vehicles are parked in any company's allocated parking space utilizing the TOKEN system, according to a number of parking management system data. Because parking takes a long time, the customer prefers to wait until a place becomes available or park on either side of the street. The process takes a little while. It takes a lot of physical work for users to manually confirm where a parking place is available. Before choosing which cars to park, the parking staff must hand create tokens, which takes a lot of work. The customer has two options: wait for a spot to open up or find another one, such on the side of the road. This will have an effect on traffic. There can be some security issues with this system. Using the existing strategy makes it difficult to arrive on time.

Table 2.1: Similar application functions & details

Website/Provider	Functions	Limitations
Pi Labs Bangladesh	• Automated slot management • One-way traffic control • Barrier-controlled security • Billing management • VIP/Guest parking zones • Real-time display for availability and ads	• Requires substantial upfront setup costs • Limited scalability for large areas.
Asian Technologies Ltd	• Elevated/stacked parking solutions • Hydraulic lifts for compact spaces • Automated puzzle parking systems	• Limited to high-tech infrastructure • High installation and maintenance costs.
Parkingkoi	• Online parking reservations • Monthly and hourly options • Parking listing service for owners • Regular quality checks.	• Limited coverage outside major cities • Relies heavily on user compliance.
Parko BD	• Simple parking management systems focused on residential and small commercial setups.	• Lacks advanced automation and real-time monitoring compared to competitors.

My website	• Sign in & sign up. • Search area & city which particular area need to parking. • Requesting for parking to the particular area. • Admin, parking attendant are handling all parking info. • Parking slot availability check. • Print parking details.	• Payment integration system.

2.3 Gap Analysis

Table 2.2: Gap analysis

Features	ParkRight	ParkEasy	SmartPark	ParkNow	EasyPark	Proposed System
Like or dislike parking spaces	No	No	No	No	No	No
Filtering liked and disliked parking spaces	No	No	No	No	No	No
Add to favorite or Wishlist parking spaces	Yes	Yes	Yes	Yes	Yes	NO
Search option for parking spaces	Yes	Yes	Yes	Yes	Yes	Yes
Detailed descriptions of parking spaces	Yes	Yes	Yes	Yes	Yes	Yes
Offers and discounts collection	No	Yes	No	Yes	No	No
Location search for specific area	No	Yes	No	Yes	No	Yes
Customer reviews and ratings for parking spaces	Yes	Yes	Yes	Yes	Yes	No
Multiple payment options	Yes	Yes	Yes	Yes	Yes	No

FAQs option	No	Yes	Yes	No	Yes	Yes
Chatting or live support option	Yes	Yes	No	Yes	No	No
Recommendations or filtering latest parking spaces	Yes	Yes	Yes	Yes	Yes	Yes
Parking space reservation or booking	Yes	Yes	Yes	Yes	Yes	Yes
Real-time availability updates for parking spaces	Yes	Yes	Yes	No	Yes	Yes
Quick view of parking space details	Yes	Yes	No	No	Yes	Yes
Parking history and receipts	No	Yes	Yes	No	Yes	Yes
Navigation to nearest parking space	Yes	Yes	Yes	No	Yes	No
Integration with other transport services	No	No	Yes	Yes	No	Yes

2.4 Summary

This chapter contains all of the previous studies conducted in this area. In the next section, they give an illustration of the breadth that arises from their refining this study topic. The main challenges or obstacles to this inquiry were the subject of the most recent conversation. This chapter includes parts on relevant research summaries and studies and talks about the challenges faced during the project's development.

CHAPTER 3

Research Methodology

3.1 Methodology/Requirement Analysis & Design Specification

The main objective of the smart parking request system is to decrease customer wait times and human labor. All that is required of the customer is to register on the web page, log in, and then look for available slots. The customer then confirms the time slot by supplying their name, address, time, and date. The customer had an easy experience since, after the reservation procedure was complete, they only needed to go to the parking spot. Because it is automated, the full process may be completed online.

3.1.1 Overview

The process for creating an online smart parking system that lets users choose a parking space is described in this section. The method consists of the design and conceptual framework of the system, the identification of attributes pertinent to the assigned parking spot, the creation of an aspect selection procedure, and the incorporation of these attributes with the current technical foundation. One advantage of the proposed system is that it aims to automate the manual process. With this system, the client—a client device, such as a Web browser—should be able to check the ability of parking spaces using the selected day and time. Through the website, customers will be able to reserve a parking space day, weeks, or even months in advance. To handle the maximum number of reservations, the system will monitor this data and distribute parking spots accordingly. Following a successful reservation, the customer receives a booking confirmation code. This makes it possible for customers to book parking spots before they arrive. Because it is mechanized, this approach requires less manual labor. This technique makes it possible to reserve parking spaces effectively and without the need for manual work. There won't be any waiting for customers. We can save money by using this strategy to keep off side roads and avoid paying penalties. Later portions of this

research will go into greater depth about the approach used to create the online smart vehicle parking system, which includes a parking application system to allow parking. It will include the system's design and structure, feature selection, user-relevant parking spot slot selection, and integration with the current academic and logistical physical environment.

3.1.2 Proposed Methodology/ system design

Developing the system architecture was the initial stage of the development process. One part of this was figuring out the parts and how they work together. The architecture of the system infrastructure prioritized scalability, security, and dependability. It required keeping database administration and product back-end functionalities separate from the user interface. The necessary security mechanisms were also included in the design to guarantee safe transactions and safeguard student data.

The Iterative Procedural Model was selected as the concept for the parking project because it offers a dynamic and adaptable method for developing software. Ongoing system development and improvement are made possible by this method's division of the creative process into iterative cycles. Specific applications are examined and enhanced with every iteration to make parking adaptable enough to accommodate changing user needs.

The effectiveness of this strategy, which incorporates user, alumni, and system assessment input, depends on regular feedback loops. Iterative methods allow for the incremental addition and modification of features and functions, one step at a time. Because user demands and efficient assistance techniques may change over time, this adaptability is essential for parking system apps. Continuous improvement is embraced by the iterative process paradigm. It guarantees that the parking system will always be at the forefront of response, effectiveness, and user experience. Building on the insights from earlier cycles, the model effectively incorporates the fluctuating character of parking data, enabling the application to

adjust to evolving needs and take into account the most recent developments in communication amongst all parking data.

Figure 3.1: System design

Flexibility in planning allows you to react quickly to changing market conditions and needs. Ongoing backlog reduction adjusts to shifting project priorities, and cross-functional cooperation guarantees comprehensive issue solutions. Frequent customer involvement, such as feedback meetings and user testing, helps guarantee that the project continues to meet user expectations.

3.1.3 Functional & Nonfunctional requirements

In order to collect requirements, it is necessary to manage both functional and non-functional data as required by the system. A website's design, layout, and inclusion must all be envisioned before it is built. The ability to control and modify each and every page and symbol will also be important to users of websites and applications. The demands of a system—which describe its features, attributes, and other components—are crucial for preserving its value and usefulness for users. Developers can start working on other technical tasks including framework construction, testing, execution, and operation as soon as the requirements are apparent. System requirements for each given system must take into account both

functional and non-functional criteria. The "visible" characteristics of the user are the functional needs. Prerequisites such as security, dependability, and upkeep that specify what the infrastructure has to fulfill are not legitimate.

Tools for Requirements in Project Development:

- The PHP framework will be used for this project's back-end development.
- The MySQL database will be used to manage and store data for the project.
- The project development process will be carried out using its Visual Studio Code IDE.

3.1.3.1 Functional Requirements

- **Admin**

- Admin dashboard.
- Log in and out.
- Add new parking area.
- Add new parking attendant
- View parking all details.
- Edit and Remove parking area details
- View parking attendants all details
- Edit and Remove attendant details
- View parking request all data table.
- All parking request data will be downloaded in: Excel, Pdf format.
- Print all request information.
- Search option of each request record.
- Remaining parking slot updates

- **Parking Attendant**

- Attendant dashboard.
- Log in and out.
- View of all parking requests.
- Action response in request of users “Accept” & “Reject”.
- If action is “Accepted” then shows all information of requested users.
- After that the requested user’s information will be downloaded in Pdf

format.

- Print the information.

➢ Users

- User dashboard.
- Log in and out.
- Sign up for account registration.
- Showing all Parking area details.
- Search city & area for parking.
- View Specific particular area parking information details.
- Active request option.
- Past all request option.
- Download active request all option details.
- Interaction with attendant.
- View remaining parking slots.

3.1.3.2 Non-Functional Requirements

➢ Security

Every user on the system has an account, and access to the system is restricted to those who have been given authorization and a password. PHP and JavaScript are used to encrypt the passwords.

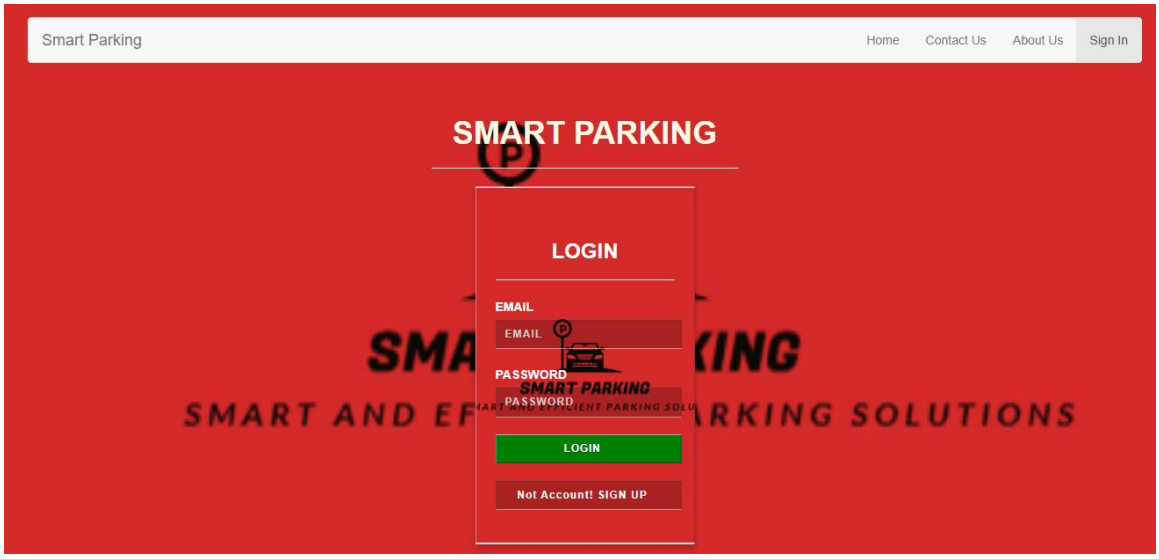


Fig 3.2: User Login Interfaces

➢ **Performance**

Maintaining and updating records is simple.

➢ **Availability**

Users only need a computer with an Internet connection to access the system from anywhere at any time. The system is compatible with a number of web browsers, including Internet Explorer, Mozilla, Opera, and Chrome.

➢ **User Friendly**

The technology is very interesting and has an easy-to-use user interface.

3.1.4 Use Case Diagram

This section uses use-case diagrams with use-case data to assess both functional and non-functional needs. The relationships between the activities are further examined using data flow diagrams and activity schematics.

In this part, both functional and non-functional needs are analyzed using use-case data and diagrams.

Admin:

After login in, the administrator may perform the following actions:

- Add new parking area.

- Add new parking attendant
- View parking all details.
- Edit and Remove parking area details
- View parking attendants all details
- Edit and Remove attendant details
- View parking request all data table.

User:

After login in, the user may perform the following actions:

- Sign up for account registration.
- Showing all Parking area details.
- Search city & area for parking.
- View Specific particular area parking information details.
- Active request option.
- Past all request option.

Park Attendant

After login in, the park attendant may perform the following actions:

- Log in and out.
- View of all parking requests.
- Action response in request of users “Accept” & “Reject”.
- If action is “Accepted” then shows all information of requested users.
- After that the requested user’s information will be downloaded in Pdf format.

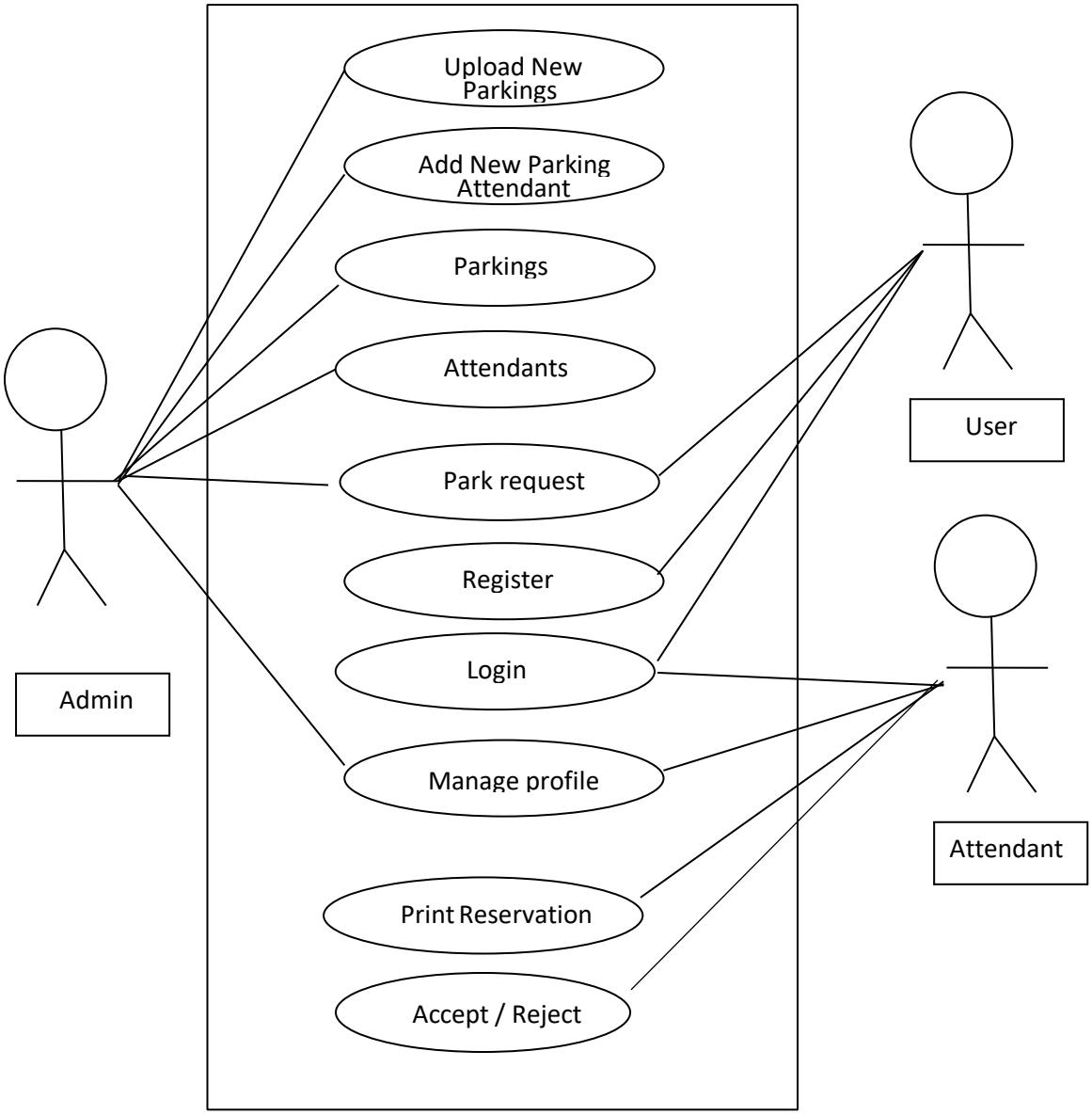


Fig 3.3: Use case Diagram

3.1.5 Data Flow Diagram

Admin Data Flow Diagram:

Three databases, six processes are all included in this data flow diagram.

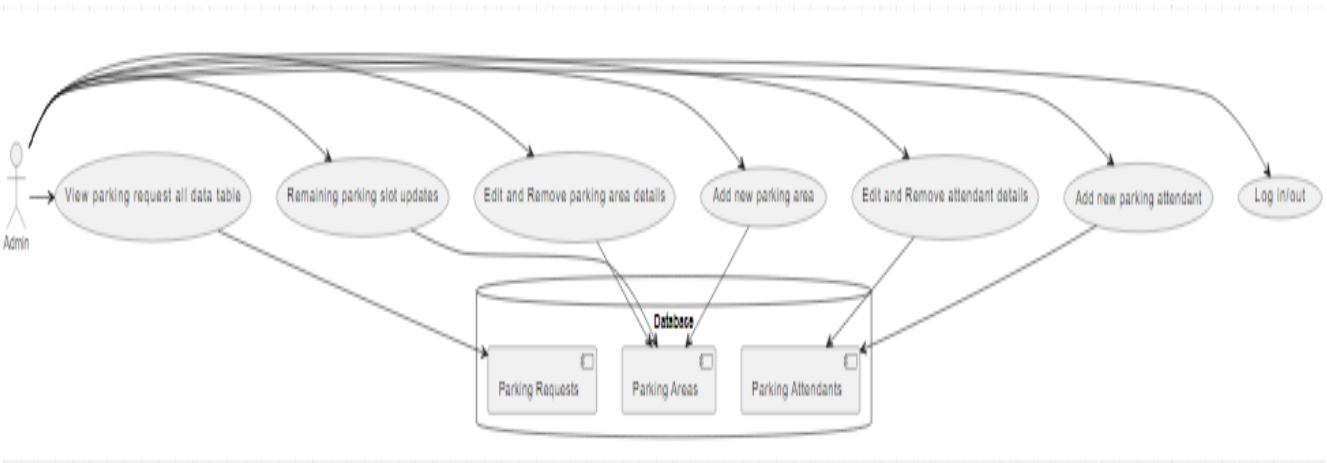


Fig 3.4: Data Flow Diagram for Admin

Users Data Flow Diagram:

There are two entities, four processes, and three databases utilized in this data flow diagram.

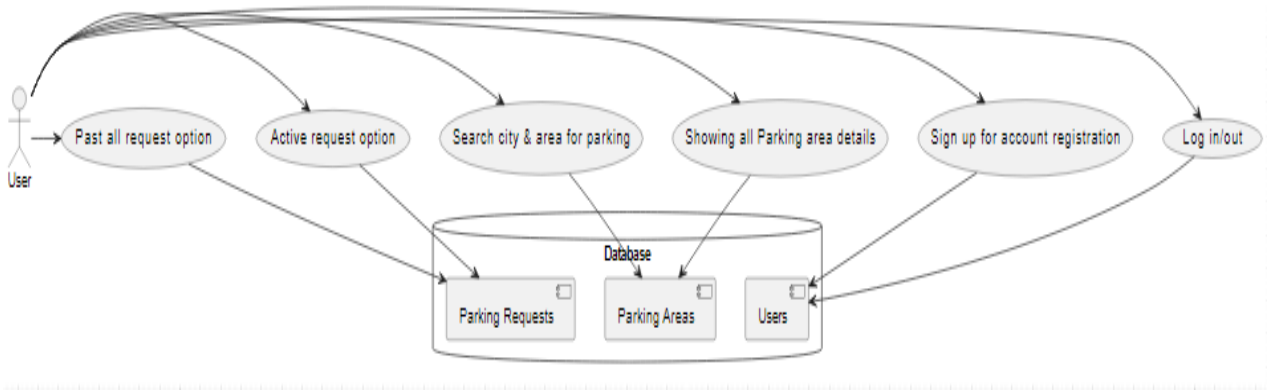


Fig 3.5: Data Flow Diagram for users.

Parking Attendant Data Flow Diagram:

There are two entities, five processes, and one database utilized in the data flow diagram.

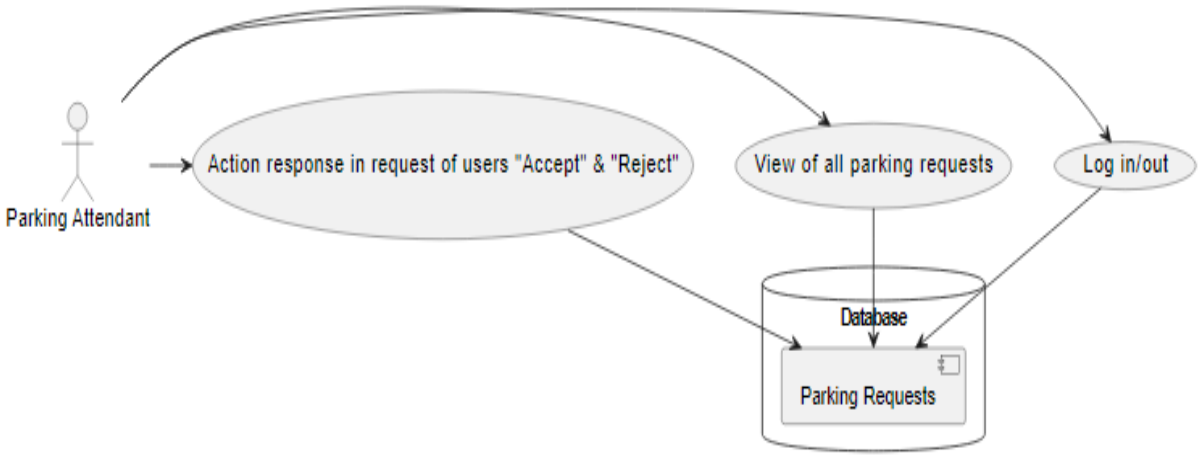


Fig 3.6: Data Flow Diagram for Park attendant.

3.1.6 Activity Diagram

Describe the dynamic aspects of the system. It is basically a flow chart that shows how one activity leads to another. The activity may be defined as the way the system operates. This results in the transfer of control across operations. All three modules' activity diagrams—Admin, Attendant, and Users—are covered here.

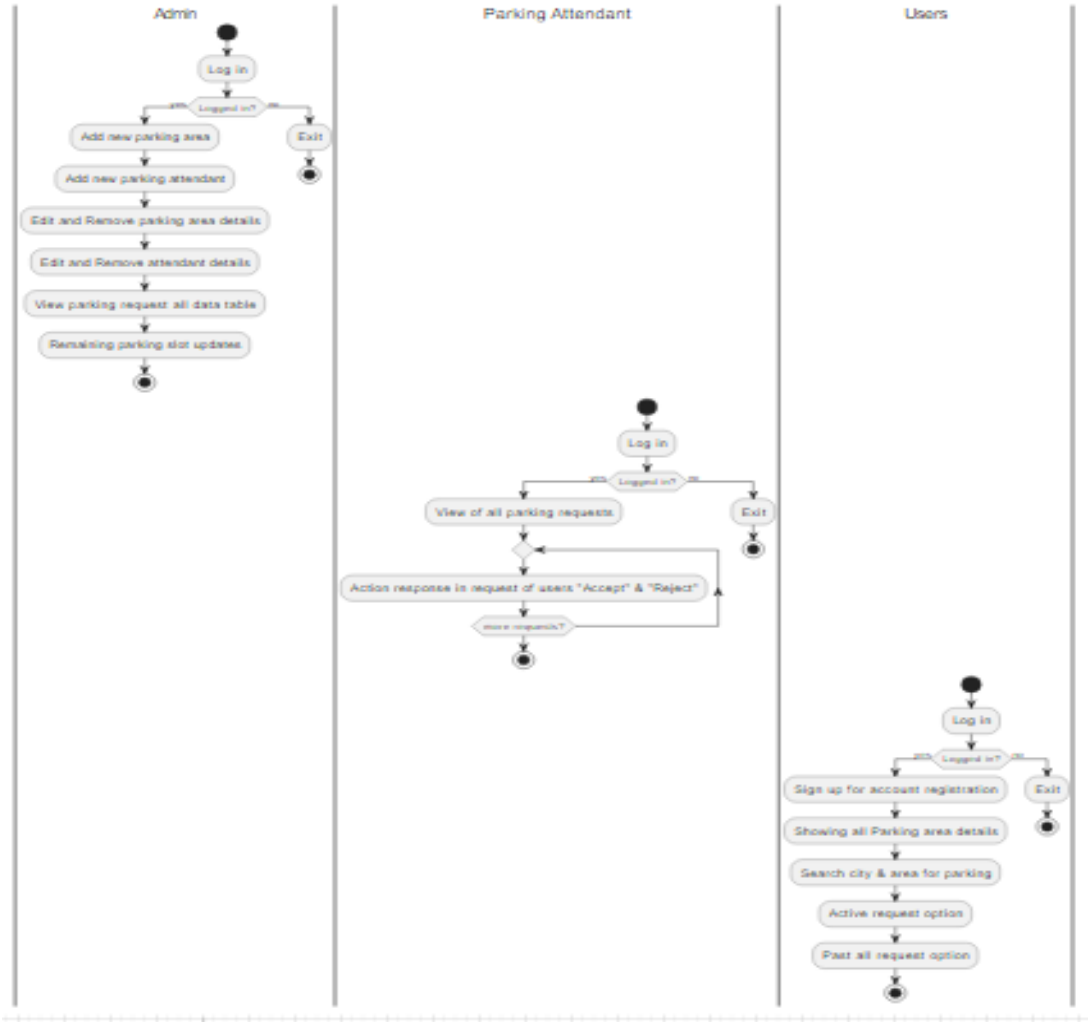


Fig 3.7: Activity Diagram.

3.1.7 ER Diagram

The ERD, ER Diagram, and ER model are some of the names for the structural application utilized in the design known as institutional means of communication. The two primary types of knowledge that the ERD aggregates and conveys in different ways are the relationships between these organizations and the key components of the constrained system. This article discusses the Entity Relationship Diagram for the Administrator, Attendant, and User modules.

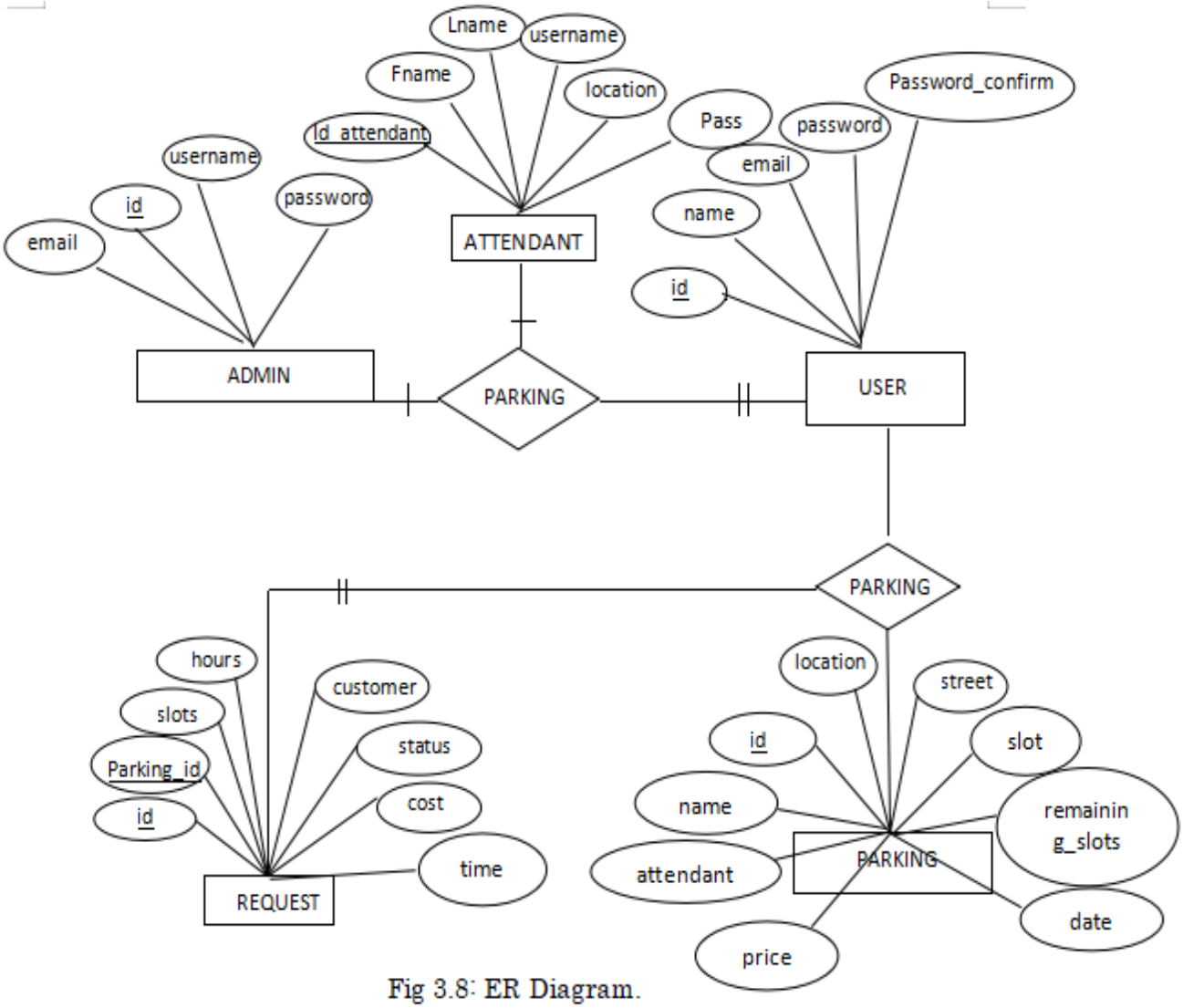


Fig 3.8: ER Diagram.

3.1.8 Sequence Diagram

All three modules' sequence diagrams—Admin, Attendant, and Users—are covered here.

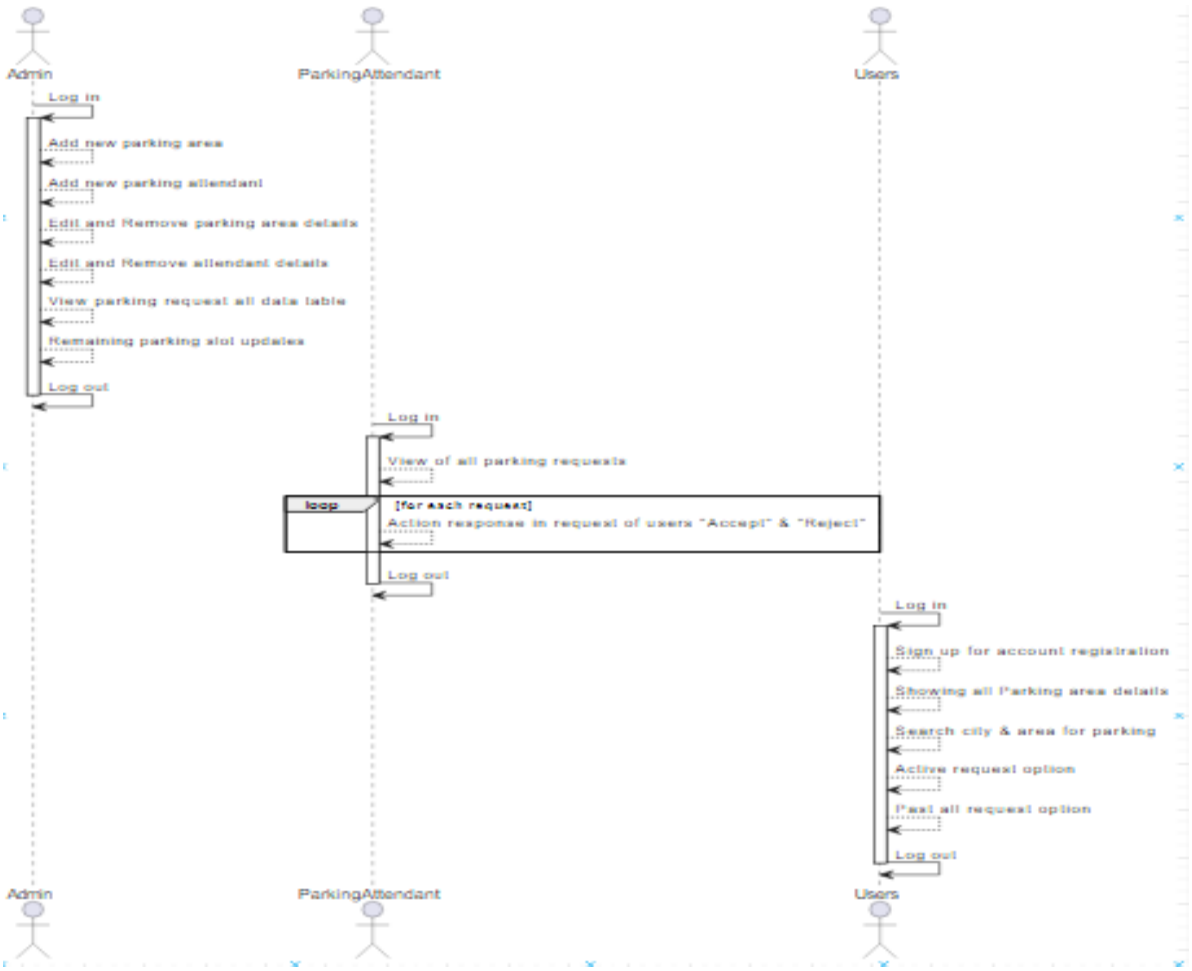


Fig 3.9: Sequence Diagram.

3.1.9 Class diagram

A class was made to show the source material of the connections between classes. In this case, the class specifies an entity's variables and operations as a single code expression or as a distinct entity within a program.

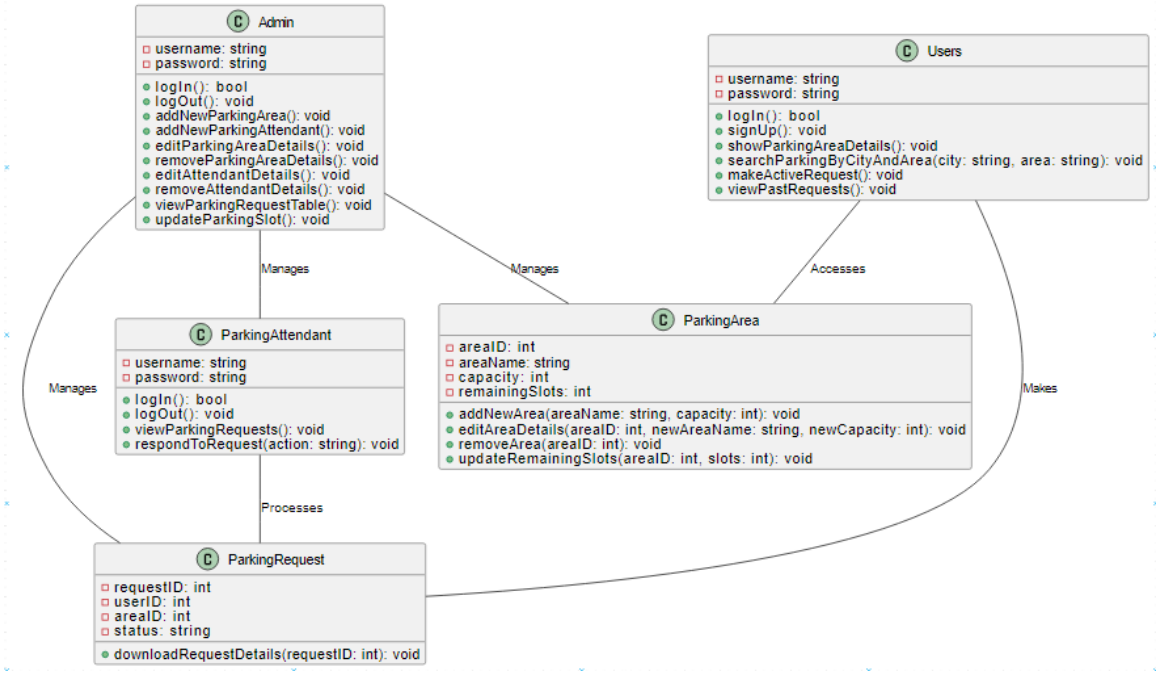


Fig 3.10: Class Diagram

3.2 Detailed methodology and Design

Overall, the "An Innovation of Smart parking system" program will simplify the management of the parking system's attendant and customer interactions. Everywhere, parking spots are essential, but in a country's cities, they are more so. An enormous amount of time is spent each day by hundreds of automobiles trying to find a parking space. The first step in the development process was creating the system architecture. Finding the components and how they interact was one aspect of this. Scalability, security, and reliability were given top priority in the system infrastructure's architecture. It meant separating the user interface from database management and product back-end features. The design also incorporated the required security features to ensure secure transactions and protect student information.

In urban places, this leads to a rise in theft, which aggravates drivers and creates traffic jams. Addressing this issue would involve the establishment of a smart parking booking technology for parking space management in this city. Through

the use of applications application programming interfaces (APIs) and secure communication technologies, the online system and the supporting framework were guaranteed to interact flawlessly. The process of choosing features for an online smart vehicle parking system involves carefully weighing a variety of factors to ensure that the final product meets user and operational needs while keeping to the overarching goals of efficiency, convenience, and sustainability. First, a thorough analysis of user requirements, including consumer trends, is carried out to identify the most crucial features and functionalities. This might have features such as online booking, safe payment processing, real-time parking availability updates, and a faultless navigation system link for parking location guidance. Considering data processing, analytics, and security measures is also essential to safeguarding the system's reliability and privacy.

Developing the system architecture was the initial stage of the development process. Part of this involved identifying the elements and their interactions. The architecture of the system infrastructure prioritized scalability, security, and dependability. It entailed keeping database administration and product back-end capabilities apart from the user interface. In order to safeguard student information and guarantee safe transactions, the design also included the necessary security measures.

- **Smart Parking for Admin**

All of the operations in this module related to parking and slots will be managed and scheduled by the administrator. The administrator can also add, remove, and modify the slots available to customers. He confirms who is registered and who has reserved a spot. The administrator is responsible for maintaining every event linked to this parking management system.

Qualities:

- The administrator may change all information, including slots.
- Parking attendants can create new spots and modify existing ones.
- The administrator confirms who has signed up and made a reservation.

- **Smart Parking for Parking Attendant**

All of the events related to slots and parking events in this module will be planned and managed by the attendant. Additionally, attendees have the option to add, edit, and remove a customer's slot availability. He ensures the registration of all those who have reserved a spot. The attendant is required to be informed about all activities related to this smart parking system.

Features:

- The attendant has the ability to create more spots for consumers.
- The slots can be updated by the attendant.
- The attendant verifies the people who have registered and reserved a spot accept or rejected.

- **Smart Parking for Users**

Clients associated to that particular slot will maintain current information on each occurrence in this module. He could get his user ID and password after creating an account on the app. After entering their login and password, the customer sees the available time slots and makes the reservation at the time of their choice.

Features include:

- The user registers for an application account.
- Enter your user ID and password to log in.
- After choosing a spot, the parking user makes sure it is available.

Parking: Customers are able to book a parking space for the time and date that are most convenient for them.

Automated cost estimation: The system calculates the overall parking fee based on the user's specified booking time.

User parking request: The admin can review the user's request and the park attendant can either approve or deny it.

3.3 Project Plan

Table 3.1: Total project plan & time estimate

Sl. No.	Next Task	Estimate completion time (MM-YY)
1	Project Initial planning	07-24
2	Analysis requirements of the project.	08-24
3	Apply back end, database and front end design to create web design.	09-24
4	Web application testing and evaluation.	10-24
5	Report writing	11-24

3.4 Task Allocation

Tasks	Weeks																	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Project Initial planning																		
Analysis requirements of the project.																		
Back end, database and front end design.																		
Testing and evaluation.																		
Report writing																		

Estimated Work Period	
Actual Work Period	

3.5 Summary

This chapter define project methodology, also has use case, data flow, sequence all diagram has been shows in this section. All detailed design and methodology has been clear in this part. After discussing the system as a whole, its users, and the functional and non-functional needs, we looked at the relationship and behavior of the activities using a variety of methodologies, including use case diagrams, data flow diagrams, sequence diagrams, and activity diagrams.

CHAPTER 4

Implementation and Results

4.1 Environmental setup

A product development tool is a piece of software or application used for task and application management, investigation, and organization. We used the following tools to work on this site:

- Apache Server
- MySQL Workbench
- PHP Strom IDE
- Browser.

Client slide	Server side
Html, CSS, JavaScript, Bootstrap	PHP, MySQL, XAMPP

The accompanying is used to determine the programming needs. As development went on, we managed the web stage. We wish to support a cross-stage application as well as an online platform. We would require HTML5, CSS3, JavaScript for the front end. Our aim is accomplished via the usage of, PHP, and MySQL. As a neighboring worker, XAMPP is also necessary in this case. As the code editorial manager, we would require a top-notch word processor.

4.1.1 Design and Implementation of Databases

To hold the information needed for the online smart car parking system, we created and put into use a scalable and robust database. In order to effectively store information about parking requests, attendants, and parking details, the data storage framework was created. Archival and query optimization were two techniques used in database administration to guarantee efficient information storage and retrieval.

TABLE DESIGN:

TABLE NA ME: **Admin_ Details.**

PRIMARY KEY: **id**

DESCRIPTION: The admin Details are maintained in this table.

Table 4.1: Admin details table

S.NO	FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
1.	Id	Varchar	30	Admin ID
2.	username	Varchar	50	Admin Name
3.	email	Varchar	50	Email id
4.	password	Varchar	50	Password

TABLE NAME: **ATTENDANT_ Details.**

PRIMARY KEY: **Id_attendant.**

DESCRIPTION: The Attendant Details are maintained in this table.

Table 4.2: Attendant_details table

S.NO	FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
1.	Id_attendant	Varchar	8	ATTENDANT ID
2.	Fname	Text	20	First Name

3.	Lname	Text	20	Last Name
4.	mobile_no	int	12	Mobile Number
5.	location	Text	50	Location
6.	username	Varchar	30	User Name
7.	password	Varchar	15	Password

TABLE NAME: **User_ Details.**

PRIMARY KEY: **id.**

DESCRIPTION: The User Details are maintained in this table.

Table 4.3: User_details table

S.NO	FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
1.	id	Varchar	30	User ID
2.	name	Varchar	50	User Name
3.	email	Varchar	50	Email id
4.	password	Varchar	50	Password

5.	password_ Confirm	Varchar	50	Confirm Password

TABLE NAME: **Parking.**

PRIMARY KEY: **id.**

DESCRIPTION: The Parking Details are maintained in this table.

Table 4.4: Parking details table

S.NO	FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
1.	id	Varchar	8	Parking ID
2.	location	Varchar	15	Location
3.	street	Varchar	15	Street
4.	slot	Varchar	15	Parking Slot
5.	remaining_slot	Varchar	15	Remaining slots
6.	attendant	Varchar	15	Attendant
7.	date	Date	-	Date
8.	price	Int	10	Price

TABLE NAME: **Request.**

PRIMARY KEY: **id**

FOREIGN KEY: **parking_id.**

DESCRIPTION: The Request Details are maintained in this table.

Table 4.5: Request table

S.NO	FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
1.	id	Varchar	8	Request ID
2.	Parking_id	Varchar	20	Parking Id
3.	slots	Int	5	Slots
4.	cost	int	5	Cost
5.	customer	Varchar	15	Customer
6.	time	-	10	Time
7.	status	Varchar	10	Status

4.2 Testing & Evaluation/ Performance

4.2.1 Description of System

A smart parking system is one that has proven beneficial for parking cars in designated spots. Parking attendants, administrators, and car owners are the three categories of system users. The idea that has been put out is an automated parking reservation system that offers clients a simple online way to book a spot. It gets rid of the need to waste time at work searching for parking. As a result, this project provides an online reservation system that lets consumers park their cars and get in touch with the management. The cars that are intended to be parked in the lot are monitored by this program. The ability to cancel bookings for cars is another advantage of this method. With approval from the administrator, users can terminate their book area at any moment. Users are also responsible for paying any fees assessed by the administrator. Users receive a customized parking ID and a parking out message after completing the debit payment. Administrators and users can easily change their various data. The admin, user, and parking attendant modules are also supplied in printed form. On the admin dashboard, you may search for a new parking spot, add a parking attendant, and modify all the information. The administrator and parking attendant can also receive parking requests from users. Additionally, the request is either accepted or denied by the parking attendant.

The implementation phase, which follows the extension of the data systems system, integrates a number of strategies and activities for the development of the website and smartphone program, as illustrated in Blew. When building a website, style defining is done using CSS and design is done with HTML. Afterwards, JavaScript and MySQL were used to create websites and sophisticated user connections. PHP was eventually used to administer the website's databases and content. The panorama eventually found its way online.

4.2.2 Description of Users

My website is utilized by three modules. These people are administrators, parking attendants, and users. Every system user is capable of doing various duties. An summary of the activities completed by each user is shown in Table 4.1.

Table 4.6: Modules descriptions

Actuators	Functions
ADMIN	• Admin dashboard. • Log in and out. • Add new parking area. • Add new parking attendant • View parking all details. • Edit and Remove parking area details • View parking attendants all details • Edit and Remove attendant details • View parking request all data table. • All parking request data will be downloaded in: Excel, Pdf format. • Print all request information. • Search option of each request record.
PARKING ATTENDANT	• Attendant dashboard. • Log in and out. • View of all parking requests. • Action response in request of users “Accept” “Reject”. • If action is “Accepted” then shows all information of requested users. • After that the requested user’s information will be downloaded in Pdf format. • Print the information.

USERS	• User dashboard. • Log in and out. • Sign up for account registration. • Showing all Parking area details. • Search city & area for parking. • View Specific particular area parki information details. • Active request option. • Past all request option. • Download active request all option details.

4.2.3 Quality Control and Testing

Throughout the development process, extensive testing and quality control techniques are employed to find and fix any possible problems or errors. Functionality, performance, and user acceptance tests were conducted. The goal of security testing was to identify and address vulnerabilities. In order to make the required changes and deliver a reliable, high-quality system, feedback from stakeholders and users was obtained.

Unit Testing:

During unit testing, test each module independently before integrating the system as a whole. Unit testing focuses verification efforts on the smallest unit of software development for each module. Another phrase for this is module testing. Every module of the system is tested separately. Verify that this approach works with all browsers as well.

Validation Testing:

In software testing, verification and validation are procedures used to make sure a system meets specifications and performs as intended. Another name for it is software quality assurance.

Integration Testing:

Integration testing is used to handle the problems pertaining to the two issues of inspection and program generation. After integrating the program, a number of high-order benchmarks are done. This testing procedure's main objective is to use unit-tested modules to build a program structure based on design criteria.

4.2.3.1 TEST CASES

Case Id	CASE NAME	Expected Result	Actual Result	Result (Pass/Fail)
1	User Name	Incorrect or empty names will result in a notice being shown.	Incorrect or empty names will result in a notice being shown.	Pass
2	Password	A notification will appear if the password is invalid or empty.	A notification will appear if the password is invalid or empty.	Pass
3	Admin	Incorrect or empty names will result in a notice being shown.	Incorrect or empty names will result in a notice being shown.	Pass
4	User id	A notification will appear if the userid is invalid or empty.	A notification will appear if the userid is invalid or empty.	Pass
5	Email id	A notification will appear if the password or mail address are not accurate.	A notification will appear if the password or mail address are not accurate.	Pass

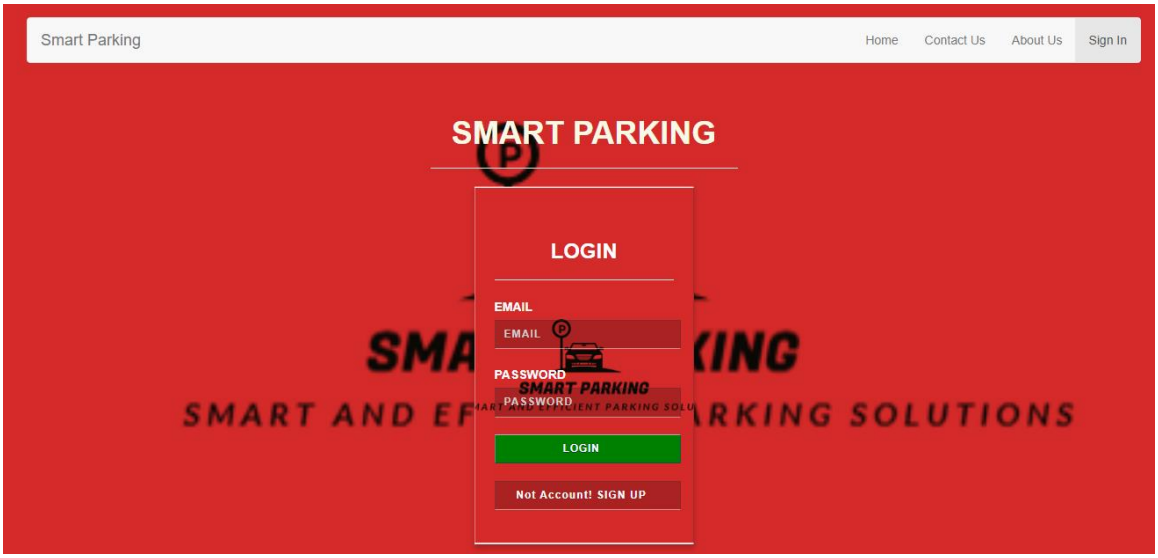
4.3 Result & Discussion

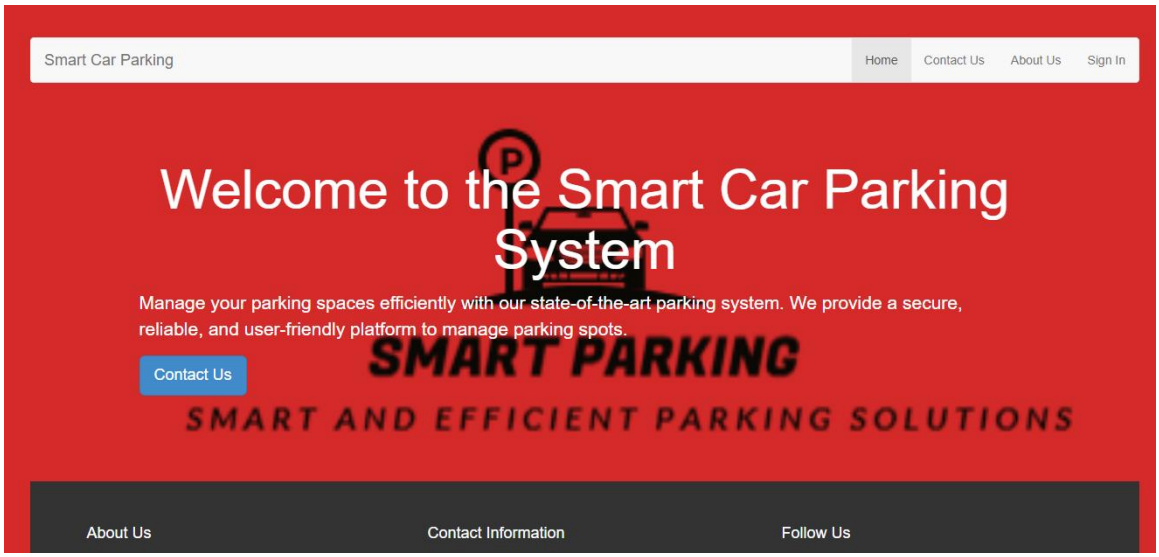
The intended idea is an online parking management tool that facilitates user reservations. It eliminates the tedious problem of needing to look for parking at places of business. In order to enable customers to browse various parking lots and select a place to verify whether it is available, this project offers a web-based reservation system. If there are still openings, he may schedule it for a specific time frame. Web extension methods (HTML, CSS, JavaScript, Boostrap4) were used to construct this system, which allowed us to design the firmware, tables, panels, and colors in addition to the UI/UX features. such as this:

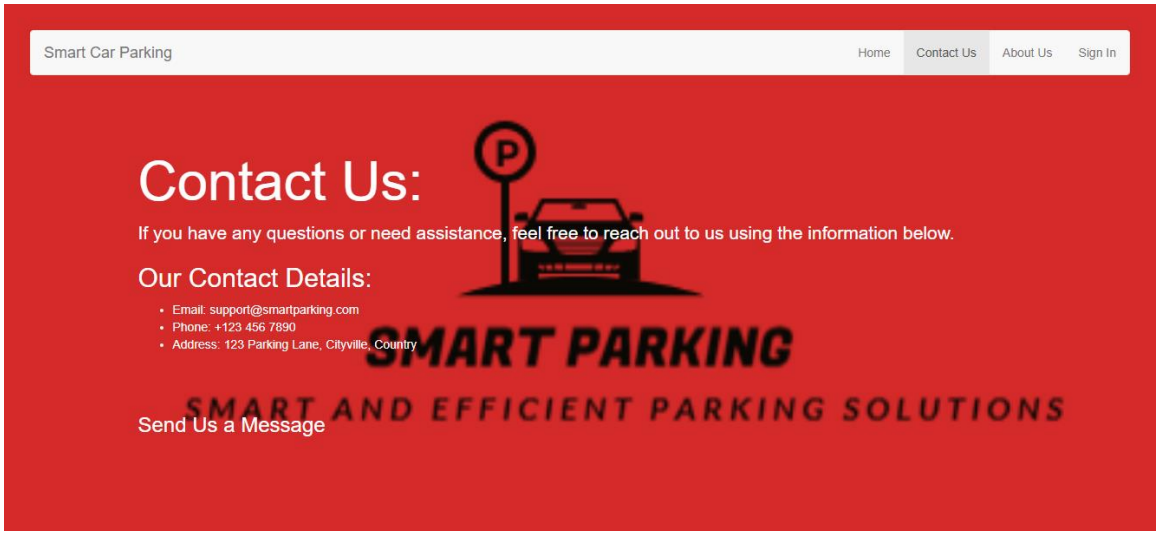
- Offer a user-friendly system.
- Make the memory's design simpler.
- By carefully selecting the colors you use, you may maximize the user experience on your website.
- Next, let's protect user data in a MySQL database and view web sites using PHP and the MySQL database management system.

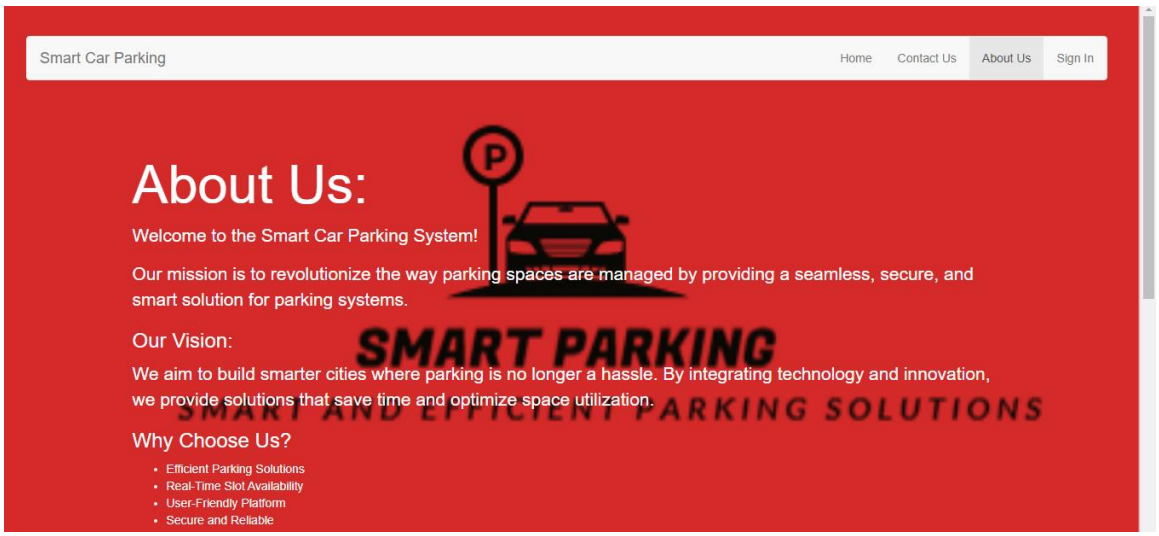
4.3.1 All User Interfaces

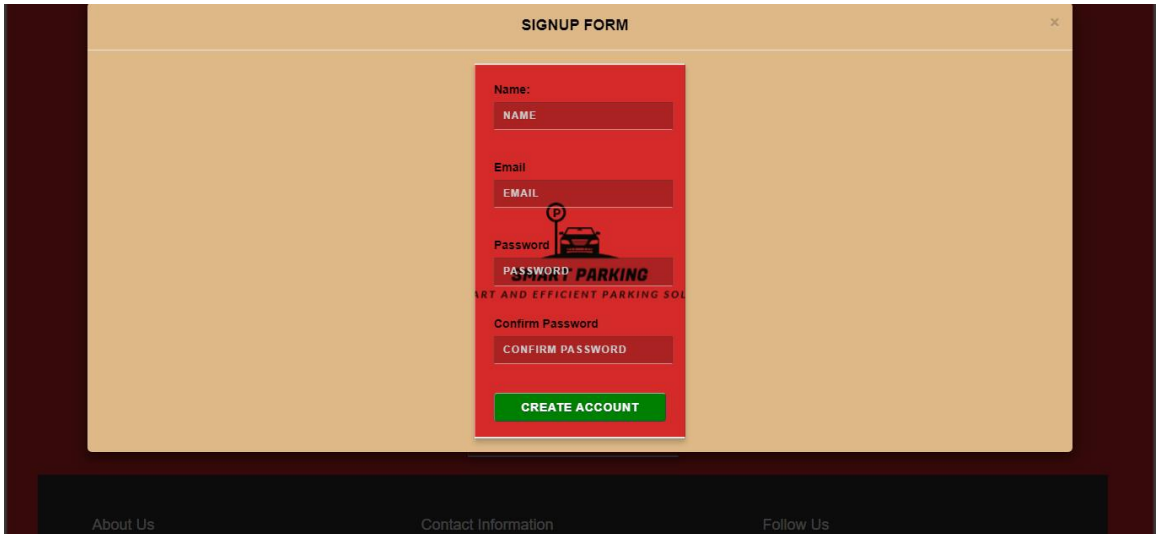
4.3.1.1 Interfaces for Users

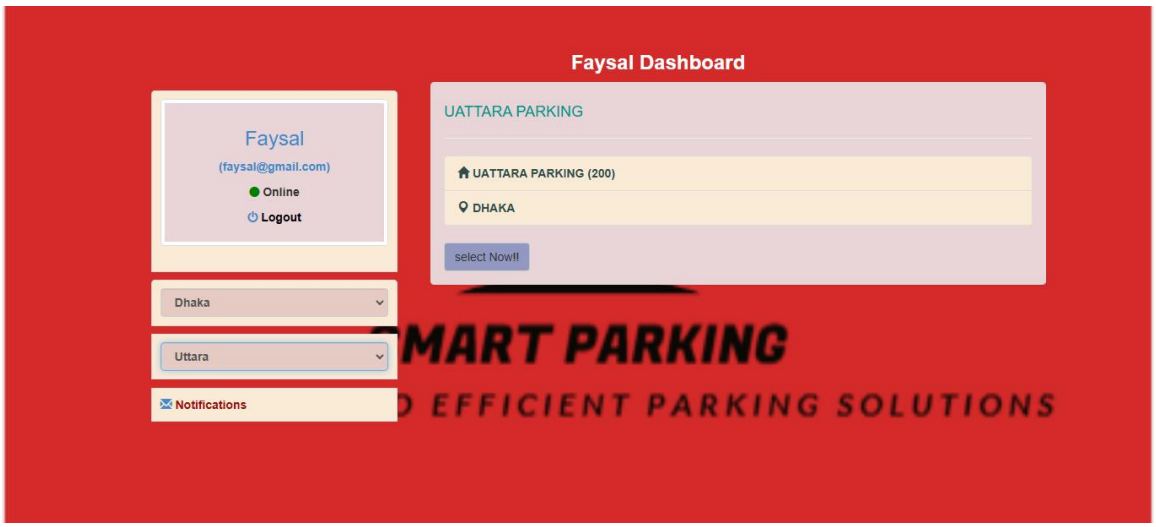


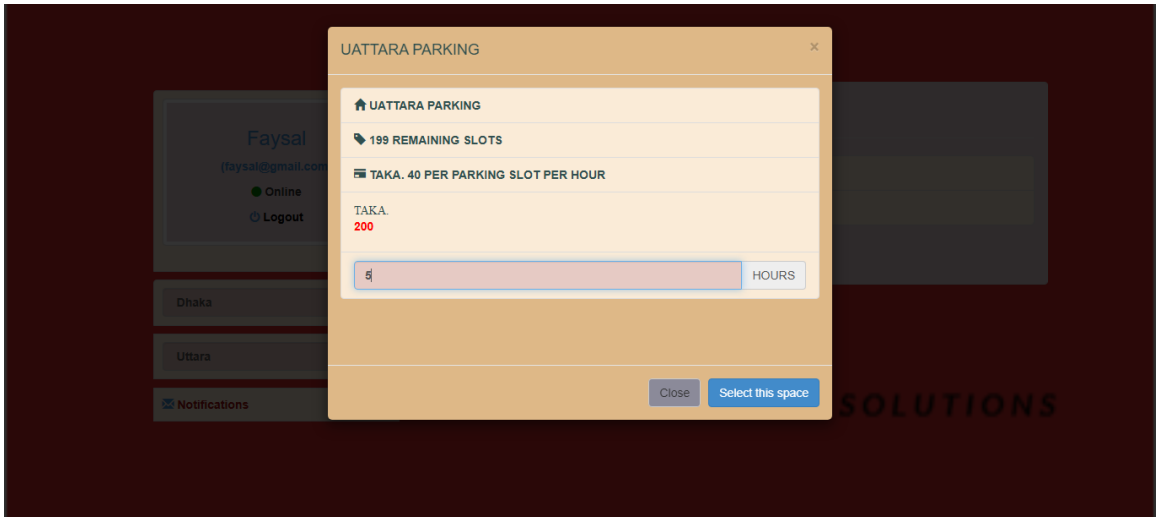












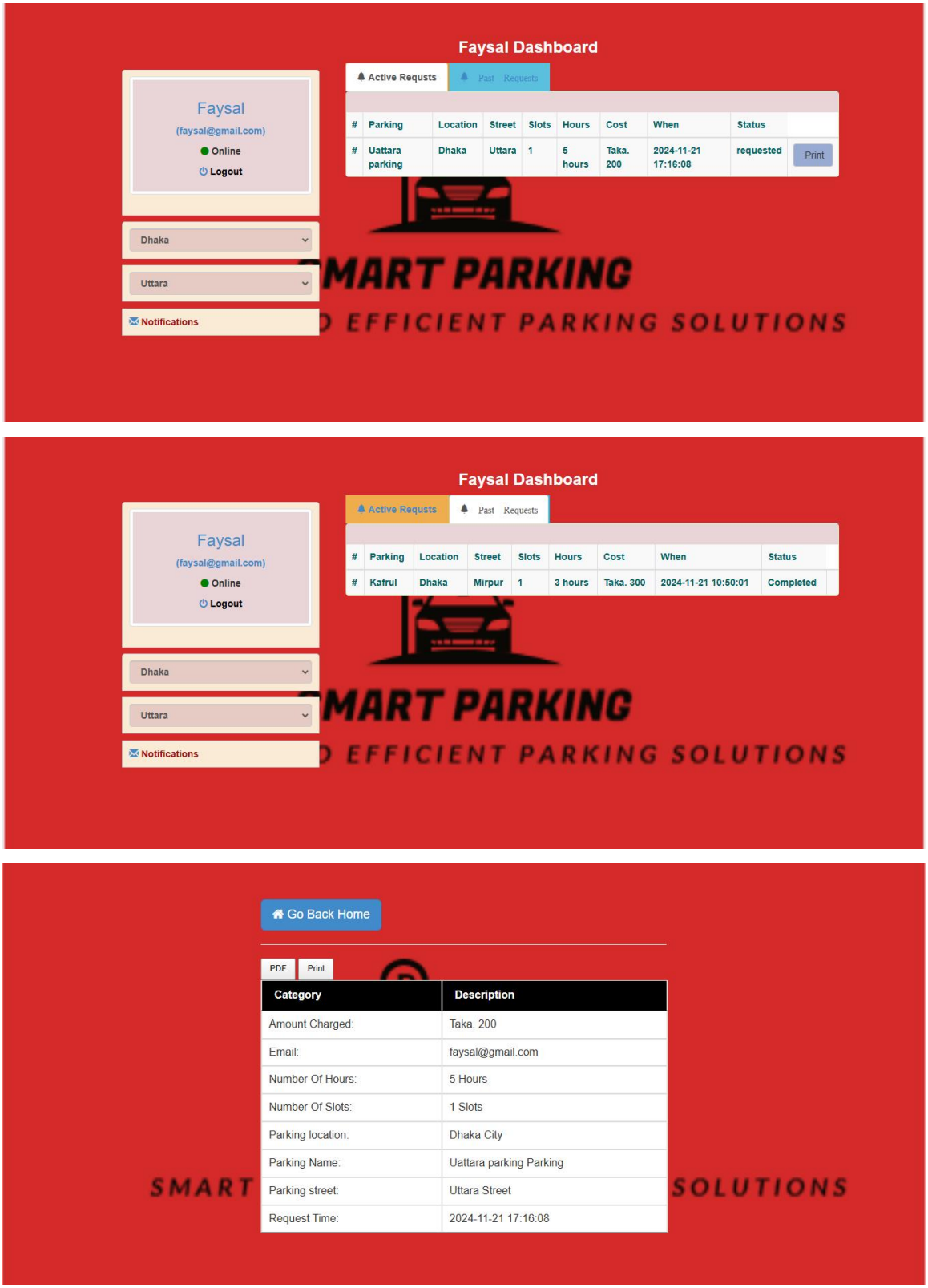
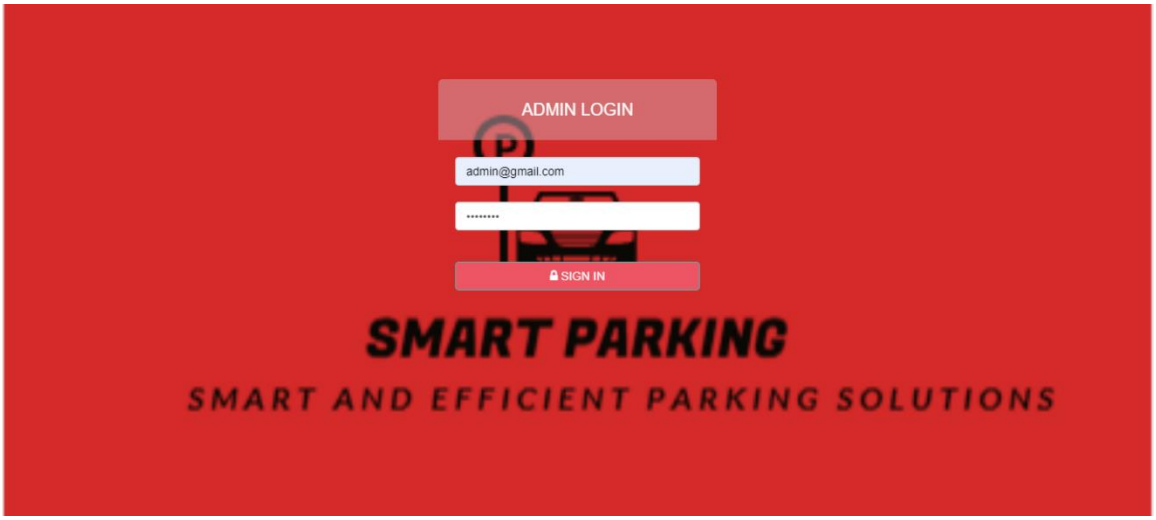
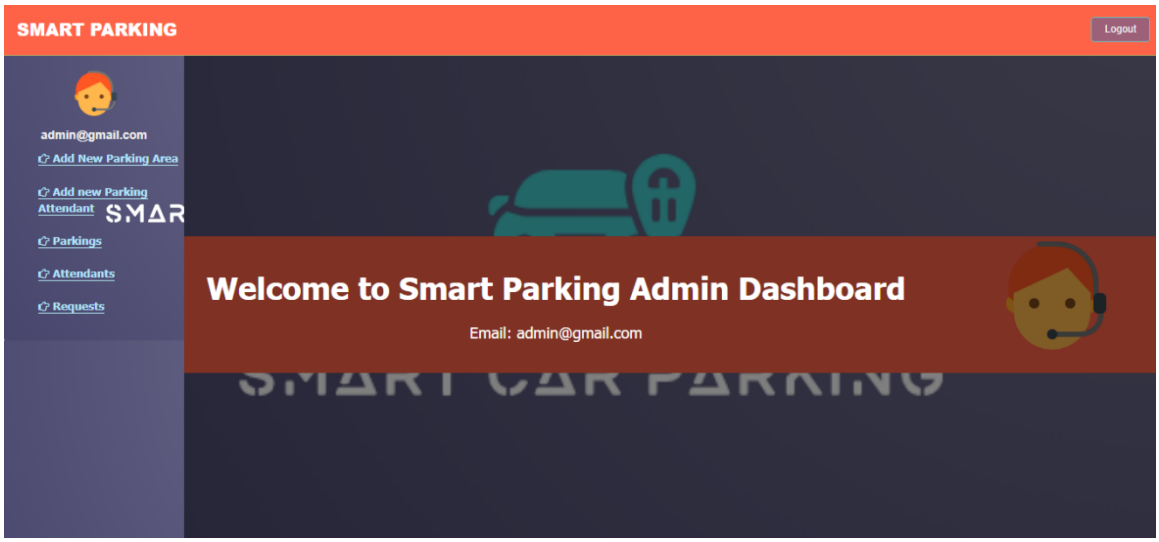


Fig 4.7: Interfaces for User account

4.3.1.2 Interfaces for Admin





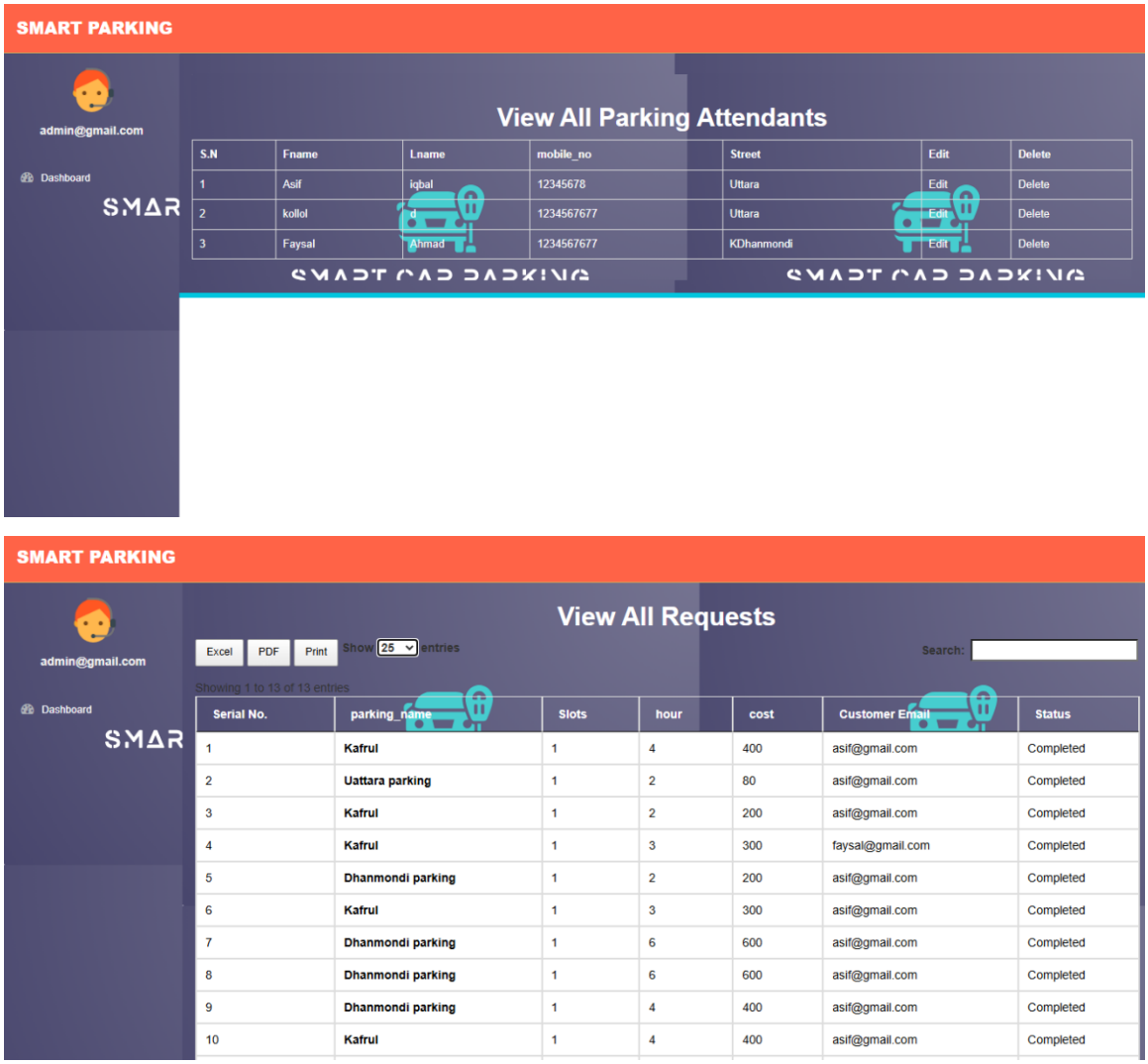
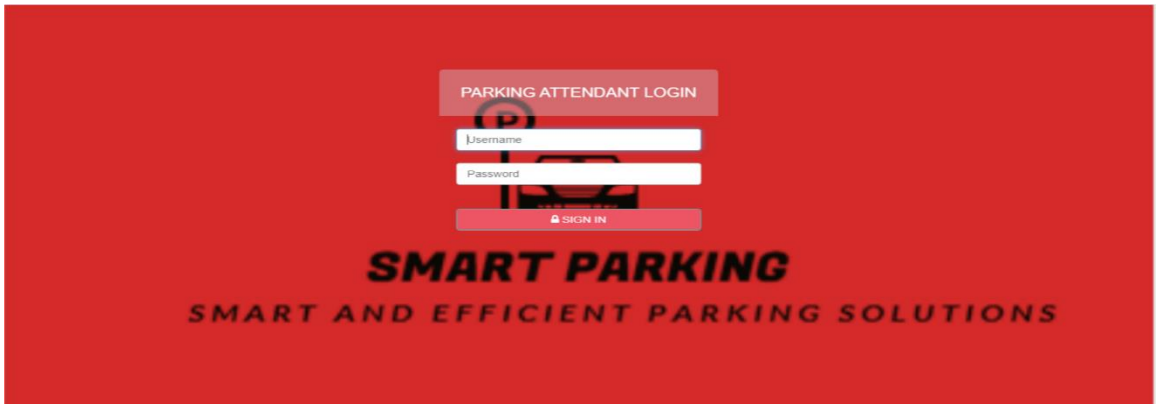


Fig 4.8: Interfaces for Admin account.

4.3.1.3 Interfaces for Parking Attendant



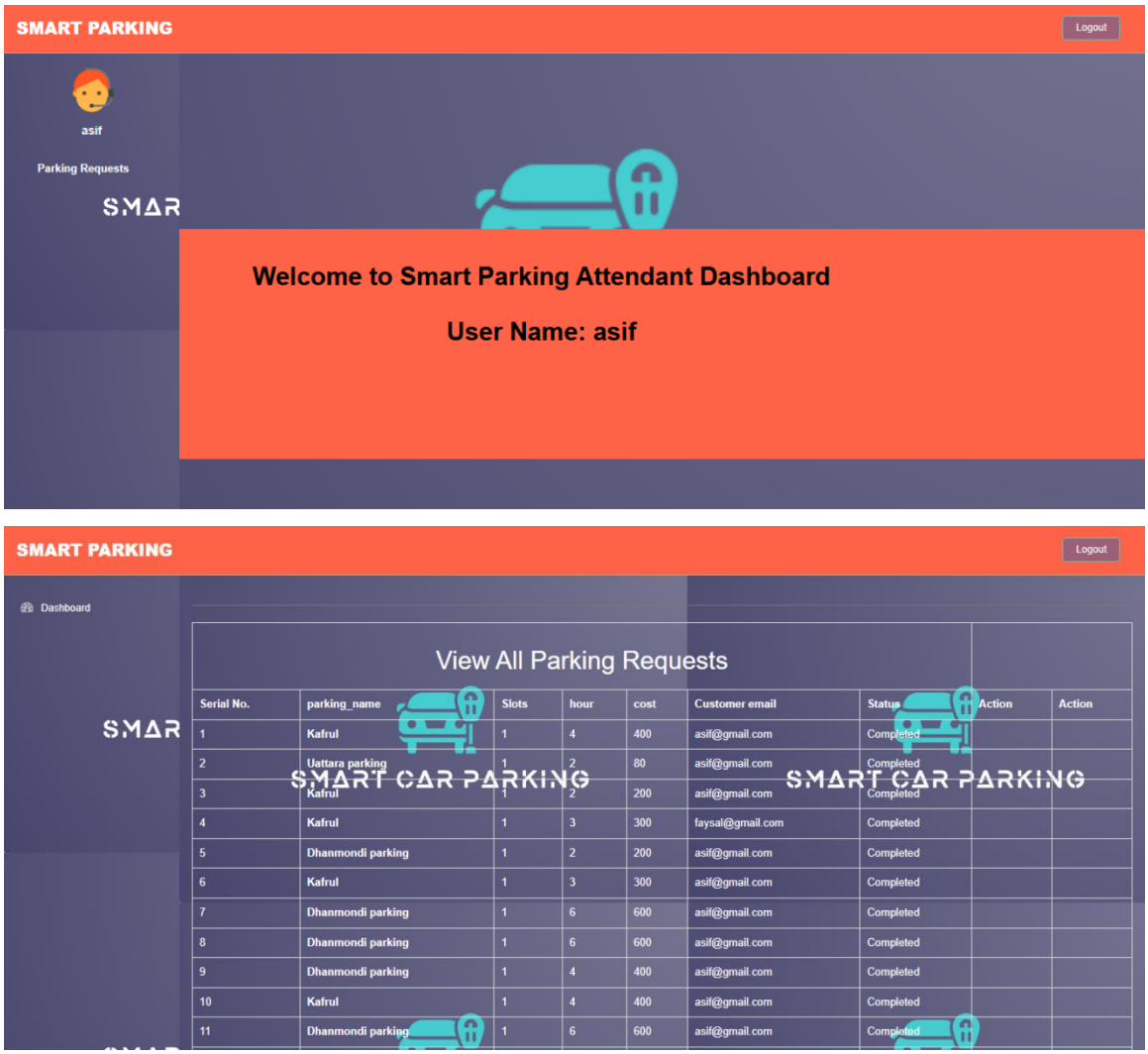


Fig 4.9: Interfaces for Parking Attendant account.

4.4 Summary

I went to a presentation that discussed the design and implementation stages as well as the system's design admin, user and parking attendant. Additionally, the admin and interfaces for users.

CHAPTER 5

Engineering Standards and Design Challenges

5.1 Compliance with the standards

All things considered, the "Smart parking system" program will make it easier to handle the interactions between customers and parking system attendants. Parking spaces are necessary everywhere, but they are even more important in a nation's metropolis. Each day, hundreds of cars spend a great deal of time searching for a parking spot. This increases theft in metropolitan areas, which irritates drivers and causes traffic congestion. The use of smart parking booking technology for this city's parking space management would be necessary to address this problem. The perfect interaction between the online system and the supporting framework was ensured by the use of secure communication technologies and application programming interfaces (APIs). A web application for a smart parking system needs to adhere to a number of standards in order to guarantee accessibility, security, and data privacy. It should comply with PCI-DSS requirements for safe payments, WCAG recommendations for accessibility, and GDPR or CCPA for data protection. In order to integrate sensors seamlessly, the system must also comply with ISO/IEC software quality standards and IoT communication protocols. To guarantee seamless operation and coexistence with urban transportation networks, local laws pertaining to parking management and public infrastructure must also be followed.

5.1.1 Software standard

- Software engineering: Product quality (ISO/IEC 9126) guarantees superior software for smart parking systems.
- Models for software product quality (including usability, performance, and functionality) are defined by ISO/IEC 25010.
- Information security management systems, which guarantee the protection of user data, particularly payment information, are outlined in ISO/IEC 27001.

5.1.2 Hardware standard

- Parking management systems use IEEE 802.11 (Wi-Fi), a wireless communication protocol, to access the internet.
- The standards for cabling systems, namely in the infrastructure of smart parking sensors, are ISO/IEC 11801.
- Parking devices and sensors are guaranteed to be of high quality and dependability according to ISO 9001-certified quality management systems.
- Electrical device safety regulations (IEC 60601) apply to smart parking stations, particularly those that charge electric vehicles.
- The standards for imbedded systems in hardware parts, such as smart meters or parking sensors, are ISO/IEC 14708.

5.2 Impact of Society, Environment & Sustainability

5.2.1 Impact of Life

The web application for a smart parking system has a big influence on everyday life by improving urban mobility's sustainability, efficiency, and convenience. The method lowers traffic jams and greenhouse gas emissions by reducing the amount of time spent looking for parking by giving real-time parking spot availability. This makes cities cleaner and greener by reducing pollutants and improving traffic flow. For both locals and guests, the option to book parking spaces in advance promotes better planning and provides peace of mind, particularly in crowded locations. Furthermore, parking becomes easier to use when services like location-based directions, automated payments, and customer evaluations are included. These systems maximize space usage and offer a more effective use of public facilities in metropolitan areas with growing vehicle densities, which is essential for sustainability and the development of smart cities.

5.2.2 Impact of Society & Environment

The environment and society are significantly impacted by the installation of a smart parking system. In terms of society, it makes city living more convenient by cutting down on the time and stress involved in locating parking spots. This results in a more efficient urban experience, better traffic flow, and less annoyance for drivers. Additionally, by providing accessible parking alternatives and connecting to different smart city services, it may encourage diversity. By cutting down on the amount of time cars spend sitting and circling finding parking, the system helps the environment by using less fuel and emitting fewer greenhouse gases. It also promotes better land management by maximizing the use of parking spaces, which lessens the demand for additional garages or parking lots that might take up precious urban space. In the end, a smart parking system contributes significantly to the social and environmental efficiency of cities, therefore bolstering the more general objectives of quality of life and urban sustainability.

5.2.3 Ethical Aspects

Equal treatment, accessibility, and privacy are the main ethical factors to be taken into account while designing a smart parking system. Good security of information and compliance to privacy rules, such as GDPR, are crucial to preventing abuse or unauthorized access, as these systems frequently gather personal data, including payment and vehicle details. Additionally, the system must be built with inclusion in mind, including accessible features for people with disabilities and guaranteeing fair and impartial distribution of parking resources to all segments of society. Pricing transparency is another ethical issue; users should be fully informed about prices and any potential extra fees to prevent any surprises. Additionally, even though smart parking systems can maximize the use of parking spaces, they must make sure that they do not unfairly benefit particular user groups, such regular or premium parkers, in order to guarantee that everyone has fair access to parking spots. Finally, preserving openness in the way the system functions and manages data, along with avoiding excessive monitoring, is essential to fostering public

confidence and defending the rights of individuals.

5.2.4 Sustainability Plan

A Smart Parking System with Sustainability Plan The goals of web applications are to ensure long-term scalability, improve efficiency, and lessen their impact on the environment. Utilizing data centers and servers that are powered by sources of clean electricity, the application should make use of cloud-based architecture to reduce energy usage. The software contributes to cleaner urban settings by minimizing transportation congestion, fuel consumption, and emissions through the optimization of parking spot utilization and the reduction of time spent looking for parking. By promoting the usage of EVs, elements like reservations and a locator for EV charging stations are included to further assist sustainable mobility. Furthermore, the app should be made to scale quickly so that it can adjust to the growing cities and parking demands without requiring a lot of new physical infrastructure. In order to keep current with changing technology, the app's design should also prioritize low resource consumption, have an energy-efficient interface, and get frequent updates. Lastly, recommendations for future planning, maximizing the use of urban space, and lowering the environmental impact of parking management may be obtained through an approach based on information to user behavior.

5.3 Project management and Financial analysis

In connection with our objective, we are engaged in a web development project. The financial analysis of our project must be covered in a subsection under this section. The projected expenditures for each component of the web development project are summarized in Table 5.1 below.

Table 5.1: Estimated Cost for smart parking system

SN	Components	Estimated Cost (BDT)
01.	Visiting Stakeholders	500-1000
02.	Software and Tools	1500-2000
03.	Front end , database & Back end design	1500-2000
04.	Documentation and Report Writing	500-1000
05.	Contingency (10% of total)	1500-2000
Total Estimated Cost		5,500-8,500

5.4 Complex Engineering Problem

5.4.1 Complex Problem Solving

Establish a mapping with categories for problem solution in this area. To provide justification, provide subsections for every mapping (see Table 5.2).

Table 5.2: Mapping with complex problem solving.

EP1 Dept of Knowledge	EP2 Range of Con-flicting Requirements	EP3 Depth of Analysis	EP4 Familiarity of Issues	EP5 Extent of Applicable Codes	EP6 Extent of Stak e-holder Involvement	EP7 Interdependence
√	√	√	√	√	√	

Mapping with Knowledge Profile for EP1

This table 5.3 is designed to map the EP1 to the Knowledge Profile.

Table 5.3: Mapping with knowledge Profile.

K3 Engineering Fundamentals	K4 Specialist Knowledge	K5 Engineering Design	K6 Engineering Practice	K8 Research Literature
√	√	√	√	√

5.4.2 Engineering Activities

In this part, provide a mapping of engineering activities. Provide subsections for each mapping to support your claims (see Table 5.3).

Engineering Activity	Related Engineering Proficiency (EP)	Rationale
1. Requirement Gathering and Analysis	EP1 - EP4	Recognize user and system demands while striking a balance between competing functional requirements.
2. System Design and Architecture	EP3 - EP6	Create a safe, scalable infrastructure that integrates real-time data with IoT devices.
3. Development of Web Application	EP2 - EP5	Create essential app features like payment methods and space availability.
4. Database Management and Storage	EP3 - EP6	Managing big database requires effective data storage and privacy management.
5. UI/UX Design	EP2 - EP5	Create a user-friendly, intuitive interface with an emphasis on mobile compatibility and accessibility.
6. Security and Privacy Implementation	EP4 - EP7	Put secure payment mechanisms, encryption, and adherence to privacy laws into practice.
7. Testing and Validation	EP2 - EP5	To guarantee dependability, test the system's performance, security, and usefulness.

8. Deployment and Maintenance	EP3 - EP6	Install the system, keep an eye on its functionality, and perform regular maintenance.
9. User Feedback and Continuous Improvement	EP3 - EP6	Gather input so that the system may be improved and refined based on actual use.

5.5 Summary

We went to a presentation that discussed the design and implementation stages as well as the system's class diagram. Additionally, the admin and interfaces for users.

Table 5.4: Mapping with complex engineering activities.

EA1 Range of re-sources	EA2 Level of Interaction	EA3 Innovation	EA4 Consequences for society and environment	EA5 Familiarity
√	√	√	√	√

CHAPTER 6

Conclusion

6.1 Summary

The smart reservation parking system improves the existing one in this digital age. Because parking lots are numbered, this new system, which is mandatory, enables users (clients, staff, and system administrators) to make online reservations for parking spaces, reducing the time customers spend looking for a spot and enhancing property safety. This project serves as an example of implementing an intelligent parking reservation system. A web application that enables users to verify the online accessibility of different parking places in the appropriate areas was developed for this project. This was accomplished by using the Apache Tomcat server and SQL server database.

6.2 Limitations

Despite their numerous advantages, online smart parking systems can have several disadvantages.

- Dependency on technology;
- Costs of internet access;
- Difficulty with user acceptance and interface;
- Concerns about confidentiality and safety

6.3 Future Work

Smart parking structures will be crucial for optimizing infrastructure and urban transportation as cities continue to evolve into smart communities. A city may become more livable overall if smart city initiatives like traffic management, public transportation, and urban planning are combined. To do this, we used a SQL server database and an Apache Tomcat server. The public can use this technology at cinemas, malls, and other locations. This technology will expedite the parking process by encouraging customers to book places online. The flexibility of this program might be further improved by sending the user a text message or email in the future with cautions about the slot details and their registered ID.

References

*[1] A. Alharbi, G. Halikias, M. Yamin, and A. A. Abi Sen, "Web-based framework for smart parking system," *International Journal of Information Technology*, vol. 13, no. 4, pp. 1495–1502, 2021.*

*[2] J. Duckett, *Web Design with HTML, CSS, JavaScript and jQuery*, 1st ed. 2001.*

*[3] L. Welling, *PHP and MySQL Web Development*, 4th ed., 2000.*

[4] W3schools.com, "JavaScript Tutorial." [Online]. Available: https://www.w3schools.com/js/default.asp. [Accessed: Dec. 17, 2021].

[5] W3schools.com, "What is Bootstrap." [Online]. Available: https://www.w3schools.com/whatis/whatis_bootstrap.asp. [Accessed: Dec. 17, 2021].

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