A

Project Report

on

Vehicle Parking Management System

Submitted to the
Savitribai Phule Pune University, Pune
In fulfilment for the award of the Degree of
Bachelor of Engineering in Computer Engineering

Submitted By

Danish Khan (B190294237)
Himanshu Baviskar (B190294206)
Darshan Chavan (B190294216)
Rahul Pardeshi (B190294250)

Under the guidance of

Mr. P. P. Shinde

Department of Computer Engineering
(ACCREDITED BY NBA)
MARATHA VIDYA PRASARAK SAMAJ'S
KARMAVEER Adv. BABURAO GANPATRAO THAKARE COLLEGE
OF ENGINEERING
Udoji Maratha Boarding Campus, Gangapur Road, Nashik, Maharashtra
422013

(2022-23)

SAVITRIBAI PHULE PUNE UNIVERSITY
2022-23

CERTIFICATE

This is to certify that Project entitled

"Vehicle Parking Management System"

Submitted by

Danish Khan (B190294237)
Himanshu Baviskar (B190294206)
Darshan Chavan (B190294216)
Rahul Pardeshi (B190294250)

are bonafide students of this institute and the work has been carried out by them under the supervision of **Mr. P. P. Shinde** and it is approved for the fulfillment of the requirement of Savitribai Phule Pune University, for the award of degree of **Bachelor of Engineering** (Computer Engineering).

Mr. P. P. Shinde [Guide]	Dr. D. V. Medhane [HOD]
Dr. S. R. Devane [Principal]	[External]

MVP's K.B.T. College of Engineering Nashik-13

Place:-
Date:-

Acknowledgement

We would like to express my gratitude and appreciation to all those who gave us the possibility to complete this project. Special thanks is due to our project guide Mr. Pushkar Shinde sir whose help, suggestions and encouragement helped us during the entire software development process and documentation part. I am also sincerely thankful for the time spent proofreading and correcting our mistakes throughout the course of the project. We would also like to thank Dr. D. V. Medhane sir for his valuable assistance and guidance during the time frame of the project. We are equally grateful to our project reviewers Mr. B. S. Tarle sir and Ms. D. L. Tidke mam who helped us make this project a successful one due to their precious views.The special gratitude goes to our Internal Guide Mr. P. P. Shinde and all the staff members, technical staff members, of the Computer Engineering Department for their expensive, excellent, and precious guidance in the completion of this work. With various industry owners or lab technicians to help, it has been our endeavor to throughout our work to cover the entire project work. We are also thankful to our parents who provided their wishful support. Lastly, we thank our all friends and the people who are directly or indirectly related to our project

Danish Khan
Darshan chavan
Himanshu Baviskar
Rahul Pardeshi

Abstract

The number of vehicles and traffic is increasing exponentially day by day, due to which automatic vehicle identification and monitoring systems are becoming increasingly important all over the world.

The Vehicle Parking Management System is an automated solution that allows for efficient management of parking spaces and tracking of vehicle and owner information. It uses sensors and software to monitor the vehicle owner's information as well as the availability of parking spots, reducing the time and effort required to manage the vehicle.

Different countries in the world are using various types of automatic systems for traffic control and vehicle identification. Number plate recognition (NPR) is an authentic-time embedded system that frequently recognises the number plate of a vehicle. Previous systems were used only for the identification of vehicles. The proposed system involves using RFID (radio frequency identification) for the identification and verification of vehicles. RFID technology allows for more accurate and efficient identification of vehicles, reducing the likelihood of errors or fraud in the verification process. Additionally, the use of RFID can also enable real-time tracking and monitoring of vehicles, improving overall security and management.

Keywords:-RFID tags, RFID Scanner,Smart Parking Systems, Internet of Things (IOT), arduino uno board

Contents

List of Figures

List of Tables

Chapter 1

Vehicle parking management system

1.1 Introduction

A vehicle management system using RFID (radio frequency identification) technology is a sophisticated system that can streamline and improve the efficiency of vehicle tracking, monitoring, and control in various applications, such as the identification and verification of vehicles and parking lots.

The system consists of RFID tags that are attached to vehicles, RFID readers that are installed in parking lots, and a smart parking software application that manages the data collected by the readers. The RFID tags transmit a unique identifier that can be read by the readers, which in turn send the information to the software application. The smart parking software then processes the data, generating reports and alerts that can be used to manage the parking lot and optimise operations.

With a vehicle management system using RFID and smart parking technology, vehicle owners can easily find that a parking lot is available, reducing the time and frustration associated with searching for a parking spot. Parking lot operators can use the system to manage parking capacity, optimise usage, and reduce congestion, leading to a more efficient and profitable operation. The system can also improve security by monitoring the entry and exit of vehicles and reducing the risk of fraud or unauthorized access.

The vehicle management system provides access to and management of different vehicles for students, teachers, faculty, and visitors. Our project is based on RFID scanning and reading, which stores and maintains the information of different vehicles within the system. The advantage of the management system is that we'll be able to track the number of vehicles entering the campus.

1.2 Motivation

- Our projects plays an important role in various applications such as vehicle monitoring, vehicle management, parking lots access control.
- To identify a car number plate using RFID is effective because of its uniqueness of the car .
- System robustly detect and recognizes the vehicle using RFID and can be implemented on the entrance of a highly restricted areas.

1.3 Problem Statement

Creating a computer application which will solve the problems of slot allocation, unidentified vehicle entry and vehicle tracking in the college campus.

1.4 Objective

1. The main aim of our project is to register and keep the information about all vehicle.
2. This project can be used in monitoring the public areas such as theatres, market areas, hospitals, offices to differentiate the vehicles from staff and owner and also the visitors.
3. Any changes required will be adapted with the same consistency. It will make sure that each module of the system is easy and smooth to operate.

Given below are some limitation of our project:

1. As we are using cheap RFID reader, so the range of RFID reader is short.
2. RFID tags falling of from vehicles can cause his entry to be denied.
3. RFID tags collision happens when two or more tags reflects their signals to the reader at the same time.

1.5 Project Scope and Limitations

1. The main aim of our project is to register and keep the information about all vehicle.
2. This project can be used in monitoring the public areas such as theatres, market areas, hospitals, offices to differentiate the vehicles from staff and owner and also the visitors.
3. Any changes required will be adapted with the same consistency. It will make sure that each module of the system is easy and smooth to operate.

Given below are some limitation of our project:

1. As we are using cheap RFID reader, so the range of RFID reader is short.
2. RFID tags falling of from vehicles can cause his entry to be denied.

1.6 Organisation of report

This report is divided into five parts. Each part deals with with the different aspects of our project. Each part has various chapters explaining in detail the entire project implementation and other relevant details regarding the project:

1. System Requirement Specifications(SRS)
2. System Design
3. Project Plan
4. Project Implementation
5. Results and Conclusion

Chapter 2

Literature Survey

The most important and also worrying portion of any number plate recognition system is that the recognition and extraction of the vehicle number directly affect overall system accuracy. The presence of noise, distortions within the image, irregular illumination, blurred images, and foggy environments make the job even tougher. During this work, we tend to suggest a different technique for having the police correctly investigate the vehicle number plates. The projected system will work very correctly in any atmosphere, daytime, or circumstance. There are certain foreign, national, or native standards for vehicles. In China, the fundamental standards [12] for the volume plate are assumed. Certain native cooperatives, like European Public (EU), have number plates that outline the country, the place of registration, etc. During this text, Chinese, Pakistani, and Kuwaiti number plates are coated. The problem of automatic NPR was discussed later in the 1990s [5], [8], and [10]. The captured image is first processed to enhance and improve boundary line information by using algorithms such as the gradient filter, leading to a picture shaped by edges. The image so processed is reborn as its binary matching half after being processed by sure algorithms, like Hough rework, to observe lines. Eventually, pairs of 2-parallel lines were thought of as a plate [6], [11]. Alternative techniques supported the morphology of substances in a picture [1], [7]. This technique focuses on certain relevant properties of car plate pictures, like their illumination, contrast, regularity, positions, etc. Due to these options, this technique might be used to notice the parallel properties in a very clear image and find the location of variety plate areas. The third technique was supported by the applied math properties of text [3] and [4]. During this method, text regions were exposed to mistreatment and math properties of text, just like variance of grey level, variety of boundaries, edge thicknesses within the area, etc. This approach was unremarkably utilised in finding text in pictures and will rather be used for locating and designating candidate variety plate areas as they embrace letters and numbers. There are a variety of different approaches to this downside, specialising in police investigation, NPR mistreatment computing, and genetic algorithms [2], [9]. These systems used edge observation and edge information, as well as artificial intelligence techniques, to detect the position and amount of plate space. All systems mentioned above have some limitations; as an example, they're

plate size dependent, colour dependent, and only work in certain conditions or atmospheres similar to indoor pictures, etc. The tactic that we tend to suggest is the freeing up of the colour, size, location, and position of the number plate of the vehicle. A lot of studies and different approaches have been suggested. The major work is done on plate localization, which is precise for the NPR area. But they have not studied verification and extraction in the same system. The model implementation expected a clear number plate text, and more tests need to be shown on this system. The text extraction process involves the localization, improvement, and recognition of text blocks in a given image. Number plate recognition (NPR) systems can be recognised as an application of text information extraction (TIE) algorithms. As the application is specific to number plate images, the NPR text extraction process can leverage particular visual features and constraints. Different methods have been proposed for NPR text extraction, and each uses a specific set of perceptible features to emphasise the text areas.
begindocument

Table 2.1: Literature survey

Sr. no.	Year	Author	Title	Description
1.	2016	Rameez Ahmad, Syed irfan ullah ,Mumtaz Ali	Identification and verification of vehicle using RFID technique	This paper proposes system uses both the RFID NPR system for identification, verification of vehicle.
2.	2022	Kay Li Ng, Choo W. R. Chiong and Regina Reine	Vehicle Recognition System using RFID Technology for Parking Management System	Experimental results demonstrate the effectiveness of the proposed method in reducing the power consumption of the RFID system.
3.	2017	Vipul More , Kiran Ravariya , Sohil Shah , Azharuddin Solkar	Automatic car parking system using RFID	There is also RFID module that will provide security as users having RFID cards can get entry otherwise not.

Chapter 3

Hardware & Software Requirements

3.1 Introduction

All of the requirements for project development are listed in the software requirement specification document. We must have a thorough understanding of the software system in order to develop it. To accomplish this, we must maintain constant contact with consumers (end users) in order to acquire their requirements.
The ”Vehicle parking management system” will be a software for institutions. By giving this tool to aid faculty and students in managing their parking , this system will be intended to enhance their productivity and performance. We intend to provide the required assistance, suggestions, and guidance in this area.

3.2 Assumptions and Dependencies

3.2.1 Assumptions:

Given below are the assumptions:

- College students and staff members will be registered in the system and provided with a unique RFID tag.
- The RFID tags provided to users will be compatible with the RFID reader used in the project.
- Sufficient parking spaces will be available within the college campus to accommodate the registered users.
- The RFID reader will accurately scan and retrieve the unique identifier from the RFID tags.
- The gate opening mechanism using the servo motor will function properly and reliably upon successful verification.
- The software system will be developed using Visual Studio, C sharp, and the .NET framework.

- Adequate network connectivity will be available to facilitate communication between the RFID reader, software system, and database.

3.2.2 Dependencies:

1. Hardware Dependencies:

   Proper installation and functioning of the RFID reader. Reliable operation of the servo motor for gate opening.

2. Software Dependencies:

   Availability of Visual Studio and the .NET framework for software development. Successful integration of the software system with the hardware components. Compatibility with the operating system used for deployment.

3. Database Dependencies:

   Proper setup and configuration of the database system. Accurate storage and retrieval of user information and parking availability data.

4. User Dependencies:

   Users must possess and carry their assigned RFID tags at all times. Users must follow the registration process and provide accurate information for database management.

5. System Administration Dependencies:

   Availability of authorized personnel responsible for system administration, maintenance, and monitoring. Adequate training and support for system administrators to manage the software interface effectively. These assumptions and dependencies will play a crucial role in the successful implementation and functioning of your vehicle parking management system. It's essential to consider and address them during the project planning and implementation stages.

3.3 Functional Requirements

- User Registration:

  Allow college students and staff members to register in the system. Collect and store user information, such as name, ID, and contact details. Assign a unique RFID tag to each registered user.

- RFID Scanning:

  Enable the RFID reader to scan the RFID tag of a user at the entrance of the college. Retrieve the unique identifier from the RFID tag.

- User Verification:

  Verify if the scanned RFID tag corresponds to a registered user in the system. Check the database to validate the user's registration status.

- Parking Availability Check:

  Determine the availability of parking spaces in real-time. Check the database to identify free parking spots.

- Gate Opening Mechanism:

  Automatically open the gate if the user is registered and a parking spot is available. Activate the servo motor to open the gate upon successful verification.

- Unregistered User Handling:

  Identify unregistered users whose RFID tags are scanned. Prompt the authority to manually record the number plate details of unverified vehicles. Direct unregistered users to park in the designated visitor parking area.

- Software Administration:

  Provide a user-friendly software interface for system administration and monitoring. Allow authorized personnel to manage user registrations, view parking availability, and generate reports. Ensure proper data security and access control for the software administration interface.

- Reporting and Logging:

  Maintain a log of all entry and exit events, including user details, entry timestamps, and parking spot allocations. Generate reports and analytics on parking usage, occupancy rates, and system performance.

- Error Handling:

  Handle exceptions and errors gracefully, providing appropriate error messages to users and administrators. Implement error logging and notification mechanisms for system administrators.

- System Maintenance:

  Enable system administrators to perform regular maintenance tasks, such as database backups, software updates, and hardware maintenance.

  .

3.4 External Interface Requirements

3.4.1 User Interface

Provide a user-friendly interface for users to register, view their parking status. Display relevant information, such as available parking spots and user registration status. Allow users to input their RFID tags for scanning.

3.4.2 Software Interface

Integrate the parking management system with the existing college software infrastructure Communicate with the database system to retrieve and store user information, parking availability, and entry/exit logs. Provide appropriate APIs or interfaces for future system integrations or expansions. Authority/Administration Interface: Offer an interface for system administrators or authorized personnel to manage user registrations, view parking occupancy, and generate reports. External Database Interface: Establish a connection and interface with the database system to store and retrieve user information, parking availability, and entry/exit logs.

3.4.3 Hardware Interface

Ensure compatibility and seamless communication between the RFID reader, servo motor, and the software system. Establish the necessary connections and protocols to enable data exchange and control signals between hardware components.

3.4.4 Communication Interface

Enable communication between the software system and the RFID reader for RFID tag scanning. Facilitate communication between the software system and the servo motor for gate opening mechanism. Support communication protocols, such as RFID protocols (e.g., ISO/IEC 14443) and standard communication protocols (e.g., TCP/IP) for network communication. External System Integration: Enable integration with existing systems, such as security systems or gate control systems, if applicable.

3.5 Non Functional Requirements

3.5.1 Performance Requirements

The system should have low latency in scanning and verifying RFID tags. Gate opening mechanism should have minimal delay upon successful verification. The system should handle a large number of simultaneous user requests without significant performance degradation. Response time for user interface interactions should be fast and seamless.

3.5.2 Safety Requirements

The gate opening mechanism should prioritize safety by ensuring no physical harm or accidents to users or vehicles. The system should have fail-safe mechanisms in case of power outages or system failures. Adequate safety measures should be in place to prevent unauthorized access or tampering of the system.

3.5.3 Security Requirements

User data and information should be securely stored and protected from unauthorized access. Communication between components (such as the RFID reader, software system, and database) should be encrypted and secure. Access to administrative functionalities should be restricted to authorized personnel only.

3.5.4 Software Quality Attributes

The software should be modular, maintainable, and easily extensible for future enhancements or changes. The system should follow coding best practices, including proper documentation, error handling, and logging. User interfaces should be intuitive, user-friendly, and visually appealing.

3.6 System Requirements

3.6.1 Database Requirements

The system should utilize a reliable and scalable database management system that is firebase Cloud to store user information, parking availability data, and entry logs. The database should support efficient data retrieval and storage operations for real-time processing. Proper backup and recovery mechanisms should be implemented to ensure data integrity and availability. The database should be able to handle a large number of records efficiently. Access to the database should be secure, with appropriate user roles and access control.

3.6.2 Software Requirements

The software system should be developed using Visual Studio, C sharp, and the .NET framework. The software should provide a user-friendly interface for user registration, parking status checking, and administrative functionalities. Integration with external systems, such as the RFID reader and gate control mechanisms, should be supported. The software should have proper error handling and logging mechanisms. It should be scalable, modular, and maintainable to support future enhancements and changes. The software should follow coding standards and best practices.

3.6.3 Hardware Requirements

- RFID tags: They are unique and every personnel is given one unique RFID.
- RFID Reader: The system should include a compatible RFID reader to scan the RFID tags of users at the entrance.
- Servo Motor: A reliable servo motor should be used to control the gate opening mechanism upon successful verification.
- Network Infrastructure: The system should have a stable network infrastructure to support communication between the software system, RFID reader, and database.
- Servers or Hosting: Sufficient server capacity or hosting resources should be available to support the software system and database.
- Power Supply: Adequate power supply should be ensured to support uninterrupted system operation.

3.7 Analysis Models

3.7.1 User Classes and Characteristics

For the development of our project, we have followed the agile model of the software development life cycle. Below given is a brief description of the same. Agile model:The meaning of Agile is swift or versatile."Agile process model" refers to a software development approach based on iterative development. Agile methods break tasks into smaller iterations, or parts do not directly involve long term planning.College students and staff members who have registered in the system and possess a unique RFID tag. Characteristics: They have valid college identification, access to parking facilities, and assigned RFID tags.

- **Unregistered Users:**

  Visitors or unverified vehicles whose RFID tags are not registered in the system. Characteristics: They do not have valid college identification or assigned RFID tags.

- **System Components:**

  RFID Reader: Responsible for scanning and reading the RFID tags of users at the entrance. Software System: Manages user registrations, verifies RFID tags, checks parking availability, and controls the gate opening mechanism. Database: Stores user information, parking availability data, and entry/exit logs.

- **User Registration Flow:**

  Users provide their personal information and receive an assigned RFID tag. The software system stores user information in the database for future reference.

- **User Entry Flow:**

  Registered users approach the entrance gate. The RFID reader scans their RFID tag. The software system receives the RFID tag information and validates it against the database. If the user is registered and a parking spot is available, the gate opens using the servo motor. If the user is unregistered or no parking spot is available, appropriate actions are taken (e.g., buzzing a buzzer, recording number plate details, assigning visitor parking).

- **System Administration:**

  Authorized personnel can access the administrative interface. They can view and manage user registrations, parking availability, and generate reports. The software system communicates with the database to retrieve and update relevant information.

- **Logging and Reporting:**

  The software system logs entry and exit events, including user details, timestamps, and parking spot allocations. Reports can be generated to analyze parking usage, occupancy rates, and system performance.

Chapter 4

System Design

4.1 System Architecture

Vehicle Parking Management System Architecture:

- User Interface Layer:

  This layer provides the user interfaces through which registered users and system administrators interact with the system. It includes the user registration interface, parking status interface, and administrative interface. Users can input their RFID tags, view parking availability, and receive notifications.

- Application Layer:

  This layer contains the business logic and functionality of the system. It includes modules for user registration, RFID tag verification, parking availability checking, and gate control. The application layer communicates with the database layer for data retrieval and storage.

- Database Layer:

  This layer consists of the database management system that stores all the necessary data for the system. It stores user information, parking availability data, entry/exit logs, and other relevant data. The database layer provides the necessary data to the application layer for processing and decision making.

- RFID Reader and Gate Control Layer:

  This layer includes the RFID reader and the servo motor responsible for gate control. The RFID reader scans the RFID tags of registered users at the entrance gate. The servo motor controls the gate opening mechanism based on the verification results.

- External System Integration:

  This layer allows for integration with external systems, such as security systems or gate control systems, if applicable. It enables seamless communication and interoperability between the vehicle parking management system and other systems in the environment.

The system architecture follows a layered approach, separating the user interface, application logic, database management, and hardware components. This modular architecture allows for scalability, maintainability, and flexibility in system design and future enhancements.

The user interface layer provides the necessary interfaces for user interaction, while the application layer handles the core functionalities and logic of the system. The database layer ensures data storage and retrieval, while the RFID reader and gate control layer enable the physical interaction with users at the entrance gate.

The external system integration layer allows for seamless integration with other systems if required, ensuring compatibility and interoperability.

This system architecture provides a high-level overview of how the different components and layers interact to support the vehicle parking management system's overall functionality.

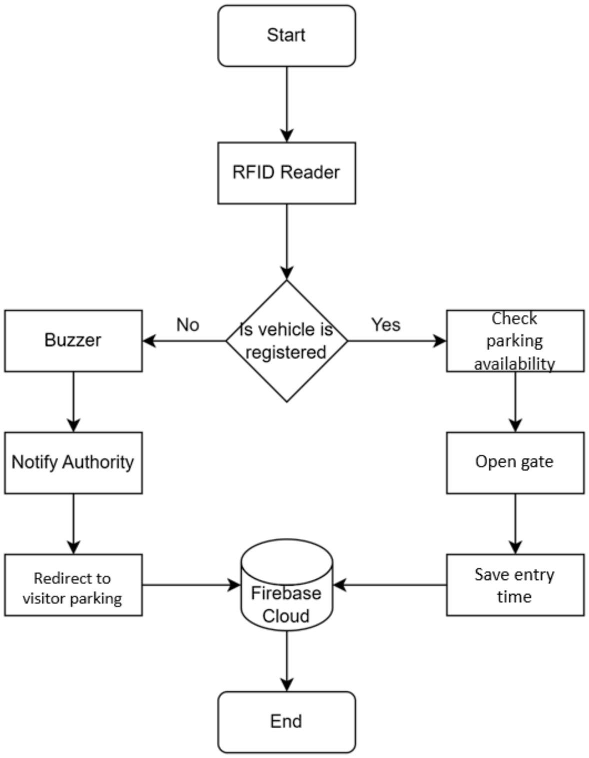


Figure 4.1: System Architecture Diagram

4.2 Mathematical Model

1. Variables:

   N: Total number of registered users M: Total number of parking slots P: Number of available parking slots R: RFID tag scanned (0 or 1, indicating whether a registered user is present) V: Number of unregistered visitor vehicles T: Total number of vehicles (T = N + V) S: Number of visitors' parking slots

2. Equations:

   a. Calculation of available parking slots: P = M - (N + S)

   b. Gate opening condition: Gate-Open = (R = 1) AND (P > 0)

   c. Buzzer activation condition: Buzzer-Active = (R = 0)

   d. Storage of unregistered vehicles' number plate: Store-Number-Plate(Vehicle-Number-Plate)

   e. Calculation of total vehicles: T = N + V

   These equations represent the basic mathematical relationships and conditions involved in the vehicle parking management project. They allow us to calculate the number of available parking slots, determine whether the gate should open or the buzzer should be activated, and store the number plate of unregistered vehicles.

4.3 Data Flow Diagram

A data flow diagram (DFD) illustrates the information flow within a process or system by utilizing symbols such as rectangles, circles, and arrows, accompanied by concise labels. It visually represents data inputs, outputs, storage locations, and the pathways connecting them.

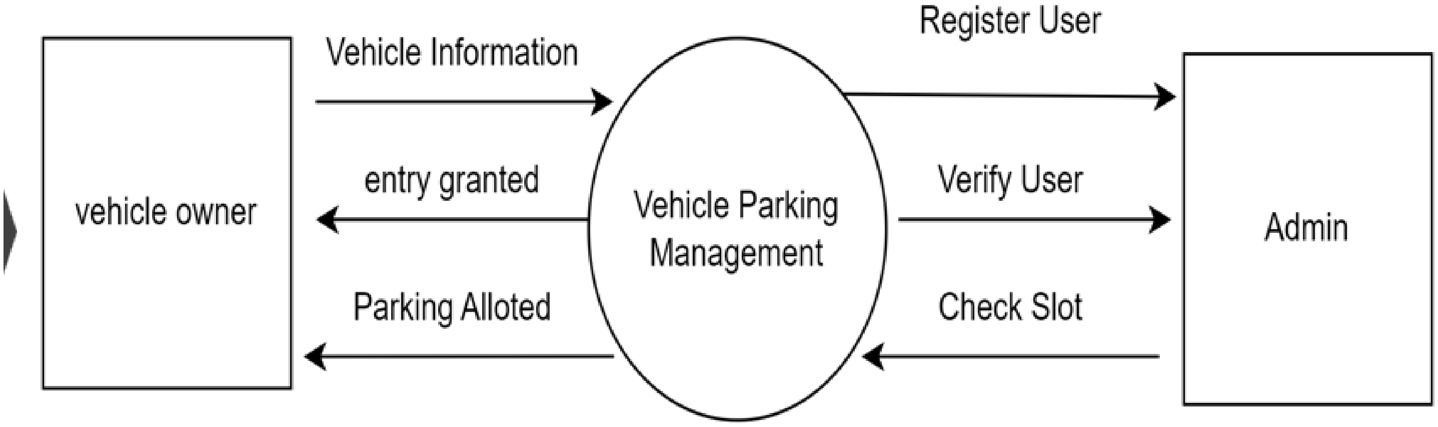


Figure 4.2: Data Flow Diagram

4.4 Entity Relationship Diagram

An Entity relationship Diagram (ERD), also known as an Entity Relationship Model, is a graphical representation that depicts relationships among the various entities (like people, objects, places, concepts or events).

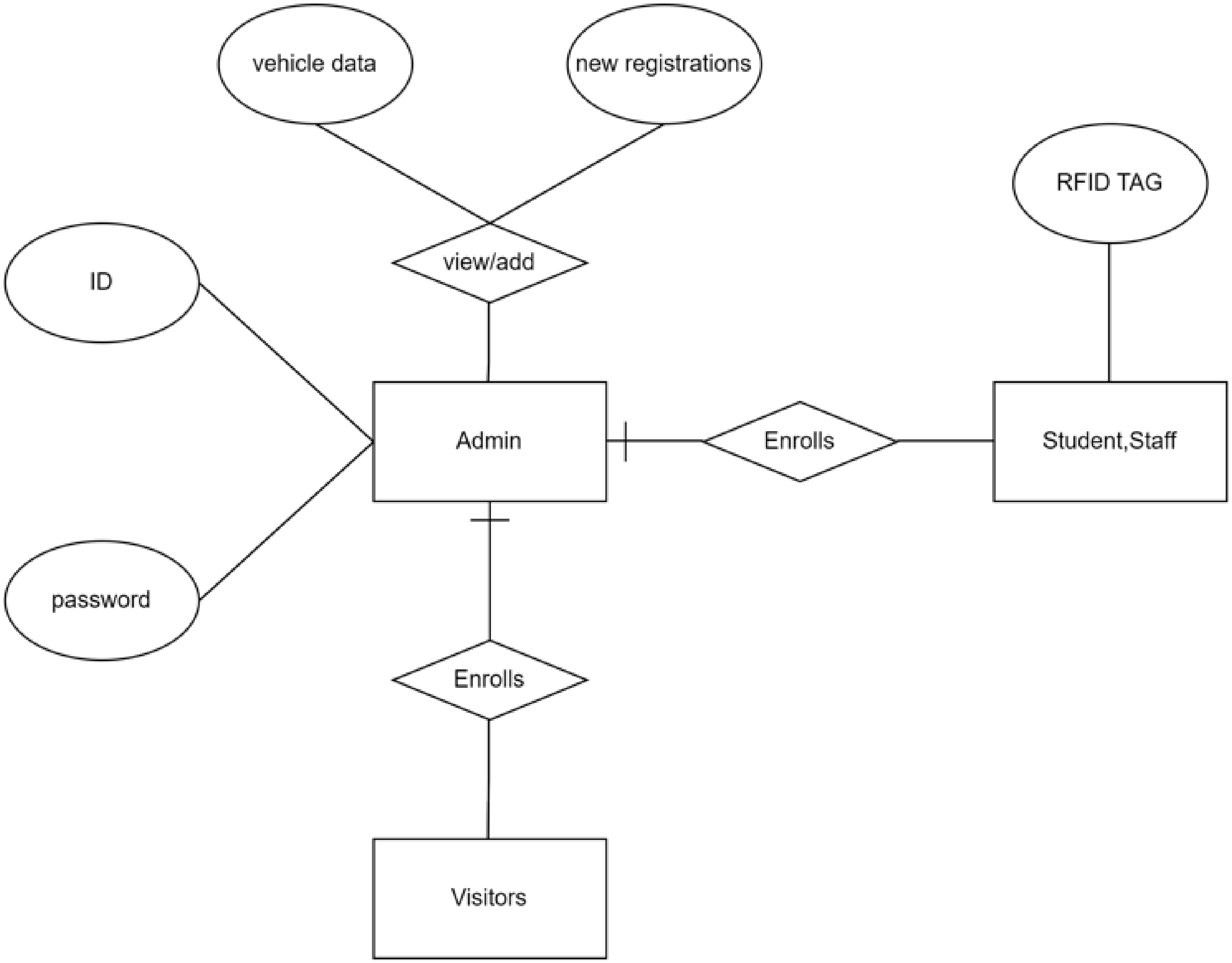


Figure 4.3: Entity Relationship Diagram

4.4.1 Activity Diagram

Activity Diagrams illustrate the coordination of activities to deliver a service, showcasing different levels of abstraction.

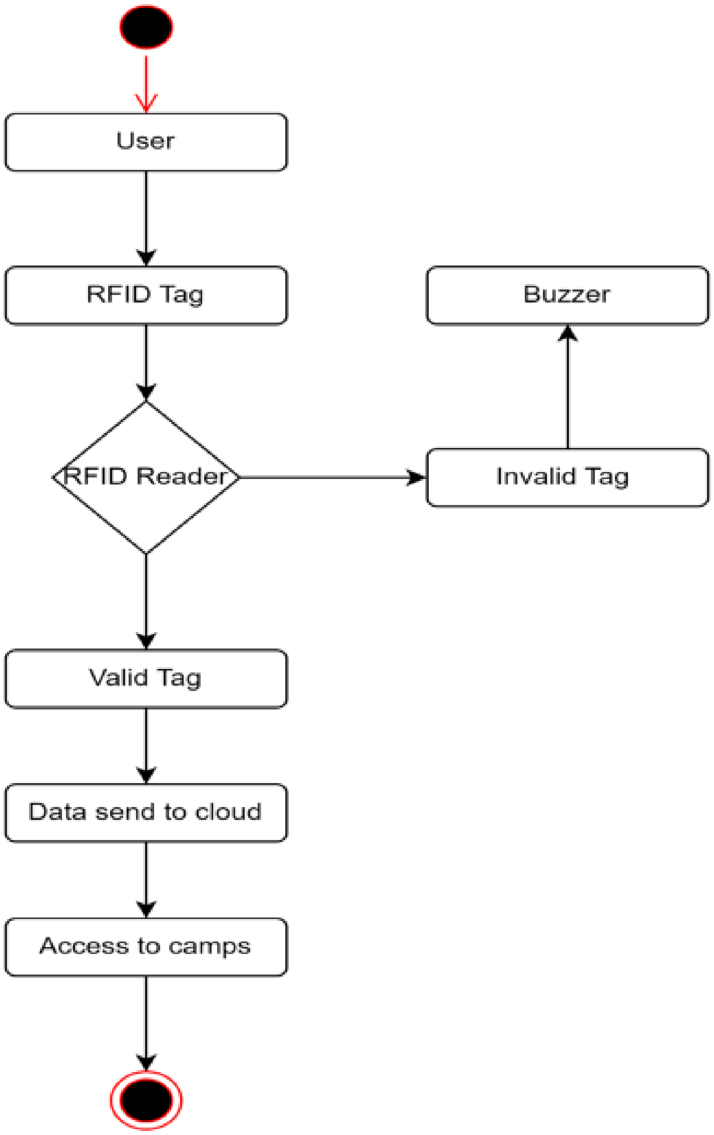


Figure 4.4: Activity Diagram

4.4.2 Class Diagram

The class diagram presents a static perspective of an application, portraying the object types and their relationships within the system. It depicts objects within a class and potential inheritance. Class diagrams aid in visualizing, documenting, and constructing executable software code, capturing various aspects of the system.

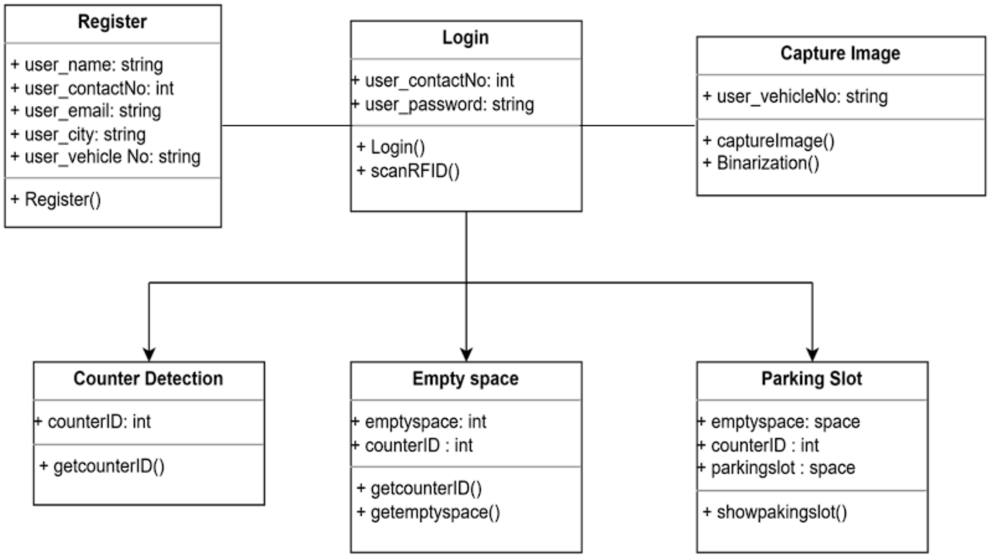


Figure 4.5: Class Diagram

4.4.3 Sequence Diagram

A sequence diagram is a UML diagram depicting the order of messages exchanged between objects during an interaction.

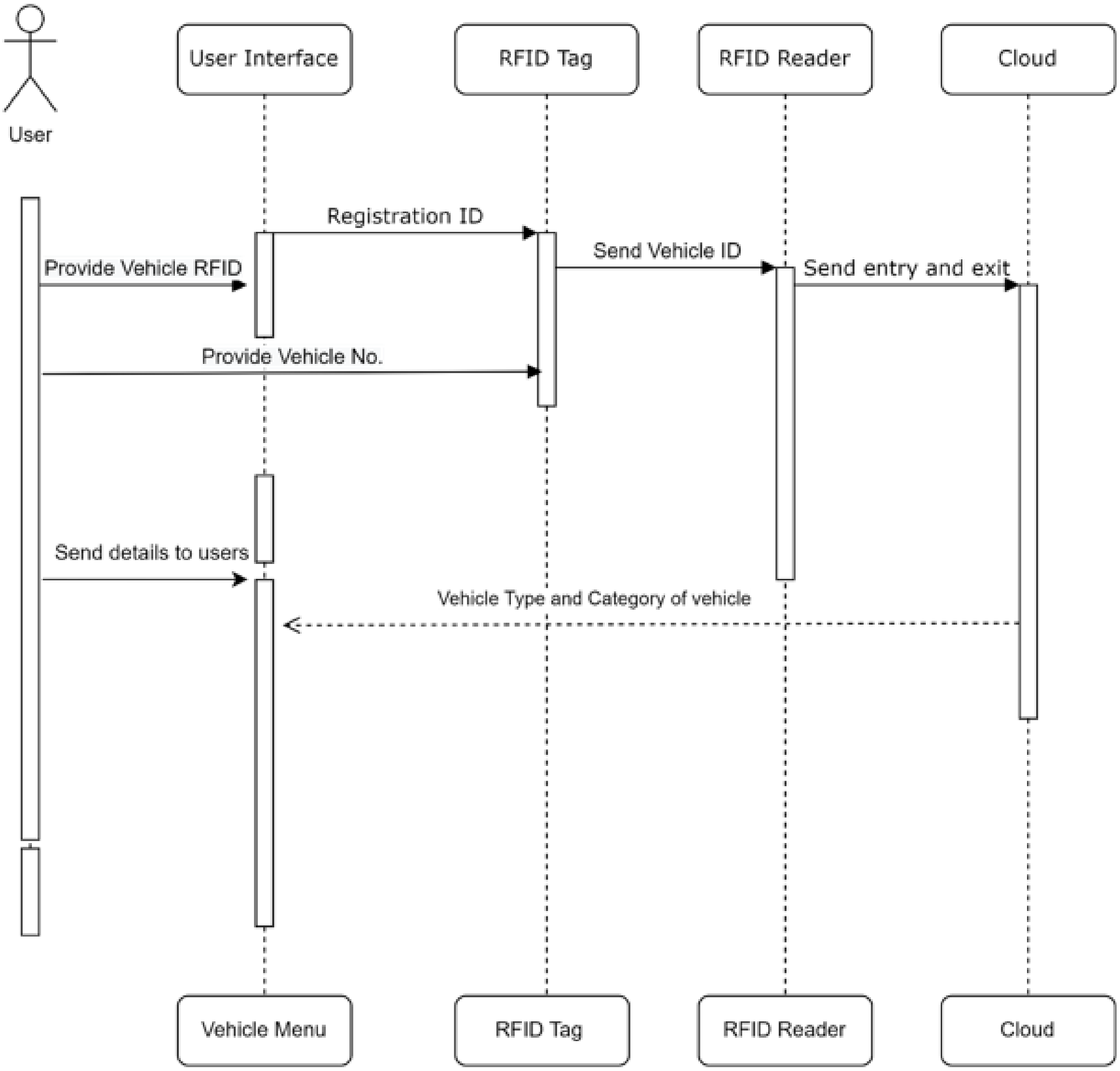


Figure 4.6: Sequence Diagram

Chapter 5

Project Plan

5.1 Project Estimates

Project tasks	Estimated days
Literature Survey	30 days
Base paper study	15 days
Requirements study	15 days
Designing of project	15 days
UML diagrams	15 days
GUI finalization	8 days
Coding	90 days
Validations and testing	30 days
Documentation	20 days

Table 5.1: Project Estimates

5.1.1 Reconciled Estimates

Using Constructive Cost Model (COCOMO first model) for estimating the effort required in completing the project. Like all the estimation models, the COCOMO first model requires sizing information. This information can be specified in the form of:

- Object Point
- Function Point (FP)
- Lines of Source Code (KLOC)

For our project, we use the sizing information in the form of Lines of Source Code. Using COCOMO Model:

- Calculate Effort:

$$Effort = a(KLOC)^b$$

$$Effort = 3(10)^{1.12}$$

$$Effort = 39.54 person - week$$

- Calculate Time:

$$Time = c(Effort)^d$$

$$Time = 2.5(39.54)^{0.35}$$

$$Time = 9.05 week$$

- Person Required:

$$PersonRequired = Effort/time$$

$$PersonRequired = 39.54/9.05$$

$$PersonRequired = 4.3 = 4$$

- Cost of Project:

$$Cost = Assumedsalary * Personrequired$$

$$Cost = 15000 * 4$$

$$Cost = 60,000$$

5.1.2 Project Resources

The resources needed for the project's effective development and completion are referred to as project resources. These resources can include capital, people, tools, or supplies like hardware and software to complete the project's tasks.

1. **Personnel:**
    - **Project Manager:** Responsible for overall project coordination, planning, and communication.
    - **Software Developers:** To develop the software application using C sharp and .NET.
    - **Database Administrators:** To design and manage the database system.
    - **UI/UX Designers:** To create an intuitive and user-friendly interface.
    - **RFID System Experts:** To assist with the implementation and configuration of the RFID system.

- **Testing and Quality Assurance Specialists:** To ensure the software meets the desired quality standards.

2. **Hardware:**
   - **RFID Readers:** To scan and read the RFID tags at the entrance gate.
   - **Servo Motors:** To control the gate opening mechanism.
   - **Servers and Networking Equipment:** To host the software application and facilitate communication between components. for this project.
3. **Software and Tools:**
   - **Visual Studio:** To write and develop the software application using C sharp and .NET.
   - **Database Management System:** Such as Firebase cloud for database storage and management.
   - **RFID SDKs or Libraries:** To integrate and interact with the RFID hardware and read RFID tags.
   - **Version Control System:** To manage source code and collaborate with the development team.
   - **Bug Tracking and Issue Management System:** To track and resolve software issues during development and testing.
4. **Communication and Collaboration:**
   - **Project Management Software:** To track project progress, tasks, and milestones.
   - **Communication Tools:** Such as email, messaging apps, and video conferencing software for team collaboration and communication.
5. **Testing and Deployment:**
   - **Testing Environment:** To conduct functional testing, performance testing, and system integration testing.
   - **Deployment Tools:**To package and deploy the software application to the production environment.
6. **Documentation and Reporting:**
   - **Documentation Tools:** To create project documentation, user manuals, and system documentation.
   - **Reporting Tools:** To generate reports on parking availability, user activity, and system performance.

5.2 Risk Management

5.2.1 Risk Identification

1. **Technical Risks:** :Incompatibility between the RFID reader and the software system. Integration challenges with existing systems or infrastructure. Technical limitations of

the RFID system, such as reading accuracy or range.

2. **Operational Risks:** Insufficient training or awareness among staff regarding the RFID system and software. Inadequate maintenance and support for the hardware components. Failure of the gate control mechanism or other hardware components.
3. **Security Risks:**Unauthorized access to the system or data breach. Malicious activities targeting the RFID system or software. Loss or theft of RFID tags, leading to potential misuse or impersonation.
4. **Project Management Risks:** Inadequate project planning or inaccurate estimation of resources and timelines. Changes in project scope or requirements. Lack of effective communication and collaboration among project stakeholders.
5. **Financial Risks:** Budget overruns due to unforeseen expenses or scope changes. Inaccurate cost estimation for hardware, software, or infrastructure. Economic factors impacting the availability or cost of resources.
6. **Legal and Compliance Risks:** Non-compliance with privacy regulations related to data handling and storage. Intellectual property infringement related to the RFID technology or software components. Legal implications if the system fails to accurately track parking activities.
7. **External Risks:** Environmental factors affecting the performance of the RFID system (e.g., electromagnetic interference). Changes in industry standards or regulations impacting the project implementation. Dependencies on third-party vendors or suppliers for hardware or software components.

5.2.2 Risk Analysis

Our system's risk analysis entails locating, evaluating, and minimising any threats to the performance, security, and operation of the system. The steps in performing a risk analysis are as follows:

1. Assess the likelihood and potential impact of each identified risk.

   .
2. Prioritize risks based on their significance and potential consequences.
3. Evaluate the risk factors and determine their overall risk level. .

5.2.3 Overview of Risk Mitigation,Monitoring,Management

1. **Risk Monitoring:**
   - Regularly monitor identified risks throughout the project lifecycle.
   - Track the effectiveness of implemented mitigation measures.
   - Maintain open communication within the project team to promptly identify new risks.

2. **Risk Mitigation :**
   - Develop strategies to mitigate identified risks.
   - Implement preventive measures to reduce the likelihood or impact of risks.
   - Assign responsibility to team members for implementing risk mitigation strategies.
3. **Risk Management:**
   - Maintain a comprehensive risk register documenting identified risks, their assessment, and mitigation strategies.
   - Conduct regular reviews and updates of the risk management plan.
   - Incorporate risk management into project decision-making processes.

5.3 Project Schedule

1. **Phase I:**
   - **Week1-2:** Define project scope, objectives, and requirements
   - **Week 3-4:** Conduct market research and analysis to identify industry trends and customer needs
   - **Week 5-6:** Develop project plan, including budget, timeline, and resource allocation
2. **Phase II:** Design and Development
   - **Week7-8:** Design system architecture and user interface
   - **Week 9-10:** Develop system backend and frontend functionality
   - **Week 11-12:** Test system functionality and user experience
3. **Phase III:** Deployment and Testing
   - **Week13-14:** Deploy system to a test environment and conduct end-to-end testing
   - **Week 15-16:** Address any bugs or issues identified during testing
   - **Week 17-18:**Conduct user acceptance testing and make any necessary changes
4. **Phase IV:** Training and Launch
   - **Week19-20:** Develop training materials and conduct training sessions for users
   - **Week 21-22:** Finalize system documentation and prepare for launch
   - **Week 23-24:** Launch system to production environment and conduct post-launch monitoring and support

The following is project task set :

1. Carrying out Literature Survey
2. Study of base Paper
3. Implementation of Project with base project functionalities and added on features

4. Continuous error discovery and debugging
5. Testing the system for various test cases
6. Documentation and report generation

5.3.1 Task Network

Task Network also called as an activity network, graphically represents the task flow followed for the development process. Figure 5.1 depicts the task network of our project.

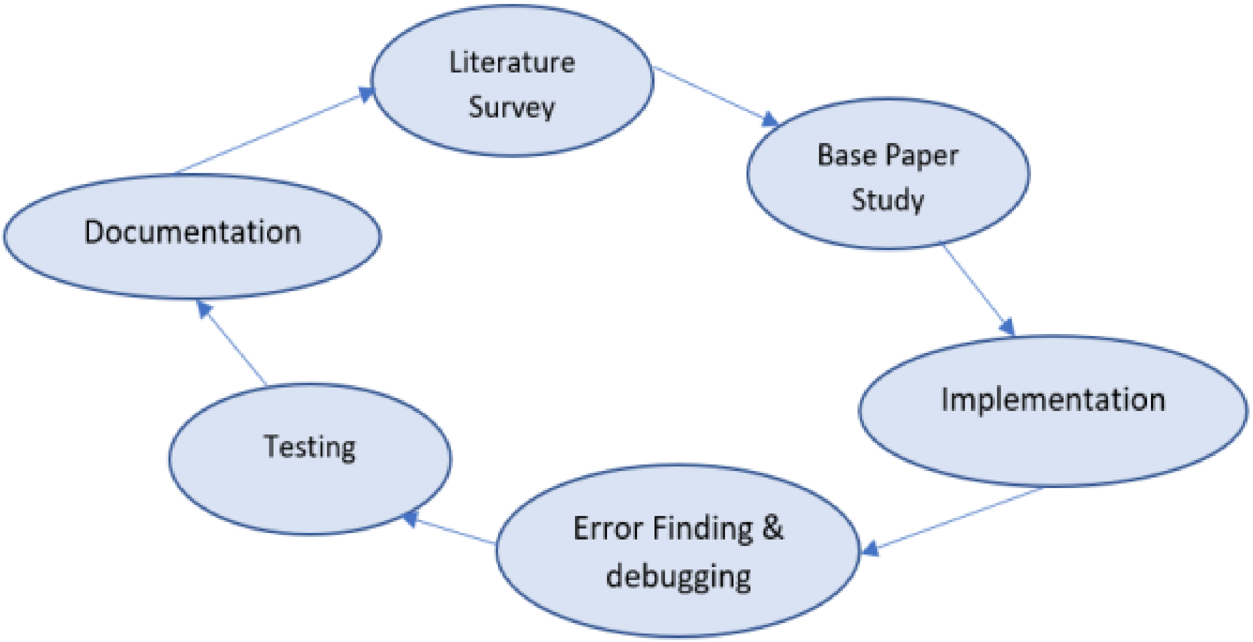


Figure 5.1: Task network

5.3.2 Timeline Chart

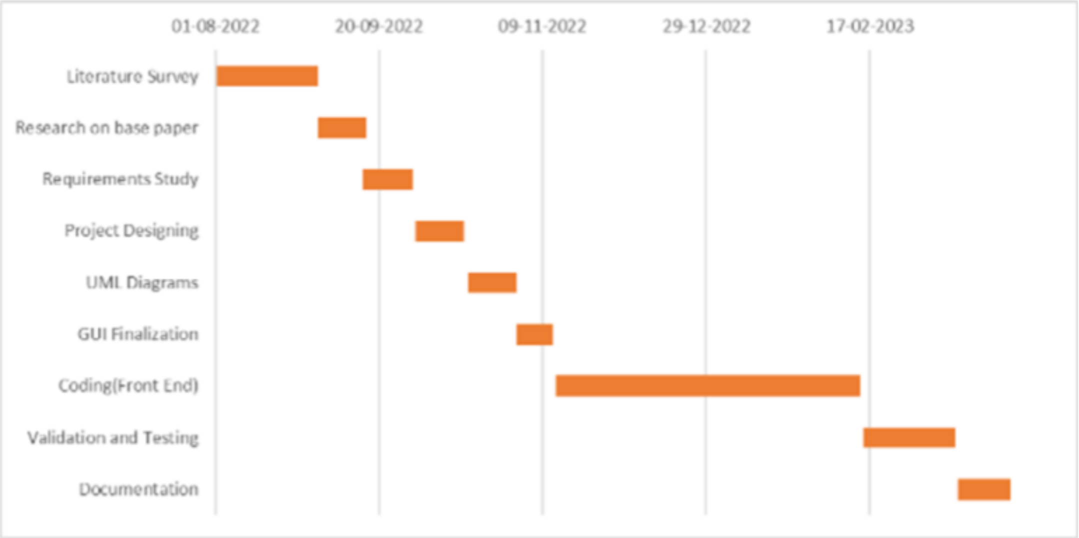


Figure 5.2: Timeline Chart

5.4 Team Organizations

The organisation of the team, its members, and each of their specific roles and responsibilities in the project's overall work are mostly covered in this chapter. Therefore, as we were planning our project, our primary attention was on creating the best project team through team-building activities. No matter the size, scope, or type of the project, there are two typical roles. the following roles:

- **Project Team Leader :** A project team leader is responsible for managing and guiding the group, ensuring their tasks are completed successfully. Their role includes coaching, leading, motivating, rewarding, and other actions aimed at encouraging and compelling team members to perform their assigned tasks.
- **Team Member :** A project team member actively works on assigned responsibilities and plays a direct and involved role in the project's development. They operate under the guidance and supervision of the team leader, contributing to the overall success of the project.

5.4.1 Management Reporting and Communication

As we gathered the information, we concentrated on our internal communications, which were by far easy to interact with. Each person shared their concerns, and together, they all worked to find solutions. We divided up the work equally among ourselves. The report we shared demonstrates our teamwork. We have good contact with Mr. P.P. Shinde, our guide. To demonstrate our project methodology, we provided timely reports. When unsure, we counsel them, and he always provided excellent guidance.

5.4.2 Team Structure

Following is the team structure as shown below in table 5.3:

Table 5.2: Team Structure

Name	Designation	Work done
Danish Khan	Team Leader	• Requirement Analysis • PPT Presentation • Sequence diagram • Deployement diagram • Coding • Testing • Documentation • Report Generation
Darshan Chavan	Member	• Requirement Analysis • Design Analysis • PPT Presentation • Use case diagram • System Architecture diagram • Coding • Testing • Documentation • Report Generation

Table 5.3: Team Structure

Name	Designation	Work done
Himanshu Baviskar	Member	• Requirement Analysis • PPT Presentation • Class ,Object diagram • Activity diagram • DFD diagram • Coding • Testing • Documentation • Report Generation
Rahul Pardeshi	Member	• Requirement Analysis • Design Analysis • PPT Presentation • Use case diagram • System Architecture diagram • Coding • Testing • Documentation • Report Generation

Chapter 6

Project Implementation

6.1 Overview of Project modules

In our system there three main project modules they are:

- **User Registration Module:** This module handles the registration process for college students and faculty members. Users will provide their personal information and receive a unique RFID tag for identification. The module validates user data, checks for duplicates, and stores the information securely in the database.
- **RFID Integration Module:**This module is responsible for integrating the RFID reader with the software system. It enables the system to read the RFID tags of registered users at the entrance gate. The module processes the RFID data and communicates with other modules to determine user access rights and parking availability.
- **Authentication Module:** The authentication module verifies the identity of users based on their registered RFID tags. It ensures that only authorized users can access the parking facility. The module performs real-time authentication and triggers the gate control mechanism accordingly.
- **Parking Slot Management Module::**This module manages the allocation and availability of parking slots. It keeps track of occupied and vacant parking spaces in real-time. The module assigns an available parking spot to a registered user upon successful authentication.
- **Gate Control Module:** The gate control module interfaces with a servo motor or gate control mechanism. It controls the opening and closing of the entrance gate based on user authentication and parking availability. The module receives instructions from other modules to open the gate when a user is authorized and a parking spot is available.

  It enables the system to read the RFID tags of registered users at the entrance gate. The module processes the RFID data and communicates with other modules to determine user access rights and parking availability.

- **Visitor Management Module:**This module handles the registration and management of unregistered or non-college-affiliated visitors. When a visitor arrives, the module prompts the authority to manually enter the visitor's vehicle details and assign a temporary parking spot. It stores the visitor's information for reference and generates reports if needed.
- **Reporting and Monitoring Module:**The reporting and monitoring module generates various reports related to user registration, parking occupancy, and system performance. It provides statistical data and analytics to assist in decision-making and system optimization. The module allows administrators to monitor the overall system status and take necessary actions.
- **User Interface Module:**The user interface module provides an intuitive and user-friendly interface for both administrators and end users. It allows users to register, check parking availability, and receive instructions upon successful authentication. The module enables administrators to manage user data, monitor the system, and generate reports.

6.2 Tools and Technologies Used

6.2.1 Tools

1. **Visual Studio:** An integrated development environment (IDE) used for writing, debugging, and testing the C Sharpe code. It provides a range of tools and features to facilitate software development.
2. **SQL Server:** A database management system used for storing and managing user data, parking slot information, and other relevant data. It offers a robust platform for data storage and retrieval.
   Microsoft Word Excel: These tools are used for documentation purposes, including writing project requirements, system design, and generating reports. NUnit or Microsoft Unit Testing Framework: Testing frameworks used for writing and executing unit tests to ensure the quality and reliability of the software.

6.2.2 Technologies

1. **C #:**
   A programming language used for developing the software system. It is an object-oriented language that provides a wide range of features and functionalities for application development.
2. **.NET Framework**
   A software framework developed by Microsoft that provides a runtime environment for executing the application code. It offers libraries and functionalities to simplify the development process.

3. **RFID Technology:**
   A technology used for user identification and access control. It involves the use of RFID readers and tags for seamless identification of registered users.
4. **Styles:** A communication protocol used for data exchange between different system components. It enables communication over networks, ensuring reliable and secure transmission of data.
5. **Windows Forms or WPF (Windows Presentation Foundation):** CSS makes it simple to keep uniform styling throughout a website. Web designers can produce a more unified and streamlined website by generating reusable styles and using them consistently.

Chapter 7

Software Testing

7.1 Type of Testing

1. **Functionality Testing :** Functional testing is an essential component of web development that focuses on confirming that a web application functions as intended in accordance with the requirements set out for it. It involves testing each of the application's features and functionalities to make sure they function as planned. Aspects of the programme such as user actions, input forms, navigation, links, buttons, and overall application behaviour are all covered by the test cases that are created by testers. Functional testing involves simulating user inputs and interactions to check the application's response. They examine whether the programme operates properly and generates the desired results. The objective is to guarantee that the programme accurately completes its intended tasks and that all functional requirements are met. The many pages, modules, and components of the web application are all subjected to functional testing. To ensure smooth integration and compatibility, testers verify the functionality of individual elements as well as the interactions between different features.
2. **Usability Testing:** Usability testing mainly focuses on evaluating the user experience and ease of use of a web application. It entails testing the user interface (UI), user flow, navigation, and general user friendliness of the application. Understanding how users interact with the system, identifying any problems or obstacles that can limit its usefulness, and gathering input for improvement are the goals.Individuals are given particular tasks to complete inside the web application during usability testing. These exercises cover a range of application functionalities and features while modelling real-world circumstances. Users' interactions are observed and recorded by testers, who make note of any challenges or confusion they have along the way.
3. **Performance Testing:** Performance testing focuses on analysing a web application's performance, responsiveness, scalability, and stability under various load scenarios. It entails calculating and examining the application's performance metrics, including

response times, server performance, and database performance. Performance testing helps in finding bottlenecks, resource limitations, and other problems that may affect the project's performance and user experience by using real-world scenarios and stress testing the application.Performance testing involves loading the web application with different approaches and tools to analyse how it responds to high usage. This entails simulating numerous users operating simultaneously, raising the volume of queries, and assessing how the application responds to peak traffic.

4. **Interface Testing:** The main goal of interface testing is to assess how users interact with the user interface (UI) of a web application. In order to create an easy and simple user experience, it requires testing the UI's visual components, functionality, and usability. The goal of interface testing is to ensure that the web application's interface is clear to use, responsive, and visually appealing. Testers evaluate the layout, typography, colours, images, buttons, forms, menus, and links of the UI while doing interface testing. They confirm the navigation is clear, the text is readable, the photos are presented appropriately, and the UI elements are aligned correctly. Interface testing assesses the functionality of UI elements in addition to their visual characteristics.

5. **Security Testing:** The main goal of security testing is to find weaknesses and flaws in the security protocols used by the web application. Its main objective is to guarantee that the application is sufficiently safeguarded from any risks or unauthorised access. Various procedures and techniques are used during security testing to evaluate an application's resistance to potential threats. Another important aspect of security testing is vulnerability assessment. This involves examining the application with automated tools for known errors, configuration errors, or insufficient security measures. Authentication and authorization testing are also included in security testing. This demonstrates the security and proper implementation of the authentication techniques, including usernames, passwords, and multi-factor authentication. In order to prevent unauthorised individuals from accessing sensitive information or carrying out restricted actions, authorization testing makes sure that access restrictions and permissions are correctly applied.

6. **Compatibility testing:** Compatibility testing ensures the proper functioning and appearance of a web application across different platforms, devices, and browsers. It entails evaluating the web application's compatibility across a range of operating systems, web browsers, screen sizes, and resolutions. Regardless of the user's preferred platform or device, the aim is to confirm that the programme performs consistently and provides a seamless user experience.Testers check how the online application renders and works on various browsers, including Chrome, Firefox, Safari, Internet Explorer/Edge, and others, during compatibility testing. They make sure that the layout, content, navigation, and interactive components of the application are shown accurately and consistently across these browsers. Any browser-specific problems, such as inconsistent rendering, broken layouts, out-of-place elements, or functional inconsistencies, can be found through compatibility testing.

7.2 Test Cases and Test Result

7.3 Test Case: User registration

1. **Description:** Verify that a user can successfully register with valid information.
   Test Steps: Enter valid user details in the registration form.
   Submit the form and check for successful registration.
   Expected Result: User should be registered successfully.
   Test Case:RFID authentication.
2. **Description:** Test the authentication process using RFID tags.
   Test Steps: Present a valid registered RFID tag to the RFID reader
   . Verify that the system authenticates the user.
   Expected Result: User should be authenticated successfully.
   Test Case: Parking Slot Availability
3. **Description:** Check if the system correctly detects available parking slots.
   Test Steps: Simulate different parking scenarios with a variety of occupied and vacant parking slots.
   Verify that the system accurately displays the available parking slots.
   Expected Result: System should display the correct number of available parking slots.
   Test Case: User Registration

7.4 Test Case: User registration

1. **Result:** Pass **Comments:** The user registration process is functioning correctly.
   Users can register successfully, and their information is stored in the database.
   Test Case: RFID Authentication
2. **Result:** Pass **Comments:** The RFID authentication process is working as expected. Registered users can be authenticated using their RFID tags, and access is granted accordingly.
   Test Case: Parking Slot Availability
3. **Result:** Pass **Comments:** The system accurately detects and displays the available parking slots.
   It correctly identifies occupied and vacant slots based on the simulated scenarios.

Chapter 8

Result

8.1 Outcomes

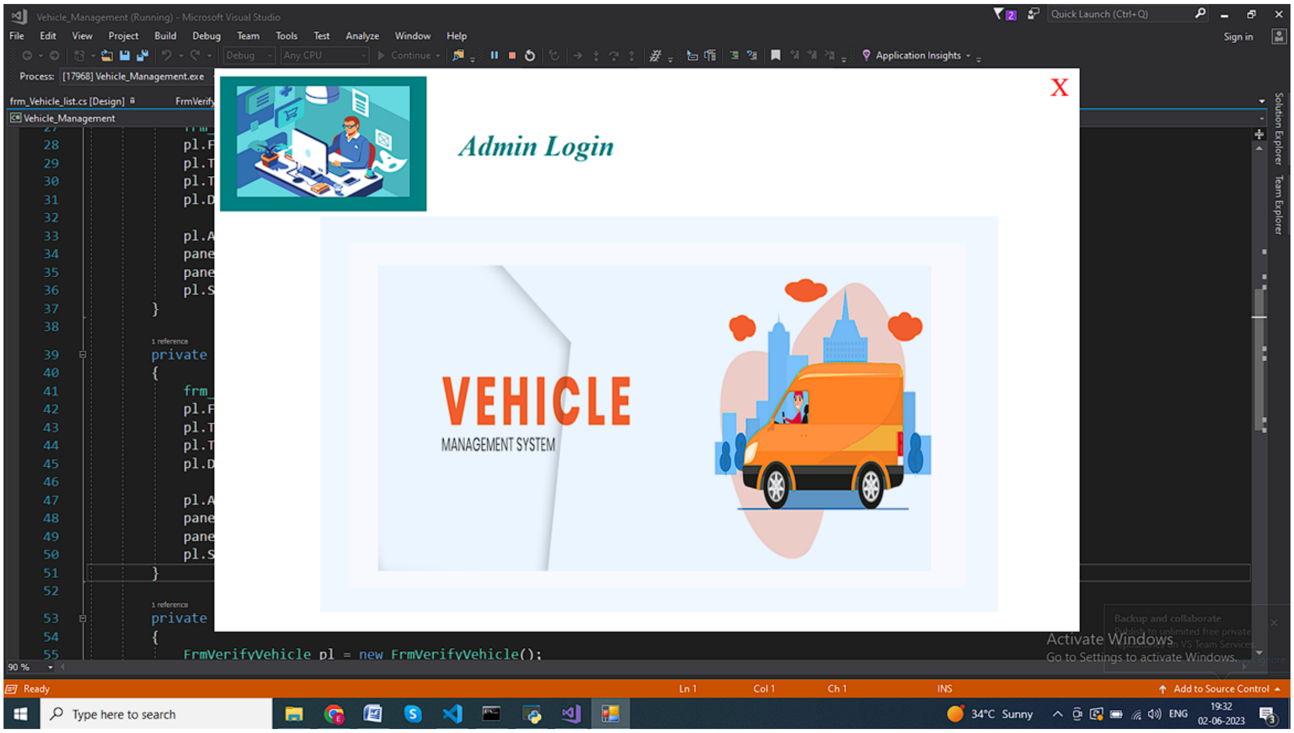
The expected outcomes or results of the vehicle parking management project can include:

- Improved Parking Efficiency: The system aims to optimize the utilization of parking spaces by efficiently assigning available spots to registered users. The expected outcome is a streamlined parking process and reduced congestion in the parking area.
- Enhanced User Experience: With the automation of the parking system and seamless access control, the project aims to provide a convenient and user-friendly experience for registered users. Users should be able to easily find available parking spots and access them without any hassle..
- Increased Security: By implementing RFID-based authentication and registration, the project aims to enhance the security of the parking facility. Only registered users will be granted access, reducing the risk of unauthorized vehicles entering the premises.
- Efficient Visitor Management: The system intends to provide a structured approach for managing unregistered visitors. The expected outcome is a smoother process for recording visitor details, assigning temporary parking spots, and generating visitor reports when necessary.
- Effective Reporting and Monitoring: The project includes a reporting and monitoring module to track parking occupancy, user registration data, and system performance. The expected outcome is the availability of accurate and real-time reports that can assist in decision-making, system optimization, and identifying any issues or bottlenecks.
- Scalability and Flexibility: The system should be designed to accommodate future growth and expansion. The expected outcome is a scalable architecture that can handle an increasing number of registered users, parking slots, and additional features or functionalities.

- Compliance with Regulations: The project aims to adhere to relevant regulations and guidelines related to parking management and data privacy. The expected outcome is a system that meets legal requirements and ensures the protection of user data.

  It's important to note that the actual outcomes of the project will depend on various factors, including the implementation, user feedback, and any modifications or enhancements made during the development process. Regular evaluation and feedback from stakeholders will help assess the success of the project in achieving its desired outcomes.

8.2 Screenshots



```
                pl.F
                pl.T
                pl.T
                pl.D

                pl.A
                pane
                pane
                pl.S
            }

            1 reference
            private
            {
                frm_
                pl.F
                pl.T
                pl.T
                pl.D

                pl.A
                pane
                pane
                pl.S
            }

            1 reference
            private
            {
                FrmVerifyVehicle pl = new FrmVerifyVehicle();
```

Figure 8.1: User Interface

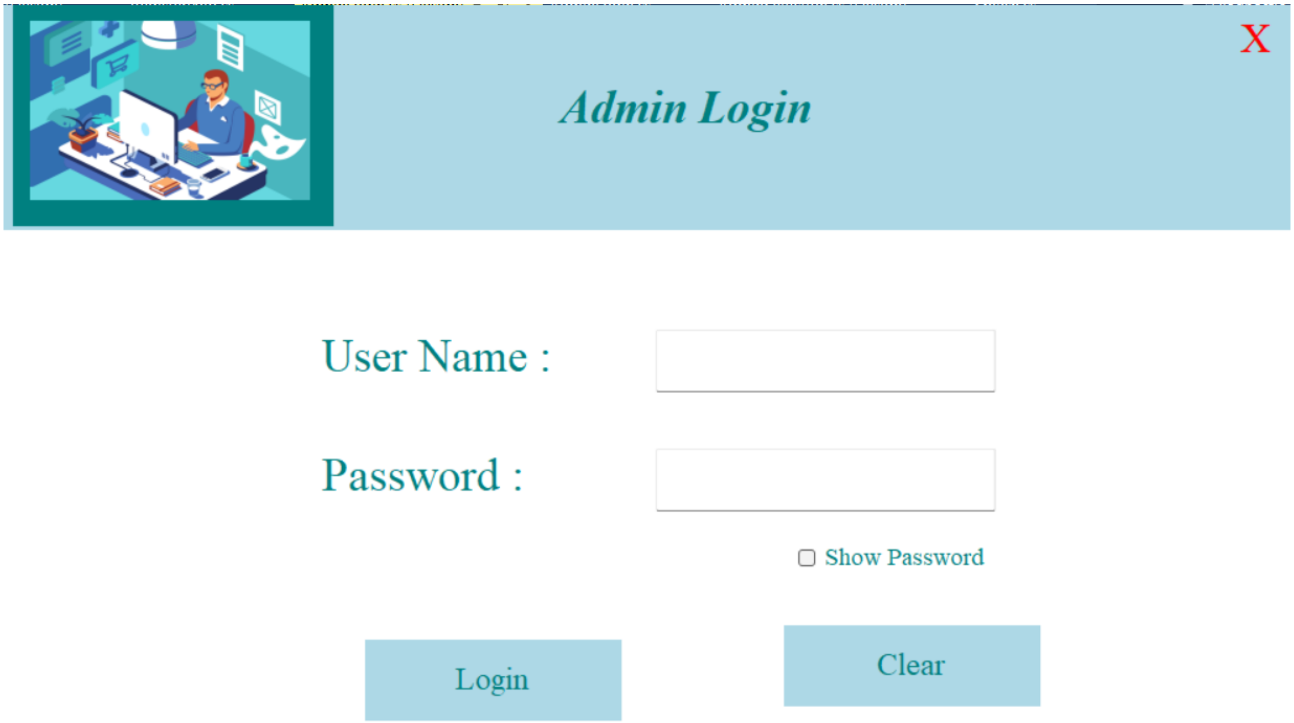


Figure 8.2: Admin Login

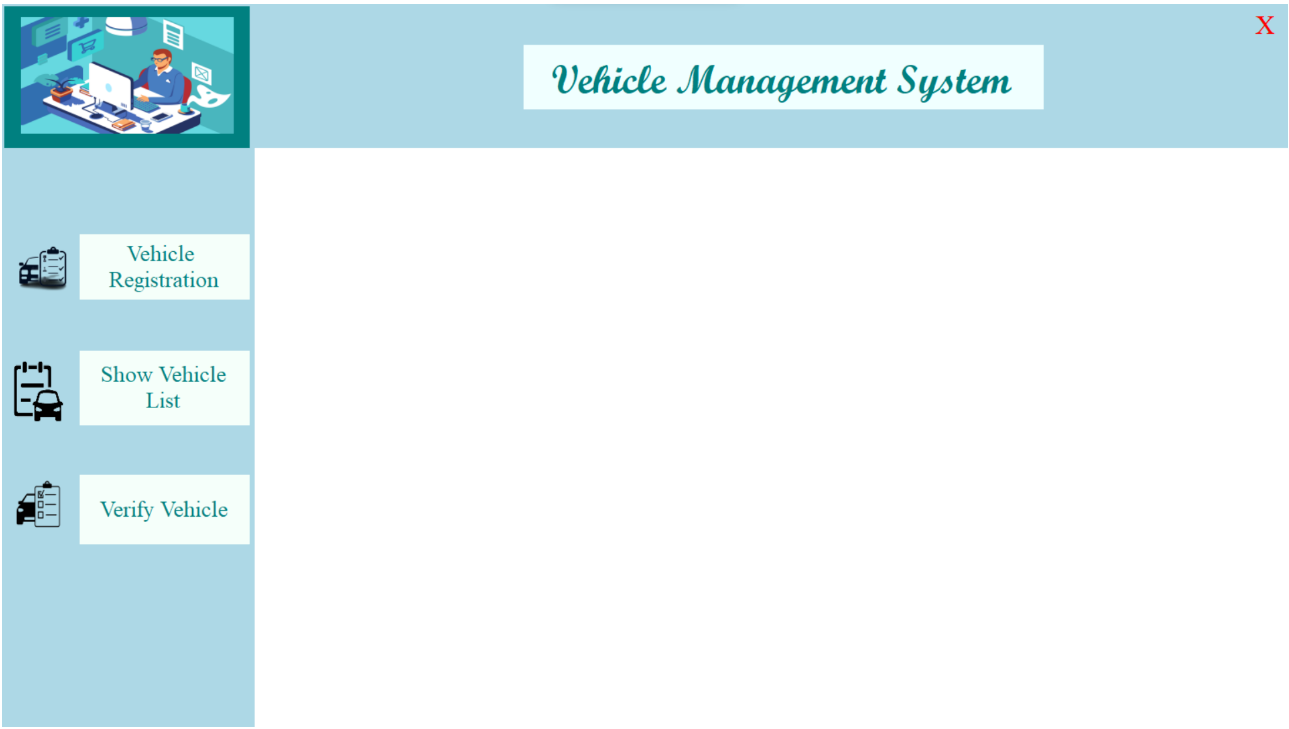


Figure 8.3: Home Page

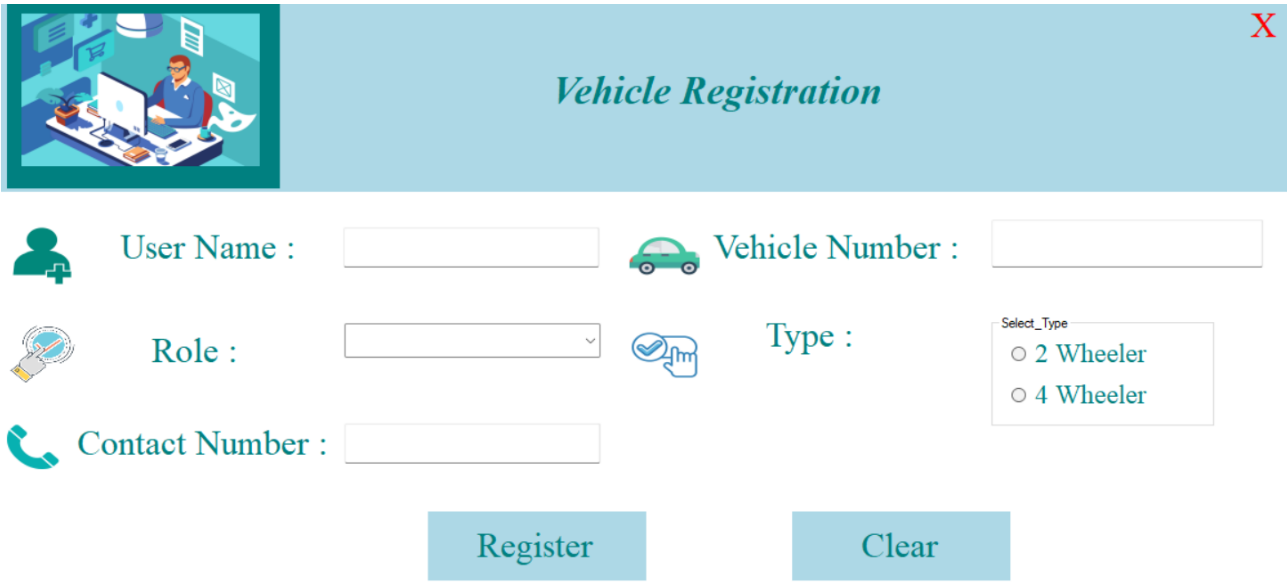
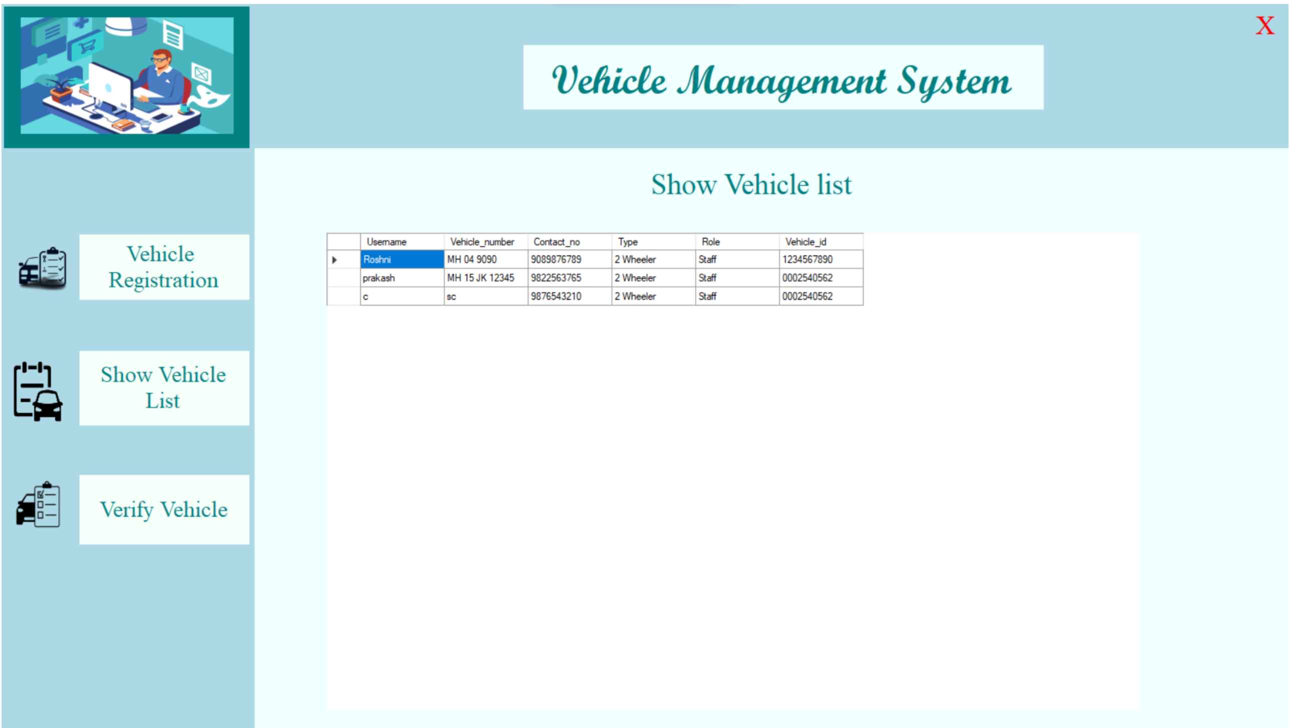


Figure 8.4: vehicle Registration

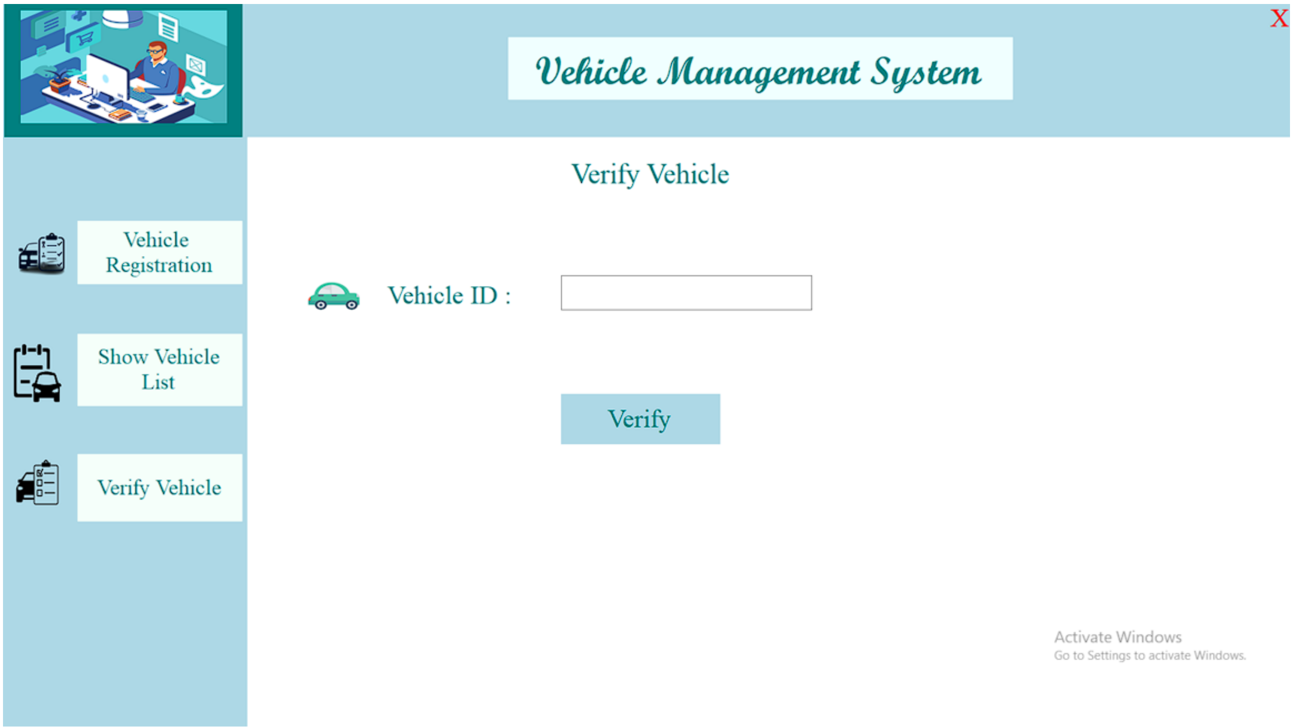


Vehicle Management System

Show Vehicle list

	Username	Vehicle_number	Contact_no	Type	Role	Vehicle_id
▶	Roshni	MH 04 9090	9089876789	2 Wheeler	Staff	1234567890
	prakash	MH 15 JK 12345	9822563765	2 Wheeler	Staff	0002540562
	c	sc	9876543210	2 Wheeler	Staff	0002540562

Figure 8.5: Vehicle list

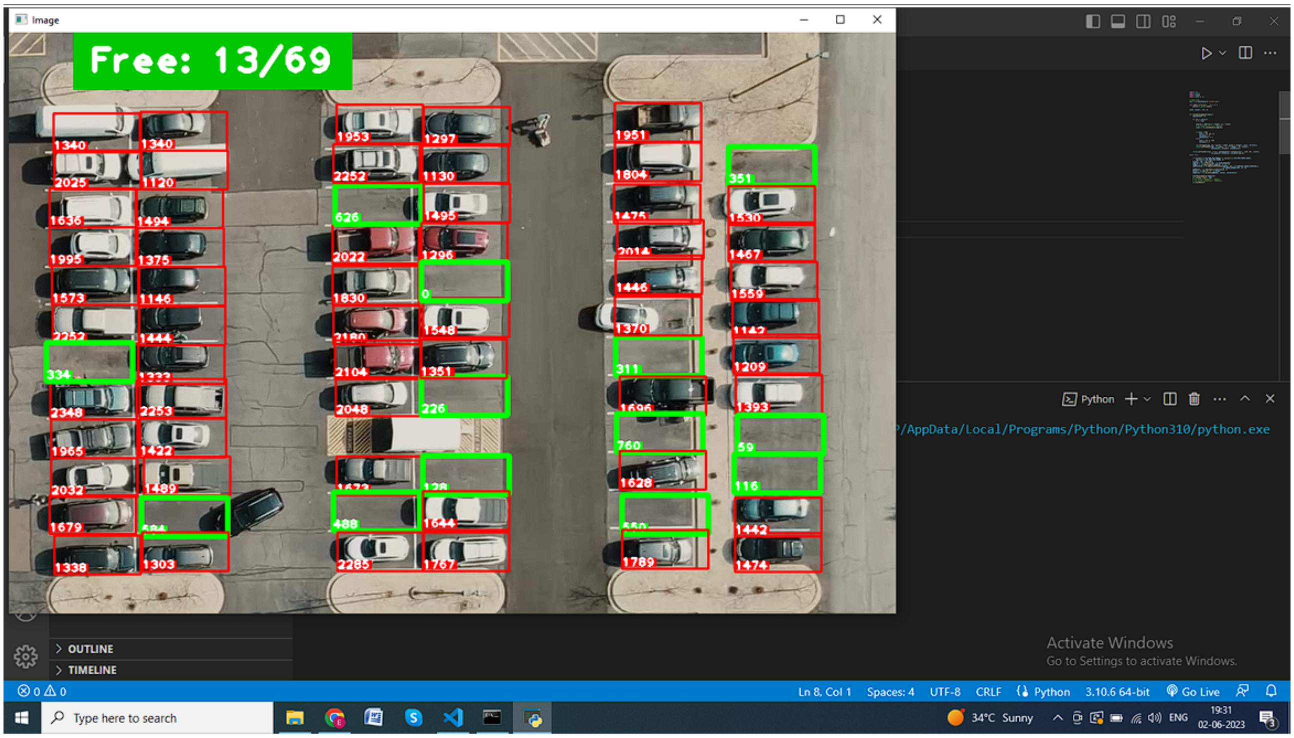


Vehicle Management System

Verify Vehicle

Vehicle ID :

Figure 8.6: Visitor vehicle verificiation



Free: 13/69

```
/AppData/Local/Programs/Python/Python310/python.exe
```

Figure 8.7: Free Slot Detection

Chapter 9

Conclusion and Future Scope

9.1 Conclusion

In conclusion, the vehicle parking management project has successfully developed a software system that streamlines the parking process, enhances user experience, and improves security. By incorporating RFID technology and an automated gate control mechanism, the project has achieved efficient user authentication and parking slot allocation. Through the implementation of user registration, the system ensures that only authorized individuals can access the parking facility, contributing to a safer and more organized environment. The project also includes provisions for managing unregistered visitors, maintaining a record of their details, and assigning temporary parking spots. The project's database management system facilitates efficient storage and retrieval of user data, parking slot information, and visitor records. Additionally, the reporting and monitoring module provides valuable insights into parking occupancy, system performance, and user registration data.

9.2 Future Work

- While the current project has successfully addressed the core requirements of the vehicle parking management system, there are several potential areas for future enhancements and expansion. Some possible avenues for future work include:
- Integration with Mobile Applications: Developing a mobile application that allows users to access parking-related information, reserve parking slots, and receive notifications about available spots.
- Real-time Occupancy Monitoring: Implementing sensors or other technologies to provide real-time monitoring of parking occupancy, allowing users to check the availability of parking slots before arriving at the facility.
- Integration with Payment Systems: Incorporating payment gateways or integrating with mobile wallets to enable convenient and seamless payment for parking services.

- Smart Parking Management: Exploring the use of IoT (Internet of Things) devices and smart sensors to optimize parking space allocation, reduce energy consumption, and provide advanced analytics for better decision-making.

9.3 Advantages

The vehicle parking management project offers several advantages, including:

1. **Enhanced Efficiency:** By automating procedures like application submission, document verification, and money collection, a college administration system simplifies the admissions process.
2. **Improved Security:** Digital records of students, including their personal data, academic standing, attendance, and conduct, are kept by a college management system. The creation of reports, transcripts, and other documents using this data is possible.
3. **User Convenience:** A college management system aids in the coordination of faculty assignments, course scheduling, and course evaluation. Students can also examine their schedules and register for classes through it.
4. **Visitor Management:** A college management system aids in the administration of faculty hiring, deputizations, performance reviews, etc.

9.4 Applications:

The vehicle parking management project has potential applications in various domains, including:

- **Educational Institutions:**The system can be implemented in universities, colleges, and schools to manage parking for students, faculty, and visitors, ensuring a smooth parking process on campus.
- **Commercial Complexes:**Shopping malls, office complexes, and business parks can utilize the project to efficiently manage parking for employees, tenants, and visitors, minimizing parking-related issues.
- **Residential Communities:**Housing societies and apartment complexes can benefit from the system by effectively allocating parking spaces to residents, enhancing security, and preventing unauthorized parking.
- **Public Parking Facilities:** Municipalities and city authorities can implement the project in public parking areas to streamline the parking process, enable online reservations, and improve overall parking management.

Appendix A

Computational Complexity

The computational complexity of a project refers to the amount of computational resources required to execute the software system efficiently. It provides insights into the scalability and performance characteristics of the project. In the case of the vehicle parking management project, the computational complexity can be analyzed in terms of time complexity and space complexity.

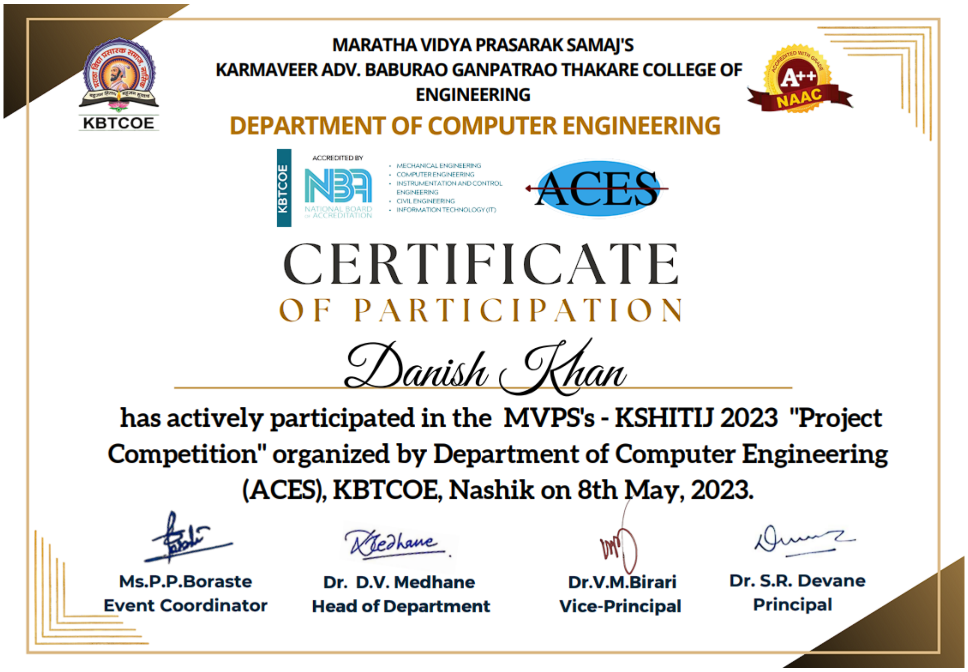
- Time Complexity: The time complexity of the project determines the efficiency of the algorithms and operations involved in various functionalities. It quantifies the amount of time required for the system to perform specific tasks. The time complexity can vary based on different operations within the project, such as user registration, RFID authentication, parking slot allocation, and database operations. For example, the time complexity of user registration and authentication operations might depend on the efficiency of searching and retrieving user records from the database. Similarly, the time complexity of parking slot allocation can depend on the algorithm used to identify and assign available slots.
- Space Complexity: The space complexity of the project refers to the amount of memory or storage required by the software system to execute its operations. It includes the memory needed for variables, data structures, and database storage. The space complexity can depend on factors such as the size of the user database, the number of parking slots, and the data structures used for efficient storage and retrieval. For instance, the space complexity of maintaining the user database would depend on the number of registered users and the attributes stored for each user. The space complexity of managing the parking slots would depend on the size and structure of the data storage used to track the availability of parking spaces.

  It's important to note that the computational complexity can be influenced by various factors, including the efficiency of algorithms, database indexing techniques, hardware capabilities, and system optimization. It is crucial to analyze and optimize the computational complexity of the project to ensure optimal performance and scalability.

By analyzing the time and space complexity of the project, developers can identify potential bottlenecks, optimize algorithms and data structures, and make informed decisions to enhance the overall efficiency and performance of the vehicle parking management system.

Appendix B

Published /Presented Paper , Certificates of Participation/Prize winning



KBTCOE

MARATHA VIDYA PRASARAK SAMAJ'S
KARMAVEER ADV. BABURAO GANPATRAO THAKARE COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

KBTCOE

ACCREDITED BY
NBA
NATIONAL BOARD of ACCREDITATION

- MECHANICAL ENGINEERING
- COMPUTER ENGINEERING
- INSTRUMENTATION AND CONTROL ENGINEERING
- CIVIL ENGINEERING
- INFORMATION TECHNOLOGY (IT)

ACES

CERTIFICATE
OF PARTICIPATION

Danish Khan

has actively participated in the MVPS's - KSHITIJ 2023 "Project Competition" organized by Department of Computer Engineering (ACES), KBTCOE, Nashik on 8th May, 2023.

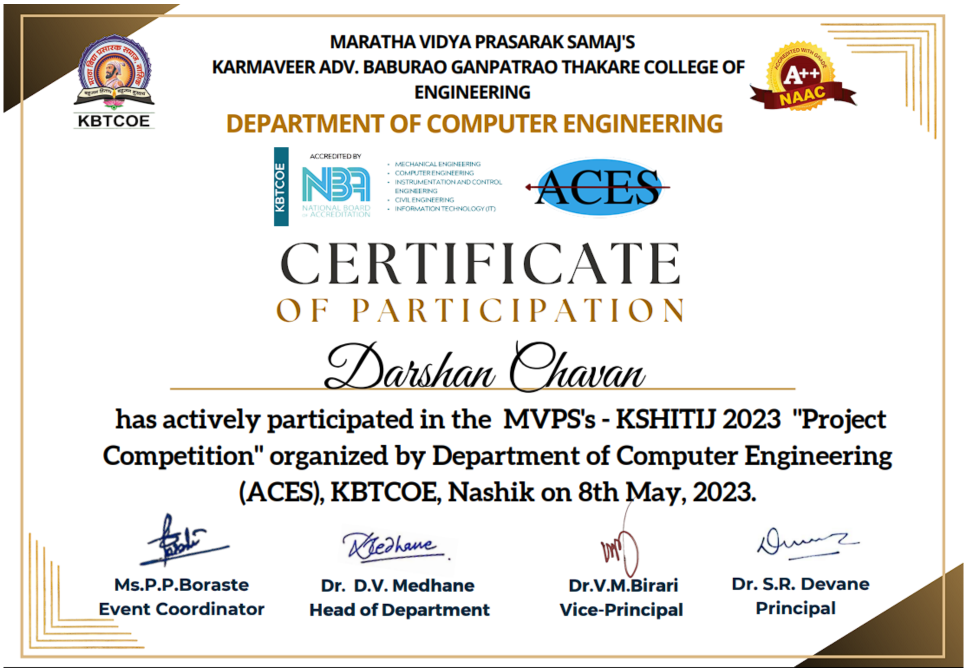
Ms.P.P.Boraste
Event Coordinator

Dr. D.V. Medhane
Head of Department

Dr.V.M.Birari
Vice-Principal

Dr. S.R. Devane
Principal

Figure B.1: MVP's KSHITIJ Certificate



KBTCOE

MARATHA VIDYA PRASARAK SAMAJ'S
KARMAVEER ADV. BABURAO GANPATRAO THAKARE COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

A++ NAAC

KBTCOE ACCREDITED BY NBA NATIONAL BOARD of ACCREDITATION

- MECHANICAL ENGINEERING
- COMPUTER ENGINEERING
- INSTRUMENTATION AND CONTROL ENGINEERING
- CIVIL ENGINEERING
- INFORMATION TECHNOLOGY (IT)

ACES

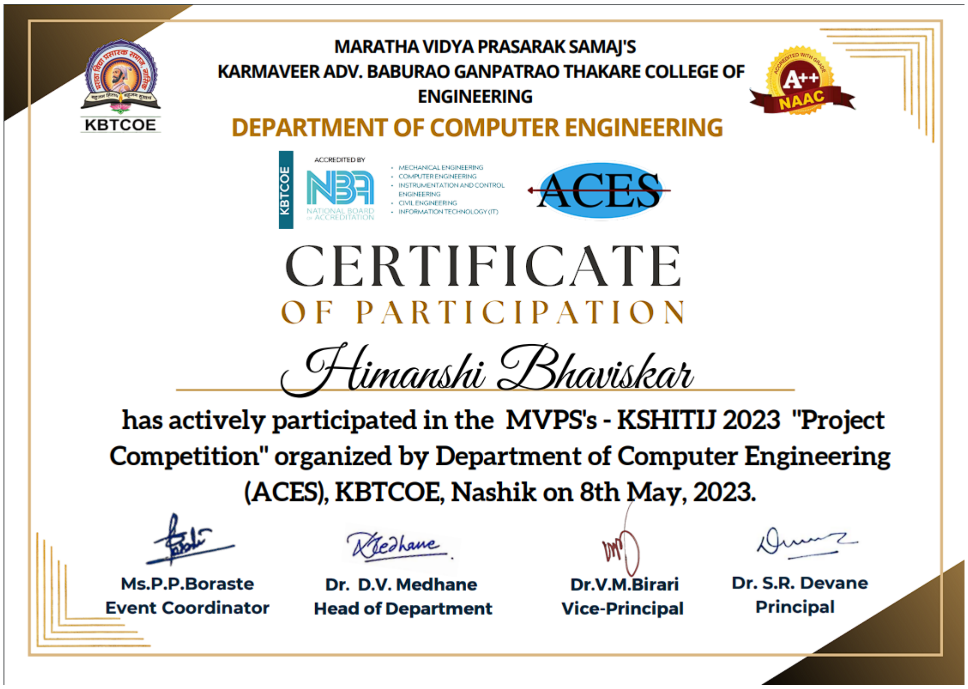
CERTIFICATE
OF PARTICIPATION

Darshan Chavan

has actively participated in the MVPS's - KSHITIJ 2023 "Project Competition" organized by Department of Computer Engineering (ACES), KBTCOE, Nashik on 8th May, 2023.

Ms.P.P.Boraste Event Coordinator	Dr. D.V. Medhane Head of Department	Dr.V.M.Birari Vice-Principal	Dr. S.R. Devane Principal

Figure B.2: MVP's KSHITIJ Certificate



KBTCOE

MARATHA VIDYA PRASARAK SAMAJ'S
KARMAVEER ADV. BABURAO GANPATRAO THAKARE COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

A++ NAAC

KBTCOE ACCREDITED BY NBA NATIONAL BOARD of ACCREDITATION

- MECHANICAL ENGINEERING
- COMPUTER ENGINEERING
- INSTRUMENTATION AND CONTROL ENGINEERING
- CIVIL ENGINEERING
- INFORMATION TECHNOLOGY (IT)

ACES

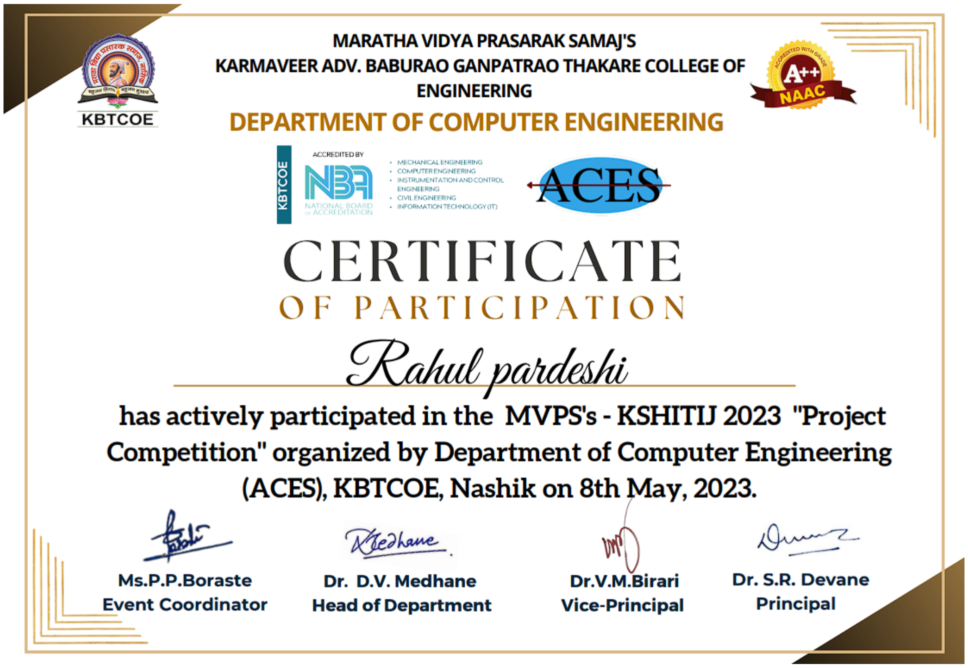
CERTIFICATE
OF PARTICIPATION

Himanshi Bhaviskar

has actively participated in the MVPS's - KSHITIJ 2023 "Project Competition" organized by Department of Computer Engineering (ACES), KBTCOE, Nashik on 8th May, 2023.

Ms.P.P.Boraste Event Coordinator	Dr. D.V. Medhane Head of Department	Dr.V.M.Birari Vice-Principal	Dr. S.R. Devane Principal

Figure B.3: MVP's KSHITIJ Certificate



KBTCOE

MARATHA VIDYA PRASARAK SAMAJ'S
KARMAVEER ADV. BABURAO GANPATRAO THAKARE COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

A++ NAAC

KBTCOE

ACCREDITED BY

NBA NATIONAL BOARD of ACCREDITATION

- MECHANICAL ENGINEERING
- COMPUTER ENGINEERING
- INSTRUMENTATION AND CONTROL ENGINEERING
- CIVIL ENGINEERING
- INFORMATION TECHNOLOGY (IT)

ACES

CERTIFICATE
OF PARTICIPATION

Rahul pardeshi

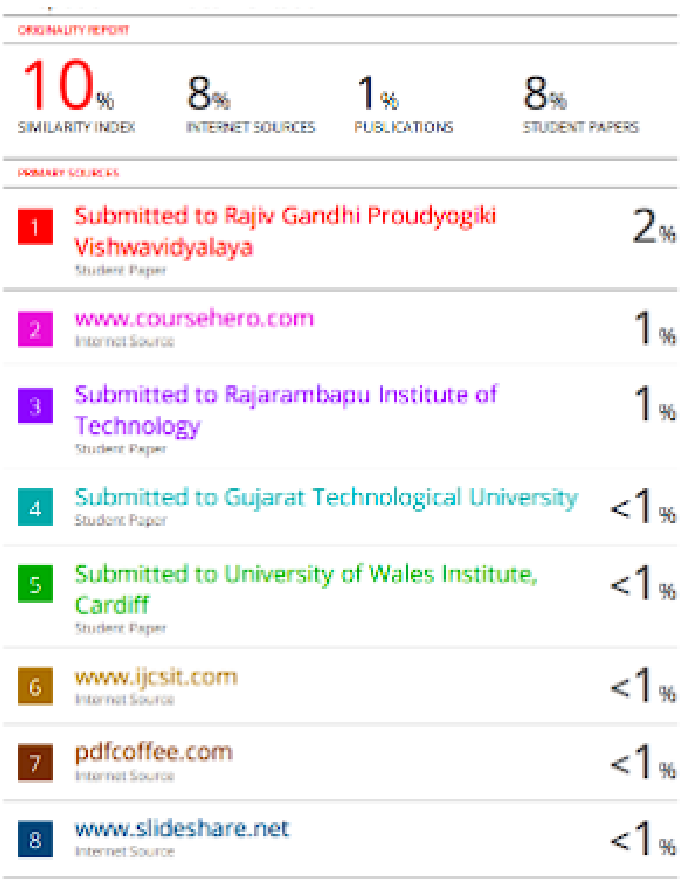
has actively participated in the MVPS's - KSHITIJ 2023 "Project Competition" organized by Department of Computer Engineering (ACES), KBTCOE, Nashik on 8th May, 2023.

Ms.P.P.Boraste Event Coordinator	Dr. D.V. Medhane Head of Department	Dr.V.M.Birari Vice-Principal	Dr. S.R. Devane Principal

Figure B.4: MVP's KSHITIJ Certificate

Appendix C

Plagiarism Check Report



ORIGINALITY REPORT

10%	8%	1%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Rajiv Gandhi Proudyogiki Vishwavidyalaya Student Paper	2%
2	www.coursehero.com Internet Source	1%
3	Submitted to Rajarambapu Institute of Technology Student Paper	1%
4	Submitted to Gujarat Technological University Student Paper	<1%
5	Submitted to University of Wales Institute, Cardiff Student Paper	<1%
6	www.ijcsit.com Internet Source	<1%
7	pdfcoffee.com Internet Source	<1%
8	www.slideshare.net Internet Source	<1%

Figure C.1: Plagarism Report

Bibliography

[1] B.Waraich, RFID-Based Automated Vehicle parking system.

[2] P Joshi, M.R Khan and L Motiwalla, Global Review of Parking Management System and Strategies. Volume 2, Issue 6, June-2011 1 ISSN 2279-5141.

[3] Duan, T. D., Du, T. H., Phuoc, T. V., Hoang, N. V. (2005, February). Building an automatic vehicle license plate recognition system. In Proc. Int. Conf. Comput. Sci. RIVF.

[4] D. Henrici, RFID Security and Privacy: Concepts, Protocols, and Architectures. Springer Science Business Media, 2008, pp. 9-15. [2] F. N. R. Center, Introduction to the rfid.

[5] A.A Kamble and A Dehankar Review on Automatic Car Parking Indicator System, InTernational Journal on recent and innovation trends in computing and communication, Vol 3 no.4 pp 2158-2161.

[6] K Sushma,P Raveendra Babu and J.Nageshwara Reddy, Reservation Based Vehicle Parking System using GSM and RFID Technology, International Journal of Engineering Research and Applications