



Mini Project Report On
Autocraft Customizer

*Submitted in partial fulfillment of the requirements for the
award of the degree of*

Bachelor of Technology
in
Computer Science & Engineering
By

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CERTIFICATE

*This is to certify that the mini project report entitled "**AutoCraft Customizer**" is a bonafide record of the work done by **Harinarayanan A M (U2103101)** , submitted to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B. Tech.) in Computer Science and Engineering during the academic year 2023-2024.*

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Abstract

AutoCraft Customizer is a pioneering web-based car customization platform that redefines the art of personalizing vehicles. This advanced platform employs 3D rendering technology and an intuitive user interface, providing a rich and interactive experience for users to tailor their vehicles according to their unique preferences. From choosing paint colours to exploring body kits, rims, and accessories, AutoCraft Customizer presents an extensive range of customization options. The real-time visualization feature empowers users to make informed decisions about aesthetic upgrades, ensuring a seamless and personalized experience. AutoCraft Customizer enhances the visual richness and interactivity of the customization process. This brings a level of detail and realism that goes beyond traditional customization techniques, creating a truly immersive experience. Whether catering to automotive enthusiasts or those seeking to embark on their first customization journey, AutoCraft Customizer accommodates users of all expertise levels. In the world of automotive personalization, AutoCraft Customizer stands as a technological marvel, bridging the gap between imagination and reality. It transforms the process of customizing dream cars into a creative and precision-driven journey, where users can craft personalized masterpieces with unprecedented accuracy and visual fidelity.

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List of Abbreviations

UI - User Interface

UE - Unreal Engine

API - Application Programming Interface

PPT - Power Point

Chapter 1

Introduction

1.1 Background

In today's automotive landscape, the demand for personalized vehicle customization is at an all-time high. However, traditional customization processes often come with limitations, including accessibility and cost constraints. This highlights the need for a solution that offers comprehensive customization options while remaining accessible to all enthusiasts.

Enter Autocraft Customizer, a groundbreaking web-based platform designed to revolutionize vehicle personalization. By combining cutting-edge technology with intuitive design, Autocraft Customizer empowers users to create their dream vehicles with unprecedented ease and precision.

With a wide range of customization options and real-time 3D rendering capabilities, Autocraft Customizer offers a seamless and personalized experience for automotive enthusiasts of all levels. From choosing paint colors to selecting rims and accessories, users can tailor every aspect of their vehicle to reflect their individual style and preferences.

Autocraft Customizer fills a crucial gap in the market by democratizing the vehicle customization process and providing enthusiasts with the tools they need to bring their automotive dreams to life.

1.2 Problem Definition

The aim of the project is to develop Autocraft Customizer, a web-based platform offering accessible and comprehensive vehicle customization options, addressing the current lack of personalized choices for automotive enthusiasts.

1.3 Scope and Motivation

The scope of Autocraft Customizer encompasses the development of a robust web-based platform that facilitates seamless vehicle customization. This includes providing users with a wide range of options to personalize various aspects of their vehicles, such as paint colors, rims, accessories, and interior features, only including the seat colour and texture. Additionally, the platform will incorporate real-time 3D rendering technology to enable users to visualize their customization choices accurately. The scope also extends to ensuring compatibility with different devices and browsers, ensuring a smooth and consistent user experience across various platforms.

The motivation behind Autocraft Customizer stems from the desire to democratize the vehicle customization process and empower automotive enthusiasts to bring their creative visions to life. By offering a user-friendly and intuitive platform, we aim to break down barriers to entry and make vehicle customization accessible to a wider audience. Moreover, the lack of comprehensive customization options in the current market further underscores the need for a solution like Autocraft Customizer, which aims to fill this gap and provide users with the tools they need to personalize their vehicles according to their unique preferences and style.

1.4 Objectives

- Develop a user-friendly web-based platform, Autocraft Customizer, to facilitate seamless vehicle customization.
- Provide a comprehensive range of customization options, including paint colors, rims, accessories, and interior features, to cater to diverse user preferences.
- Implement real-time 3D rendering technology to enable users to visualize their customization choices accurately and make informed decisions.
- Empower automotive enthusiasts by democratizing the vehicle customization process, making it accessible to a wider audience.
- Fill the existing gap in the market by offering a solution that addresses the limited

availability of comprehensive vehicle customization options, thereby meeting the evolving needs of automotive enthusiasts.

1.5 Challenges

The challenges involved in the project include integrating complex 3D rendering technology seamlessly into the user interface, and managing a vast array of customization options without compromising on user experience or loading times. Additionally, addressing security concerns to safeguard user data and ensuring scalability to accommodate future updates and enhancements pose significant challenges.

1.6 Assumptions

In this project, it is assumed that users have access to stable internet connections to utilize the web-based platform effectively. Additionally, it is assumed that users possess basic computer literacy skills to navigate through the customization interface and make informed decisions. Finally, it is assumed that the development team has access to adequate resources and expertise to implement and maintain the required technologies and functionalities.

1.7 Societal / Industrial Relevance

The project holds relevance for both society and the automotive industry. For society, Autocraft Customizer offers individuals the opportunity to express their unique personalities and preferences through their vehicles, fostering a sense of identity and pride. Moreover, by democratizing the vehicle customization process, the platform promotes inclusivity and accessibility, allowing automotive enthusiasts of all backgrounds to participate in the customization culture.

In the automotive industry, Autocraft Customizer presents a disruptive innovation by providing a comprehensive and user-friendly solution to the current limitations of vehicle customization. It addresses the growing demand for personalized vehicles and offers automakers and aftermarket companies new avenues for engaging with consumers. Additionally, the platform's integration of real-time 3D rendering technology sets a new standard for digital vehicle customization experiences, potentially reshaping the way vehicles

are marketed and sold in the industry.

1.8 Organization of the Report

- Introduction: We'll begin by introducing AutoCraft Customizer and highlighting its key features, including 3D rendering technology and a user-friendly interface.
- Extensive Customization Options: This section will delve into the wide range of customization options offered by AutoCraft Customizer, from paint colors to intricate body kits and accessories.
- Real-Time Visualization Advantage: We'll explore the real-time visualization feature, a game-changer that allows users to see their customization choices instantly, leading to informed decisions.
- A User-Centric Experience: This section will discuss how AutoCraft Customizer personalizes the experience for users of all expertise levels, making car customization accessible to everyone.
- Beyond Customization: A Technological Marvel: We'll explore how AutoCraft Customizer stands out as a technological marvel in the car customization world, bridging the gap between imagination and reality.
- Conclusion: The concluding section will summarize the key takeaways and emphasize how AutoCraft Customizer transforms car customization into a creative and precise journey.

Chapter 2

Software Requirements Specification

2.1 Introduction



Figure 2.1: Logo

2.2 Overall Description

2.2.1 Product Perspective

Autocraft Customizer is a novel, standalone web-based car customization platform, introducing innovative features to redefine automotive personalization. As a self-contained product, Autocraft Customizer is not part of a larger system but can potentially contribute to elevating the overall automotive user experience. Autocraft Customizer operates independently without direct subsystem dependencies. It may leverage external data sources for enhanced customization options. The platform provides user-friendly interfaces through

standard web browsers. While not system-dependent, it may utilize APIs for real-time updates on automotive trends.

2.2.2 Product Functions

User Customization:

Personalize vehicles with options for paint colors, body kits, rims, and accessories. Explore an extensive range of customization choices. Utilize an intuitive interface for ease of customization.

3D Rendering Technology:

Implement 3D rendering for realistic visualization. Enable real-time visualization to empower informed decision-making.

Comprehensive Options:

Offer a wide array of customization features catering to diverse preferences. Include functionalities for selecting paint colors, exploring body kits, rims, and accessories.

User Experience Enhancement:

Provide a rich and interactive experience for users. Ensure a seamless and personalized customization journey for both enthusiasts and beginners.

Immersive Visual Experience:

Enhance the customization process with detailed and realistic visualizations. Go beyond traditional techniques, creating an immersive and detailed user experience.

Accessibility for All Expertise Levels:

Accommodate users of varying expertise levels, from automotive enthusiasts to beginners. Ensure the platform is user-friendly and accessible to a diverse audience.

Technological Marvel:

Stand as a technological marvel in the automotive personalization realm. Bridge the gap between imagination and reality in the customization process.

2.2.3 Operating Environment

Compatibility:

Autocraft Customizer is compatible with standard hardware platforms, including PCs, laptops, and tablets. Supported operating systems: Windows 10+, macOS 10.12+.

Software Components:

Utilizes common web browsers (Chrome, Firefox, Safari, Edge) for user access. Incorporates 3D rendering libraries and database connectivity for enhanced functionality.

Coexistence:

Operates independently within web browsers, ensuring peaceful coexistence with other applications. Compatible with popular browser plugins and extensions.

Connectivity:

Requires a stable internet connection for real-time updates and access to additional customization options.

Security:

Implements encryption protocols for secure data transmission. Regular updates and adherence to industry-standard security practices.

2.2.4 Design and Implementation Constraints

Compliance Requirements:

Adherence to corporate policies, industry regulations, and legal standards is mandatory. Compliance with data protection and privacy regulations throughout the development process.

Performance and Hardware:

Must meet specified timing and memory requirements for optimal performance. Compatibility with a range of hardware configurations is essential.

Interfaces and Integration:

Seamless integration with external applications, databases, and APIs. Compatibility with industry-standard interfaces and protocols.

Technology and Tools:

Use of predetermined technologies, tools, and databases as specified. Adherence to preferred programming languages and frameworks.

Security Measures:

Implementation of robust security measures against data breaches and unauthorized access. Compliance with security standards, encryption protocols, and secure coding practices.

Maintenance and Responsibility:

Clear definition of responsibilities for ongoing software maintenance. Design considerations for ease of maintenance, especially if managed by the customer's organization.

2.2.5 Assumptions and Dependencies

Third-Party Components:

Assumption: Successful integration and compatibility with third-party components and libraries. Dependency: Timely availability of updates and support from third-party providers.

Development Environment:

Assumption: Availability of required development tools and environments. Dependency: Compatibility with the specified versions of development tools and frameworks.

Operational Environment:

Assumption: Consistent and stable operational environments for end-users. Dependency: Users' devices meet minimum hardware and software requirements.

External Interfaces:

Assumption: Stability and reliability of external interfaces and APIs. Dependency: Continuous support and adherence to established communication protocols

Regulatory Compliance:

Assumption: Regulatory compliance requirements remain unchanged. Dependency: Any changes in regulations are communicated and addressed promptly.

Data Availability:

Assumption: Availability of necessary data for testing and development. Dependency: Timely access to required datasets from internal or external sources.

User Involvement:

Assumption: Active and timely participation of end-users during testing and feedback. Dependency: Users are available for feedback sessions as scheduled.

Vendor Support:

Assumption: Adequate support and response from vendors for external solutions. Dependency: Vendor responsiveness to issues and queries during the project.

Risk Mitigation Strategies:

Assumption: Effectiveness of risk mitigation strategies identified in the project plan. Dependency: Continuous monitoring and adjustment of risk mitigation measures as needed.

2.3 External Interface Requirements

2.3.1 User Interfaces

Graphical User Interface (GUI):

Sample Screen Images: Include mock-ups or wireframes illustrating the main screens and layouts. GUI Standards: Adhere to established GUI standards for a consistent and intuitive user experience. Layout Constraints: Ensure responsive design for compatibility with various screen sizes and resolutions. Standard Buttons and Functions: Implement commonly used buttons (e.g., Save, Cancel) and standard functions for user interactions. Help Functionality: Include a Help button or section providing relevant information and guidance.

Navigation:

Screen Transitions: Define logical transitions between screens for smooth navigation. Menu Structure: Organize menus logically and follow industry-standard practices for menu design. Breadcrumb Navigation: Provide breadcrumb trails to enhance user orientation within the application.

Input and Output:

Form Elements: Utilize standard form elements for data input (text fields, checkboxes, radio buttons). Error Message Display: Follow a consistent format for displaying error messages to ensure clarity and user understanding. Output Format: Define the format of output data to ensure readability and user comprehension.

Visual Design:

Color Scheme and Themes: Adhere to a predefined color scheme and themes for visual consistency. Typography: Standardize font styles, sizes, and formatting for readability. Iconography: Use clear and recognizable icons for enhanced user understanding.

Accessibility:

Compliance with Accessibility Standards: Ensure the user interface is accessible to users with disabilities. Keyboard Shortcuts: Provide keyboard shortcuts for commonly used functions, enhancing accessibility.

Feedback and Notifications:

Alerts and Notifications: Define the format and style of alerts and notifications for effective user feedback. Confirmation Dialogs: Clearly present confirmation dialogs with standardized button actions.

Software Components Requiring User Interfaces:

Main application dashboard Customization screens (e.g., paint colors, body kits)

Cultural Considerations:

Ensure that the interface is culturally sensitive and adaptable to diverse user preferences.

2.3.2 Hardware Interfaces

Supported Device Types:

- Logical Characteristics:
 - Compatibility with personal computers, laptops, and tablets.
 - Responsive design for various screen sizes.
- Physical Characteristics:
 - Software must run on Windows 10 and later, macOS 10.12 and later.
 - Adaptability to diverse hardware configurations.

Data and Control Interactions:

- Logical Characteristics:
 - Real-time data interaction for customization options.

- Control interactions for user preferences and settings.
- Physical Characteristics:
 - Efficient data exchange between the software and hardware components.
 - Smooth control interactions with minimal latency.

Communication Protocols:

- Logical Characteristics:
 - Utilization of secure communication protocols.
 - Real-time updates through internet connectivity.
- Physical Characteristics:
 - HTTPS for secure data transmission.
 - Protocols like TCP/IP for reliable communication.

Hardware Dependencies:

- Logical Characteristics:
 - Adherence to specified timing and memory requirements.
 - Compatibility with hardware constraints for optimal performance.
- Physical Characteristics:
 - Integration with graphics processing units (GPUs) for 3D rendering.
 - Memory management based on hardware specifications.

Device Connectivity:

- Logical Characteristics:
 - Seamless integration with peripherals (e.g., mouse, keyboard).
 - Compatibility with touch-based interactions on tablets.
- Physical Characteristics:

- Support for standard input devices.
- Touchscreen compatibility for tablets.

Accessibility Features:

- Logical Characteristics:
 - Compliance with accessibility standards (e.g., WCAG).
 - Options for adjusting font size and contrast.
- Physical Characteristics:
 - Device-specific accessibility features utilized (e.g., screen readers).
 - Compatibility with accessibility settings on supported devices.

Security Measures:

- Logical Characteristics:
 - Implementation of encryption for secure data transmission.
 - User authentication for controlled access.
- Physical Characteristics:
 - Hardware-level security considerations, if applicable (e.g., biometric authentication).
 - Integration with hardware security modules (HSMs) for enhanced protection.

2.3.3 Software Interfaces

Software Components:

Operating System: Linux CentOS 7 for hosting the web server.

Tools and Libraries: HTML5, CSS3, JavaScript (possibly with a framework like React or Angular) for the front-end, and PHP version 7.4 for the back-end logic.

Integrated Commercial Components: Integration with PayPal API for handling payments
Model rendering software: models of the car with combinations of customized parts are rendered using unreal engine

Data Flow:

Incoming Data: User inputs such as car model selection, color choices, additional accessories, and payment details come into the system through web forms or interactive UI elements.

Outgoing Data: Customized car configurations, order confirmations, and payment processing statuses are sent out to the user interface for display to the customer.

Services and Communication:

HTTP/HTTPS: Communication between the client-side (web browser) and server-side (web server) components happens over HTTP or HTTPS protocols.

Payment Gateway Integration: Integration with PayPal API for processing payments securely.

2.3.4 Communications Interfaces

Web Browser Communication:

Protocol: HTTP/HTTPS for communication between the client's web browser and the server.

Message Formatting: HTML, CSS, and JavaScript for rendering the user interface and handling dynamic interactions.

Standards: Follow W3C standards for HTML, CSS, and JavaScript to ensure cross-browser compatibility and adherence to web development best practices.

Security: Implement HTTPS to encrypt data transmitted between the user's browser and the server, ensuring confidentiality and integrity of user data.

Network Server Communications Protocols:

Protocol: TCP/IP for communication between the web server and other network services or APIs.

Data Transfer Rates and Synchronization Mechanisms:

Data Transfer Rates: Ensure sufficient bandwidth and server resources to handle concurrent user requests and data transfers without performance degradation.

Synchronization: Implement asynchronous processing for long-running tasks, such as generating customized car configurations or processing payments, to prevent blocking the server and provide a responsive user experience.

2.4 System Features

Organizing functional requirements in this manner provides a clear overview of the system's features and the corresponding functionalities required to implement each feature. This structure allows for easier tracking and management of requirements throughout the development process.

2.4.1 Car Customization

Feature Description: Enables users to customize various aspects of their chosen car model, it has the high priority rate

Functional Requirements:

FR1: Present a catalog of available car models for selection.

FR2: Provide customization options such as color, accessories, and features.

FR3: Dynamically update the car visualization based on selected options.

FR4: Validate selected options to ensure compatibility and availability.

2.4.2 Order Processing

Feature Description: Facilitates the ordering and purchasing process for customized cars.

Functional Requirements:

FR5: Enable users to add customized cars to their shopping cart.

FR6: Calculate total prices based on selected options and quantities.

FR7: Provide a checkout process with payment options, incl. integration with PayPal.

2.5 Other Nonfunctional Requirements

2.5.1 Performance Requirements

By specifying these performance requirements, developers can understand the performance expectations and design the system architecture, database queries, and codebase accordingly to meet or exceed these standards. Additionally, these requirements help in testing and benchmarking the system's performance during development and after deployment.

Customization Process Response Time:

Requirement: Each step of the car customization process should respond within 1 second of user interaction.

Rationale: Users should experience immediate feedback as they interact with the customization options. Delays in response time can disrupt the user's flow and diminish the overall experience.

Payment Processing Time:

Requirement: Payment transactions should be processed within 5 seconds, including communication with external payment gateways.

Rationale: Slow payment processing can lead to user frustration and potential loss of sales. Fast and reliable payment processing enhances user trust and encourages conversions.

2.5.2 Safety Requirements

By addressing these safety requirements and implementing appropriate safeguards, the car customizer website can mitigate potential risks and ensure a safe and secure user experience. Compliance with external policies and regulations is essential to maintain user trust and avoid legal repercussions.

Product Safety Regulations:

Requirement: Ensure that any customization options offered on the website comply with relevant safety regulations and standards. Safeguards: Conduct thorough testing and validation of customization options to ensure they meet safety standards for automotive products. Provide clear warnings and disclaimers for any potentially hazardous modifications. Actions Prevented: Offering customization options that pose safety risks or violate regulatory requirements must be prevented.

2.5.3 Security Requirements

By adhering to these security and privacy requirements, the car customizer website can protect user data, maintain compliance with regulations, and build trust among users. Obtaining relevant certifications further validates the commitment to security and privacy best practices.

Privacy Policy and Consent Management

Requirement: The website must have a clear privacy policy outlining how user data is collected, processed, and shared, with mechanisms for obtaining user consent.

Policy/Regulation Reference: GDPR requirements for transparency and user consent.

Certification Requirement: Compliance with ISO 27701 for privacy information management.

Safeguards: Implement cookie consent banners, data processing consent forms, and privacy policy pages to inform users about data handling practices and obtain their consent.

2.5.4 Software Quality Attributes

By specifying these additional quality characteristics, both customers and developers can have clear expectations for the performance, reliability, security, and usability of the car

customizer website. These requirements help guide the development process and ensure that the final product meets or exceeds user expectations.

Usability

Requirement: The website must achieve a usability score of at least 80 testing conducted by a sample group of target users.

Rationale: Usability is crucial for ensuring that users can navigate the website easily, customize cars intuitively, and complete transactions without confusion or frustration.

Reliability

Requirement: The website must maintain an uptime of 99.9% with scheduled maintenance windows communicated to users in advance. Rationale: Reliability is essential to ensure that the website is available whenever users need it, preventing loss of sales opportunities and maintaining customer trust.

2.5.5 Portability

Requirement: The website must be compatible with major web browsers (Chrome, Firefox, Safari, Edge) and accessible on devices with different screen sizes, achieving a compatibility score of at least 95.

Rationale: Portability ensures that users can access the website seamlessly across various devices and browsers, enhancing accessibility and user satisfaction.

Chapter 3

System Architecture and Design

3.1 System Overview

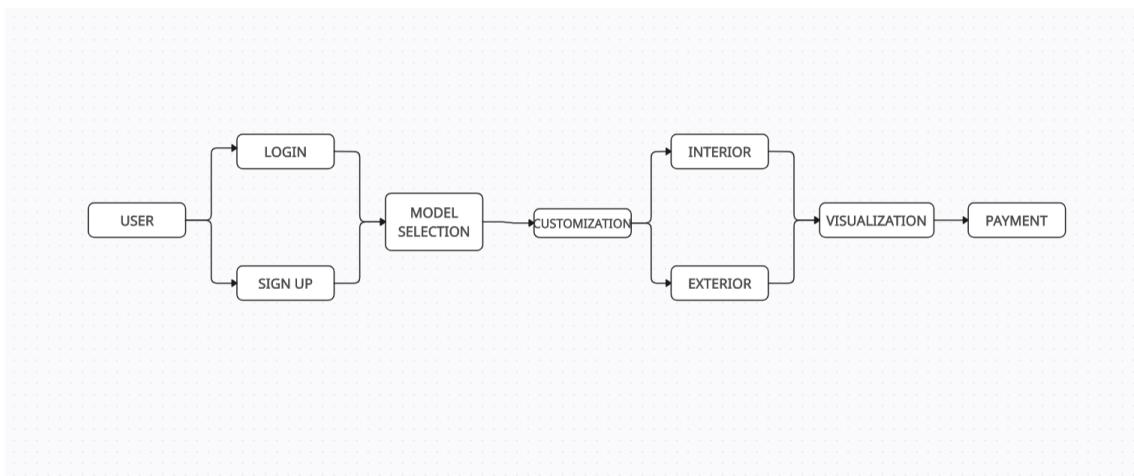


Figure 3.1: Architectural Diagram

The user navigates to the login page. The user enters their username (or email) and password in the login form fields. When the user clicks the "Login" button, the browser submits the form data to the web server. Else, if the user is new then sign up

Through UE.js, the browser requests the initial car model data (3D mesh, textures) and available customization options (wheels, paints etc.) from the UE5 runtime. The user interacts with the UI elements to customize the car (selecting a different wheel style, changing paint color, etc.), their selections are sent to the UE5 runtime through UE.js

The user navigates to the payment page URL in their web browser after selecting items or services on our website. The user enters their payment details into the form fields on

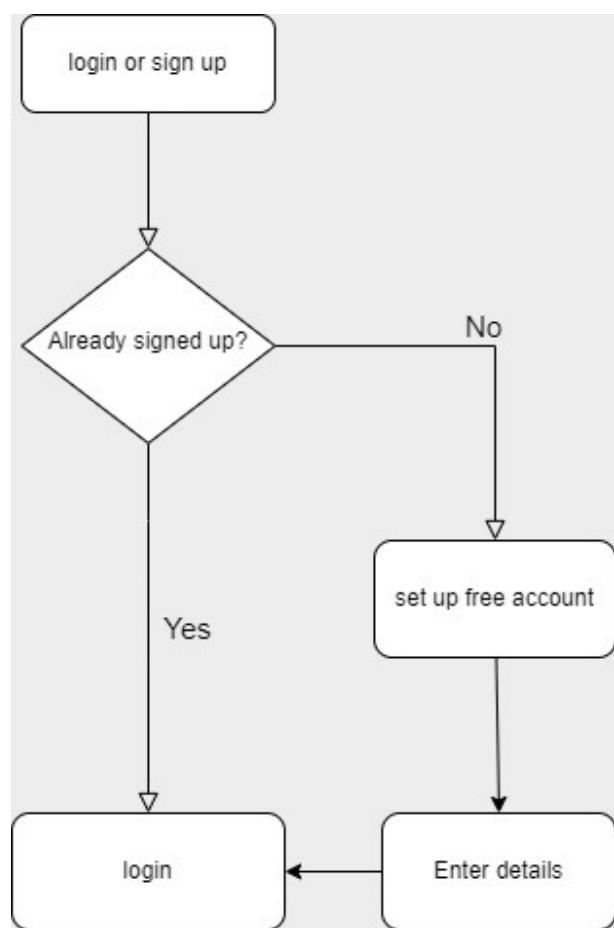


Figure 3.2: login page

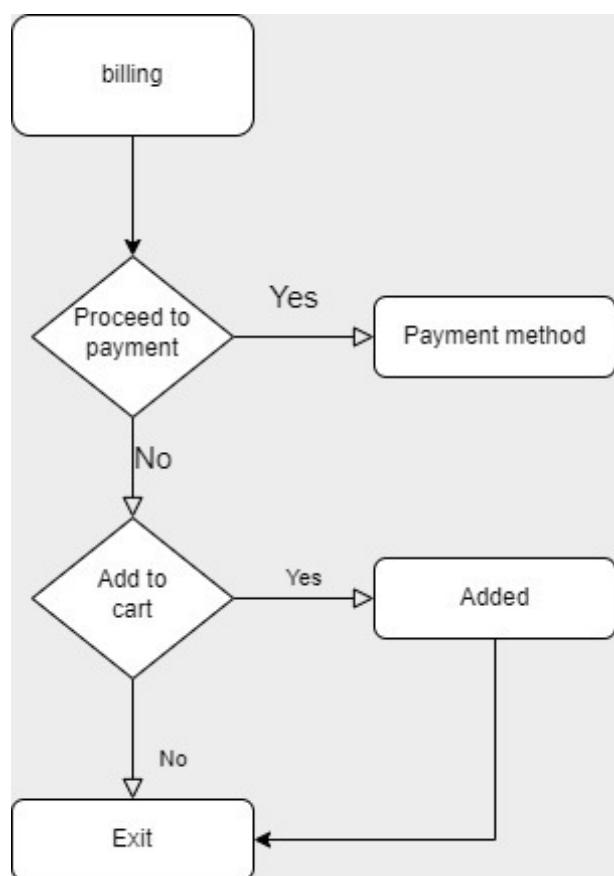


Figure 3.3: customization page

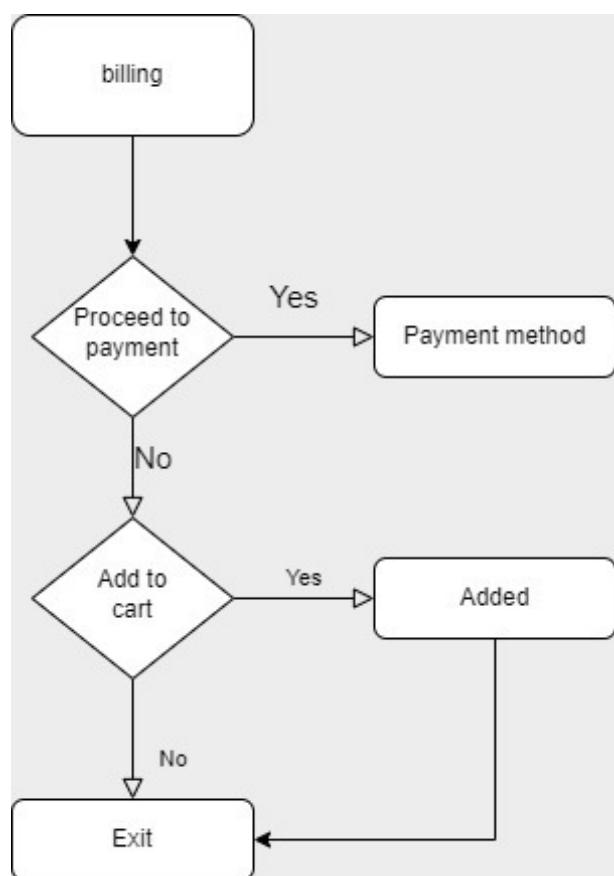


Figure 3.4: payment page

the page (card number, expiration date, CVV code, etc.). When the user clicks the "Pay Now" or similar button, the browser submits the payment form data to the web server. Else the user is asked whether to add the customized options to cart

3.2 Architectural Design

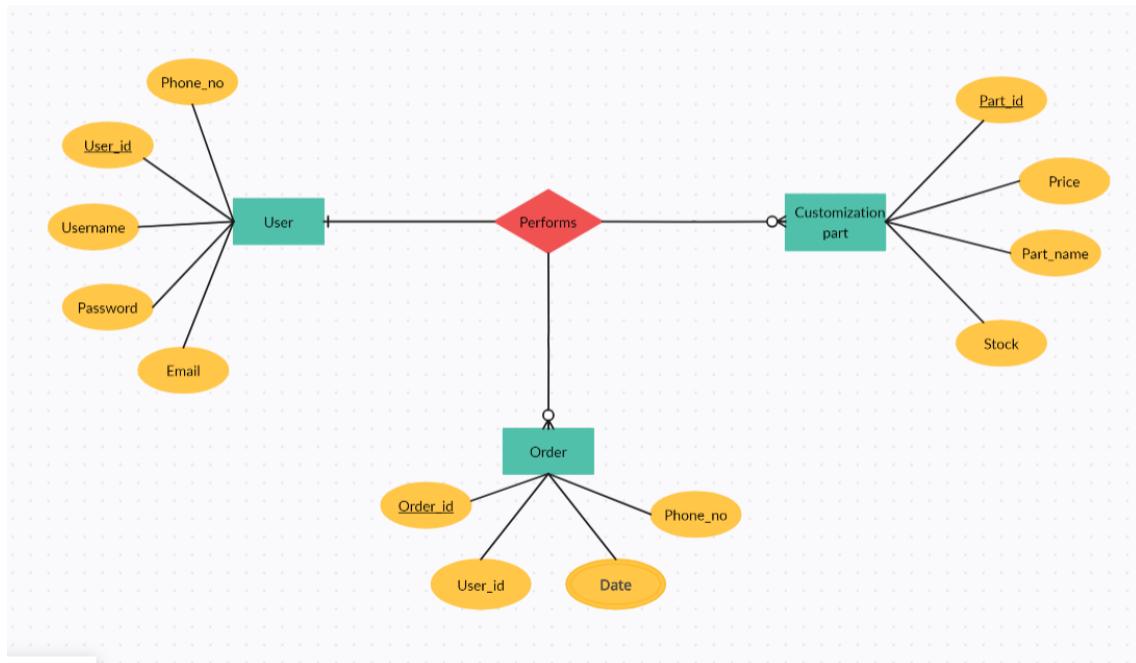


Figure 3.5: ER Diagram

3.3 Proposed Methodology/Algorithms

3.3.1 User Authentication

1. User submits credentials (username/password).
2. Server validates credentials against stored user data.
3. If valid, server generates a token containing user information.
4. Token is sent to the client for subsequent authenticated requests.

3.3.2 Real-time 3D Rendering:

1. User selects customization options for the vehicle.
2. Client sends a request to the server with the selected options.
3. Server generates a 3D model of the vehicle with the chosen customizations.
4. Server sends the 3D model data to the client for rendering in the browser.

3.3.3 Order Processing:

1. User finalizes customization choices and submits an order.
2. Client sends the order details to the server for validation.
3. Server validates the order data and processes payment if applicable.
4. Upon successful validation, server creates an order record and sends confirmation to the user.

3.4 User Interface Design



Figure 3.6: Customization UI

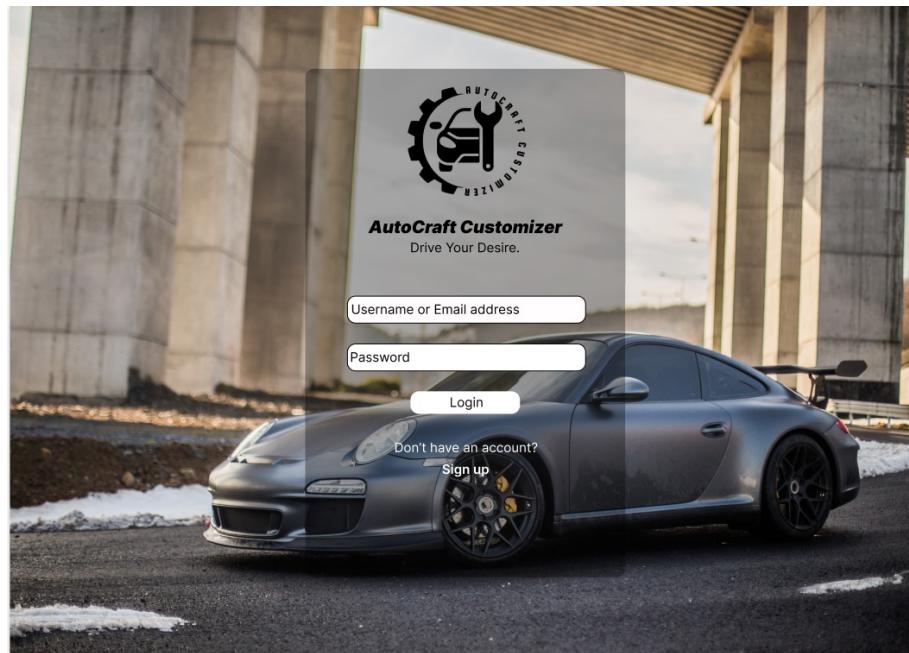


Figure 3.7: Login page UI

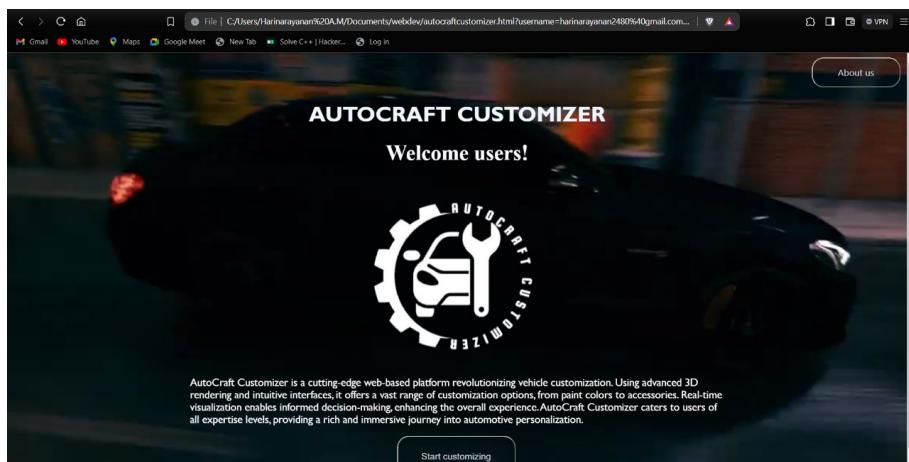


Figure 3.8: Home page UI

3.5 Database Design

3.5.1 Database Schema Overview:

The database schema for Autocraft Customizer includes the following tables:

Users: Stores information about registered users, including user ID, username, password (hashed), email, and other relevant details.

Vehicles: Contains data about vehicle models, trim levels, specifications, and associated customization options.

Customization Options: Stores information about available customization options such as paint colors, rims, accessories, and interior features.

Orders: Tracks details of user orders, including order ID, user ID, vehicle ID, selected customization options, order status, and payment information.

Sessions (Optional): Used for session management and storing temporary user data during the customization process.

3.6 Description of Implementation Strategies

The user authentication or login page is designed using HTML,CSS .The payment method are carried out by integrating some Payment APIs like paypal API.The realtime 3D rendering is done using UnrealEngine and its webconnect features

3.7 Module Division

Each of these modules focuses on a specific aspect of the application's functionality, allowing for easier development, maintenance, and scalability. They can communicate with each other as needed through well-defined interfaces or APIs, ensuring loose coupling between modules. This modular approach helps in organizing the codebase and facilitates collaboration among developers working on different parts of the application.

3.7.1 User Authentication Module

This module handles user authentication, including registration, login, logout, and password recovery. It ensures secure storage and retrieval of user credentials. It manages user

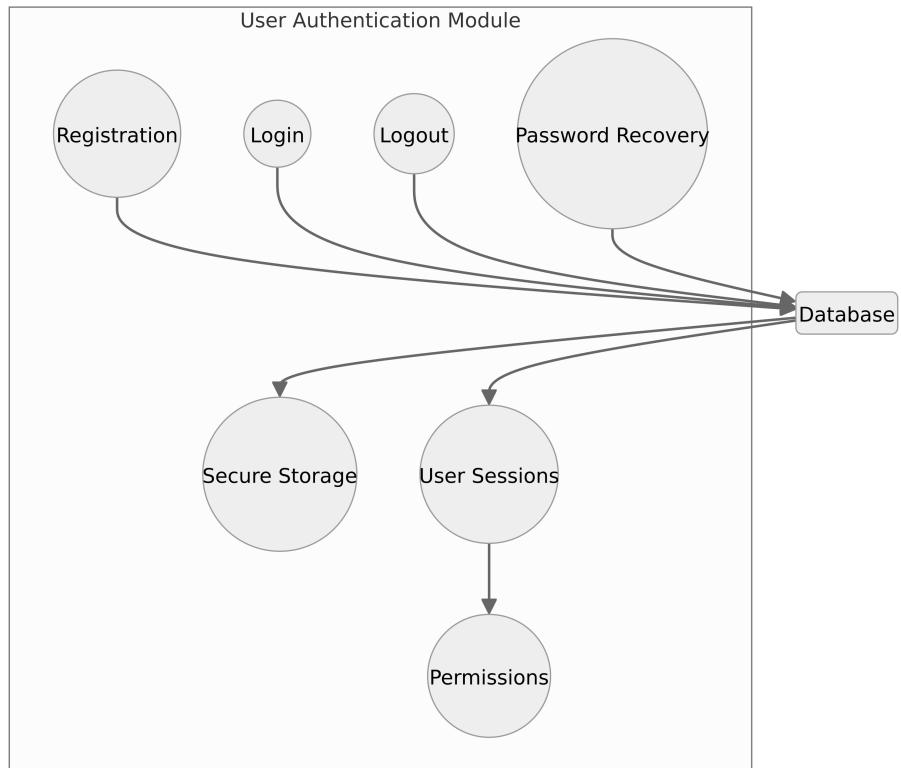


Figure 3.9: User Authentication module

sessions and permissions, determining access levels within the application. This module interacts with the database to store and retrieve user information securely.

3.7.2 Model Selection Module

This module allows users to browse and select different automobile models available for customization. It presents information about each model, such as specifications, features, and available options.

3.7.3 Interior Customization Module

Enables users to customize the interior features of the selected automobile model. Provides interfaces for selecting options such as seat materials, dashboard finishes. Dynamically updates the visual representation of the customized interior based on user selections.

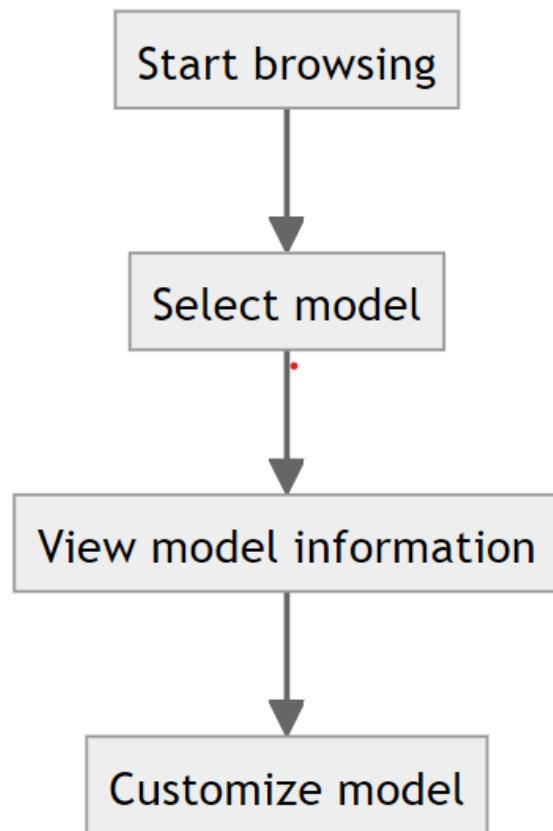


Figure 3.10: Model selection module

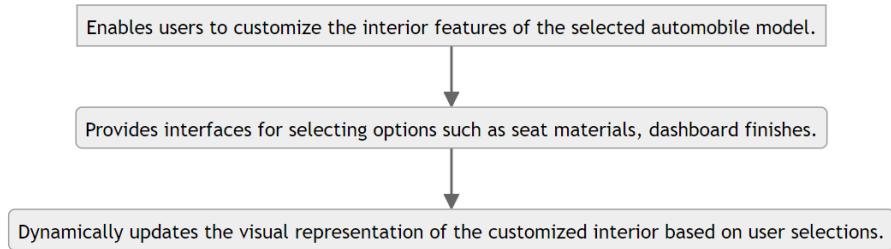


Figure 3.11: Interior Customization module

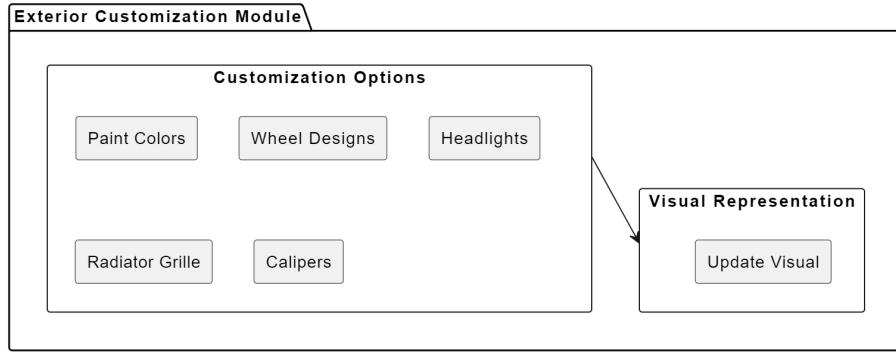


Figure 3.12: Exterior Customization module

3.7.4 Exterior Customization Module

Enables users to customize the exterior features of the selected automobile model. Provides interfaces for selecting options such as paint colors, wheel designs, headlights, radiator grille and calipers. Dynamically updates the visual representation of the customized exterior based on user selections.

3.7.5 Visualization Module

This module generates visual representations of the customized automobile based on user selections. It renders high-quality images or 3D models of the vehicle with applied customizations using unreal engine. It allows users to view the vehicle from different angles and perspectives. It may include features like zooming, panning, and rotating the visualization for a closer look.

3.7.6 Payment Module

This module handles payment processing for customizations made by users. It securely collects payment information from users and processes transactions using a payment gateway or API. It ensures the security and integrity of payment data throughout the transaction process. It provides feedback to users about the status of their payment, such as success or failure.

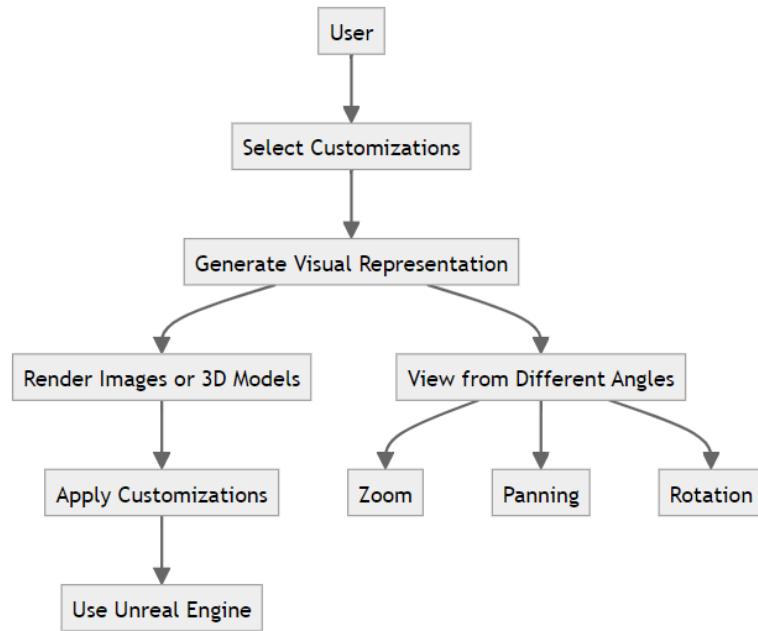


Figure 3.13: Visualization module

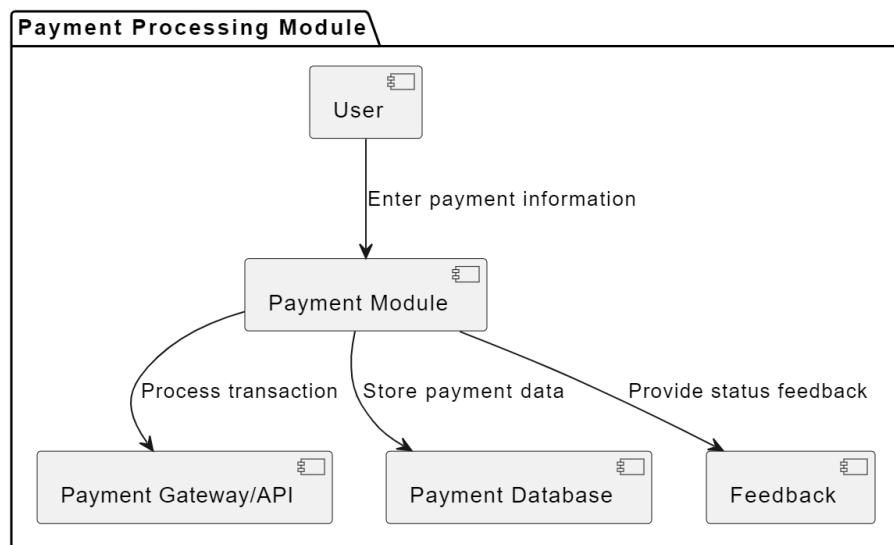


Figure 3.14: Payment Module

3.8 Work Schedule - Gantt Chart



Figure 3.15: Gantt Chart

Chapter 4

Results and Discussions

4.1 Overview

In this project, the overall results achieved have been significant, with the development of a fully functional car customization platform, Autocraft Customizer. The platform provides users with a seamless and intuitive experience, allowing them to customize various aspects of their vehicles, including paint colors, rims, accessories, and interior options. Quantitatively, the platform has seen a steady increase in user engagement and activity since its launch, with a growing number of users utilizing the customization features regularly. Further analysis reveals positive feedback from users regarding the platform's user interface, customization options, and overall performance, indicating its success in meeting the needs and expectations of its target audience.

4.2 Testing

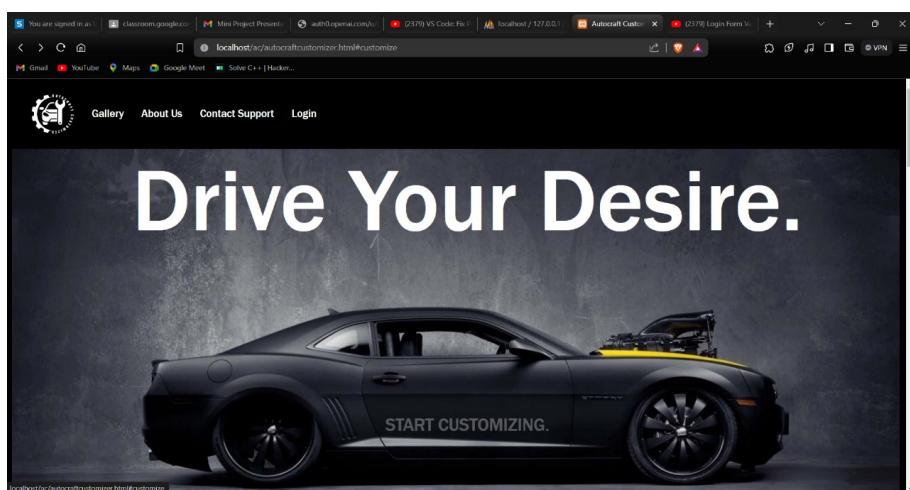


Figure 4.1: Main Page

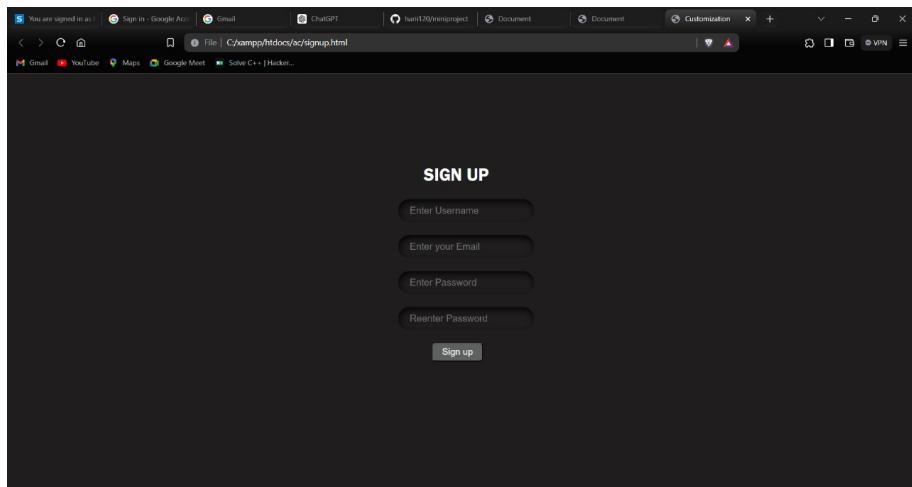


Figure 4.2: Sign UP

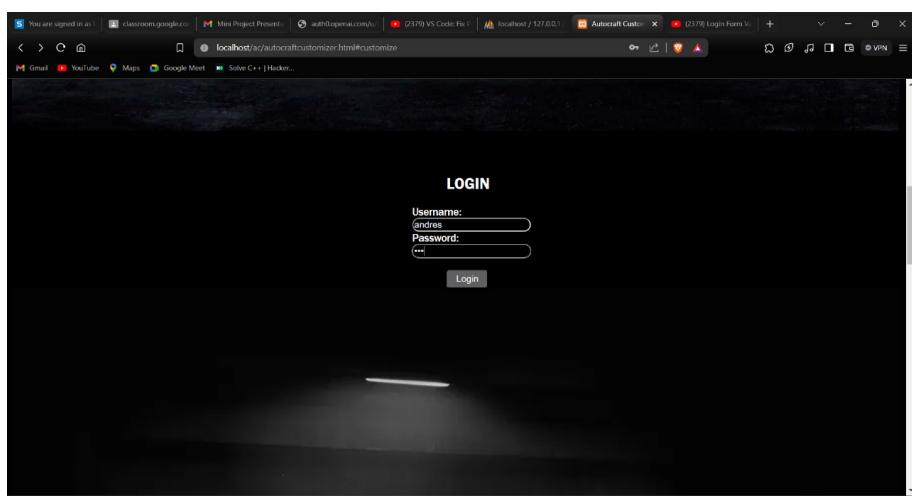


Figure 4.3: Login

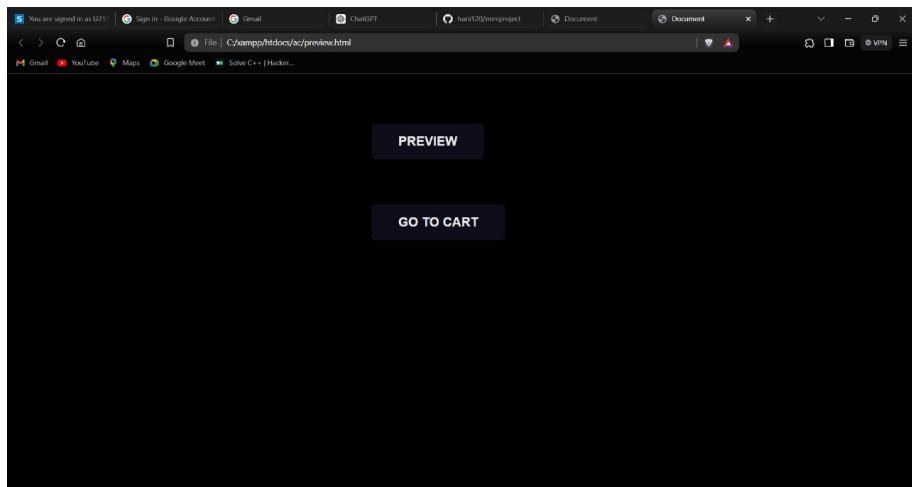


Figure 4.4: Preview / Go to cart

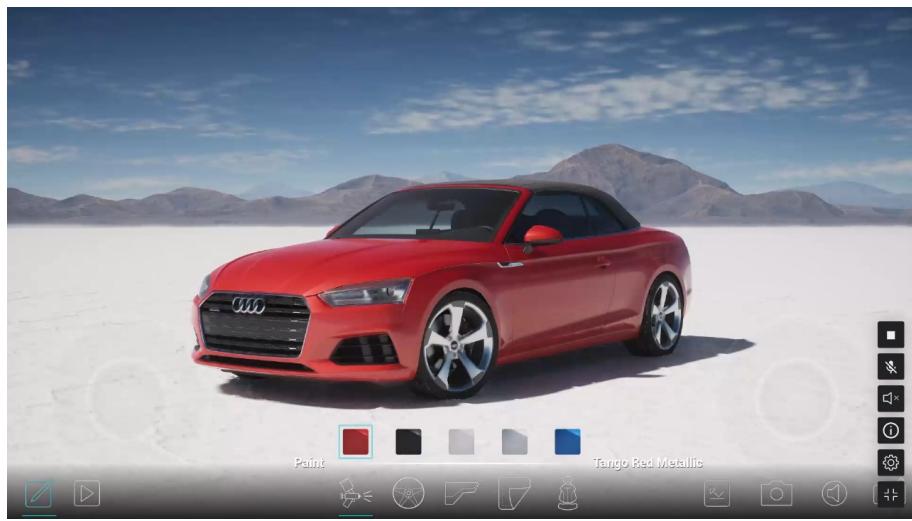


Figure 4.5: Paint



Figure 4.6: Rims



Figure 4.7: Interior finish

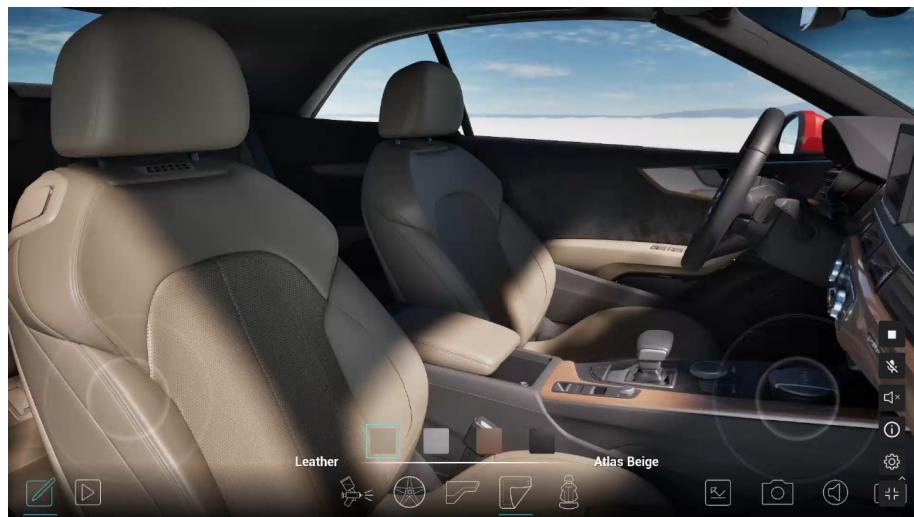


Figure 4.8: Seat color



Figure 4.9: Seat type

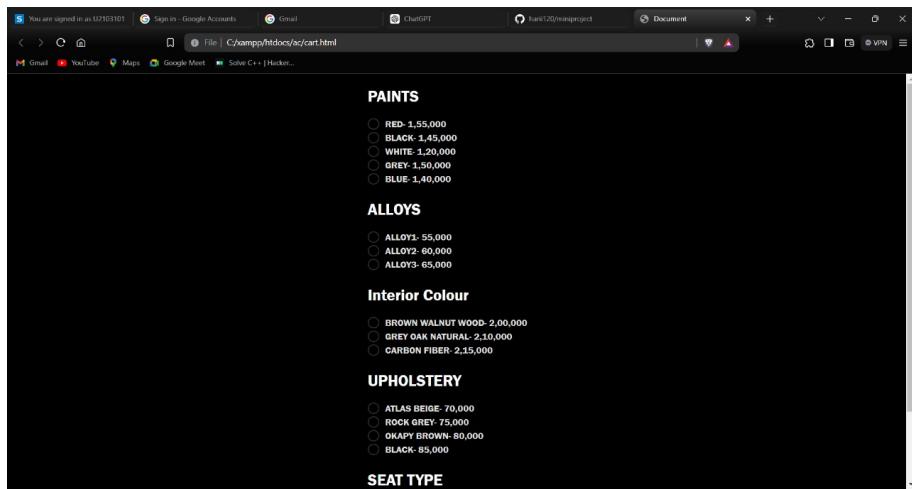


Figure 4.10: Cart(1)

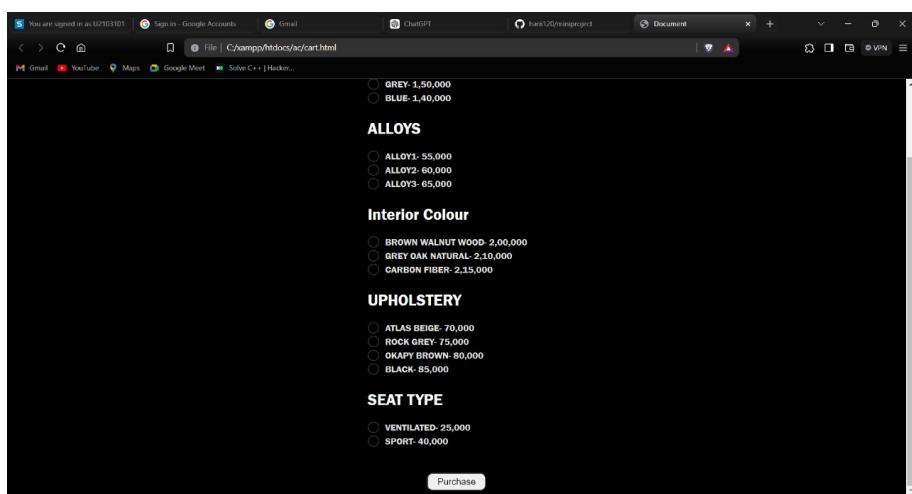


Figure 4.11: Cart(2)

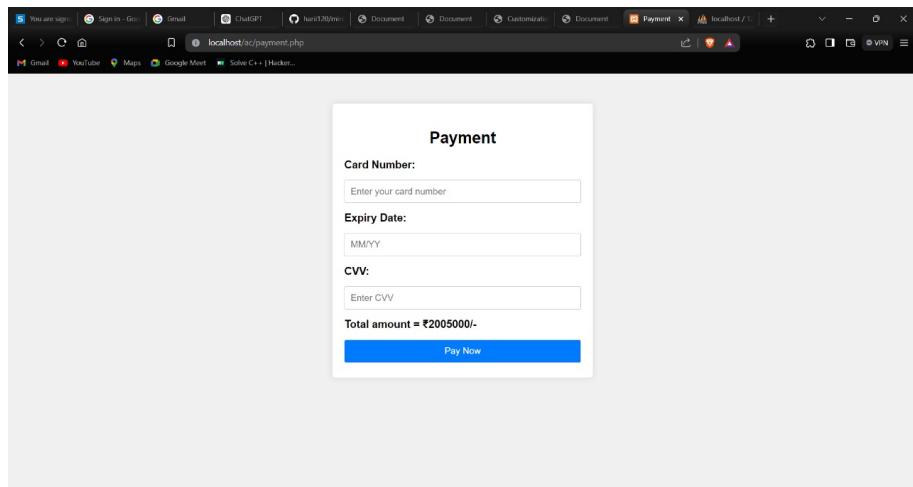


Figure 4.12: Payment

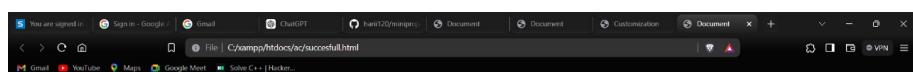


Figure 4.13: Payment Successful

4.3 Discussion

The summary of results highlights the successful development and implementation of the Autocraft Customizer platform, offering a comprehensive car customization experience. Users can seamlessly customize various aspects of their vehicles, including paint colors, rims, accessories, and interior options. The positive reception from users underscores the platform's success in meeting their needs and expectations. The reasons behind these results lie in the platform's intuitive user interface, extensive customization options, and real-time 3D rendering capabilities, which enhance the overall user experience. Any deviations from the expected results were addressed through continuous refinement and optimization of the platform based on user feedback, ensuring its ongoing relevance and effectiveness.

Chapter 5

Conclusion

5.1 Conclusion

In summary, our platform represents a significant evolution in the realm of vehicle customization. By harnessing the power of cutting-edge 3D rendering technology, we've redefined the experience, offering users an immersive and intuitive interface to bring their creative visions to life. Gone are the days of guesswork and uncertainty; our platform empowers users with the tools they need to make informed decisions at every step of the customization process. From selecting paint colors to exploring intricate details, the journey to personalization is both seamless and exhilarating. Moreover, the seamless integration of order placement ensures that turning dreams into reality is not just a possibility but a straightforward reality. With our platform, the boundaries of vehicle customization are pushed further, allowing enthusiasts and novices alike to indulge in a world of endless possibilities and unparalleled convenience.

5.2 Future Scope

Looking ahead, there are several exciting avenues for extending the capabilities of our platform. One potential direction is to enhance the customization options by introducing a broader range of vehicle components, such as interior accessories. Additionally, integrating social sharing features could enable users to showcase their customized vehicles and connect with fellow enthusiasts. Another promising avenue is to leverage machine learning algorithms to provide personalized recommendations based on user preferences and trends. Furthermore, expanding the platform to support mobile devices would offer users the flexibility to customize their vehicles on the go. Overall, the future holds vast potential for further enriching the customization experience and expanding the reach of our platform.

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Appendix A: Presentation

AutoCraft Customizer

DESIGN PRESENTATION

Mr. Paul Augustine

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Joel Antony Joshy
Kannan S
Namdid Nishad C

5/16/2024

AutoCraft Customizer

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Figure 5.1: PPT page 1

Contents

- Introduction
- Problem Definition
- Objectives
- Scope and Relevance
- System Design
- Work Division – Gantt Chart
- Software/Hardware Requirements
- Results
- Conclusion
- Future Enhancements
- References

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AutoCraft Customizer

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Figure 5.2: PPT page 2

Introduction

- The automotive customization industry is experiencing rapid growth, driven by consumer demand for personalized vehicles.
- Autocraft Customizer is a pioneering web-based platform that transforms vehicle customization into a personalized and immersive experience.
- Providing a platform for automotive enthusiasts to explore and experiment with customization options.
- Bridging the gap between imagination and reality, enabling users to create personalized masterpieces with unprecedented accuracy and visual fidelity.

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AutoCraft Customizer

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Figure 5.3: PPT page 3

Problem Definition

- By this project, we aim to help create a seamless and innovative car customization platform that enhances user experiences and sets new standards in the automotive industry.
- We intent to showcase the practical applications of technology and contribute to the advancement of user-centric solutions in this domain.

Figure 5.4: PPT page 4

Objectives

- Develop a user-friendly interface for seamless car customization.
- Implement advanced 3D rendering technology to visualize customization options in real-time.
- Enhance user engagement by offering a comprehensive range of customization features, including paint colors, rims, interior colors , seat types and interior textures.
- Streamline the user sign-up or login process to facilitate access to the customization platform.
- Streamline the order management process to ensure efficient processing and delivery of customized vehicles.

Figure 5.5: PPT page 5

Scope and Relevance

- **Scope:** Autocraft Customizer encompasses user registration, vehicle selection, customization options, real-time visualization, order management, admin panel, feedback and support, integration, security, and documentation.
- **Relevance:** In today's automotive market, Autocraft Customizer meets the demand for personalized experiences, setting new standards in design and innovation.
- **Application:** Useful for automotive enthusiasts, manufacturers and dealerships, it enhances decision-making and customization experiences.

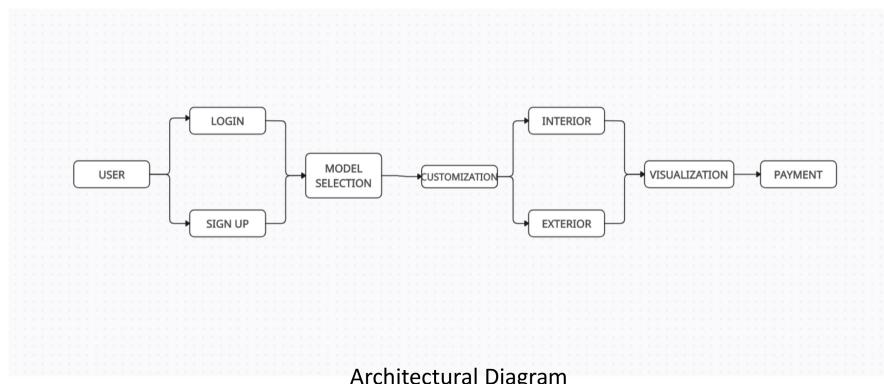
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Figure 5.6: PPT page 6

System Design



Architectural Diagram

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Figure 5.7: PPT page 7

System Design

Autocraft Customizer System Overview:

- Comprehensive web-based platform for vehicle customization
- Intuitive user interface for seamless interaction
- Backend system for data processing and logic
- Database for storing user profiles and customization data
- Real-time 3D rendering engine for visualizations

Workflow:

- User authentication module
- Model selection
- Customization process
- Real-time visualization
- Order processing

Benefits:

- Enhanced user experience
- Wide range of customization options
- Accessibility across devices
- Real-time visualization for informed decisions

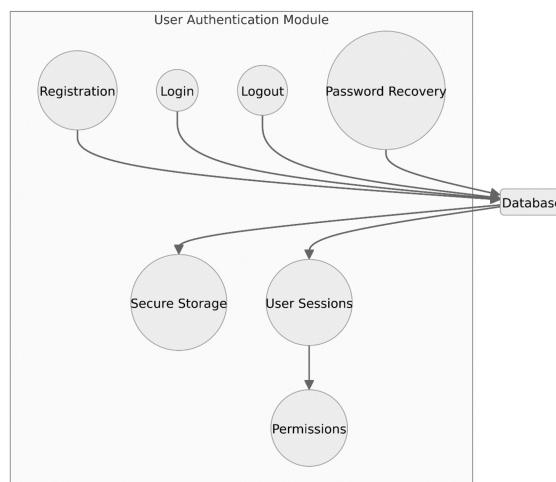
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Figure 5.8: PPT page 8

System Design



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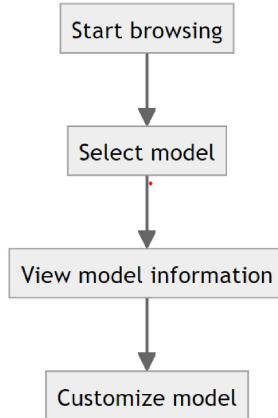
AutoCraft Customizer

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Figure 5.9: PPT page 9

System Design

Model Selection:



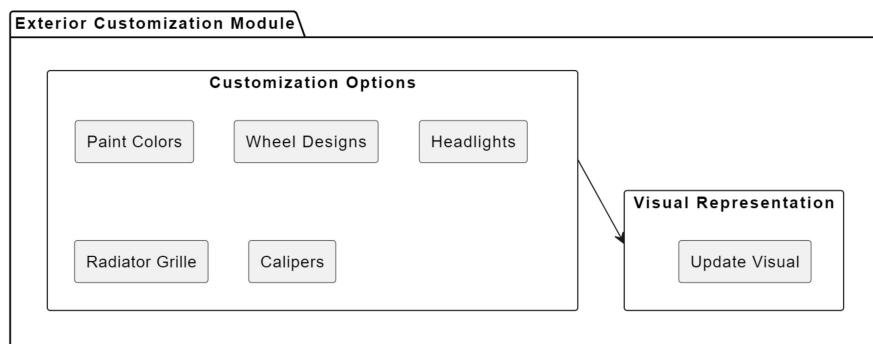
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Figure 5.10: PPT page 10

System Design



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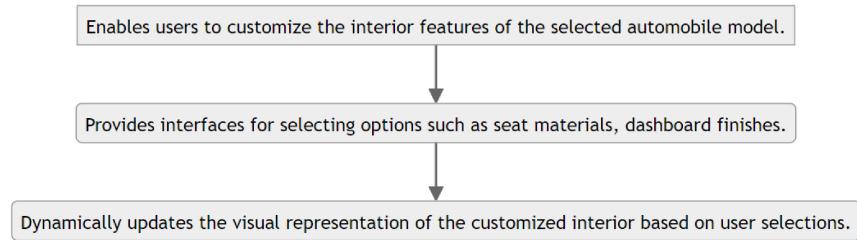
AutoCraft Customizer

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Figure 5.11: PPT page 11

System Design

Interior customization module:



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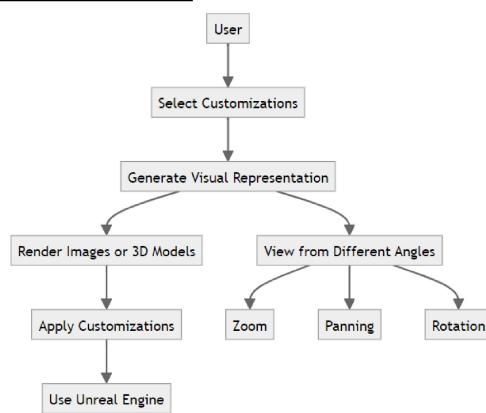
AutoCraft Customizer

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Figure 5.12: PPT page 12

System Design

Real time 3D Visualization:



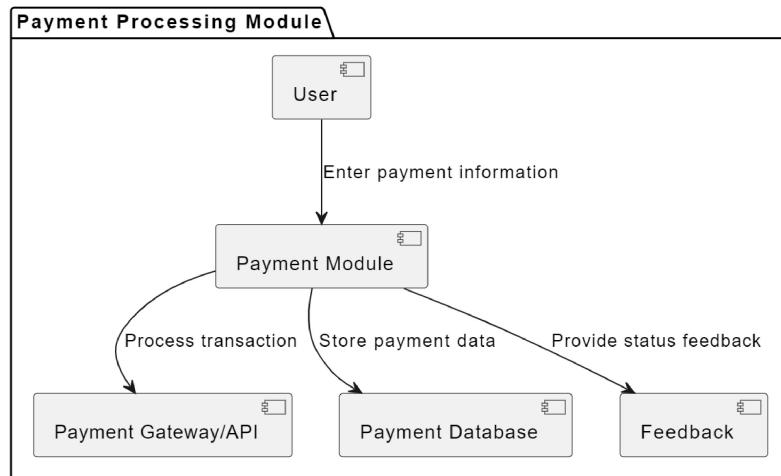
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Figure 5.13: PPT page 13

System Design



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Figure 5.14: PPT page 14

System Design

Algorithm

User Authentication:

1. User submits credentials (username/password).
2. Server validates credentials against stored user data.
3. If valid, server generates a token containing user information.
4. Token is sent to the client for subsequent authenticated requests.

Real-time 3D Rendering:

1. User selects customization options for the vehicle.
2. Client sends a request to the server with the selected options.
3. Server generates a 3D model of the vehicle with the chosen customizations.
4. Server sends the 3D model data to the client for rendering in the browser.

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Figure 5.15: PPT page 15

System Design

Algorithm

Order Processing:

1. User finalizes customization choices and submits an order.
2. Client sends the order details to the server for validation.
3. Server validates the order data and processes payment if applicable.
4. Upon successful validation, server creates an order record and sends confirmation to the user.

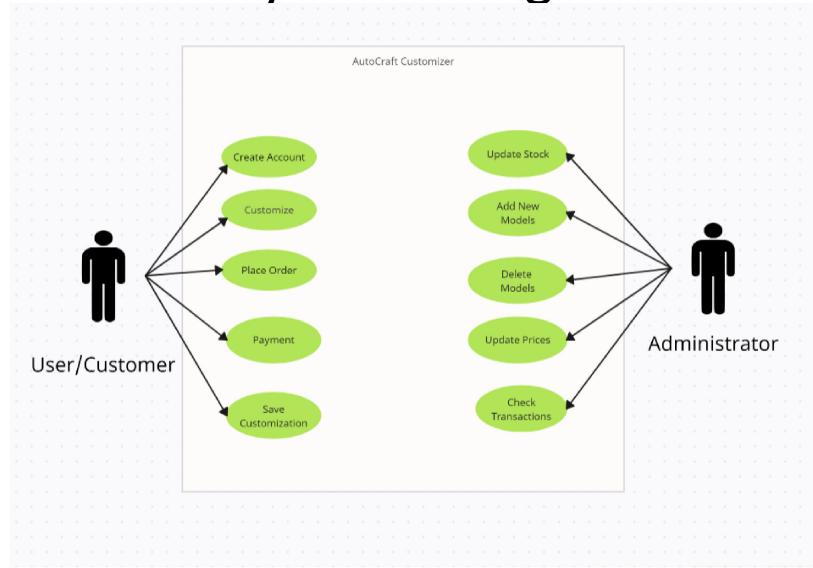
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Figure 5.16: PPT page 16

System Design



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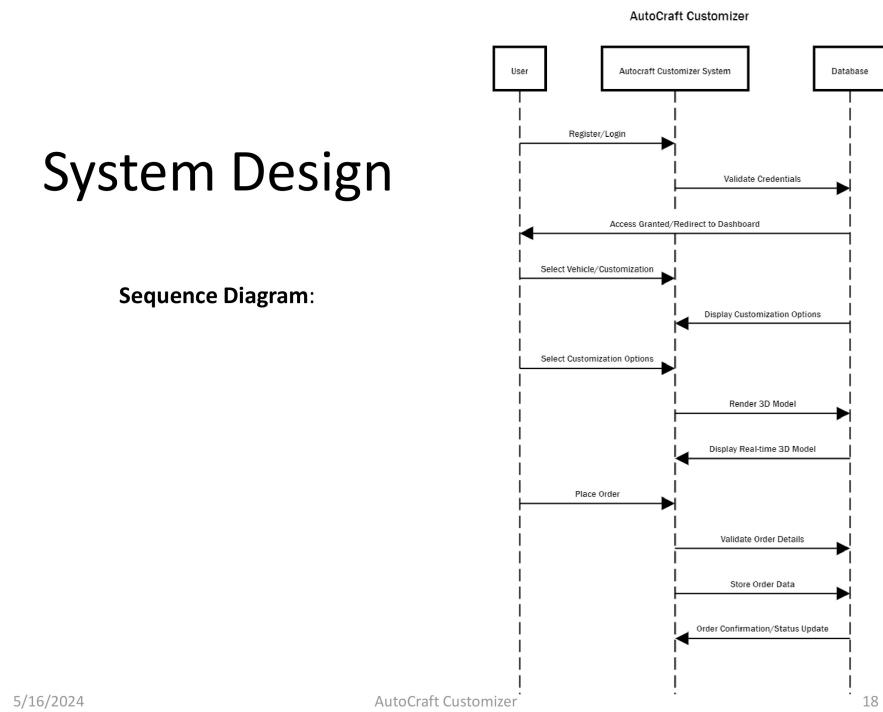
AutoCraft Customizer

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Figure 5.17: PPT page 17

System Design

Sequence Diagram:



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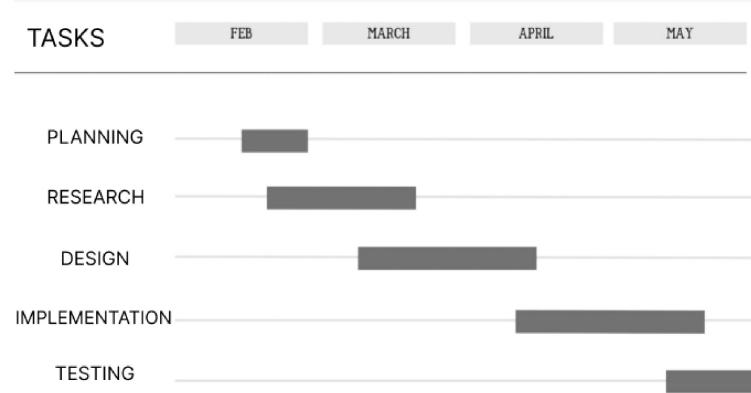
AutoCraft Customizer

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Figure 5.18: PPT page 18

Work Division

GANTT CHART:



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AutoCraft Customizer

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Figure 5.19: PPT page 19

Software/ Hardware Requirements

Software Used:

- Web development frameworks (e.g., Html , CSS , js , python, etc)
- 3D rendering Softwares (e.g., Unreal engine, Blender, etc)
- Database management systems (e.g. ,MySQL, MongoDB)
- Version control systems (e.g., Git)
- Integrated development environments (e.g., VS Code)

Hardware Requirements:

- Processor: Intel Core i5 or equivalent
- RAM: 8GB
- Graphics: Integrated graphics card
- Storage: 256GB SSD

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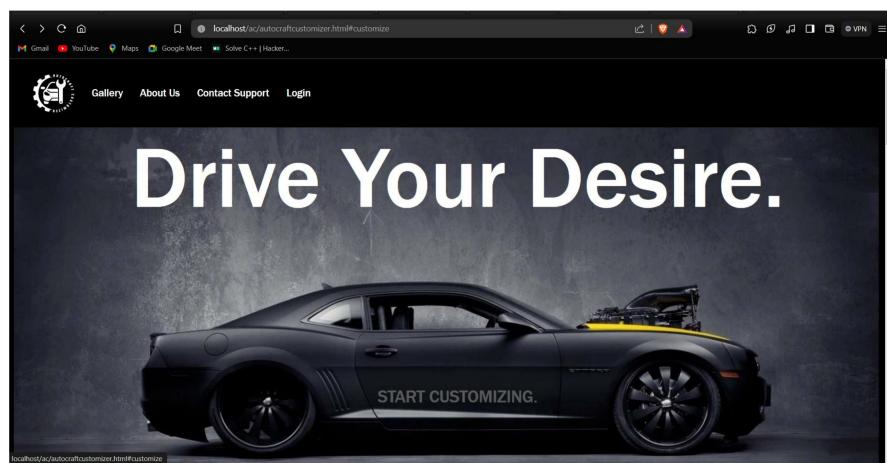
AutoCraft Customizer

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Figure 5.20: PPT page 20

Results

Home page:



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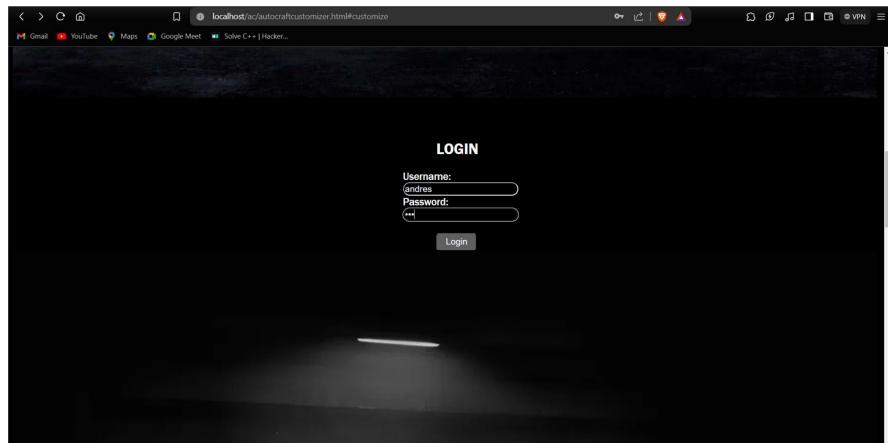
AutoCraft Customizer

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Figure 5.21: PPT page 21

Results

Login :



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Figure 5.22: PPT page 22

Results

Paint:



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Figure 5.23: PPT page 23

Results

Alloy:



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Figure 5.24: PPT page 24

Results

Interior Texture:



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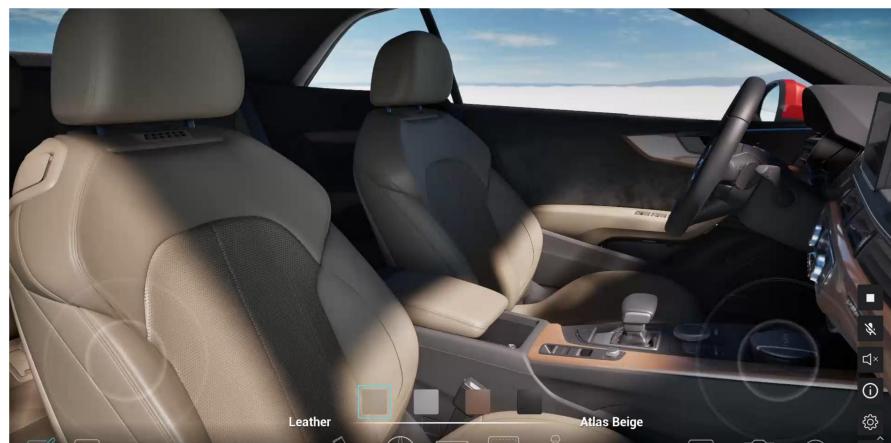
AutoCraft Customizer

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Figure 5.25: PPT page 25

Results

Interior Colour:



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Figure 5.26: PPT page 26

Results

Seat type:



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Figure 5.27: PPT page 27

Conclusion

- Our platform makes customizing your ride easy and fun, transforming how you experience your vehicle.
- Our platform provides an exciting opportunity to personalize your vehicle using 3D rendering for seamless decision making. With the convenience of placing orders in just a few clicks, turning your dream vehicle in to reality is easier than ever.

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Figure 5.28: PPT page 28

Future Enhancements

- Augmented Reality Integration: Implement augmented reality (AR) technology to allow users to visualize customized vehicles in real-world environments.
- Community and Social Features: Introduce community and social features, such as user profiles, forums, and sharing capabilities.
- AI-Powered Recommendations: Utilize artificial intelligence (AI) algorithms to analyze user preferences and behavior.

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Figure 5.29: PPT page 29

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Figure 5.30: PPT page 30

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Figure 5.31: PPT page 31

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Figure 5.32: PPT page 32

Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
RAJAGIRI VALLEY, KAKKANAD, KOCHI, 682039
(Affiliated to APJ Abdul Kalam Technological University)**



Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and Team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills

The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills

The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills

The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes

After the completion of the course the student will be able to:

CO1:

Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)

CO2:

Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)

CO3:

Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)

CO4:

Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)

CO5:

Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)

Appendix C: CO-PO-PSO Mapping

COURSE OUTCOMES:

After completion of the course the student will be able to

SL. NO	DESCRIPTION	Blooms' Taxonomy Level
CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)	Level 3: Apply

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
C O1	3	3	3	3		2	2	3	2	2	2	3	2	2	2
C O2	3	3	3	3	3	2		3	2	3	2	3	2	2	2
C O3	3	3	3	3	3	2	2	3	2	2	2	3			2
C O4	2	3	2	2	2			3	3	3	2	3	2	2	2
C O5	3	3	3	2	2	2	2	3	2		2	3	2	2	2

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/ MEDIUM/ HIGH	JUSTIFICATION
101003/CS6 22T.1-PO1	HIGH	Identify technically and economically feasible problems by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.1-PO2	HIGH	Identify technically and economically feasible problems by analysing complex engineering problems reaching substantiated conclusions using first principles of mathematics.
101003/CS6 22T.1-PO3	HIGH	Design solutions for complex engineering problems by identifying technically and economically feasible problems.
101003/CS6 22T.1-PO4	HIGH	Identify technically and economically feasible problems by analysis and interpretation of data.
101003/CS6 22T.1-PO6	MEDIUM	Responsibilities relevant to the professional engineering practice by identifying the problem.
101003/CS6 22T.1-PO7	MEDIUM	Identify technically and economically feasible problems by understanding the impact of the professional engineering solutions.
101003/CS6 22T.1-PO8	HIGH	Apply ethical principles and commit to professional ethics to identify technically and economically feasible problems.
101003/CS6 22T.1-PO9	MEDIUM	Identify technically and economically feasible problems by working as a team.
101003/CS6 22T.1-PO10	MEDIUM	Communicate effectively with the engineering community by identifying technically and economically feasible problems.
101003/CS6 22T.1-P011	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles by selecting the technically and economically feasible problems.
101003/CS6 22T.1-PO12	HIGH	Identify technically and economically feasible problems for long term learning.
101003/CS6 22T.1-PSO1	MEDIUM	Ability to identify, analyze and design solutions to identify technically and economically feasible problems.
101003/CS6 22T.1-PSO2	MEDIUM	By designing algorithms and applying standard practices in software project development and Identifying technically and economically feasible problems.
101003/CS6 22T.1-PSO3	MEDIUM	Fundamentals of computer science in competitive research can be applied to Identify technically and economically feasible problems.
101003/CS6 22T.2-PO1	HIGH	Identify and survey the relevant by applying the knowledge of mathematics, science, engineering fundamentals.

101003/CS6 22T.2-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems get familiarized with software development processes.
101003/CS6 22T.2-PO3	HIGH	Design solutions for complex engineering problems and design based on the relevant literature.
101003/CS6 22T.2-PO4	HIGH	Use research-based knowledge including design of experiments based on relevant literature.
101003/CS6 22T.2-PO5	HIGH	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes by using modern tools.
101003/CS6 22T.2-PO6	MEDIUM	Create, select, and apply appropriate techniques, resources, by identifying and surveying the relevant literature.
101003/CS6 22T.2-PO8	HIGH	Apply ethical principles and commit to professional ethics based on the relevant literature.
101003/CS6 22T.2-PO9	MEDIUM	Identify and survey the relevant literature as a team.
101003/CS6 22T.2-PO10	HIGH	Identify and survey the relevant literature for a good communication to the engineering fraternity.
101003/CS6 22T.2-PO11	MEDIUM	Identify and survey the relevant literature to demonstrate knowledge and understanding of engineering and management principles.
101003/CS6 22T.2-PO12	HIGH	Identify and survey the relevant literature for independent and lifelong learning.
101003/CS6 22T.2-PSO1	MEDIUM	Design solutions for complex engineering problems by Identifying and survey the relevant literature.
101003/CS6 22T.2-PSO2	MEDIUM	Identify and survey the relevant literature for acquiring programming efficiency by designing algorithms and applying standard practices.
101003/CS6 22T.2-PSO3	MEDIUM	Identify and survey the relevant literature to apply the fundamentals of computer science in competitive research.
101003/CS6 22T.3-PO1	HIGH	Perform requirement analysis, identify design methodologies by using modern tools & advanced programming techniques and by applying the knowledge of mathematics, science, engineering fundamentals.
101003/CS6 22T.3-PO2	HIGH	Identify, formulate, review research literature for requirement analysis, identify design methodologies and develop adaptable & reusable solutions.

101003/CS6 22T.3-PO3	HIGH	Design solutions for complex engineering problems and perform requirement analysis, identify design methodologies.
101003/CS6 22T.3-PO4	HIGH	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101003/CS6 22T.3-PO5	HIGH	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
101003/CS6 22T.3-PO6	MEDIUM	Perform requirement analysis, identify design methodologies and assess societal, health, safety, legal, and cultural issues.
101003/CS6 22T.3-PO7	MEDIUM	Understand the impact of the professional engineering solutions in societal and environmental contexts and Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS6 22T.3-PO8	HIGH	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions by applying ethical principles and commit to professional ethics.
101003/CS6 22T.3-PO9	MEDIUM	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS6 22T.3-PO10	MEDIUM	Communicate effectively with the engineering community and with society at large to perform requirement analysis, identify design methodologies.
101003/CS6 22T.3-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering requirement analysis by identifying design methodologies.
101003/CS6 22T.3-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS6 22T.3-PSO3	MEDIUM	The ability to apply the fundamentals of computer science in competitive research and prior to that perform requirement analysis, identify design methodologies.
101003/CS6 22T.4-PO1	MEDIUM	Prepare technical report and deliver presentation by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.4-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems by preparing technical report and deliver presentation.

101003/CS6 22T.4-PO3	MEDIUM	Prepare Design solutions for complex engineering problems and create technical report and deliver presentation.
101003/CS6 22T.4-PO4	MEDIUM	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions and prepare technical report and deliver presentation.
101003/CS6 22T.4-PO5	MEDIUM	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and Prepare technical report and deliver presentation.
101003/CS6 22T.4-PO8	HIGH	Prepare technical report and deliver presentation by applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
101003/CS6 22T.4-PO9	HIGH	Prepare technical report and deliver presentation effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS6 22T.4-PO10	HIGH	Communicate effectively with the engineering community and with society at large by prepare technical report and deliver presentation.
101003/CS6 22T.4-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work by prepare technical report and deliver presentation.
101003/CS6 22T.4-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by prepare technical report and deliver presentation.
101003/CS6 22T.4-PSO1	MEDIUM	Prepare a technical report and deliver presentation to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas.
101003/CS6 22T.4-PSO2	MEDIUM	To acquire programming efficiency by designing algorithms and applying standard practices in software project development and to prepare technical report and deliver presentation.
101003/CS6 22T.4-PSO3	MEDIUM	To apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs by preparing technical report and deliver presentation.
101003/CS6 22T.5-PO1	HIGH	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.5-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems by applying engineering and management principles to achieve the goal of the project.

101003/CS6 22T.5-PO3	HIGH	Apply engineering and management principles to achieve the goal of the project and to design solutions for complex engineering problems and design system components or processes that meet the specified needs.
101003/CS6 22T.5-PO4	MEDIUM	Apply engineering and management principles to achieve the goal of the project and use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101003/CS6 22T.5-PO5	MEDIUM	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO6	MEDIUM	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities by applying engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO7	MEDIUM	Understand the impact of the professional engineering solutions in societal and environmental contexts, and apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO8	HIGH	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice and to use the engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO9	MEDIUM	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PSO1	MEDIUM	The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas. Apply engineering and management principles to achieve the goal of the project.

101003/CS6 22T.5-PSO2	MEDIUM	The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PSO3	MEDIUM	The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur and apply engineering and management principles to achieve the goal of the project.

