CarModLive Web Application

Submitted by	**Mujtaba Qamar and Sibt-e-Haider**
Roll. No	**0011-BSCS-20 and 0008-BSCS-20**
Session	**2020 - 2024**
Supervised by	**Dr. Muhammad Umair Sadiq**
	Lecturer

BS(HONS)

IN

COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

GC UNIVERSITY LAHORE

CarModLive Web Application

Submitted to GC University Lahore in partial fulfillment
of the requirements for the award of degree of

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Declaration

I, **Mujtaba Qamar**, student of **BS(Hons)** in the subject of **Computer Science** session **2020-2024**, hereby declare that the matter printed in this thesis titled, **CarModLive Web Application** is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research Institution etc in Pakistan or abroad.

Date: _____   **Signatures of Deponent**

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Date: _____   **Signatures of Deponent**

Research Completion Certificate

It is certified that the research work contained in this thesis titled **CarMod-Live Web Application** has been carried out by **Mujtaba Qamar** and **Sibt -e-Haider** Roll. No **0011-BSCS-20 and 0008-BSCS-20** under my supervision.

_____

Dr. Muhammad Umair Sadiq
Lecturer

Date: _____

Submitted Through

_____ _____

Prof. Dr. Muhammad Waqas Anwar **Controller of Examination**

Chairperson   **GC University Lahore**
Department of Computer Science
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Acknowledgements

I am grateful to the Almighty **Allah**, Who blessed me with health, wisdom, knowledge, thoughts and opportunity to make some contribution in the form of present effort. I offer my humblest thanks from the deepest core of my heart to the **Holy Prophet Muhammad (Peace be upon him)**, the most perfect and excelled among and ever born on the surface of earth.

The research work embodied in this dissertation was accomplished under the able guidance and affectionate supervision of **Dr. Muhammad Umair Sadiq**, Lecturer, GC University, Lahore. I will always remember his moral encouragement, skillful guidance, positive criticism and valuable advice throughout the course of my study.

I also express my feelings of love and respect for my beloved parents that are the real asset of my life and gave me confidence and my friends also deserve my thanks for their loving encouragement and prayers for my success. Lastly, I would like to specifically mention my father who worked day and night to make it possible for me to study at such a prestigious institute like GC University, Lahore and be able to write this dissertation.

Dedication

My documentation is dedicated to my family and my honorable teacher Dr. Muhammad Umair Sadiq who encouraged and helped me to pursue the CarModLive project involving 3D models and their real-time modifications.

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Chapter 1

Introduction

To introduce the project, let us straight up delve into discussing what is CarMod-Live and why is it important. Afterwards we shall move on to the literature review of the project.

1.1   What is CarModLive

CarModLive is an idea, one that has been put to good use by this project of ours. It is basically a web application, where- as the name suggests- users can modify their cars in real-time.

So how this works is that many people out there who are car enthusiasts, modifiers, or even own a car, want to customize their ride. They want to see how their vehicle might look in a certain body color, with a certain wrap or with a certain shade of rims. They'd like to see how their car can be modified and to what extent will that modification suit the car.

Now there's two ways to do this; One is the hard way, where you actually try all the modifications on your car to then see if it looks like the one in your head- this method obviously takes a lot of time, effort and money. The other way, is the one that we have proposed through this project of ours. You simply go to the

CarModLive website, select the modifications bar and you'll be shown a grid of all the commonly used vehicles in Pakistan.

Since this project is for the common man, we haven't added a lot of fancy or super cars, instead there are every-day driven sedans and hatchbacks that most Pakistani's own and drive on local roads. We wanted the project to have the maximum practicality and not just be a one-time show off. So, once you choose your specific car model from the ones displayed, you can then view your car and modify it in real-time. The 3D model of your vehicle shall be displayed in a 3d 'room' where multiple modification options shall also be at your disposal. These modifications are subtle and not 'riced out' as we don't want to promote or encourage anything illegal for the general public. These subtle modifications include changing the car color- this would be a wrap in terms of physical modification.

Changing the car's rims, changing the trim on the car model – only available for specific models since all cars don't have trims running along their body work, and changing the window tint. Now once you have done all these modifications, you can then simply download your configuration by clicking on the save-to-device button available in the web app.

This was pretty much the main functionality of the project, but since this is a website made by a car enthusiast for other car enthusiasts- its functionality does not end here.

There is a lot of other exiting stuff in it for our users to explore. To begin with, there is a parts section where users can explore all sorts of automobile parts and learn about them through our expertly written articles. You can choose to learn more about them or in case you need to buy those parts, by clicking the buy part button- you shall be directed to a third-party website where all the parts are listed for you to purchase. Anyone familiar with the hassle of finding parts for their car or learning which part does what and what it is called and why, their functionality, maintenance – all that is quite a hassle and without proper guidance one can easily fall prey to scams.

Hence this functionality of our project greatly benefits those car people who're either looking for parts or learning about them. Then we have another interesting feature on our website, this is the blogs section. Every car enthusiast out there knows that there is no automobile knowledge that is too much, anything that's new out there to learn- we hop up on the internet to learn about it just because we don't want to feel left out when it comes to these things. And so CarModLive has this amazing blog section where we upload the most exciting and absorbing blogs all related to automobiles, current innovations, hot topics, historic fun facts and what not!

Last but not the least the CarModLive website has this later part of our website where all our social media handles including Instagram, YouTube, Twitter and Facebook are linked. You can conveniently connect with us there and be a part of our interactive communities where you can digitally meet with other car lovers who are affiliated with CarModLive or have been using it for their car modifications.

To sum it all up, CarModLive is an ambitious project that has its basis on the question that says 'WHY NOT' rather than simply 'WHY'. Although we do understand that for any project to survive, it needs to have proper functionality otherwise no matter how good our efforts are- the project simply dies down. Therefore, CarModLive has various practical implementations for our users, including modifying their cars in 3D visuals for future reference to the mechanic, informative blogs about car parts and links to purchase them online, up-to-date blogs that give new insights into the automotive industry to our users to fuel their brain inquisitively into learned and well-informed car enthusiasts.

Now that we have briefly introduced what is CarModLive, we shall now proceed to the literature review of the project.

1.2 Literature Review

To begin with the literature review for this project, we must first analyze the problem whose solution we have come up with.

We all know how people who own cars like to modify or customize their vehicles. Everyone likes to beautify what they own to make it look better, make it look unique and make it look personalized enough that their vehicle can be called theirs. Now in order to modify a car, since it is all an objective process, there is no one-rule-fits-all when it comes to modifying cars. Some modifications might look good on some cars and some might just look overdone or out-of-the-blue. In other cases, some modifications might be suitable for a certain user and would look way-off for another user. In this case, car enthusiasts can't just simply go on about the hit-and-trial method to see if their customizations look as good as they do in their head[1]

As implied, this would cost a lot of money, time and effort- and even despite putting in all these useful resources, there is still no guarantee that one would end up with the optimum or best-looking modification for his/her vehicle. This is a huge problem for those that modify cars and want them to look the best.

Now that we have identified the problem, let us elaborate how CarModLive comes in to solve the problem. CarModLive is a web application where all the commonly driven cars of Pakistan have their 3D Models uploaded for users to choose from. So now when a car enthusiast or someone who wants to modify his/her car, let's say John feels the need to modify his car- he shall come across CarModLive.

Let's say John has a Kia Sportage that he just purchased, he's been driving it around for a while. It feels great, but there's just something missing. John feels like his car needs some personal touches, maybe some rim modification, a little touch to the trim- just so he could boast of it as his own uniquely modified Sportage. Once modified, it'll finally be John's Kia Sportage and not just 'any' Sportage. So as commonly done, John takes his car to a local customization shop in his city, the car guy he meets there asks John what he wants done. Now as vivid as John's

imagination is, he could not really think of what to get done. He had some ideas in mind, but nowhere was he sure that the ideas would look as good on the actual car as they seemed in his mind. In a state of confusion and perplex, John leaves the shop and starts to look for a solution to this problem of his. Meanwhile he comes across CarModLive Web Application.

Without any further delay, John opens up CarModLive on his desktop and goes into the modifications section. There amongst an array of other commonly driven car models, John finds a 3D model of his Kia Sportage. Once he clicks on it, the model opens up with all the modification features in it. John then selects the wrap color from amongst he given options, selects the rim and trim color and chooses the optimum combination that shall look good on his car. Once John was done with all his modifications, he simply clicks the 'save to device' button to save his configuration. Once that specific configuration is downloaded, John prints it out and takes it to his car modifier, he shows him the exact thing he is aiming for with his car. The technician there immediately gets what John wants done and start working on the car. We are aware how car modification has been involved in the growth and evolution of automobile for a long time. 3

This is just one example of how CarModLive can be able to solve the problem of car enthusiasts wanting to modify their vehicles.

There are many other functionalities and features that you can explore with Car-ModLive. It's is not a boring website just limited to a narrow functionality, once you have done modifying your own car, you can view and edit other 3D models just for fun or as a goal as to what you might want to do in the future. Users can also visualize their future car goals and live them through the CarModLive web application.

What's more is that it solves and helps with another really crucial problems that car guys experience on an everyday basis. Yes, we are taking about car parts! The forbidden word of the car community. Believe me, it is the last thing any car owner wants to hear from his/her mechanic that your car needs to have some parts replaced.

Now the thing about car parts is that not only are they expensive and hard to find, there's also a lot of ignorance among car owners when it comes to car parts- and let's be honest we can't blame them. Let's be honest, there are simply so many car parts with such complex functionalities and uses that its almost impossible for the common car owner to remember them for good use. Therefore, it is pretty common for car owners to often get confused or rather clueless about what car part to buy and how much is it really needed. It is not uncommon for car owners to be scammed into replacing a car part with one that is not genuine or replacing a car part when replacing it was not even necessary in the first place. This therefore is another potential problem that CarModLive effectively solves and helps with.

Let's say someone has a problem with their car and they need a car part replaced, however they are not really sure about the nature of the problem and why they really need that replacement. So, what they'll do in such a case is that he/she shall head over to CarModLive and go to the parts section. Here they shall look into the specific part that they need information on. Our expertly written article shall then explain them all they need to know about that part. Additionally, users can also click on the buy now button that takes them to a third-party website where they can actually purchase those parts. So, our Car Parts section basically serves as an affiliate between the users and those third-party part sales websites.

CarModLive is also home to the most innovative and interesting car blogs. These automotive blogs also help car enthusiasts learn new and stuff about the automotive industry and helps users stay up-to-date with the latest developments in the car space. These blogs are written by a car enthusiast for other car lovers out there so they can feel at-home when they look for blogs on CarModLive. Lastly at the later part of the CarModLive website we have all our socials attached so that users can connect with CarModLive on a much deeper level.So that you can join the community and interact among other members who have used CarModLive and have loved it. Users can share their experiences and feedback and even add some valuable information to the community so others can benefit from it. Car owners

have always been concerned and affected by the design of their cars. 4 Blogs therefore are an effective way of keeping them hooked with the latest developments in the design and modification industry.

To conclude the literature review, it can be said that CarModLive addresses a few significant problems of the car community. If you're a car owner, a mod-savvy car enthusiast or just a person who want his/her own personalized car- CarModLive is just the site for you.

A good justification of using 3D-models in the website is that they provide the best overview and the most close-to-reality experience of a physical product.2 From offering 3D Model real-time modification options to educating the masses on various car parts and their uses to a whole world of exciting car blogs; CarModLive is the complete package.

Due to all the above-mentioned cases, reasons and facts- this project of ours is fulfilling in terms of its practicality, usage and even the fun-factor that makes it significant and its creation meaningful. We shall now move to the requirement specification of CarModLive.

Chapter 2

Requirement Specification

When it comes to requirement specifications, there are two clearly distinct types of requirements that we shall be discussing in this document. These are Functional Requirements and Non-Functional Requirements.

2.1   Functional Requirements

Functional requirements basically refer to all the product features that must be implemented in the project by the developers in order to enable the users in achieving their goals. In other words functional requirements elaborate what users should be able to do with the project and developers make this possible. These requirements are generally decided clearly before the project has started to develop, developers and designers all have a clear-cut image of what the functional requirements are for a certain project.

Now let us discuss the functional requirements for CarModLive; The functional requirements for this project comprise of the following:

· Users should be able to access and start using the website directly without having to go through the hassle of sign-up or login. This is one of our personal choices to make the website accessible as quickly as possible. We the makers of CarModLive

believe that users shall be coming on to CarModLive to modify their vehicles, read blogs and learn about or explore car parts, they don't have time or the energy to be making accounts and signing up- and also what for? Why should we make it difficult for users to make use of the site when we can simply let them use the website directly without having to log-in or sign-up.

· Users should be able to choose from a list of 3D Models of commonly found vehicles in Pakistan. This functionality is amongst the core ones of our project. This project is made for local people and for their maximum practicality, it is eminent that CarModLive should have 3D models of the commonly found, daily driven vehicles in Pakistan. This should include car models like Honda Civic, Suzuki Carry Van, Toyota Hilux, Toyota Land Cruiser and others.

· Users should be able to access the Model in a dedicated screen view, rotate it at 360 degrees and view it from all angles. Users should also be able to zoom in and out of the model as per their convenience. CarModLive aims at providing the best visual representation of the modified cars and therefore a 360 degree rotatable view along with a zooming option in a dedicated screen view is necessary to fulfil the functional requirements of the project.

· It is among the functional requirement of the project that users should be able to modify their selected car model; these modifications include being able to modify the car's color(wrap), modify the rim shade, modify the car trim, modify the window tint/shades. We believe in legal modifications only, and therefore no aftermarket chassis modification or ricing is entertained by CarModLive, only decent color modifications of body, rims, shades and grill/trim should be allowed to users on the CarModLive website. The trim mentioned here includes window handles in some models, lower lining, upper lining and other small details that circle the body.

· Users should be able to view information about car parts and be directed to third-party websites to purchase them. The website CarModLive should have a dedication section for car parts where all the different types of car parts are listed along with an estimate for their prices, users should then be able to view the

details or information about a certain car part by clicking on it. There should also be a link embedded into these car parts that leads users to third party websites where they can actually purchase these car parts as they desire.

· Users should be able to read and scroll through blogs and articles related to cars. CarModLive should also have a blog and articles functionality several up-to-date blogs should be uploaded and maintained for the users to read and scroll through. These blogs should be related to cars, automotive and the vehicle industry.

2.2   Non-Functional Requirements

Non-functional requirements for a project indicate all the qualitative aspects that are necessary for a project to function. While all the functional requirements basically elaborate what a user should be able to do, the non-functional requirements are responsible for how he must be able to do it- with ease, with efficiency etc. While functional requirements are pretty objective and clear cut, non-functional requirements can sometimes be a little subjective as to what are the quality requirements for a certain project.

The Non-Functional requirements for this project include:

· The website should be scalable, it should open on any screen without impact on the user interface. The quality of a website to adapt and adjust to any device and any screen without impact on its user experience, visuals, graphics or user interface as a whole is very much crucial to how well the website performs. Nowadays, all well-performing websites are scalable and so should CarModLive.

· The website should efficiently load all the 3D models, all the modifications should be implemented instantly. When it comes to 3D models in websites, it often feels like a slow and laggy process, not in this case. CarModLive should efficiently load all the 3D models so that the users feel no lag or delay in viewing their 3D models. What's more is that the modifications should be implemented instantly, this means that once the user clicks on the button in the modifications tab, be it

body color, rims or any other; it should be implemented on the model instantly in order to give a seamless and responsive 3D car modification experience to our users.

· The blogs and all parts-information should be up-to-date and current- no out-dated information should be on the website. When a website hosts blogs and such written material for the users, it is vital that the content be new and fresh so that the users keep coming for more. Another important thing here is that the content should be authentic and no false news of bias should be propagated on the blogs section of CarModLive.

· The website should have a pleasing UI with good readability and a theme that matches that of the project. The project is a bit futuristic and ambitious with cars and modifications and all sorts of stuff that interests car enthusiasts. There-fore the UI and the overall theme of the website should be such that it matches the vibe of the project. Readability is also an important non-functional require-ment. Apart from readability it should have a high HCI score, also known as the Human-Computer Interaction. The buttons should be spaced distinctly, no controls should be overlapping or mixing with each other. There should be no ambiguity in operation, every thing should be known to the user as soon as he/she sees the interface- the users should no need a lot of time to get familiar with the website and its functions.

· All the visual elements should be such designed that they give off good software ergonomics. When we talk about software ergonomics, we mean all the things that one must keep in mind when designing a software for humans/users. The way the interface needs to be designed, the way the users shall interact with the software and how it shall be easy for them. What steps should be taken to make the software more compatible with humans, easy to use, and easy to learn.

Chapter 3

Project Design

3.1   Class Diagram

We can see the class diagram of the project CarModLive as below. It has multiple classes with their relations and the functions that these classes perform respectively.

For instance, when the client accesses the web product, they shall be taken to the interface through a menu bar. We have made a class for the menu, whose attributes are homeOption, carOption, partsOption, blogsOption and aboutOption. All these attributes define certain options on the menu through which the user can access specific desired outcomes and use the CarModLive project to their advantage.

Class Diagram: CarMod Live

Client
- name: string
- age: int
-license: string

has access to

CarMod Live
-Homepage: Page
-menu: Menu[]
-aboutSection: AboutUs[]
-blogSection: BlogSection
-legalDocumentation: LegalDocumentation

MenuItem
+ ClickOnIt(): void

Page
+ ClickOnStart(): void

contains/ has

BlogSection
-articles: Article[]

LegalDocumentation
-refundPolicy: string
-privacyPolicy: string
- cookiePolicy

-readPolicy(): void

Menu
-homeOption: MenuItem
-carsOption: MenuItem
-partsOption: MenuItem
-blogsOption: MenuItem
-aboutOption: MenuItem

Article
-content: string

PartSection
-partsList: CarPart[]

CarSection
-carModels: CarModel[]

-seeMore(): void

CarPart
-priceEstimate: int

+viewDetail(): void
+buy(): void

3D Car Models
-modifications: Modification[]

+explore(): void
+modify(): void
+save(): void

FIGURE 3.1: Class Diagram CarModLive

3.2 Data Flow Diagram

In the data flow diagram provided below, we can see that the client proceeds by accessing the CarModLive web product, straight after that he'll be on the home page by default. It can be seen that a Menu icon is provided for the user's ease where multiple subsections are stated along with their respective functionalities. Now it all comes to user's choice. If he wants to directly access the Car Model in a designated 3D space, he can do so by going to the Car Section, select the Model, perform modication and then save it into his own repository.

If the user wants to know about certain mechanical parts, he'll go to the part section, see some details about them and if it seems good to him, he'll click on the buy button to make the purchase for the product.

This way, the user can experience the most out of this product of ours which can benefit him in the long run and expand his knowledge of motor vehicles.

Client will be taken to a
oriented list of mechanical
parts with some specifications
concerning them

SelectPartsToPurchase()   ViewPartsDetails()

Client buys the
desired parts he
was searching for

Mechanical Parts
Repository

DisplaySpareParts()

External entity
I.e. Customer/
User

Client   Menu
                Selection   Opt A
                                   Vehicle

access Web
module   List of Cars along
                                              with their
                                              respective
                                              models displayed
Reads the
chosen article   Three
                                              Dimensional
                                              Car Models
                Displayed
                Blogs
SelectArticle()
                          Modifications will be done. for
                          instance changing rim colour,
                          changing exterior frame etc.

Data Flow Diagram (Level 2): CarMod
              Live   PerformModifications()

                          Revised models saved
                          into the system if the   SaveModel()
                          user intended to

                                              Data repository
                                              for saved
                                              models

FIGURE 3.2: Data Flow Diagram CarModLive

3.3 Use Case Diagram

In the Use case diagram seen below, we can observe that there are three actors for every different type of user. CarModLive offers three major functionalities to its users, and therefore we use three types of actors, these are blog reader, parts explorer and Car Modifier.

The blog reader uses CarModLive to explore new blogs on the website and learn about current information regarding the auto-industry.

The second actor, parts explorer uses the website to search for spare parts. The third actor, is the car modifier, they see their vehicles from among the models and modify them according to their taste and interests.

We also have an admin who uploads new models and controls the blog posting on the website.
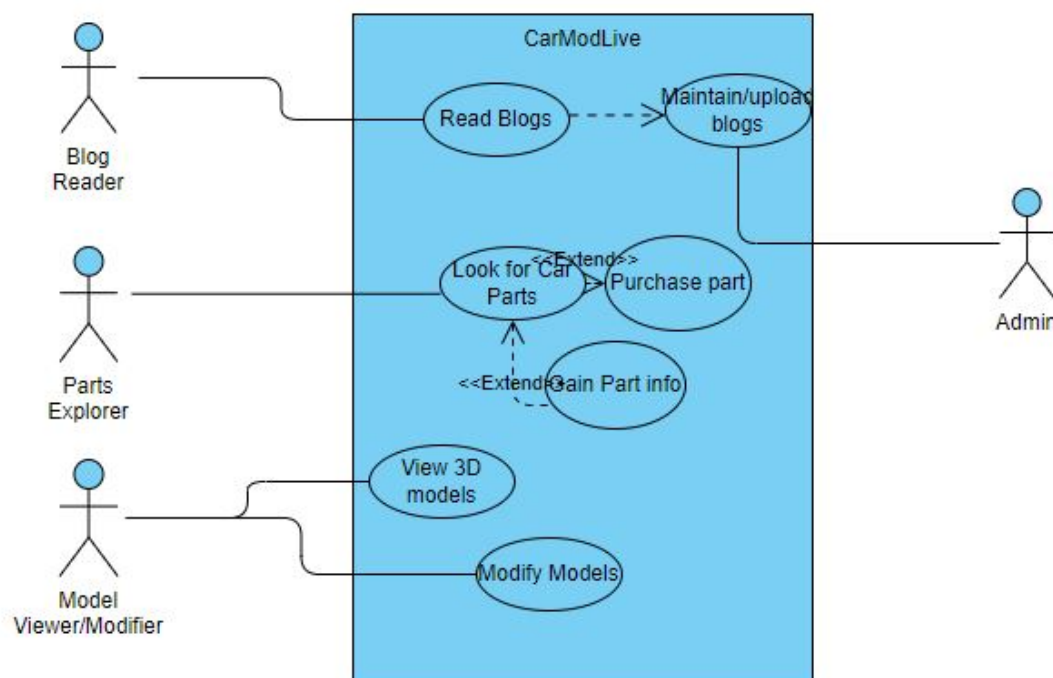
FIGURE 3.3: Use Case Diagram

3.4   Activity Diagram

In this activity diagram posted below, we can see that the user opens the website and lands on the home page. Then he/she clicks on the menu icon to see options: Home, Cars, Parts, Blogs, and About Us. In Cars, they view images, click "See More" for 3D models, and modify cars, saving changes to their device.

In Parts section, they view parts, see prices, and either view details or buy, redirecting to a third-party site. In About Us, they view site information. In Blogs, they read articles. Finally, users can access legal documents. The diagram shows these choices and actions.
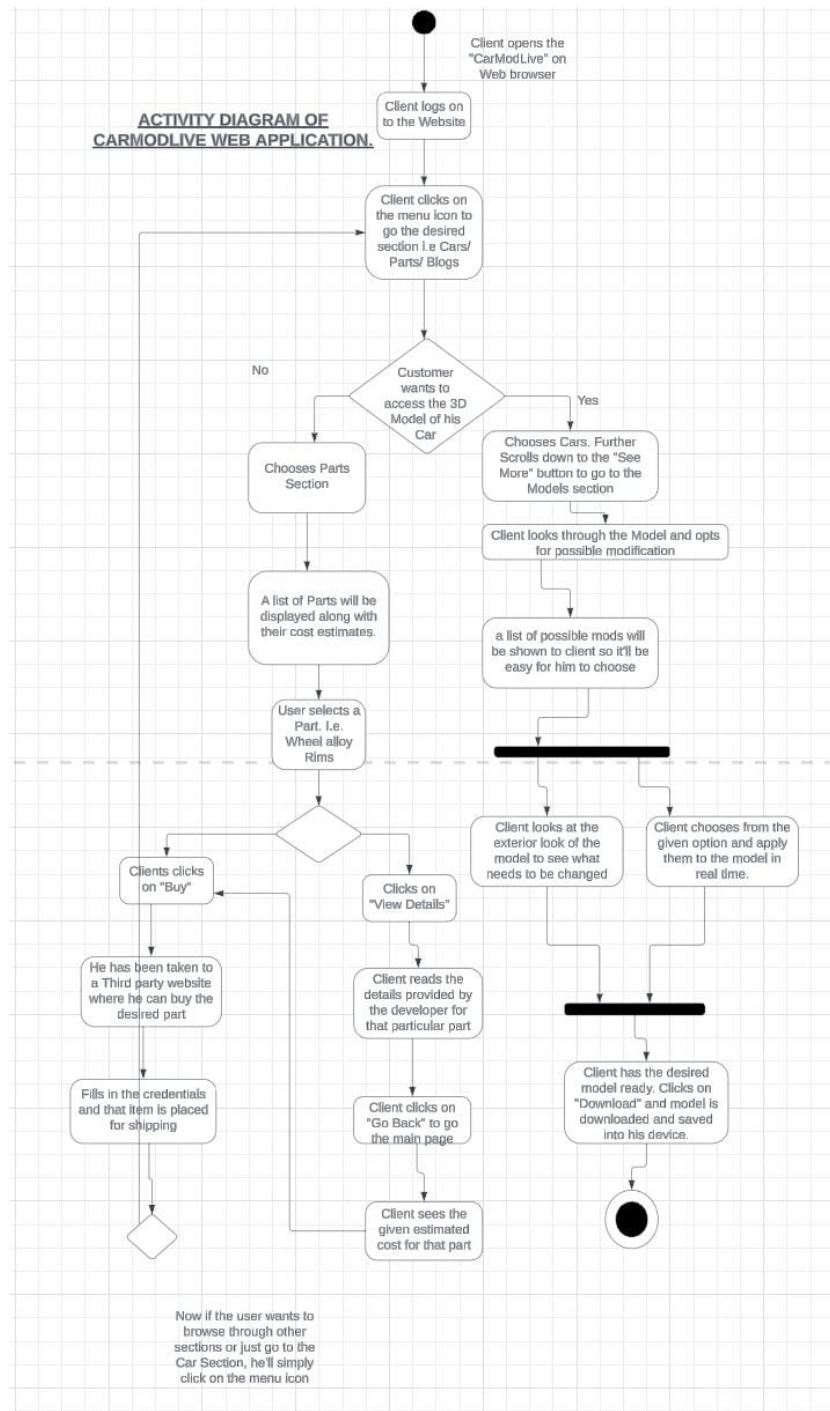
FIGURE 3.4: Activity Diagram CarModLive

Chapter 4

Implementation and Evaluation

4.1 Development Stages

As far as the development stages of the project are concerned, we first started off by building an about us page. That is simply a web page that shows what is CarModLive.

Then once the about us page was done, we created another web page connected to the site, which shall host all the 3d Models for modification:

Once this was done, we started working on the 3D models. Since we are not designing any new car by ourselves, instead we are using the existing cars that are already in the local market, we therefore took the model blueprints from their respective sources and started to render 3D models on those blueprints using blender.

The model had to be shaped and rendered from all sides using the guidelines from the blueprints. To make the process easier to understand, its like putting clay into molds. We take a rectangular 3D mass of polygons, that are then cut from the sides, top and bottom according to the blueprint of the actual vehicle in order to sculpt 3D models.
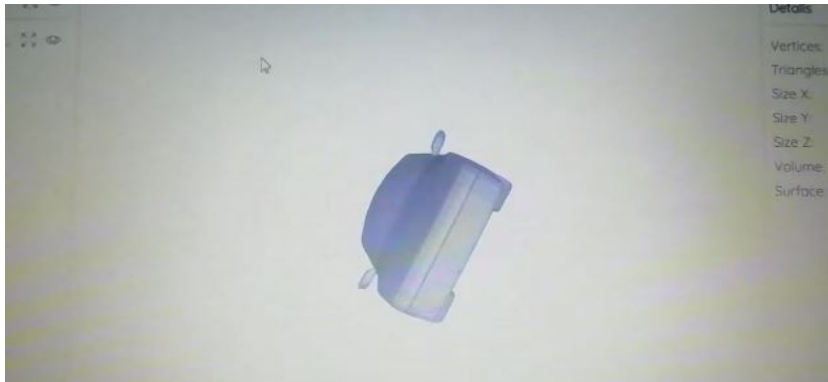
The base of these models has been left as flat since we do not really need to modify or worry about what happens under the car. The wheels look like they have been sculpted as separate objects but they are the same object as the body of the car. This is because these are low-poly models and we do not need to show any animation of the wheels or of the body of the car. Our website's functionality is complete with the type of models that we have made.

Now that we created the basic renders for our car models, it was now time to embed them in a 3D 'room' or a three-dimensional space inside the website. It must be known that 3D models or anything 3d can only exist inside a 3d space and therefore we had to create one. We did this using Three-JS:
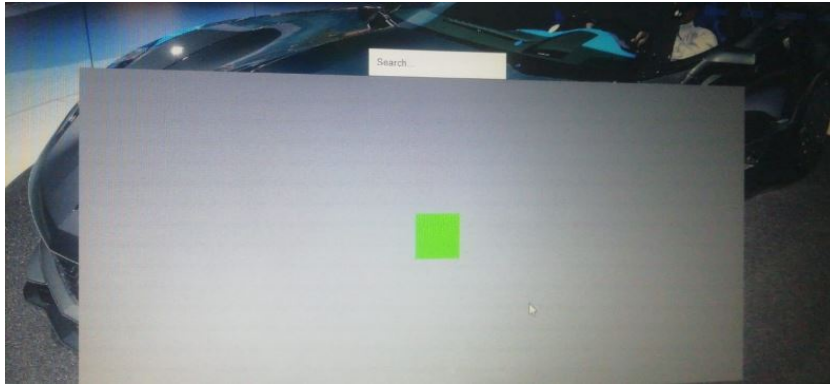
Now there is some debate in the industry that another language called Babylon.JS can also be used to do all these 3D integrations, but the fact is that Three-JS is much more flexible and can be used for more functionalities than Babylon. Also, Three-JS is best for basic model works and 3D integrations. If you are new to the 3D field, also then you are recommended to start with Three-JS and therefore that is what we used to embed our models in CarModLive.

As visible in the picture above, we added a 3d block in a 3d space in an HTML-web page. Now it was time to integrate the models. And add modification functionality to them.

This is how one of our models looked while embedded in a 3d space inside the website.

Now we added the modification functionalities which included the color change feature, rim modification and car trim modification. It looked somewhat like this:

For the rim color feature:

Here's the stage when we tried changing the rim color for one of our test models:
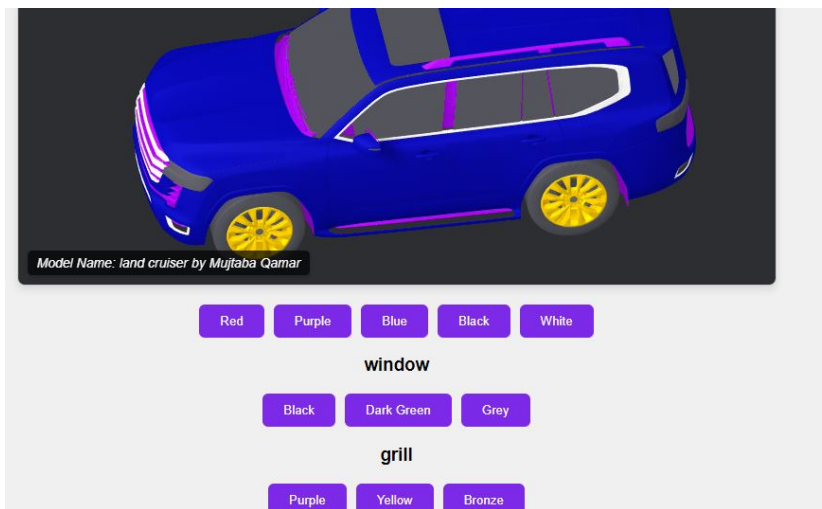
Once this development stage of the project was completed, we then proceeded onto the parts section. For the parts section, we use JavaScript, CSS and HTML to create a red and white themed website where all these parts are listed in a grid.
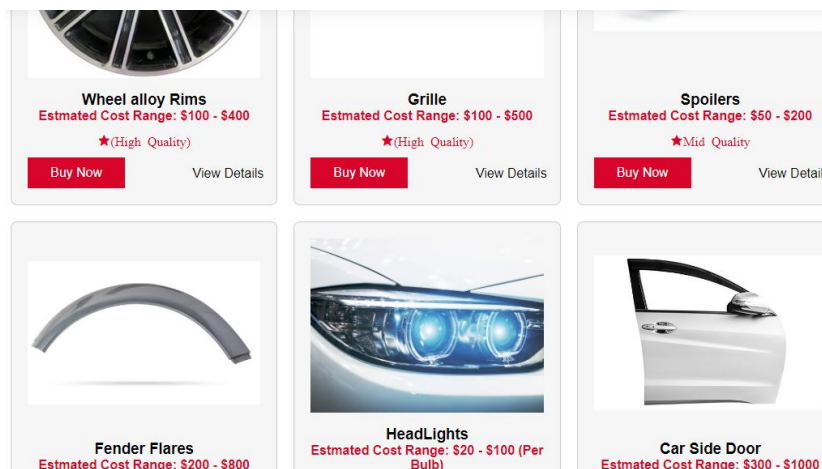
Then we added web pages for all the view details buttons on these parts. These web pages were then filled with articles and information about those parts. We also added links to third-party websites for users to buy parts from those sites. The part detail page looks somewhat like this:
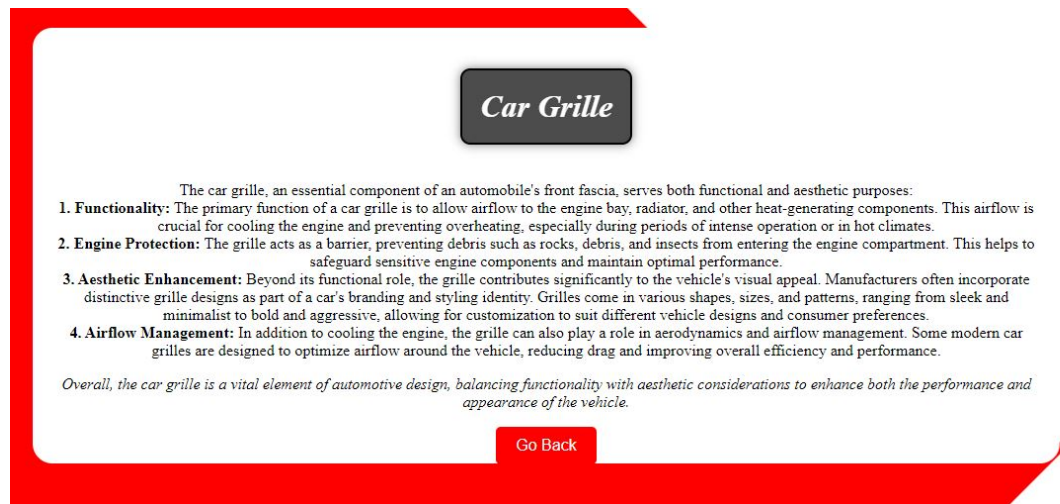
Once we were done with the car parts section, we then added the blogs section of our website. This was done similarly, using the above-mentioned tools and languages. It looked somewhat like this:
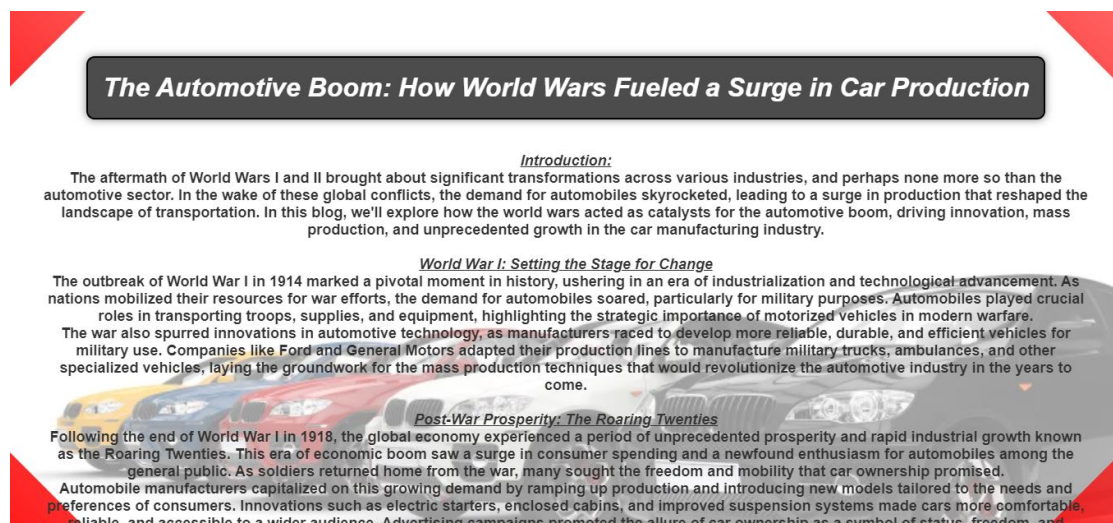
This is basically the general layout of the blogs, making them easier to read as well as easy on the eye. Once we were done with the blogs section of our website, it was almost complete.

Last but not the least we added a drop-down menu to assist users with navigating across the website. A bunch of other quirks and features were also added to make the website smooth, efficient.
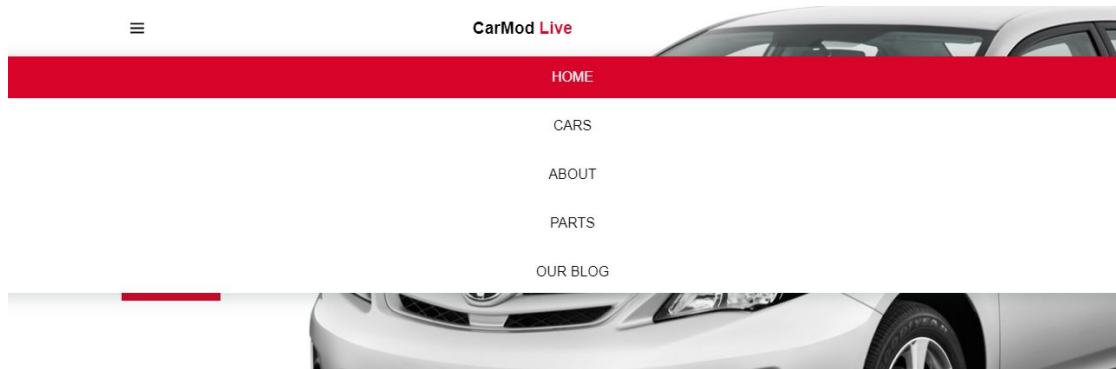
4.2   Functional Testing

Now we shall be exploring and analyzing all the functional aspects of the CarMod-Live website. The CarModLive web application basically has the core functionality of allowing users to view and modify their car models in a 3D interactive space.

Apart from this core functionality, we come across many other side functions that the users can explore as passionate car enthusiasts.

Let us begin by testing the blogs section.

4.2.1   Blogs

In the case that the user wants to open CarModLive website and access the blogs section, let us see if the user can succeed in making use of this functionality.
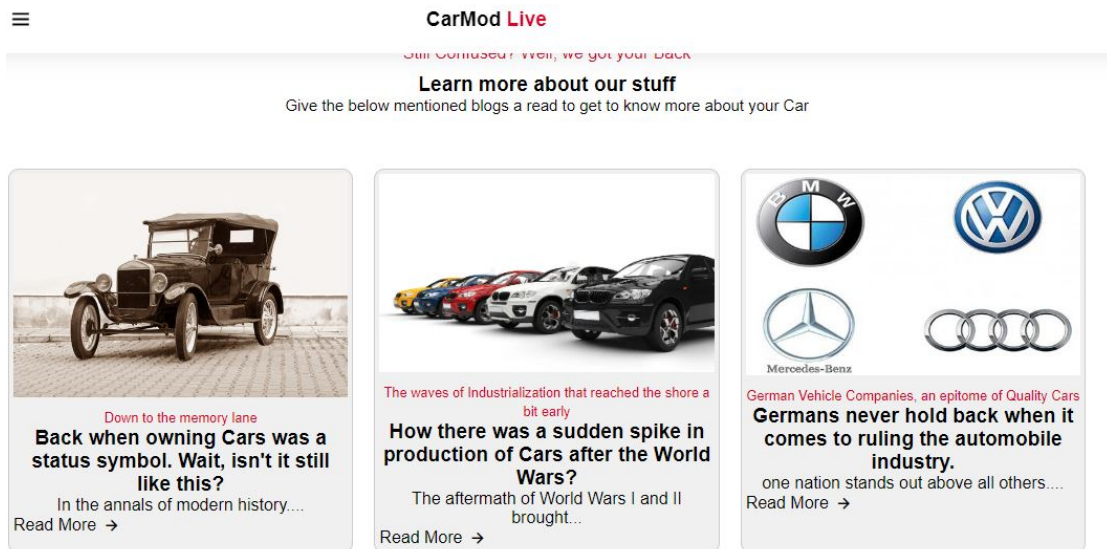
As evident from the above image, users can successfully open the CarModLive website and access the blogs section where he/she can choose from amongst the list of different blog posts and read whatever they may desire. Now that we have successfully tested the 'blogs' functionality, let us now move on to another functional aspect of CarModLive and accordingly test it.

4.2.2 Search Car Parts and Gain Information

In the case that the user wants to open the CarModLive website and search for a certain car part or gain valuable insights about that particular part, let us see if the user can succeed in making use of this functionality.
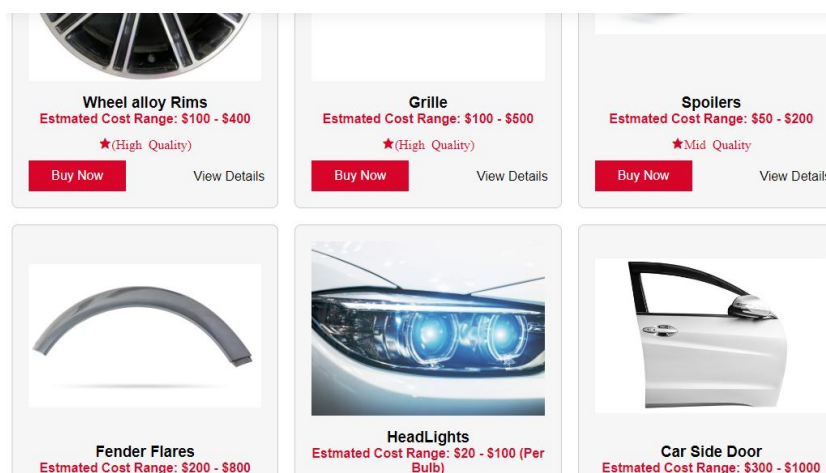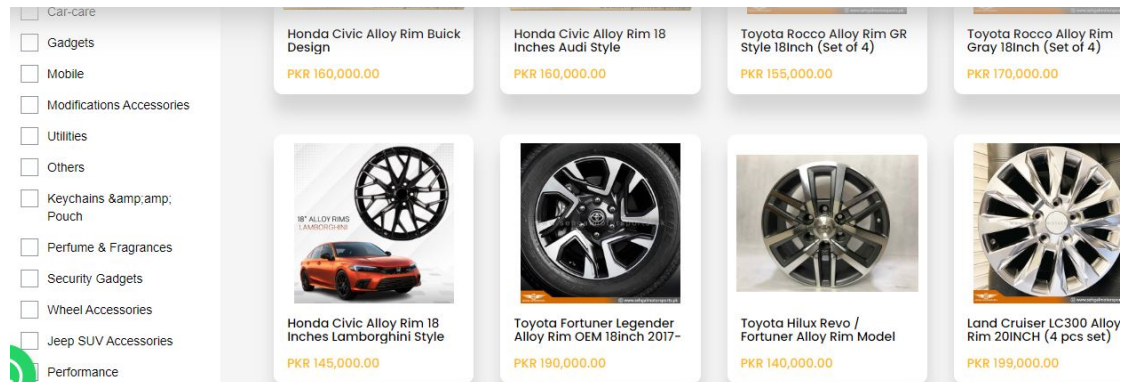
As evident from the above pictures, we can see that in one of the attached picture, the user is able to locate the car part that he was looking for and then gain valuable information regarding that specific car part through the blog post. In the second pic, we can see how the buy now link leads the user to a third party website where they can conveniently purchase the car part for their vehicle. Now that both these side functionalities have been explored, let us now begin functional testing of the major function that CarModLive offers, 3D model viewing and modification.

4.2.3 3D Model View and Modify

In the case that the user wants view and modify the 3D model of their specific vehicle, let us see if the user can succeed in making use of this functionality.
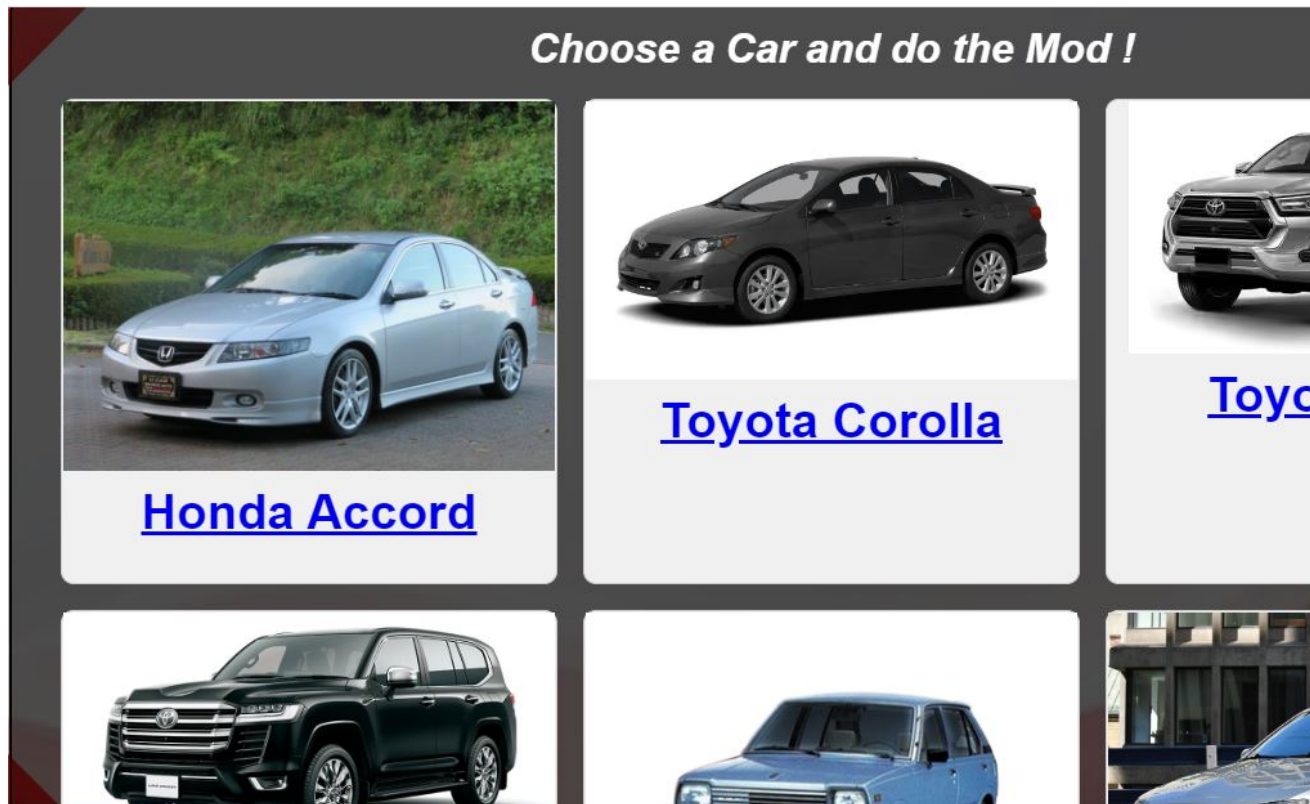
As evident from the above pic, the user can choose from an abundance of locally driven vehicle models. Now in this pic, we can see that when the user clicks on one of the models of his choice, the 3D model and modification screen pops up. Here the user can conveniently view the 3D model as they desire. There are certain modification buttons placed below the model, let's see if the user can modify their model using these buttons.
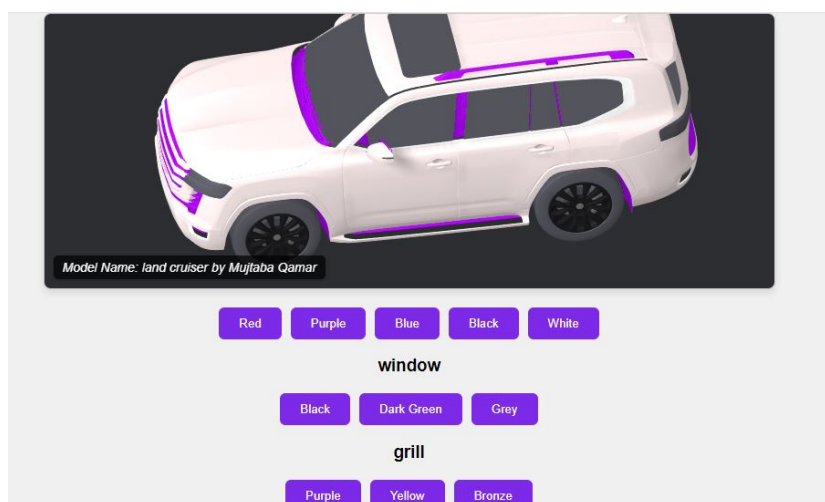

As evident from the above picture, the user has successfully managed to change the body color of the vehicle using the modification buttons.
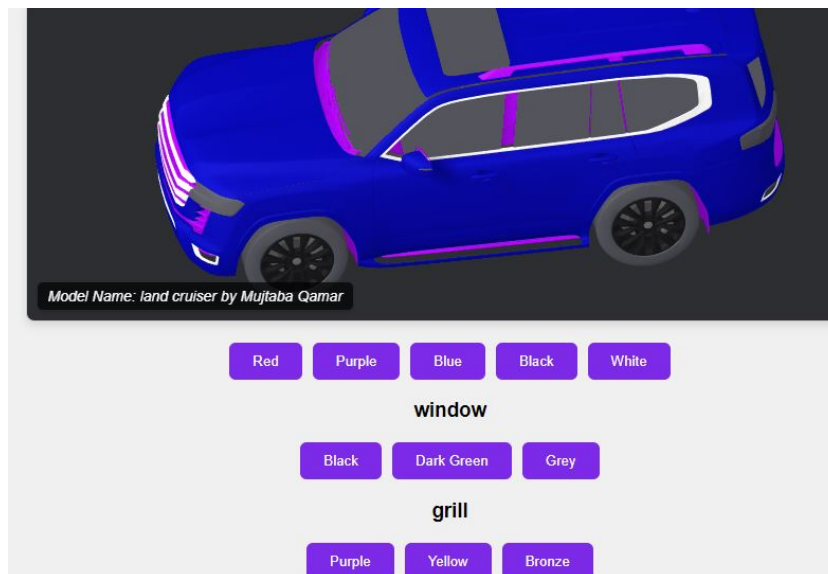
This second pic shows how the user was able to change the window tints of the vehicle that he selected for modification.
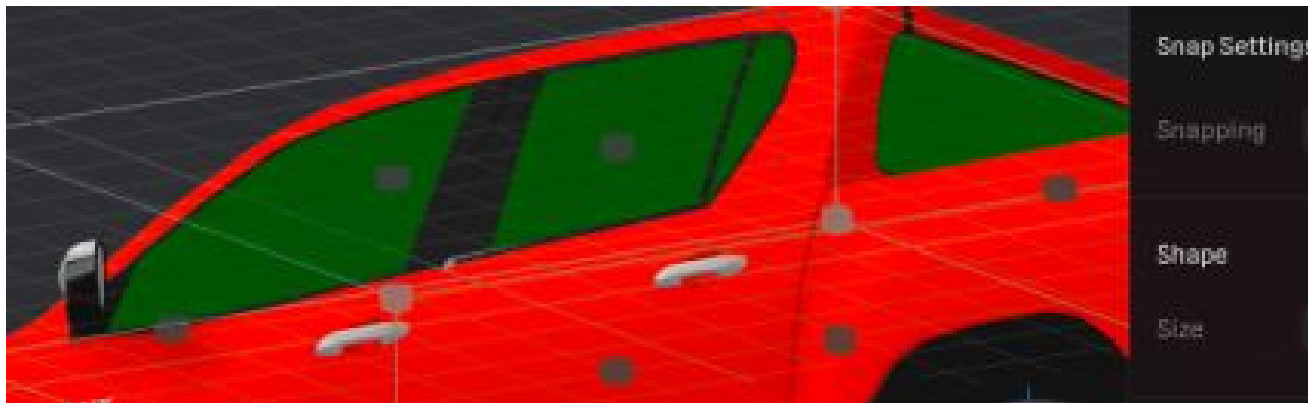
Similarly we can also functionally test the changing of the trim and grill on the car. Let us use the same Toyota Land Cruiser model for the trim and grill test. As is evident in the picture that the grill is of purple color, we shall now change it to yellow color and then bronze color and see if it works fine.
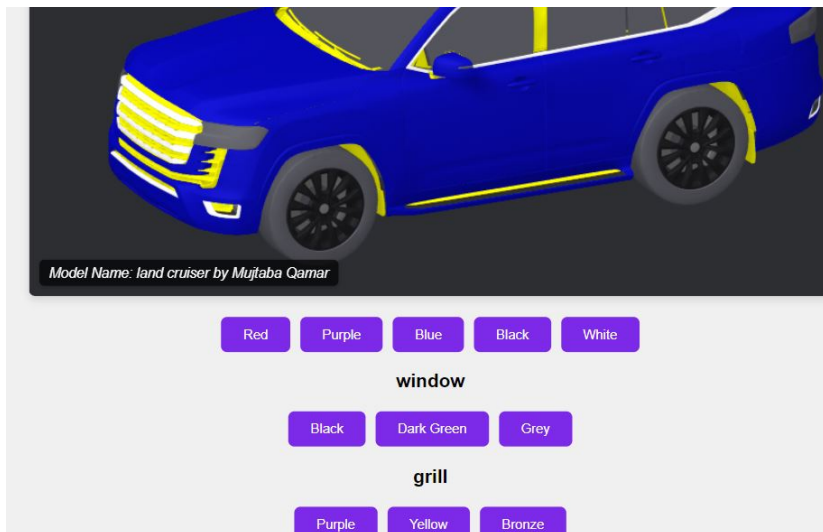
As evident from the above pic, the grill and trim on the specific car model in question has turned yellow. Now let us try another variation.
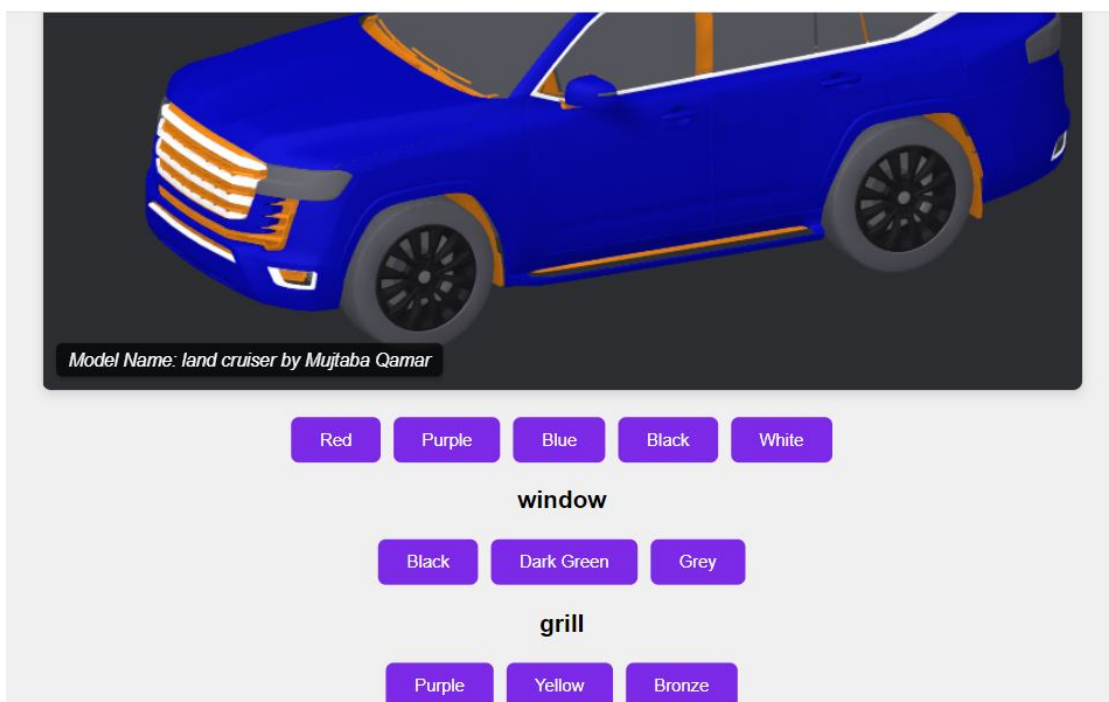
Now we can see that the grill and trim on the said car model has turned to bronze on command. Therefore now our functionality for modifications of all sorts has been successfully tested.

These modifications are also being saved into their current state and therefore can be downloaded to be printed or saved to the device. Now let us delve into the
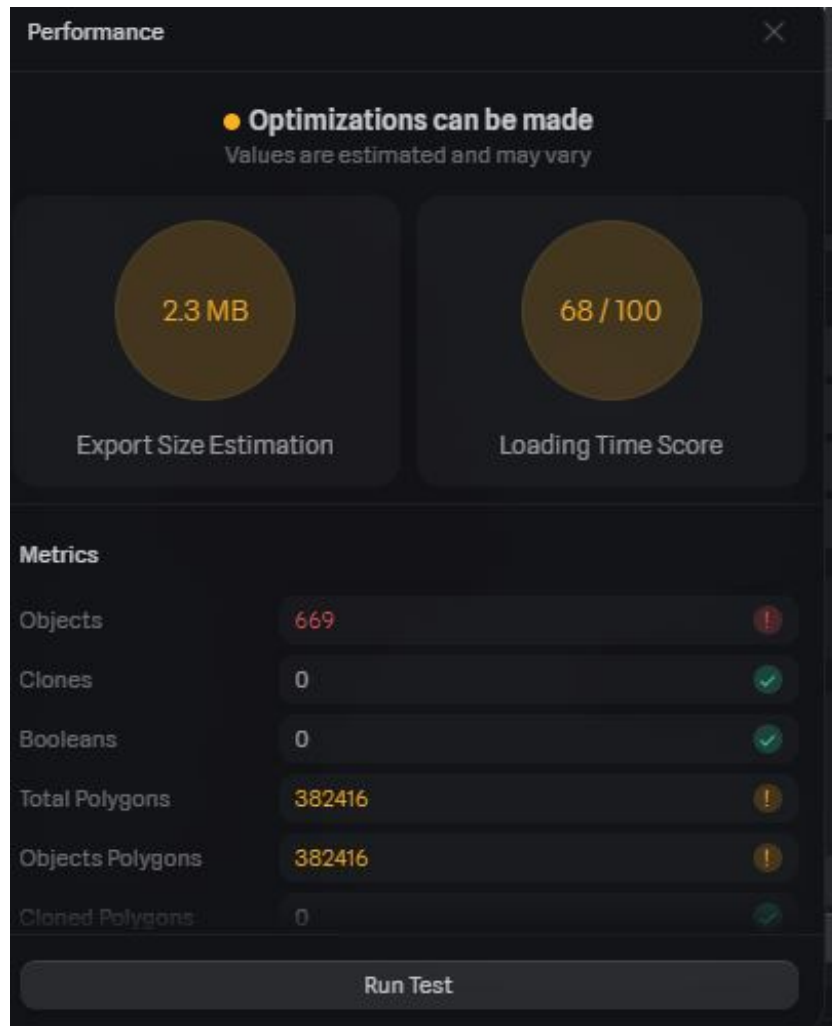
.

FIGURE 4.1: Performance Test 3D Model

performance testing section.

4.3 Performance Testing

When it comes to performance testing of our website, there are certain aspects that we shall be discussing. First up we have the 3D models and their efficiency with which they load into the embed housing. This load-ability can be efficiently tracked and measured by Spline's in-built performance testing mechanism.

We shall now perform this performance testing on our 3D models and analyze the results.

c

FIGURE 4.2: Performance Testing Better model

As we can see in the above pic for the performance testing for one of our 3D models, it has a certain number of polygon count which affects its ability to load faster.

In the second case we see that another 3D model is being put to the test and its polygon count differs from the one above and so does its ability to efficiently load

into the website space. It has a much better loading time score as compared to the previous one. The picture is added below.

Since the website is not hosted on to a domain where we can do the load testing, this part is unnecessary for our project. As for the stress testing, we can see if we can open multiple 3D models at once.

After multiple models opened and all the renders loaded, we can successfully say that the website can take stress of multiple models opened all at once.

Chapter 5

Conclusion and Future Prospect

5.1   Future Prospect

As far as the future prospect for CarModLive is concerned, it is a practical project that's here to stay.

The website could very easily be commercialized and be turned into a profitable business in the long run. Though there is no intention to charge the users for modifications as that would simply be against what we have envisioned- a free for all website where users can modify their cars.

Although we could run ads on the website that can generate income and help sustain the business. We could keep adding more and more models in the future to accommodate all of our users with their different cars.

Another future prospect of the project could be that we add more functionalities to the modifications, maybe add 3d components or body kits to the vehicles that could be very interesting.

What's worth mentioning here is that we also have a car parts section that directs the part buyers to a 3rd party website. This could also be turned into an affiliate site business where we get paid to target and direct large amounts of audience to the specific car parts websites.

The CarModLive community shall also grow in the future with active blog posting options and customer feedback so that others can retrieve benefit from it. Our socials shall also continue to grow and market the sites concept all across the digital realm.

5.2 Conclusion

At the end of the dissertation, we can effectively conclude that CarModLive is an ambitious car enthusiast project that is built and brought to realization for the primary purpose of helping the car owners modify their cars according to their plans.

It is pretty evident how CarModLive's 3D modelling feature shall help the people who have a vague idea about how to modify or customize their vehicle. It shall help guide them as to what is the best mod combination for their vehicle.

Other functionalities that the website offers are also pretty fun and interesting for those who love cars. The car parts section greatly helps those seeking to learn about or by car parts for their vehicles.

The blog section is full of informative and catchy blog articles that are cherished by car enthusiasts.

CarModLive is a beacon of hope for the car community, a project that shall help foster a productive and more vibrant car ownership in Pakistan. Where car owners shall now be able to modify and enhance their rides according to what they desire.

CarModLive is a web application made by using HTML, CSS, JAVASCRIPT, Three JS, and Blender to combine all these tools and technologies in order to give a collective positive result.

BIBLIOGRAPHY

"Car and Driver" - Provides reviews, news, and comparisons of various car models. Available at www.caranddriver.com.

"Motor Trend" - Offers automotive news, reviews, and buyer's guides for car enthusiasts. Available at www.motortrend.com.

"3D Warehouse" - A repository of 3D models created with SketchUp software, including various car models and parts. Accessible at 3dwarehouse.sketchup.com.

"TurboSquid" - Offers a wide range of 3D models for purchase, including cars, car parts, and accessories. Visit www.turbosquid.com for more information.

"CGTrader" - Provides a platform for buying and selling 3D models, including cars and car modifications. Explore the collection at www.cgtrader.com.

"The Car Modeller" - A blog dedicated to car modifications, providing tips, tutorials, and inspiration for car enthusiasts. Read articles at www.thecarmodeller.com.

"Car Modification Guide" - Offers comprehensive guides and resources for modifying cars, including performance upgrades, visual enhancements, and DIY projects. Access the guide at www.carmodificationguide.com.

"3D Car Modeling Tutorial" - Provides step-by-step tutorials on creating 3D models of cars using various software tools like Blender, Maya, and 3ds Max. Find tutorials at www.3dcarmodelingtutorial.com

REFERENCES

[1] Daniel Abate-Daga and Marco L Davila. Car models: next generation
     car modifications for enhanced t-cell function.
     Molecular Therapy
     Oncolytics, 3, 2016.

[2] S Hinz, C Schlosser, and J Reitberger. Automatic car detection in high resolution urban scenes

     based on an adaptive 3d model. In 2003 2nd GRSS/ISPRS Joint Workshop on Remote Sensing
     and Data
     Fusion over Urban Areas,
     167171. IEEE, 2003.

[3] David L Thomas. Metallic mask: a history of car modification. PhD thesis, Carleton University,
     2006.

[4] Guy H Walker, Neville A Stanton, and Mark S Young. The ironies of vehicle feedback
     in car design. Ergonomics, 49(2):161179, 2006.

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