Virtual and Augmented Reality: Final Project

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Figure 1. Augmented Reality in the Automobile Industry

Figure 2. Color Customization of Automobiles

Abstract

With the use of augmented reality (AR), a relatively new technology, users can interact with machines by superimposing virtual information on their actual surroundings. Numerous fields of contemporary study have potential applications - Manufacturing, healthcare, advertising, sports, entertainment, military logistics, education, retail, and real estate are just a few industries, to begin with.

This proposal presents a systemic implementation to build an 'Augmented Reality Automobile Customization' tool. The implementation will involve creating an augmented reality application using Unity's Vuforia Engine to tweak various car components to make them more aesthetically pleasing and visually appealing.

By inserting and superimposing virtual elements on the actual world, this type of human-machine interaction will offer the user the impression of an enriched reality and enable them to see automobile customization before they are actually implemented.

1. Introduction

Using contemporary technologies helps businesses succeed in the competitive global market in many different sectors. It increases a business's capacity for innovation, and it can even reduce production costs and increase revenues. Historically, the auto industry has been at the forefront of utilizing the most recent technology developments. As a result, the automotive industry has seen tremendous growth, mostly as a result of the adoption of new, cutting-edge technological advancements like automated vehicle safety, sophisticated robotic systems-based advanced manufacturing techniques, virtual mock-up and prototyping, and user-friendly interfaces that enhance the driving experience and vehicular design.

Due in large part to its accessibility and potential for creative problem-solving, augmented reality (AR) has garnered the attention of numerous automakers in recent years. It has the ability to improve a person's sensory perception and gives them access to specific information they require about particular elements or procedures right in the workplace. Augmented reality (AR) is a subset of mixed reality (MR), which is the fusion of the physical and digital realms.

A mobile software development kit (SDK) called Vuforia Unity makes it possible to create augmented reality (AR) apps. Anyone who wants to become an expert in augmented reality should be aware of this system as it aids in the creation of augmented reality applications.

This application may be used both for car customization by users and for new car design by companies.

2. Related Work

- Augmented Reality car customiser using Unity ARKit/ ARCore. Created by Parth Anand. He created an Augmented Reality Car Customiser App using ARKit. Demonstrated how a customer can have a

look at a car model he is interested in choose between various color options, wheel types, have a peek at the interior drive the car using on-screen controls.

- Build your Nissan Today - Check out the latest customization options on a new Nissan® Car with Safety Shield 360. Tech that changes every part of your drive. Nissan USA has a car customization software inbuilt to their website to enhance user experience.
- Brandwidth and Toyota enable customers to 'see inside' C-HR model with new hybrid Augmented Reality experience. The new Toyota Hybrid AR application uses Augmented Reality technology and object recognition software to overlay graphics of the inner workings of the Hybrid drivetrain onto physical vehicles, helping customers to gain a better understanding of how the system works.
- WayRay, a leader of holographic AR displays for cars, has announced a new investment from Porsche, Hyundai Motor, Alibaba Group, China Merchants Capital, JVCKENWOOD, and Consortium of Sovereign Wealth Funds (JBIC and partners). The newly raised funds will bolster the company's focus on RD, industrialization and team expansion to become a supplier of holographic AR solutions for car manufacturers.
- EvolveAR is driving the automotive industry by providing incredible customer experience in a way akin to something straight out of sci-fi movies!
- 8th Wall AR Car Customization - Welcome to the exciting world of Augmented Reality (AR) car customization! With this AR experience, you can now bring the car customization process right to your driveway or wherever you want, using just your smartphone or tablet. To get started, simply launch the experience, point your device to wherever you want to place you car and tap the screen. Once you have placed your car, it's time to get creative and customize it to your heart's desire. You can also choose from a range of painting patterns or submit a picture so the app can extract a color palette for you! After you're done with customizing, you can take pictures and record videos to share with family and friends. With this AR experience, you can finally bring your dream car to life and see what it would look like in your own driveway.

3. Design and Implementation

- Set up Vuforia Engine in Unity - Open the Asset Store and add Vuforia Engine. You must use the same Unity account for both your Unity project and the shop in order to accomplish this. Click Add to my Assets on the Unity Asset Store after finding the Vuforia Engine entry. Choose Packages: My Assets from the Window -¿ Package Manager menu in your Unity project.
- Find and Import Automobile Prefabs to Unity from the assert store. An expanding collection of commercial and free assets made by community members as well as Unity Technologies itself may be found in the Unity Asset Store. There is a vast array of assets accessible, ranging from models, textures, and animations to tutorials, complete project examples, and Extension Assets.
- Edit asset as per requirement. After an asset has been published, you can make the following changes to it: Right-click the asset from a project or collection, then choose Edit. The files and information associated with the item can be changed in the same manner as when it is added.
- Create project liscence key for vuforia engine in unity account.
- Set app orientation to landscape left. Then under "Resolution and Presentation" group you can see the "Orientation" sub group, then you will find the relevant "Default Orientation" option. You can set it to Landscape Left from the dropdown menu here to force orientation.
- Set IOS version to 12.0 and above.
- Replace main camera with Vuforia AR camera.
- Create a target to display the projected automobile on the AR space in the unity account. Import target to application.
- Create buttons for customization options.
- Design and place buttons around screen for user to interact with at run time.
- Create script to continuously rotate automobile asset such that its visible from all angles during run time. Set appropriate rotation speed and axis.
- Create script to customize individual parts of assets based on colors / stickers / tires / etc.
- Add script functions to asset parts and buttons in Unity.
- Build and run AR application for test asset. The test asset will rotate in 3D space in the AR camera view. Buttons will enable user to interact with application to perform customization on automobile asset.
- Try procedure for multiple automobiles. Can add buttons for switching between automobiles too.

Figure 3. Tire Customization of Automobiles

4. Demonstration Plan

Configuration: Marker will be required to project the automobile in the Augmented Reality Space. Marker will be target image created in unity account. It will be added to the application space in Unity. When image is visible in AR camera, the projection of automobile will occur above it.

Input:

- Automobile Selector Buttons - Choose asset which user wants to customize.
- Automobile Part Selector Buttons - Choose asset part user wants to customize. That is, tire, hood, roof, door, etc.
- User Customization Selector Buttons - Color, Stickers, Tires, etc.

Output: AR Visual of Automobile design as per user's input choices. The automobile will rotate in 3D space in the Ar Camera view on the marker target image.

5. Timeline

- By Oct 25: Start Creation of Augmented Reality Automobile Customization tool.
- By Oct 30: Import test Automobile asset to Unity and learn basics of using Vuforia Engine to develop AR applications.
- By Nov 15: Implement Customization to multiple parts of test asset vehicle using Unity and Code Scripts.
- By Nov 25: Apply above procedure on other Automobile assets, debug errors and clean codes.
- By Dec 1: Draft final project report and start creating demonstration video.
- By Dec 10: Completion of Project.

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