Final Project Report

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Abstract

Augmented Reality (AR), a cutting-edge technology, empowers users to engage with machinery by overlaying virtual information onto their real-world surroundings. This innovative approach holds tremendous potential across diverse fields, including manufacturing, healthcare, advertising, sports, entertainment, military logistics, education, retail, and real estate.

This report outlines the development of an 'Augmented Reality Automobile Customization' tool. The proposed implementation entails the creation of an augmented reality application using Unity's Vuforia Engine. This application aims to customize various car components, enhancing their aesthetic appeal and visual allure.

Through the seamless integration of virtual elements onto the physical world, this form of human-machine interaction will provide users with a heightened sense of reality. Consequently, individuals will be able to visualize and assess automobile customizations before they are executed, offering a valuable preview of the desired modifications.

1. Introduction

The use of contemporary technologies is crucial for businesses aiming to excel in the competitive global market, offering opportunities for innovation, cost reduction, and increased revenues. The automotive industry, historically at the forefront of technological adoption, has experienced substantial growth by integrating advancements like automated vehicle safety, sophisticated robotics in manufacturing, virtual prototyping, and user-friendly interfaces.

In recent years, augmented reality (AR) has become a focal point for automakers due to its ability to enhance sensory perception and deliver specific information directly in the workplace. Operating within the broader realm of mixed reality (MR), which merges physical and digital environments seamlessly, AR plays a pivotal role.

The development of AR applications is simplified by the Vuforia Unity mobile SDK, a crucial tool for aspiring augmented reality experts. This application, with dual functionality, serves as both a user-friendly car customization tool and a platform for companies to explore innovative car designs. Positioned at the intersection of user engagement and cutting-edge design, this versatile solution reflects the automotive industry's commitment to staying at the forefront of technological advancements.

Related Work 1. AR Car Customiser: An app using ARKit lets users explore, customize, and "drive" cars via on-screen controls. 2. Nissan USA's Build Your Nissan: Nissan integrates a website tool for users to customize new cars with Safety Shield 360. 3. Brandwidth and Toyota's Hybrid AR: Toyota employs AR to show the inner workings of hybrid drivetrains, enhancing customer understanding. 4. WayRay's Holographic AR Displays: WayRay secures investments to focus on becoming a supplier of holographic AR solutions for cars. 5. EvolveAR in the Automotive Industry: EvolveAR transforms the automotive customer experience with sci-fi-inspired AR solutions.

2. Results and Demonstration

Results: 1. AR-driven car customization tools contribute to an enriched customer experience by allowing users to virtually customize and visualize their vehicles before making decisions. 2. The application allows users to switch amongst multiple automobile models, switch automobile colors and tires, increase and decrease the automobile scale, and edit the automobile material.

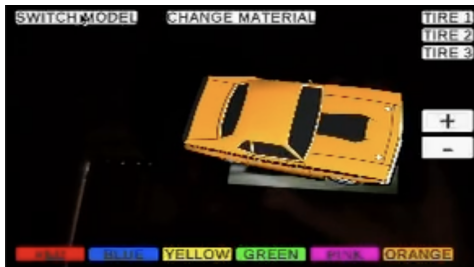Figure 1. Change Tires

Figure 2. Change Automobile Material

Figure 3. Change Automobile Model

Figure 4. Change Automobile Color

3. Implementation

Steps to Build AR Automobile Customizer: 1. Create AR Project in Unity. Set target device IOS/Android and add open scene. 2. Download Vuforia Engine package online and import it as a custom package to Unity. 3. Retrieve and import automobile prefabs from the Unity Asset Store, which offers a diverse collection of commercial and free assets. 4. Generate a Vuforia Engine license key in the Unity account. This liscence key must be added in the AR camera created using Vuforia engine in Unity under the open edit configuration tab. 5. Set the app orientation to landscape left, and ensure the iOS version is set to 12.0 and above. 6. Generate a target to display the automobile in the AR space using Vuforia engine, then import it into the application. Add automobile prefabs as children of the target. 7. Design buttons for customization options and place them around the screen for user interaction during runtime. 8. Develop a script to continuously rotate the automobile asset, ensuring visibility from all angles. Set rotation speed

and axis accordingly. 9. Create scripts to customize parts of the automobile prefabs based on colors, stickers, tires, etc, switch amongst the automobiles, and scale the automobile. 10. Implement script functions for asset parts and buttons in Unity using empty game objects for application settings.

AR application is ready for use. Click on play and interact with it.

4. Discussion

Insights: The integration of AR into automobile customization demonstrates the industry's commitment to adopting contemporary technologies for enhanced user experiences. AR applications, such as car customizers, contribute to increased user engagement by providing interactive and immersive experiences, allowing customers to visualize and personalize their vehicles. The development of AR car customization tools by various entities, from individual developers to major automotive companies, indicates a perceived market demand for such interactive and visually appealing experiences.

Limitations: AR applications may be limited by the devices they support, and not all users may have access to compatible hardware, potentially restricting the widespread adoption of such systems. Users may need time to adapt to AR interfaces and controls, potentially affecting the ease of use and overall user satisfaction. External factors such as light play a vital role in making sure that the image target is visible. The application depends on the visibility of this target.

Future Work: Creation of more image target to work with a larger variety of automobiles. Extend technology to assets with numerous exterior and interior parts which can be modified for aestheticity of vehicular design.

References

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