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Augmented Reality in E-Commerce

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Abstract: *The current e-commerce technology cannot help the user or the customer to visualize their product. The Augmented Reality technology might improve the performance of E-commerce by placing the virtual information of products on the real world. The primary objective is to create 'Real World' augmented reality application for Three dimensional data. The paper proposes an Android application for the voice controlled Car showroom which projects a full size vehicle in the real world and a watch using which we will be able to try realistic virtual watch models on our wrist. A common trend with AR courses is to demonstrate the technology by creating simple mini apps, projecting a 3D model on a surface in front of the user, this is usually done with an image target or possibly a ground plane. Although this is 'cool' it doesn't capitalize on the marketing power AR offers. We break this trend by creating beautiful apps fit for commercial demonstration to potential customers!*

Keywords: *Augmented reality, unity, vuforia, virtual reality, AI*

I. INTRODUCTION

Augmented Reality in E-commerce allows customers to preview products or experience services in their normal lives before buying. Using augmented reality customers can preview products and be more likely to pick the right choice in the very first attempt. It is most likely to save time of both Customers as well as sales person. In simple words, Augmented Reality means to augment or enhance the real world or our perception of the real world. This means adding or superimposing a layer of virtual information or objects over what we see with our naked eye.

Online shopping should be convenient. However, customers face a lot of potential challenges when they go down this route. Perhaps their most important challenge is determining whether a or superimposing a layer of virtual information or objects over what we see with our naked eye. Online shopping should be convenient. However, customers face a lot of potential challenges when they go down this route. Perhaps their most important challenge is determining whether a product makes a good fit into their lives. After all, pictures on a screen can be deceiving.

When there isn't enough information available, consumers won't have the confidence to make a purchase. E-commerce merchants can use AR to address this problem. In this project we are trying to address the very same problem by creating a android application that could provide ease in purchasing products like car, watch using AR. Using AR, brands can create in-depth customer experiences. Also the role of Artificial Intelligence becomes more impact when combined with AR and VR to deliver personalized customer experiences. In the presence of AI technology, virtual environment becomes more intelligent and personal and customers in making informed purchasing decisions. E-commerce marketers can take off with AI-driven salespersons that understand the needs and preferences of customers and shows relevant suggestions.

II. LITERATURE REVIEW

Due to increase in Shopping and Booking Online. The software companies tried adding more comforts to the users. As there are images and the detail information of the product on their site or apps of E-Shopping company.

The unsatisfied products reaching the customers have led to returning of product back to the company, due to lack of idea and imagination of the product .Through a couple of years Augmented Reality has come to the screen and software company have been trying to implement E-Commerce with Augmented Reality. Regarding AR applications, specifically in the automotive context, the former presented an in-depth discussion focusing on user interaction and display concepts, the latter put more emphasis on the design of the in-vehicle electric/electronic (E/E) architecture. In 2005, Regenbrecht presented a review of ten different industrial AR projects; among them was an AR training system for driver safety programs . Here, a number of dangerous driving scenarios that could not be easily exhibited in the real world were virtually presented on head-mounted displays (HMDs) with see-through capabilities.

III. METHODOLOGY

A. Software Used

- 1) *Unity Engine*: The engine can be used to create three-dimensional, two-dimensional, virtual reality, and augmented reality games, as well as simulations and other experiences.
- 2) *Vuforia*: Vuforia is an augmented reality software development kit (SDK) for mobile devices that enables the creation of augmented reality applications.
- 3) *Visual Code*: Visual Studio Code is a source code editor developed by Microsoft for Windows, Linux and macOS.
- 4) *Online ChatBot*: Chatbot makes it easy for developers to build applications and devices that you can talk or text to.
- 5) *Google AR Core*: ARCore is a software development kit developed by Google that allows for augmented reality applications to be built.

B. Working(AR CAR)

Creating a vehicle showcase app. Projecting a full-size vehicle in the real world. Then using voice commands, open the car doors, change the colors etc. Even view a car promotional video on an augmented reality video screen placed on the dashboard of the car. We have created 3 scenes for AR Car application. They are Intro, Indoor, Outdoor scenes respectively.

1) Intro Scene



Fig 3.1 UI of the application

Intro scene is the User Interface of our application where user can toggle through various cars and select the car which user want to project it in real world.

2) Indoor and Outdoor Scenes

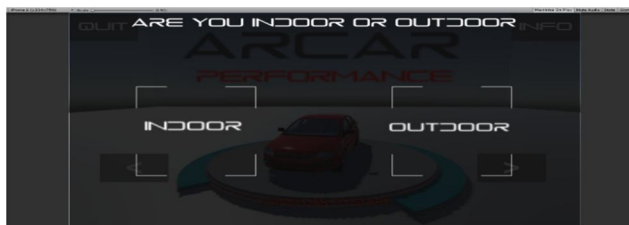


Fig 3.2 Interface for Indoor Outdoor scenes

Here user can select wherever he/she want to project the car. In indoor scene user needs to define a target to project the car (User Defined Target) whereas in outdoor scene the application will find the ground plane for user by using Google's AR Core technology.

Indoor scene is used when user is inside the house where he/she needs to specify a user defined target like mouse pad, book, dining table etc. to project a car on it. User-defined targets are Image Targets that are created at runtime from camera frames selected by the user. They share most of the capabilities of a standard Image Target with the exception that they do not support Virtual Buttons.

Outdoor scene is used when user is outside of his/her house. For example, when he/she is on ground. So the app will detect the ground by itself and project the car on it. ARCore uses three key technologies to integrate virtual content with the real world as seen through your phone's camera.^[2]

Six degrees of freedom allows the phone to understand and track its position relative to the world.

Environmental understanding allows the phone to detect the size and location of flat horizontal surfaces like the ground or a coffee table.

Light estimation allows the phone to estimate the environment's current lighting conditions.

AR Core has been integrated into a multitude of phone manufacturers. It supports Android 7.0 and later platforms.

a) *Car Projected Indoor's By User Defined Target*

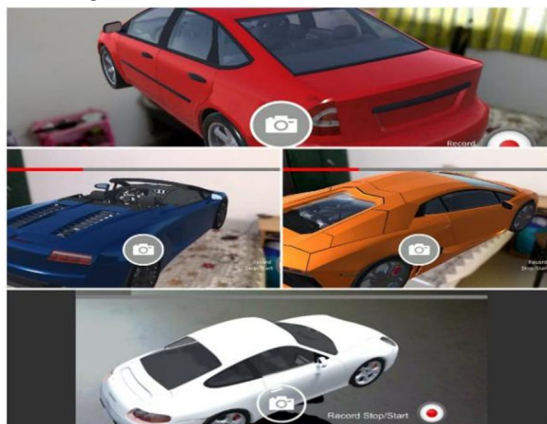


Fig 3.3 Car models included in this model

b) *Car Projected Outdoor By Ground Plane Technology*

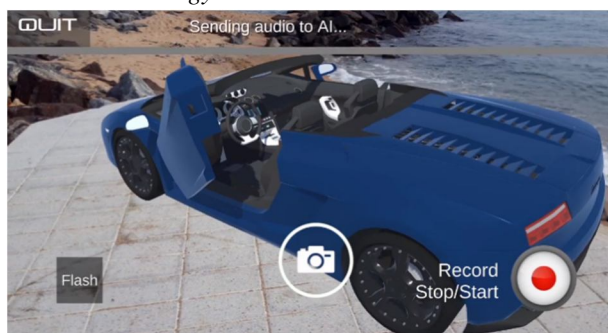


Fig 3.4 AR Car

We have fused 3 powerful technologies to create a simplified approach to connect a voice controlled Augmented Reality application to an online AI brain using Unity. The app, record user's voice in unity and automatically send the voice command through to an online AI which we train along the way. The AI learns and processes user's voice request, returning commands to the code in Unity. Using the response, app then manipulate the scene. The additional benefit of this is that we send and receive information from an app to a website API. Opening doors for other development projects where information would need saving online or retrieving. As it is a voice controlled, the app needs to convert user's voice into a text. This is done by an online speech to text bot which sends back text in the form of Json files.

The bot currently understands English, French, German, Italian, Dutch, Spanish, Polish, Swedish, Portuguese, Estonian and Russian. Over the coming months 39 new languages are coming out of beta :
 | Albanian | Croatian | Icelandic | Persian | Turkish | Arabic | Czech | Indonesian | Romanian | Ukrainian | Azerbaijani | Danish | Japanese | Serbian | Vietnamese | Bengali | Finnish | Korean | Slovak | Bosnian | Georgian | Latin | Slovenian | Bulgarian | Greek | Lithuanian | Swahili | Burmese | Hebrew | Macedonian | Tagalog | Catalan | Hindi | Malay | Tamil | Chinese | Hungarian | Norwegian | Thai |

We have created 5 entities for the bot to train. While training the bot each entity have specific user defined objects.

- Open (Entity)
- Drivers door.
- Windows.
- Trunk.
- Bonnet

- Close (Entity)

-Drivers door.

-Windows.

-Trunk.

-Bonnet

- Start (Entity)

-Engine.

-Video.

- Stop (Entity)

-Engine.

-Video.

- Color (Entity)

-Red.

-Black.

-Blue.

-Green.

-Magenta.

-White.

-Yellow.

-Grey.

Each entity is trained online several times to get perfect accuracy while converting speech into text.

3) *Script:* There are several scripts written in C# which performs the backend operation of the application. Some of the scripts are:

1) *Car Selection:* This script handles the code to toggle between the cars.

2) *Saw Wav:* This script handles the sawtooth and square waves which are among the most common waveforms used to create sounds.

3) *Wit3D:* This script handles the audio recording of the user and further sends the audio to wit.ai which converts the speech to text and sends back Jason files.

4) *Car Controller:* This script handles all sound related function such as play sound, stop sound, kill sound and reset sound.

5) *Handle:* This script handles all voice-controlled specifications of car. The text returned from Wit3D script is configured and user's demand for specific function is resolved. If user passes the audio "Please open the driver's door" to the bot it will return the text and the operation to open drivers door is performed.

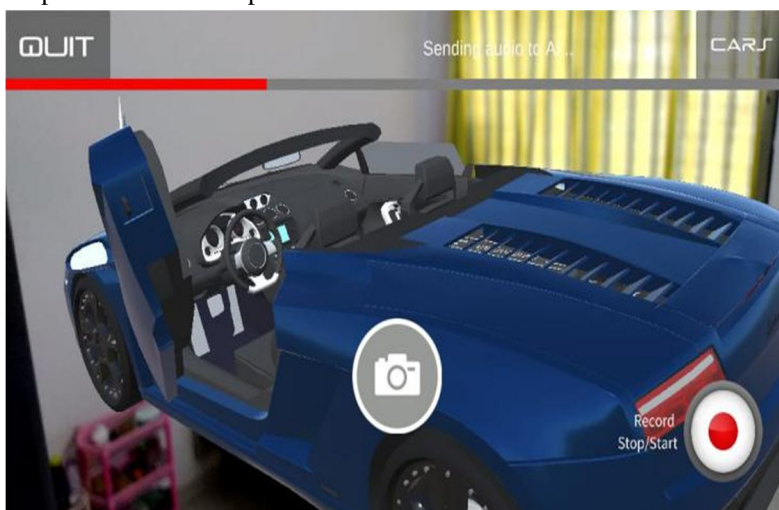


Fig 3.5. Driver Door opens

If users says "Open the engine", the bot will again convert the audio to text and the operation of displaying the engine is performed.



Fig 3.6 Display engine

In the above figure, engine of the car is popped out. Similarly the operations of “Close” entity are executed. As this a car showroom application, user needs to see advertisement videos related to a specific car. Hence when the user says “Start the video” the video relating to the cars will start playing in the background of the car.

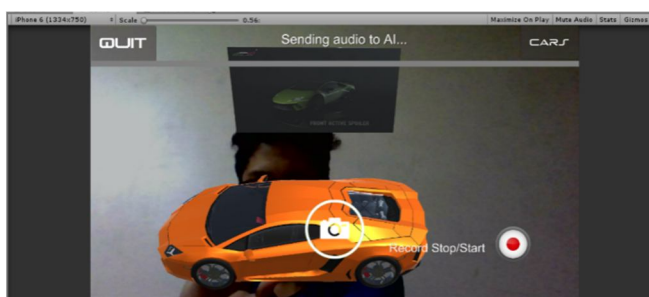


Fig 3.7 Video Screening of the car model

Similarly when user says “Start the engine”, the sound track of engine of current projected car will start and like that if user says “Open the windows”, all windows of the car will get opened. All this functions are handled by the script.

-Algorithm for handle Script

Create a boolean variable ‘actionFound’ and initialize it to false.

Create a 2D array ‘itemOptions’ of Boolean datatype to store available features of all cars.

Check if jsonString is not null and then create a JSONObject ‘theAction’ and populate it with jsonString.

Check if ‘open’ entity in ‘theAction’ is not null and loop through all values of ‘open’ entity.

Debug the log value of ‘open’ entity in a variable ‘aPart’.

If theAction._text.Contains ‘open’, switch to aPart.value and check if user’s demand is available in ‘itemOptions’ and return.

If returned value is true then trigger the animation and display the message.

Set the value of ‘actionFound’ to true.

Repeat the steps for various car operations.

- 6) *Color Switcher*: This script handles the operation of changing the colors of the car. An app also allows user to change the color of the car to his/her choice. Just he/she needs to say “Change the color to black” or any color they want.

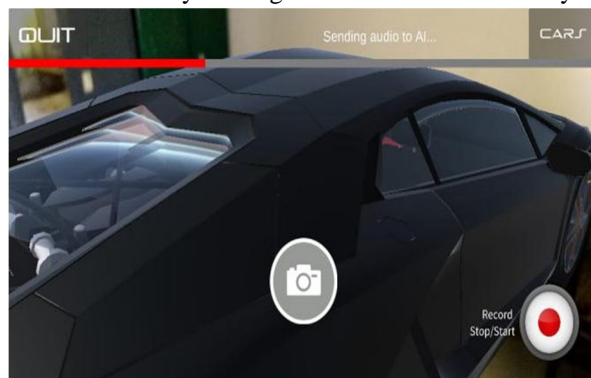


Fig 3.8 Black car model

C. Working (AR WATCH)

1) Watch Model Select

- a) Create and Initialize 3 variables for 3 watch models, 3 variables for each watch window each of type 'GameObjects' and 3 variables for window animation of type 'Animation'.
- b) Assign/Store values in them in Unity by dragging the respective object from hierarchy to the respective variable blank space in inspector window. Also assign animation variables values to animation component in unity.
- c) Create 3 functions WatchButtonClicked() for each watch model to operate after the watch buttons are clicked. (When this button is clicked two things will happen
-watch will appear on user's wrist
-animate watch window)
- d) In these functions,
-Make a particular watch model activate and simultaneously make other two watch models inactive
-Call window animation of the particular watch by setting a constant speed.
- e) Create a function Close() to go back to previous stage from WatchButtonClicked() function.
- f) In this function, again call the animation function by setting the speed negative.

2) Band Colour Change

- a) Create and Initialize 3 variables for each watch band material of type 'Material'.
 - b) Assign/Store values in them in Unity by dragging the respective material object from hierarchy to the respective variable blank space in inspector window.
 - c) Create 3 functions WatchColourSelect() for each watch model.
 - d) In these functions, set the desired colour to the bands by entering the color code of the respective colour.
- 3) After opening the android application in the smartphone there will be three models of virtual watches located at the right side of the screen.



Fig 3.9 Band

- 4) At the very right side of the application there are three icons (i.e. Three watch models).
- 5) User may click on any one of the virtual watch models. The screen containing information of watch (like watch price, available band colors of that particular watch) will get displayed.



Fig 3.10 AR Watch

- 6) In the above image you can see that the watch on which the user has clicked is displayed and the information about that particular watch is displayed.
- 7) User should wear the band in the wrist which will give the user exact position where he/she wants the watch to be projected. Since the watch cannot be placed anywhere else except wrist, therefore wearing the band will take the user to the exact position where the watch should be placed. Then place the mobile camera pointing to the wrist of the user on which he/she have worn the particular band.

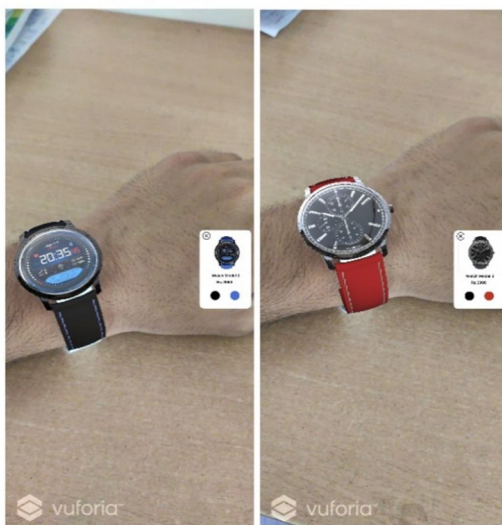


Fig 3.11 Changing colour of the band

- 8) In the above image there is a watch present at the exact position where the user can see the watch when projected on the wrist.
- 9) If the user wants the color of the watch band to be changed then there are options for changing the colors of the band.
- 10) After trying one watch model there is an option of closing the window of particular watch model at top left side of the watch information window.
- 11) Desired watch model can be tried by clicking on that particular Widget.
- 12) Script: Some of the scripts written in C# for this application are:
 - a) *Watch Select*: This script handles the buttons such as changing watch models, opening particular watch model information window and closing that window.
 - b) *Color Select*: This script handles the band color changing buttons which are present in the model information window.

IV. RESULT

The table given below tells about the features which are available for each vehicle when an audio request is sent to the bot.

	LamboConvert	Lamborghini	Porsche	Tocus
Door	True	True	False	True
Start/ Stop Engine	True	True	True	True
Color	True	True	True	True
Windows	True	True	False	True
Show Engine	True	True	True	True
Video	True	True	False	True
Bonnet	True	True	True	True
Hood	True	True	True	True
Trunk	True	True	False	True

The table given below shows the information about watch.

Watch Model	Watch Model 1	Watch Model 2	Watch Model 3
Type of Watch	Digital Watch	Analog Watch	Analog Watch
Band Material	Rubber Band	Rubber Band	Still Band
Available Colors of Band	Blue & Black	Black & Red	Black & White
Price	Rs.2999	Rs.3999	Rs.5999

V. CONCLUSION AND DISCUSSIONS

- A. Instead of going to shops, showrooms etc., a person can get the real-world experience by just sitting in his/her room through augmented reality.
- B. Customer can view the product in 3D and can justify how it fits for their convenient use.
- C. By creating an app of AR Car the user can see if that car fits in his/her parking space just by projecting it, instead of taking a test drive to bring that in his/her house. User can also try different voice controlled features to get real world experience of the car
- D. By creating an app of AR Watch the user can project different watches on his/her wrist and can select the one which suits him/her.
- E. As a student, business owner, developer, marketing executive or IT professional, it's vital to stand out from the crowd and boost the sales of a particular product using augmented reality to maximize the profit.

In this paper, we mainly focus on AR in marketing of wrist watch and cars.

VI. FUTURE SCOPE

Majority of customers say augmented reality would improve their shopping experience. Customers will prefer to use augmented reality features to preview their product variations such as color or style differences and select products which best suits them. Augmented reality features save the time to make their decisions on Products. The customer or user who've experienced augmented reality will prefer augmented reality application over video content or images of product. The E-Commerce usage will expand and returning policy will fade out slowly by augmented reality in E-commerce.

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