Interior Décor using Augmented Reality

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Abstract: *Augmented reality helps us to visualize computer-generated content in our physical space. Often, when you buy furniture or any other decorative item, you regret that purchase as it did not suit your home space. The inability to place that object in your home space before buying it, probably due to the size of the furniture or some other reasons renders this problem. Augmented reality can help to solve this problem. Using AR one can view 3d models of furniture in their home or office environments and purchase them accordingly. This can help businesses to reduce the return rate, and increase order and cart conversion rates of the products thereby improving customer experience and benefiting the retailers.*

Keywords: Web-based AR, Markerless AR, Model viewer web component, WebXR Device API.

I. INTRODUCTION

Augmented reality is a technology that helps to visualize computer-generated content in the physical world. Based on the use of predefined markers such as images or QR codes to overlay digital contents on them, we can classify AR into two types: marker-based and Markerless. Markerless AR uses a gyroscope, accelerometer, compass, and other sensors present in the user's mobile to orient itself in order to overlay the 3d models. In this project, web-based Markerless AR is used to place digital models of furniture and other decorative items in the home space. This project is implemented using Google's model viewer web component which makes use of WebXR device API and Three JS library. WebXR device API is used to implement AR, Virtual Reality, and mixed reality experiences through web browsers. In order to view AR and VR content mobile devices must have AR Core or ARKit Software development kit. AR Coreor Google Services for AR is used to sense the environment, understand the world, and interact with information. Three js is a JavaScript library that helps to create and display 3d models in web browsers using WebGL (Web Graphics Library). Our web app is hosted on Google Cloud through Firebase.

Being able to visualize furniture in a home space before purchasing it certainly assists customers in their decision-making. Trying it before purchasing may also help to reduce the return rate of products. It may also help to increase the cart conversion rate. Cart conversion rate refers to the percentage of customers buying online who add a product to their cart and complete the purchase. It may also help toincrease the order conversion rate. Order conversion rate is the percentage of customers who buy a product regardless of the fact they added or did not add it to the cart. The above three are Key Performance Indicators of online stores that may be significantly affected the by use of AR in a positive sense.

Fig. 1. Visualizing a chair in a room

II. LITERATURE SURVEY

Shopify is a Canadian-based e-commerce company. It started the use of 3d features in 2018 in order to visualize the objects. The incorporation of 3d visualization leads to a significant improvement in the Key Performance Indicators.

- Customers were 44% more likely to add an item to their cart after interacting with the 3d model.
- Customers were 27% more likely to purchase an item after interacting with a 3d model.
- Customers were 65% more likely to purchase a product after interacting with it in AR.
- So, one can see how effective the use of AR in e-commerce can be. For large items like dog kennels, Shopify saw:
- 3% increase in cart conversion rate
- 40% increase in order conversion rate
- 5% reduction in return rate[5]

Ikea, a leading furniture giant started using AR in 2017 for iPhone users. This helped Ikea to reduce the returns rate by up to 30% which is quite remarkable. It helped build customer retention, customer decision-making, and confidence in purchases. Forbes also reported that using AR convinces up to 200% of customers to buy more items once they have tested it in AR. [7]

EQ3, a Canadian furniture retailer introduced the WebAR feature in its web app which resulted in a 112% higher conversion rate and an overall 429% increase in customers. Also, recently in 2021,Flipkart started a 'View in your room' feature to enable users to view their products in AR. [6]

III. METHODOLOGY

3.1 Model Viewer

It is a web component provided by Google for rendering 3d models through web browsers and for viewing them in immersive AR sessions. It mainly uses WebXR device API for creating the immersive AR session and three js for rendering the 3d models.[3]

3.2 WEBXR

WebXR device API is used to implement AR, Virtual Reality, and Mixed Reality experiences through web browsers in AR-supported mobile devices and headsets. In this project, we are mainly focusing on Mobile devices and not headsets. WebXR does not work on devices not having AR Core installed in them.[2]

Fig. 1. WebXR logo

3.3 THREE JS

Three js is a JavaScript library that helps to create and display 3d models in web browsers using WebGL (Web Graphics Library).
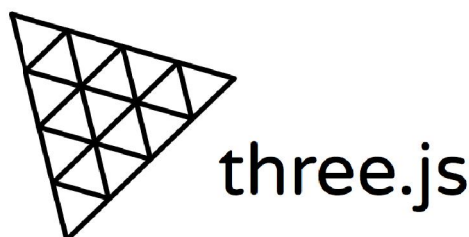

Fig. 3. Three Js logo

3.4 Firebase

In the backend, we are using Firebase which is a backend cloud computing service that uses google cloud. It provides services like hosting, authentication, database, etc.

Fig. 4. Firebase logo

IV. WORKING

First, the user is directed to a sign-in page. On clicking on the sign-in button he is directed to an authentication page where he can choose a Google account to sign up. Once authentication is completed the home page of the website is opened. From the dropdown, one can select from different types of models e.g., chairs, tables, flooring, etc. Based on the type selected, the page will show different models that the user can try.

Once the AR button on the bottom right corner of the model card is clicked it asks for permissions, after which Webxr checks if the mobile support AR services or not. If AR services are not available yet the user can interact with the 3D model but not in AR. Else an immersive AR session is started. Hit testing is performed to detect the plane surfaces and then the 3d models are overlayed on the anchor.

Now the user can rotate, scale, and translate the 3D model as he wants in the home space. In order to end the session, he can click on the close button in the top right corner.
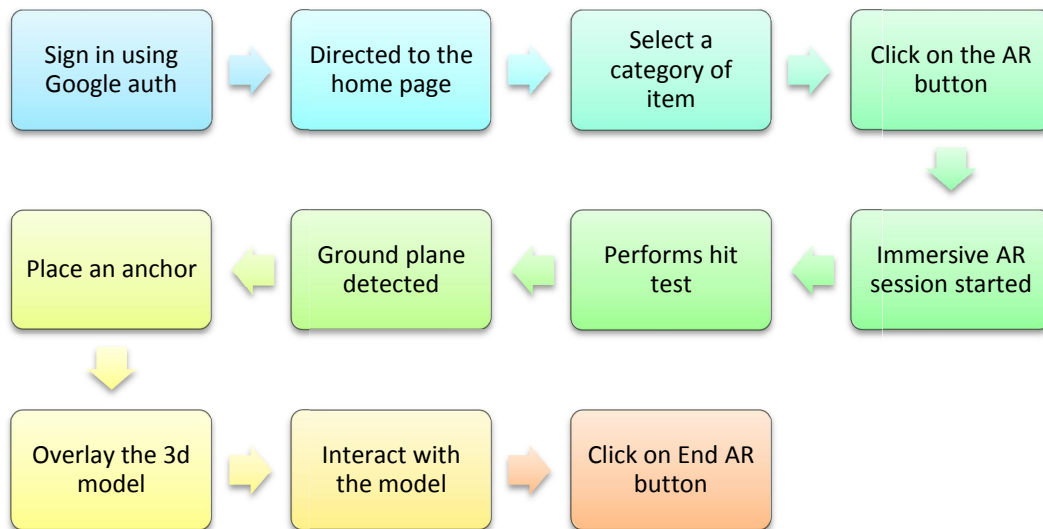
Fig. 5. Workflow of the web app

V. RESULTS

Working model of our project can authenticate a user using Firebase. Users can select from a variety of interior furnishing products like chairs, tables, flooring, plants, sofa, etc. Users can even interact with the 3d models before an immersive AR session. It can start an immersive AR session and perform hit testing to detect the ground plane. Then it places an anchor on the plane to overlay the product model. Thus, users can view the product in his/her home space. He/she can interact with it by rotating to view it at different angles, scaling it in case of some miscalculations inplane detection, and translating it anywhere in the room.
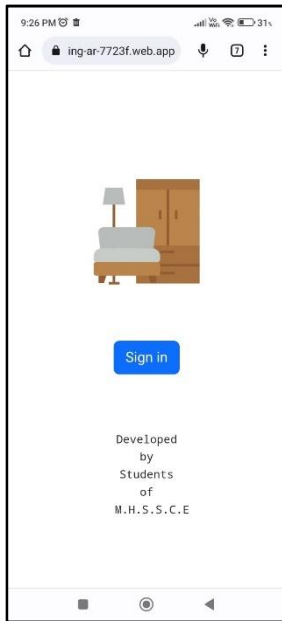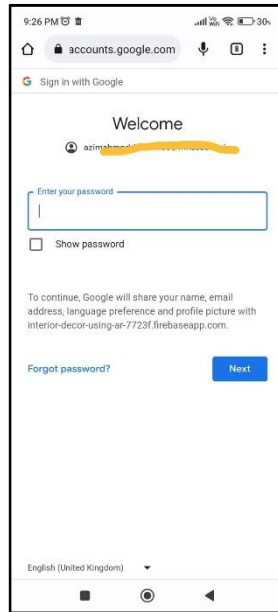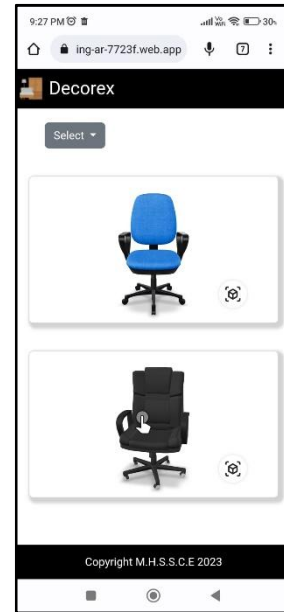
Fig. 6. Sign-in page

Fig. 7. Google Authentication

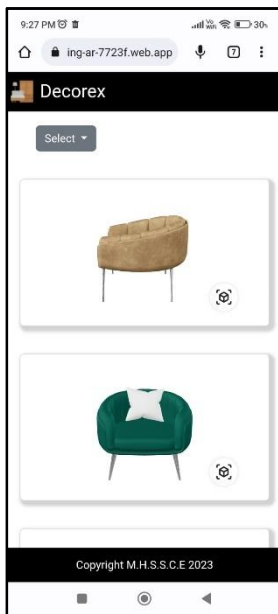Fig. 8. Home page

Fig. 9. Sofas

Fig. 10. Select from the dropdown menu
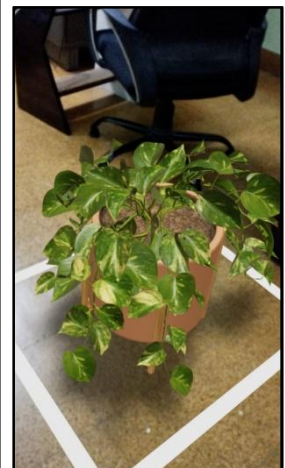

Fig. 11. Visualizing a sofa

Fig.12. Visualizing a plant

VI. CONCLUSION

Using Augmented reality for visualizing interior furnishing products is quite effective as it helps customers to build their decision-making and purchasing confidence. It also helps retail businesses to reduce their returns rate and improve their order conversion rate and cart conversion rate thus improving the Key Performance Indicators. E-commerce sites that incorporated AR feature not only improved their KPI but also increased the number of customers and customer retention rate. It is because AR engages customers more effectively.

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