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AUGMENTED REALITY FURNITURE WEB APPLICATION

Avdhut Madan[1] , Krishna Kapse[2] , Omkar Chavan[3] , Arti M Devmane[4]
[1]Department of Information Technology, SSJCOE, India
[2]Department of Information Technology, SSJCOE, India
[3]Department of Information Technology, SSJCOE, India
[4]Department of Information Technology, SSJCOE, India

Abstract : The project introduces an innovative Augmented Reality (AR) furniture application developed using Web. The app aims to provide users with an immersive and interactive experience while shopping for furniture by leveraging AR technology. It integrates real-time camera feed and 3D furniture models, enabling users to visualize how furniture items will look in their homes before making a purchase decision. The Web app utilizes the WebXR framework for seamless integration of realistic 3D models into the user's physical environment, enhancing their shopping experience. The design and implementation of an interactive mobile Augmented Reality (AR) application aimed at enhancing the furniture shopping experience. The main objective is to improve user engagement by enabling interaction with both physical and virtual environments simultaneously. The application allows users to view furniture in AR within their homes before making a purchase, choose furniture remotely via phone, and customize aspects like color and size. By leveraging state-of-the-art AR technology, this application revolutionizes traditional furniture shopping, offering a more immersive and convenient experience for customers and potentially transforming how businesses engage with their clientele [2]. Exploring the potential impact of AR on the retail sector, the research underscores the necessity for a more efficient and convenient customer experience in response to shifting consumer behavior. It positions the application, named "Furnished," as an ideal solution, leveraging AR to streamline the furniture purchasing process and meet the expectations of modern consumers. Moreover, it outlines plans for expanding the project dataset and scope, indicating a commitment to ongoing development and enhancement to address evolving consumer needs [1].

Index Terms **:- Augmented Reality (AR), Unity3D, Furniture Shopping, Real-time Visualization, Online Retail Innovation**

I. INTRODUCTION:

Augmented reality (AR) has emerged as a transformative immersive experience in the 21st century, revolutionizing sectors such as healthcare, education, tourism, and manufacturing. Its widespread adoption has been accelerated by significant market growth, with projections indicating a staggering rise from USD 27.6 billion in 2021 to an estimated USD 856.2 billion by 2031. Major corporations like Amazon leverage AR to enhance customer experiences, particularly in sectors like online retail. Advances in mobile technology have further propelled AR's popularity, with smartphones now capable of running sophisticated AR applications seamlessly [8].

1.1 Key Features:

1. Real-time Visualization: Users can see furniture items in real-time through their device's camera, allowing them to place virtual furniture in their physical space.
2. Interactive 3D Models: Furniture items are represented as interactive 3D models, enabling users to rotate, resize, and move them for a perfect fit in their rooms.
3. Accurate Measurements: The app should allow users to measure the available space and ensure that the selected furniture fits perfectly in their room.
4. AR Navigation: Implement intuitive AR navigation to help users easily place, move, and remove furniture items in their environment.
5. WebAR Integration: Leveraging WebAR technology, users can experience augmented reality directly from their web browsers, eliminating the need for additional apps or downloads.

1.2 Objectives:

1. Enhanced User Experience: Improve the way users interact with furniture products by allowing them to virtually place items in their homes using AR technology. This enhances user engagement and satisfaction.
2. Increased Sales and Conversions: AR apps enable customers to visualize furniture in their homes, helping them make more informed purchasing decisions. This can lead to increased sales and higher conversion rates as customers gain confidence in their choices.

3. Reduced Returns: By allowing users to see how furniture fits in their space before buying, you can potentially reduce the number of returns due to size or style mismatch, saving both customers and your business time and money.
4. Brand Differentiation: A well-designed AR furniture app can set your brand apart from competitors, showcasing your products in an innovative and immersive way.
5. Education and Engagement: Use AR technology to educate users about your products, their features, and benefits. Interactive 3D models and animations can engage users and provide a memorable shopping experience.
6. Partnerships and Collaborations: Explore partnerships with furniture manufacturers, interior designers, or home decor brands to expand your app's offerings and provide a comprehensive solution for users.

II. LITERATURE REVIEW :

2.1 Literature Review:

Pooja S, Praveen B, Raghul Prasath S, Krishnnammal M proposed the development of an "Furniture Try On Application Using Augmented Reality" to enable virtual furniture visualization in home environments, leveraging markerless AR technology and 3D models, with potential future expansion to other applications [3].

Snehal Mangale, Nabil Phansopkar, Safwaan Mujawar, Neeraj Singh proposed the development of a virtual furniture application using augmented reality, enabling users to preview furniture in their home environment before purchase. The application aims to enhance furniture shopping efficiency and accessibility [4].

Chirag Sanas, Omkar Yadav, Sakshi Patil, Charvi Mhadgut, Sarin Deore proposed paper on Augmented Reality (AR) Furniture explores the use of AR technology to visualize and interact with furniture in a virtual environment. It aims to help users preview and customize furniture in their living spaces before making a purchase. The paper discusses the development of AR software and 3D models for this purpose [5].

Zhao Du, Jun Liu, and Tianjiao Wang proposed augmented reality (AR) marketing, examining publication characteristics, research designs, and application areas. It reveals a surge in AR marketing research, predominant use of quantitative methods, and major application areas in retail, tourism, and advertising, highlighting future research directions. Tailored product experiences lead to a sense of ownership and connection with the products[6].

III. METHODOLOGY:

3.1 System Architecture

Creating an augmented reality (AR) furniture app using Web Techgnology involves several key components in its system architecture as follows:

1. User Interface (UI): Allows users to navigate and access various features of the app. Displays furniture items available for AR visualization. Provides the AR environment for users to place and interact with furniture items. Allows users to review their selected items before making a purchase.
2. WebXR: WebXR is an API standard that facilitates immersive experiences, including augmented reality (AR) and virtual reality (VR), within web browsers. It enables developers to create interactive, cross-platform XR content accessible directly through compatible web browsers..
3. Backend Services: Firebase is solely used for hosting the backend of our AR furniture web app. It provides scalable, reliable hosting services, ensuring efficient delivery of content to users while allowing for real-time updates and seamless performance optimization.
4. Authentication and User Management: Implements secure login and registration processes to manage user accounts.
5. Augmented Reality Interaction: Incorporates gesture recognition for user interactions, allowing users to rotate, resize, and place furniture items in the AR environment. Utilizes WebXR for realistic interactions between virtual furniture and the real world, ensuring objects respond naturally to user interactions.
6. Device Compatibility: Platform Optimization: Ensures the Web app is optimized for various Android and iOS devices, considering differences in screen sizes, resolutions, and performance capabilities.

System Architecture Diagram:

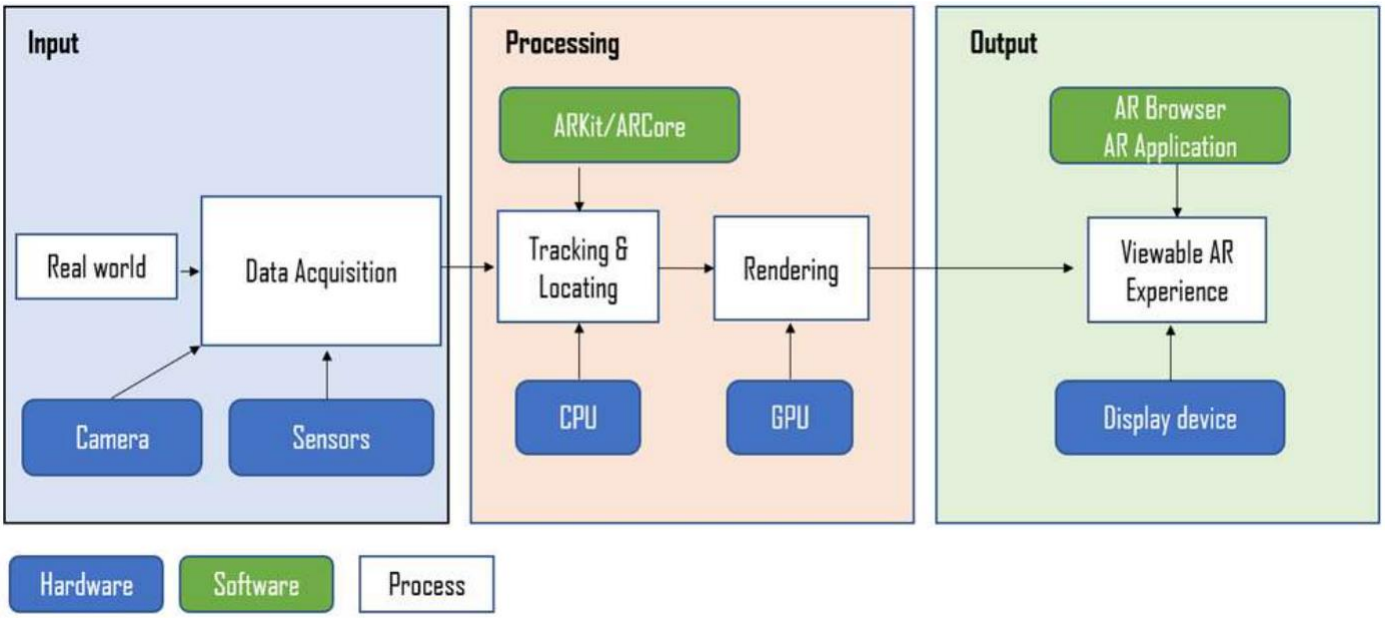

Figure 3.1: System Architecture
Illustration of the system architecture of the AR furniture app, depicting the interaction between different components.

3.2 System Specifications

2.3.1 Hardware specification:

- CPU: Dual-core processor or higher.
- GPU: Adreno 540 or higher for Android devices, Apple A9 or higher for iOS devices.
- RAM: 2GB or higher.
- Storage: At least 16GB of available storage space.

2.3.2 Software specification:

- For desktop/laptop computers: Windows 10, macOS, or Linux.
- For mobile devices: iOS 11 or later for iPhones and iPads, Android 7.0 (Nougat) or later for Android smartphones and tablets. 3.IDE: VS Code
- Database: Firebase
- Mobile: Android or iOS mobile
- Language: HTML, CSS, JavaScript

Use-Case Diagram:

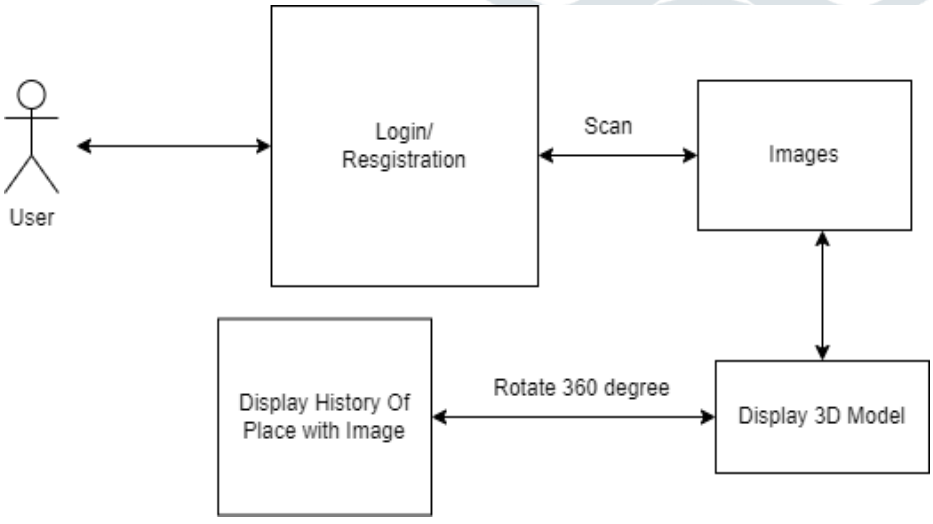

Figure 3.2: Use-Case Diagram
Illustration of the Use-Case Diagram of the AR furniture app, depicting the interaction between different components

IV. RESULTS:

Users are likely to spend more time interacting with the Web app due to its immersive 3D and AR experiences, leading to higher engagement metrics such as session duration and page views. The ability to visualize furniture items in 3D and AR helps users make more informed purchasing decisions, leading to greater satisfaction and confidence in their choices.

The interactive and personalized nature of the app may result in higher conversion rates, as users are more likely to proceed to purchase after experiencing the furniture items in AR and customizing them to their preferences. Users may provide positive feedback on the app's usability, design, and functionality, contributing to its reputation and encouraging others to use it. The success of the AR-based furniture web app may lead to increased brand awareness, customer loyalty, and ultimately, business growth as more users engage with and purchase furniture through the platform.

4.1 Login Page:

Open web browser and enter our website link ‘https://furniture-ar-d88eb.web.app/’. The login page will appear. User should click on ‘Sign in’ button to sign in. After that google authentication page will appear. The user should use there google account to sign in.

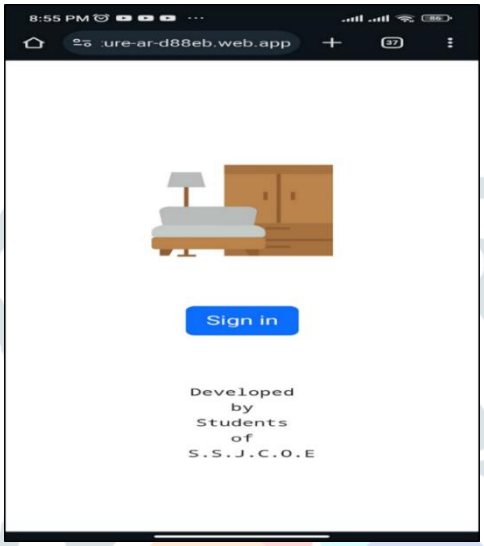

Figure 4.1. Login Page
Illustration of the Login Page of the AR furniture Web app

4.2 Menu Page:

Select the desired furniture from the catalogue. Use the drop-down list to see different furniture options. Click on the cube button on the 3d model to see the model in the real world.

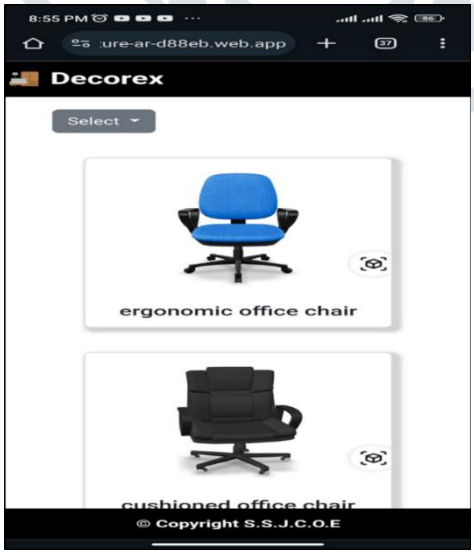

Figure 4.2 Menu Page
Illustration of the Menu Page of the AR furniture Web app

4.3 AR Model in Real World:

The camera will get open and the user will see their model in the real world. User can freely move the model and see it in real world.

Figure 4.3. AR Model in real world
Illustration of the AR Model in real world

CONCLUSION:

The development of AR furniture Web apps represents a significant leap in the evolution of the furniture retail industry. By offering users a seamless blend of virtual and real-world experiences, these apps empower customers to make informed decisions and create a more enjoyable shopping journey. Quantitatively, WebXR-powered AR furniture apps have shown promising results, with businesses reporting a reduction in return rates and an increase in customer satisfaction scores. The boost in sales and customer engagement metrics indicates the tangible benefits of integrating AR technology into the furniture retail sector. In conclusion, the development and adoption of AR furniture Web apps hold tremendous potential for both businesses and consumers. As technology continues to advance, the future of AR apps in the furniture industry is promising, offering exciting developments and endless possibilities for enhancing the retail experience.

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