

Home Decor using AR

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Abstract: *The proposal envisions tackling the predicament encountered by consumers when trying to envision home decor items within their living spaces prior to purchasing, particularly in the realm of online shopping. To surmount this challenge, the plan suggests crafting an innovative Augmented Reality (AR) solution tailored for home decor. This AR-based application aims to empower users by enabling them to virtually position, manipulate, and engage with home decor products within their domiciles, thereby offering an immersive and realistic shopping experience. Emphasizing convenience, precision, and user-friendliness, the proposed platform seeks to bridge the divide between the convenience of online shopping and the tangible experience of physically arranging decor items. Leveraging ARCore for Augmented Reality implementation and API2Cart for seamless shopping integration, the approach promises a seamless amalgamation of high-fidelity 3D models, lifelike rendering, and an intuitive interface. The project's methodology advocates for a phased development strategy, with each iteration geared towards achieving specific objectives. Ultimately, the goal is to furnish users with a dynamic and responsive environment where they can effortlessly manipulate and interact with placed furniture, facilitating well-informed decision-making. This innovative fusion of AR and mobile technology holds the potential to redefine the furniture industry, ushering in a more interactive and customer-centric shopping experience. Furthermore, the proposal contemplates future enhancements such as expanding the product catalog and implementing personalized recommendations, paving the way for continual development and refinement*

Keywords: Augmented Reality (AR), Home decor, Online shopping, Immersive experience, Customer-centric

I. INTRODUCTION

In the contemporary digital landscape, navigating the realm of home decor shopping poses a formidable challenge for consumers. The crux of this challenge lies in the difficulty of envisioning how diverse decor items will seamlessly integrate and elevate their living spaces before committing to a purchase. This lack of visualization not only fosters uncertainty but also acts as a significant deterrent for online shoppers seeking to revitalize their homes with new furniture and decor pieces. To tackle this formidable obstacle head-on, we advocate for the inception of a groundbreaking Augmented Reality (AR)-based application tailored for home decor enthusiasts. This pioneering solution holds the promise of reshaping the consumer experience, offering an innovative approach to shopping for home decor and redefining how individuals conceptualize their living spaces.

At the heart of our proposal lies the conception of an AR-driven platform designed specifically for home decor aficionados. This transformative application empowers users by granting them the ability to virtually position, manipulate, and interact with a diverse array of home decor products within the confines of their own homes. By seamlessly integrating AR technology, we aim to usher in a new era of shopping characterized by heightened realism and immersive experiences. Our ultimate goal is to seamlessly bridge the gap that exists between the convenience of online shopping and the tactile experience of physically arranging decor elements in a real-life setting.

Central to the success of our AR-based home decor platform are three fundamental tenets: convenience, precision, and user-friendliness. Convenience ensures that users can effortlessly navigate the application and access its full suite of features with ease. Precision guarantees that the virtual representations of decor items mirror their real-world counterparts as faithfully as possible, instilling confidence and trust in the shopping experience. Meanwhile, user-

friendliness ensures that individuals of all technological proficiencies can harness the power of AR to make informed and confident decisions when selecting home decor items..

II. LITERATURE SURVEY

The literature survey presents a comprehensive exploration of various Augmented Reality (AR)-based home decor systems, delving into their methodologies, advantages, and limitations. Nandita Nandakumar et al. [1] introduce an application emphasizing user flow and features, yet lacking in hands-on object manipulation. Ayman Kandil et al. [2] focus on usability, utilizing pinch gestures for resizing objects but facing challenges in color readability. Rohan Moaresa et al. [3] present a system leveraging marker-less AR and OpenGL for seamless rendering, aiming to empower users in home design despite incomplete catalogs. Khong Lin Yan [4] explores Unity and AR Core for interior design, addressing usability concerns with Lean Touch integration. Jiang Hui [5] discusses cost reduction and customization benefits of AR3D models in interior design, while Sidra Nasir et al. [6] introduce Interno, integrating marker-based and marker-less AR for dynamic 3D modeling with real-time interaction. Finally, Yashwant Singh Patel et al. [7] review environmentally friendly practices in cloud computing. Collectively, these studies contribute valuable insights into AR-based home decor systems, highlighting areas for improvement.

The objective of the application is to develop an innovative AR-based home decor system that empowers users to envision and customize their living spaces effectively. It aims to bridge the gap between online shopping and physical arrangement of decor items by providing a realistic and immersive experience. Key objectives include enhancing user experience through intuitive interfaces, incorporating seamless object manipulation, expanding furniture catalogs, and addressing usability challenges such as color readability and accuracy in placement. Through these efforts, the application seeks to revolutionize the way consumers shop for and conceptualize their living spaces, fostering creativity and ownership in home decor decision.

III. PROPOSED METHOD

In the digital era, consumers often face challenges in visualizing how home decor items will fit into their living spaces before committing to a purchase. This lack of clarity can lead to hesitation among online shoppers, hindering their willingness to invest in furniture and decor pieces. To tackle this issue head-on, our proposal suggests the development of an Augmented Reality (AR)-based home decor application. This innovative solution will empower users to virtually place and interact with a wide range of decor products within their own homes, offering them a lifelike and immersive shopping experience. Emphasizing convenience, accuracy, and user-friendliness, the AR platform aims to bridge the gap between online browsing and the tactile experience of physically shopping for decor items. With the app, users will have the ability to select, place, resize, and customize virtual furniture, lighting fixtures, wall art, and more, enabling them to make well-informed decisions about their interior design choices. Moreover, the application will facilitate seamless purchasing directly through the platform, streamlining the entire shopping process for users.

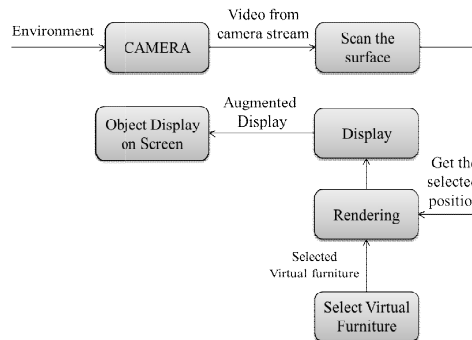


Fig. 1 System Architecture

At its core, the proposed AR-based home decor app will leverage the capabilities of mobile phone cameras that support Augmented Reality to capture real-life scenes and overlay 3D furniture models onto the screen. The framework will primarily rely on Unity 3D for user interface elements such as buttons, text areas, background images, and virtual item

selection. Utilizing Google AR Core for scene detection and tracking, the camera will generate reference points and establish projection models, ultimately superimposing the imported 3D virtual models onto the real view.

Leveraging the touch screen interface of Android smartphones, users will be able to manipulate and place furniture by simply sliding across the screen. This approach ensures a seamless and intuitive user experience, allowing consumers to effortlessly envision and arrange decor items within their living spaces.

IV. IMPLEMENTATION

The implementation of our AR-based home decor application involved several key steps and required specific materials and resources. To begin with, we outlined clear objectives for our research, aiming to explore and evaluate various aspects of home decor using AR technology. Our focus was on providing users with a realistic and immersive shopping experience while bridging the gap between online browsing and physical shopping.

For the development of the application for Android users, we utilized ARCore for augmented reality functionalities and API2Cart for cart and shopping features. Integration of AR features into our model involved coding, animations, and realistic rendering to ensure a seamless and visually appealing user experience. We prioritized the creation of an intuitive and user-friendly interface, considering how users would navigate, select, and visualize different decor elements within their living spaces.

In terms of materials required for developing the application, we utilized a computer with at least 16GB of RAM, a dedicated graphics card, and an i5 processor to handle the demanding tasks of coding and rendering. Development tools such as Android Studio and ARCore were essential for building and testing the application. Additionally, users would need a smartphone or tablet with a rear camera, running the latest Android version, and having a minimum of 6GB RAM to ensure smooth performance and compatibility with the AR features of the application. With these resources and considerations in place, we were able to successfully implement our AR-based home decor application, providing users with a transformative shopping experience right at their fingertips.

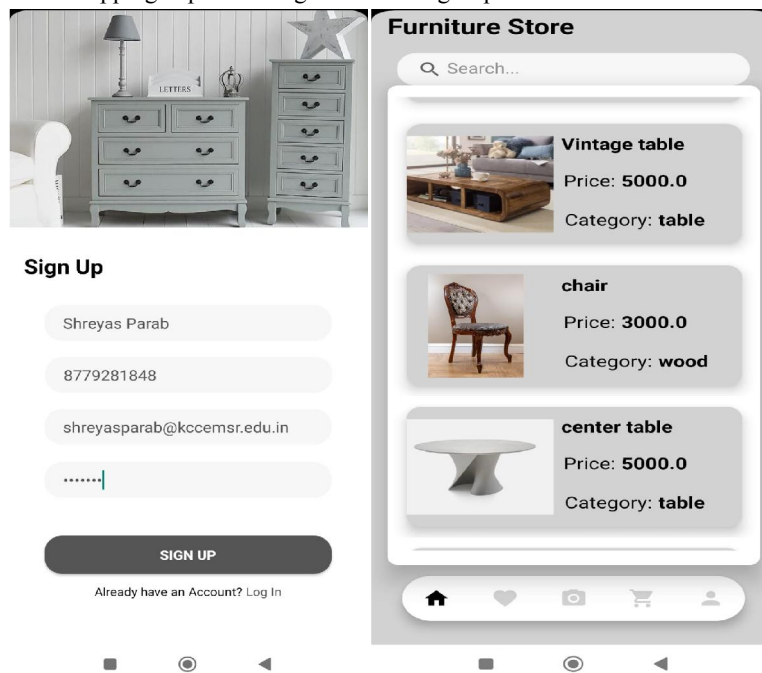


Fig. 2 Sign Up Page and Furniture store page

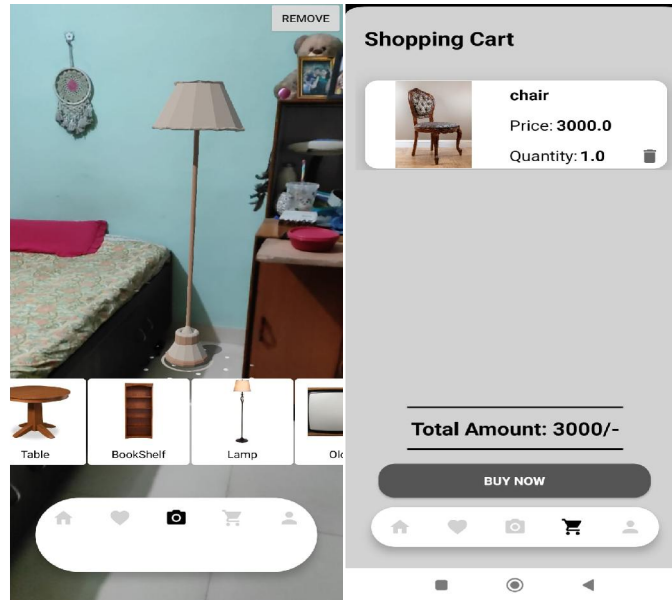


Fig. 3 Verification of virtually placed object and Shopping cart page

V. RESULT AND DISCUSSION

Following a thorough testing process covering sign-up, payment, performance, and placement accuracy, our application has shown exceptional performance. All test cases passed seamlessly, affirming the application's reliability and functionality. The sign-up process proved to be intuitive, facilitating easy account creation for users. Payments were processed securely without any glitches. Performance tests revealed consistent responsiveness, even under varying loads. Moreover, the accuracy of furniture placement using AR was commendable, providing users with a realistic and immersive experience. Overall, the successful testing outcomes underscore the application's reliability and user satisfaction.

TABLE I: TEST CASES

| ID | Test cases | Expected Output | Actual Output | Pass/Fail |
|----|--------------------------------|--|--|-----------|
| 01 | Sign in | The login to the system should be tried with correct email & password | Successfully logged in into the system | Pass |
| 02 | AR Feature Functionality Test: | -Verify that AR functionality works seamlessly across different devices and screen | -Test the accuracy of the placement and scaling in various environment and lightning condition | Pass |
| 03 | Placement Accuracy | -Test the accuracy of the placement and scaling in various environment and lightning condition | Accuracy of AR objects is also good and it gives realistic look & feel. | Pass |
| 04 | Catalog Navigation Test: | Test the navigation within the home decor catalog to ensure smooth browsing and filtering of products. | Navigation panel is working smoothly | Pass |

| | | | | |
|----|----------------------------|---|---|------|
| 05 | Performance test | Test the app on different mobile devices to ensure it can handle the processing and rendering required for AR feature without lag or crashes. | App is running smoothly without any interruption on any device with given specification | Pass |
| 06 | Checkout and Payment Test: | Test the checkout process to ensure smooth transaction flow, including adding items to the cart, entering shipping and payment details, and completing the purchase | User is able to checkout properly and billing system is working properly | Pass |

VI. CONCLUSION

Employing the rapid application development methodology, our project is structured into three distinct versions, each with its own targeted outcomes. This approach allows for efficient progress by breaking down the project into manageable phases. One of the primary reasons for adopting this methodology is its ability to facilitate future enhancements and changes. By dividing the project into versions, it becomes easier to identify where to begin and track progress effectively. Additionally, rapid application development enables flexibility for future upgrades and improvements without necessitating a complete overhaul of the system.

In System Version 1, users are empowered to manually input the corners of their rooms, generating a 2D floor plan for easier furniture placement in subsequent stages. This feature not only streamlines the process but also ensures accuracy by creating planes to prevent furniture from appearing on walls accidentally. It lays the foundation for a seamless and precise furniture placement experience.

Moving on to System Version 2, users gain the capability to select and insert furniture into the augmented reality (AR) view of their rooms. This feature grants users unparalleled flexibility as they can adjust and relocate furniture within the room to suit their preferences. By harnessing the power of AR technology, users can visualize how different furniture pieces complement their living spaces, enhancing the overall shopping experience.

Through these successive system versions, our project aims to provide users with a comprehensive and user-friendly platform for visualizing and arranging home decor items. With a focus on efficiency, accuracy, and flexibility, we are committed to delivering a solution that meets the evolving needs of our users while laying the groundwork for future enhancements and iterations.

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