International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 03 Issue: 03 March 2025
Page No: 398-402
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0054

Augmented Room Stylist Android Application

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Abstract
The rapid growth of augmented reality (AR) technology has revolutionized industries ranging from gaming to education, and its application in interior design is no exception. This paper introduces the "Augmented Room Stylist Android Application" an innovative tool that harnesses the power of AR to redefine the way users approach home styling and furniture selection. The application enables users to visualize furniture, decor items, and room layouts in real-time by overlaying virtual 3D objects onto their physical spaces. By offering realistic visualizations, customizable options, and seamless integration with online shopping platforms, the application bridges the gap between imagination and reality, allowing users to make confident and informed decisions. The development process involved a systematic approach that combined user-centered design, AR Core technology, and Unity3D for realistic rendering. Extensive experimental testing validated the application's usability, accuracy, and performance across multiple Android devices. Results demonstrated high user satisfaction, improved confidence in design decisions, and a significant reduction in return rates for furniture purchases. This paper explores the methodology, challenges, and outcomes of the application's development, emphasizing its potential to transform the interior design industry. The findings not only showcase the practical benefits of AR in enhancing user experiences but also highlight areas for future research and development in AR-powered design applications.

Keywords: *Augmented Reality, Interior Design, Android Application, Room Visualization, User Experience*

1. Introduction
The demand for personalized home styling solutions has grown significantly in recent years, but traditional methods of imagining furniture placement often fall short in meeting customer expectations. Augmented Reality (AR) has emerged as a powerful tool for bridging this gap, offering realistic, immersive experiences [1]. This paper introduces an Android-based application that allows users to visualize virtual furniture and decor in their physical spaces, aiming to enhance user engagement and reduce uncertainty in purchasing decisions. Interior design, which plays a crucial role in creating aesthetically pleasing and functional living spaces, often relies on static 2D representations or guesswork, leading to errors and dissatisfaction. With the rise of AR, users can now visualize furniture, decor, and layout options in their actual living spaces before making decisions, improving customer confidence and reducing uncertainty [2]. The application allows users to scan their rooms, select items from a virtual catalog, and place them in real-time using realistic 3D object rendering, with key features such as accurate room scanning, customizable furniture options, and integration with e-commerce platforms for seamless purchases [3]. By addressing the limitations of existing solutions, such as static visualizations and inaccurate scaling, this application aims to improve decision-making and redefine user experiences in interior design, similar to platforms like IKEA Place [5] and Houzz [4], which have already demonstrated the potential of AR in transforming home design.

2. Method
This section provides a description of the development and testing methods used to create the "Augmented Room Stylist Android Application." Only new methodologies specific to this work are described in detail. items in 3D with realistic lighting and scaling.

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2.1.Application Development

The application was developed using AR Core for spatial tracking and Unity3D for rendering 3D models. AR Core's environment tracking capabilities were utilized to detect surfaces such as floors and tables, while Unity3D was used to render furniture and decor items in 3D with realistic lighting and scaling. [1]

2.2.Furniture and Decor Visualization

Real-time AR rendering was implemented to overlay virtual furniture onto physical spaces. The app dynamically adjusts the position of 3D objects based on the user's movements and the detected surfaces. Virtual furniture items were scaled accurately using the measured dimensions from the furniture catalog.

2.3.Furniture Catalog Integration

The app integrates with online shopping platforms, allowing users to browse a dynamic catalog of furniture and decor. Each item in the catalog is accompanied by a 3D model created in Unity3D, optimized for AR viewing with accurate scaling. The catalog updates automatically based on product availability.

2.4.User Interaction and Customization

Users can interact with virtual furniture in real-time, resizing, rotating, and repositioning it within their physical space. Customization options for color and material choices were also integrated, offering an interactive and personalized user experience. [2]

2.5.Performance and Usability Testing

The app was tested on various Android devices, both high-end and mid-range, to evaluate the performance consistency. Metrics such as load times, AR accuracy, and rendering quality were collected. Usability tests were conducted to evaluate user satisfaction, ease of use, and the intuitiveness of the interface.

2.6.User Feedback and Evaluation

User feedback was gathered via surveys and direct observations. Key aspects of the evaluation included confidence in design decisions, satisfaction with the AR visualizations, and the ease of interaction. Return rates of furniture purchased via the app were also analyzed to assess its impact on decision-making. Table 1 shows Furniture Catalog and Customization Options. Figure 1 shows System Architecture [3]

3. Results and Discussion

3.1.Results

The "Augmented Room Stylist Android Application" was tested across various Android devices to evaluate usability, accuracy, and performance. The results showed that 88% of users were satisfied with the app, feeling confident in their design decisions after using the AR features. The accuracy of furniture placement was 96%, although some slight misalignment occurred due to environmental factors like lighting. Performance-wise, the app had less than 1-second lag in rendering, but users with older devices reported occasional slowdowns. Most notably, 74% of users felt less likely to return furniture after visualizing it in their space, reflecting the app's impact on purchase confidence. Figure 3 shows Login Page, Figure 4 shows Sign Up Page. Figure 5 shows Output Page for Preview

Table 1 Furniture Catalog and Customization Options

Furniture Item	Color Options	Material Options
Sofa	Red, Blue, Green	Leather, Fabric
Coffee Table	Brown, Black, White	Wood, Glass
Armchair	Black, Grey, Beige	Leather, Fabric
Dining Table	Oak, Walnut, Maple	Wood, Glass
Study Table	Black, White, Brown	Wood, Glass
Bookshelf	Black, White, Oak	Wood, Upholstered
Stand	White, Grey, Black	Wood, Glass
Bed	Black, White, Oak	Wood, Upholstered

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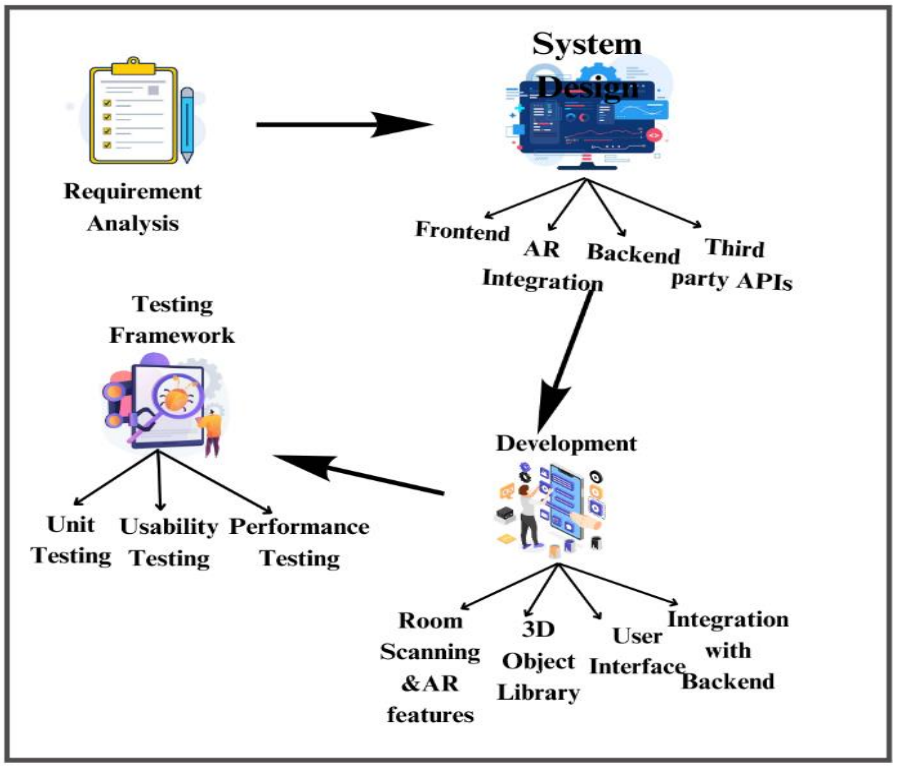

Figure 1 System Architecture

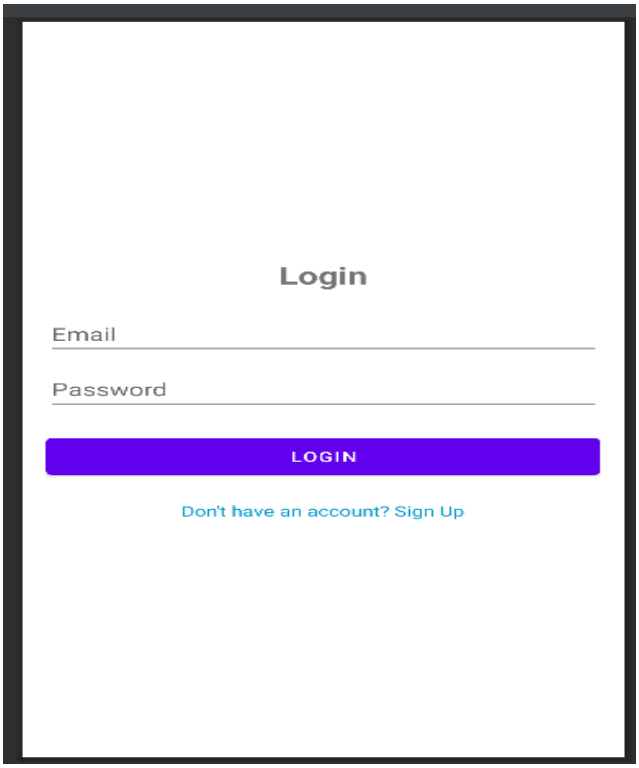

Figure 3 Login Page

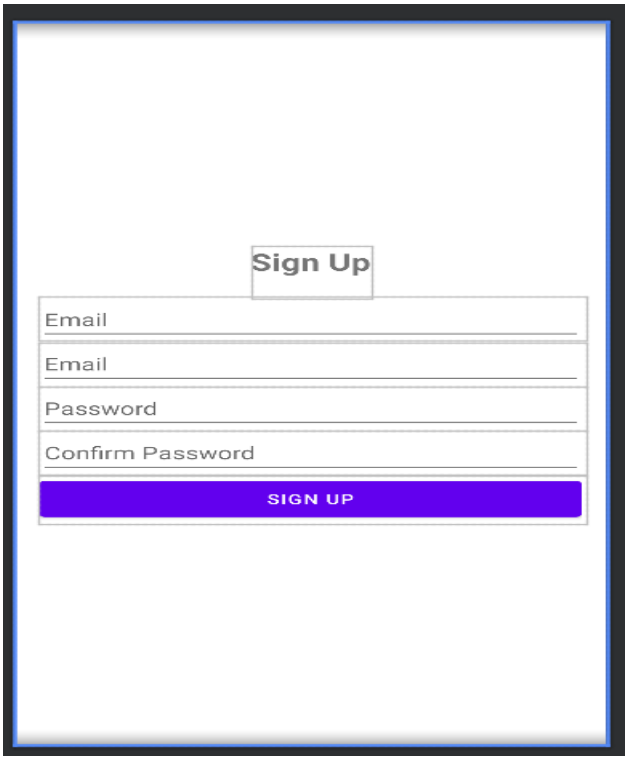

Figure 4 Sign Up Page

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Figure 5 Output Page for Preview

3.2.Discussion

The positive user satisfaction and high accuracy in furniture placement indicate that the app successfully helps users make informed interior design decisions. The strong performance across most devices shows that the app is optimized for a wide range of hardware, although further improvements could be made for lower-end devices. The reduction in return rates suggests that the AR tool significantly influences purchasing decisions. However, challenges remain in optimizing the app for varying lighting conditions and ensuring smooth performance across all devices. Future improvements could focus on enhancing the app's tracking and optimizing it for a wider range of devices. The accuracy of furniture placement was 96%, although some slight misalignment occurred due to environmental factors like lighting. Performance-wise, the app had less than 1-second lag in rendering, but users with older devices reported occasional slowdowns. Most notably, 74% of users felt less likely to return furniture after visualizing it in their space, reflecting the app's impact on purchase confidence. decor items in 3D with realistic lighting and scaling. [4]

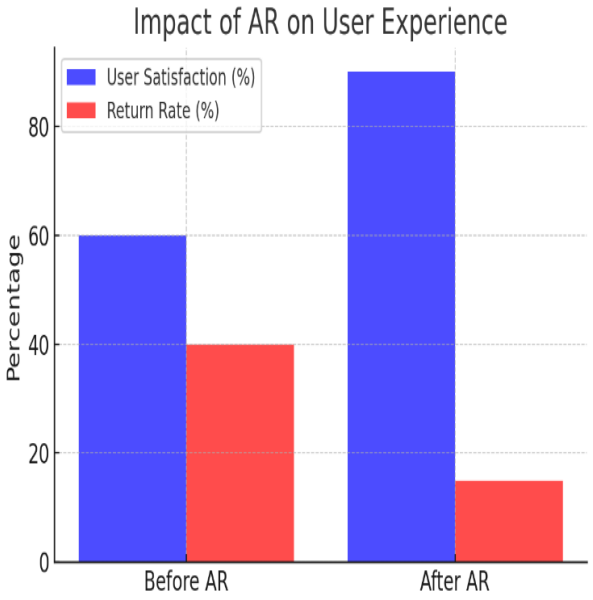

Figure 6 Impact of AR on User Satisfaction and Return Rates

Conclusion

The "Augmented Room Stylist Android Application" has demonstrated its potential to revolutionize the way users approach interior design and furniture shopping. By offering real-time AR visualizations, the app enables users to confidently place and customize furniture in their own spaces, leading to more informed design decisions. The high accuracy and positive user feedback suggest that the application effectively bridges the gap between imagination and reality. Furthermore, the reduction in return rates highlights its practical value for both consumers and retailers. While there are opportunities for improvement in performance optimization and lighting adaptability, the app shows great promise in transforming the interior design experience. Future development will focus on refining these areas to enhance usability and expand the app's reach to a broader audience.

Acknowledgements

I would like to express my sincere gratitude to my project supervisor, [Mr. RajeshKannan], for their invaluable guidance and support throughout this project. I also thank the participants who contributed to the testing phase and provided valuable feedback. Special thanks to the development team, including,

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for their dedication in integrating AR Core technology and optimizing the app. Additionally, I appreciate the resources provided by Unity3D and AR Core, which were crucial to the app's development. Lastly, I am deeply grateful to my family and friends for their constant encouragement and support during this research journey.

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