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shrutidhomne.mca23@kdkce.edu.in***Abstract**

Modern interior design is a dynamic field that is always changing with new trends, materials, and user preferences. With the help of augmented reality, this app offers users a dynamic and immersive experience that seamlessly blends the virtual and real worlds, revolutionising the way people envision and personalize their living spaces. Traditional interior design often relies on static images and imagination, which leads to uncertainty and dissatisfaction during the implementation phase. As technology develops, Augmented Reality (AR) offers a potent instrument for revolutionising how people design and customize their living environments. This abstract presents a cutting-edge augmented reality (AR) interior design application that aims to transform the interior design process. Users may see and interact with virtual furniture, décor, and layouts in real time by utilising AR's capabilities, which allows digital components to be seamlessly integrated into their physical environment. Users may experiment with many design options using this app's user-friendly and immersive platform, which guarantees that every choice they make will properly suit their practical requirements and personal flair. This augmented reality tool helps users make well-informed design decisions by bridging the gap between imagination and reality, from selecting the perfect colour scheme to positioning furniture in real dimensions.

Introduction

In science fiction, future settings with digital overlays that mixed in perfectly with actual rooms are where the idea of augmented reality (AR) in interior design first emerged. The creation of AR technology, which has subsequently evolved into a useful tool with real-world uses, was influenced by these early fictional representations. AR has become a useful tool in the interior design sector, facilitating better client-designer collaboration. In the context of a real-world physical space, designers can use augmented reality (AR) to visualise and test out various design elements, including furniture, layouts, and colour schemes. AR lets clients to view how various design concepts would appear in their homes or businesses, offering a deeper knowledge of the ultimate product before any physical modifications are made. As AR becomes more integrated into interior design, it has revolutionised the design process, making it more efficient and interactive. Here, we examine how AR technology is specifically being applied to customised and interactive furniture solutions. With real-time visualisations and immersive experiences, clients can explore multiple design options, make adjustments, and refine their choices on the spot. This ability to experiment not only enhances

decision-making but also fosters creativity, as clients can visualise different styles and configurations without physically moving furniture or making costly changes. Additionally, AR lets designers create immersive walkthroughs, which help clients fully understand the proposed designs and experience them in a more engaging, hands-on way. The study focusses on creating an intuitive and interactive augmented reality application that uses on-screen visualisations to streamline the process of choosing and arranging furniture. The proposed app will enable users to place virtual furniture in their real-world spaces, personalise it in real-time, and interact with the virtual objects in a way that makes the design process more fun and easy. This will make the design experience more accessible and personalised, which will benefit both clients and designers.

Home Decor with AR examines how Augmented Reality (AR) may be used into home décor, emphasising how it can revolutionise design, visualisation, and experience. AR offers a fascinating design experience by facilitating a smooth transition between the real and virtual worlds. Users may envision interactive design visualisation, furniture layout, and improved shopping experiences thanks to it. Additionally, AR makes collaborative design possible by enabling simultaneous interaction between several users.

Additionally, it affects businesses by influencing market trends and improving online buying experiences. AR and home décor together represent a fundamental change in how we interact with and design our living environments. The study provides a deeper understanding of how augmented reality is changing home environments by examining the uses, advantages, and possible drawbacks of AR adoption in the home decor industry. As technology advances, augmented reality (AR) has the potential to completely transform how people interact with their living environments by providing a smooth fusion of creativity, usefulness, and practicality in the quest to create houses that accurately represent individual tastes and style. Augmented Reality (AR) is revolutionizing the way we approach home decor. Imagine being able to visualize how a new sofa would look in your living room or experiment with different paint colors without lifting a paintbrush. Homeowners may accomplish all of that and more with AR. AR apps enable users to evaluate and alter their home designs in real-time by superimposing virtual furniture, décor pieces, and paint colours onto the physical reality using a smartphone or tablet. In addition to expediting the decision-making process, this immersive technology gives homeowners the confidence to confidently modify their living environments and let their imagination run wild. Greetings from the future of interior design, where the options are as endless as your creativity.

The goal is to create a smartphone application that uses augmented reality (AR) to create a space with precise measurements. The user may then customise the room to their preferences. Users will be able to arrange and drop different pieces of interior décor, as well as alter the goods' colours and other orientations to personalise them. Apart from this, the application will concentrate on a room's overall design. In addition to helping customers choose and personalise the necessary décor pieces, it will also assist them pay attention to other room design norms like wall colour, frames, and other little aspects.

Because the program will build a 3D model of the room, it can be saved and used again to change the designs, and it can also keep the current designs. The user will be able to move around the room more naturally thanks to this. By initially visualising the ideas before actually working on them, it would improve the user experience and provide a deeper knowledge of how the room would appear. It will also assist interior designers in their job.

Literature Survey

Users may experiment with many design options using this app's user-friendly and immersive platform, which guarantees that every choice they make will properly suit their practical requirements and personal flair. This augmented reality tool helps users make well-informed design decisions by bridging the gap between imagination and reality, from selecting the perfect colour scheme to positioning furniture in real dimensions.[1]

This essay examines the unique applications of augmented reality technology to personalised and interactive furniture solutions. The goal of the project is to create an interactive, user-friendly augmented reality application that makes use of on-screen visualisations to streamline the process of choosing and arranging furniture.[2]

In order to allow customers to digitally sample furniture, décor pieces, and spatial configurations prior to making a purchase, this study investigates the use of augmented reality technology into home decor apps.[3]

This subfield is actively conducting research on the metaphysics of virtual objects, the phenomenology of augmented experiences, and other ethical issues surrounding AR systems, including (but not limited to) issues with informed consent, privacy, property rights, ownership, and trust.[4]

The current models that attempt to address these issues are mostly based on augmented reality, are limited to iOS devices, and are primarily designed with e-commerce in mind. The suggested concept is a cross-platform mobile application that seeks to serve as a one-stop shop for all problems related to interior design. One of the features will be a 3D model that replicates a room with precise measurements. Additionally, customers will have complete creative control over how they arrange the space and an intelligent platform to buy various products whenever they want.[5]

Unity3D software is used in the development of this application. Augmented reality is often the foundation of this software. This program has a number of built-in packages. Vuforia Engine AR and the Visual Studio code editor have been installed for this application. The Interior Design Application makes it simple to arrange furniture in a space by utilising Augmented Reality technology. The user may select the furnishings that can be arranged in a living room here. Depending on the type of room, the user can choose furniture from the database.[6]

The idea behind augmented reality is to overlay a computer-generated image on top of the user's perspective of the actual environment to create a composite vision. Without really owning the thing,

it can enable viewers to observe it in three dimensions. As a result, it will save time and money and assist a particular user in making better decisions. Because of this, augmented reality is more applicable in the field of interior design.[7]

The study that backed the Android OS Virtual Home Augmented Reality System included studies and, therefore, advancements for the main algorithms in each system module. The technology can construct a home setting in a dream, install furniture through human-computer interaction, stack virtual 3D furniture models on the user's actual room, and make furniture selection and, therefore, décor more convenient—all of which have economic value. Real-time tracing with identification markers is supported by this method.[8]

An Interactive Interior Design Tool Based on Augmented Reality. IEEE International Conference on Virtual Reality and Artificial Intelligence (AIVR), 2020, pp. 21–26. The authors suggest an interactive augmented reality (AR)-based home design tool that lets users see and alter virtual furnishings and décor in real time.[9]

By enabling designers and clients to see and test out design ideas in real time, augmented reality technology has completely changed the interior design industry. It makes remote cooperation possible by reducing the requirement for in-person meetings and site visits. Additionally, AR cuts down on the time and expense of conventional design procedures. It creates an immersive and engaging experience by superimposing digital items and information onto the physical world. AR is anticipated to grow in popularity and keep changing interior design and space creation.[10]

An intuitive smartphone application that uses marker-less augmented reality to expedite home restoration may provide customers with a clear visual representation of their home's aesthetics once they have chosen wall frames, floor tiles, and furnishings. [11].

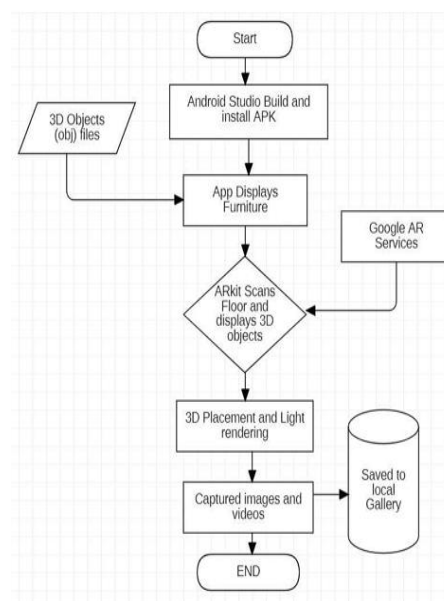
This research explores the potential applications of augmented reality in home décor systems, enabling users to view life-sized product previews using their smartphones' built-in cameras. It highlights how augmented reality benefits companies by increasing revenue and providing a smooth user experience. This paper examines research on 3D mode, marker-based, marker-less, augmented reality, and interior design. [12].

This study examines a system that uses augmented reality (AR) technology to decorate homes and allows for real-time tracking without the need for identification marks. It addresses the problems of human manipulation and constrained 3D interfaces

by suggesting a way to use a camera to add virtual items to the actual world. By automatically determining the best angle, the device facilitates user transitions and enhances comprehension of space arrangement [13].

Proposed System

Developing a straightforward and user-friendly app interface that offers an engaging and immersive augmented reality design experience is the main goal. actual-time spatial mapping and object detection will be made possible by the app's use of ARCore for Android or ARKit, guaranteeing precise and lifelike placement of virtual furnishings and décor in the actual world. Users will be able to explore and choose from a large selection of virtual furniture and décor items thanks to the app's integration of a varied catalogue of 3D models and textures. The virtual objects will be freely movable, resizeable, and customisable by users to fit their preferred interior design. By giving users the freedom to try out different layouts and design ideas, this interactive design tool will encourage originality and creativity in the interior design process. User testing and feedback will be crucial throughout the development process, guiding iterative enhancements to maximise usability and performance. By allowing users to visualise several design options in their actual area, the app will serve as a decision-making aid, assisting users in making well-informed decisions. An approach to interior design that is more effective, engaging, and interactive is required. By enabling customers to see and engage with possible design aspects in real time, within their own environments, augmented reality (AR) technology presents a feasible option. improving the usability and friendliness of the user interaction.



To accomplish the project's goals, the following actions are taken:

1. Research and Planning Phase

- Objective : Establish the project's parameters and the ways in which augmented reality will be used in interior design. Determine the main players, including customers, architects, interior designers, and IT specialists.
- Recognise User Needs: To learn about the expectations and pain points of potential users (designers and clients), conduct surveys and interviews with them.
- Examine Current Solutions: Examine the market's current AR tools to find any gaps or areas that could use innovation.
- Establish Objectives: Establish specific project objectives, such as enhanced visualisation, simpler adjustments, and quicker decision-making.

2. Technology Selection and Development Phase

- Objective : Select the appropriate AR technology stack and project-related tools.
- Hardware Selection: Choose the AR-capable devices (such as smartphones, tablets, and AR glasses).
Software Platform: Select or create an augmented reality software platform that allows 3D interior design visualisation and interactivity. The following technologies were used: Sketchfab, ARCore from Google, Java, XML, Sceneform/Sceneview, and Android Studio (IDE).
- Features of AR to Use:
 1. Give clients and designers the ability to see real-time layout, texture, lighting, and furniture changes using real-time visualisation.
 2. Space Measurement & Mapping: Measure the sizes of rooms and furniture pieces using augmented reality (AR) to create precise space maps.
 3. Interactive elements: Let users alter the layout, colour palette, or furnishings to engage with the design.
 4. User Interface (UI) Design: Create an intuitive user interface for the platform or application, taking into account how easy it is for clients and designers to use.

3. Data Collection and 3D Modeling Phase

- Objective : Compile information for precise visualisation and produce 3D models of the interior design components.

- Scan & Map the Space: Make a map of the room's or space's size and characteristics using AR and 3D scanning technologies.
- 3D Model Creation: Develop 3D models of furniture, décor, and architectural components (or utilise pre-made items).
- Make sure that the materials, colours, and textures are appropriate for the augmented reality experience by using material and texture mapping.
- Lighting Integration: Use dynamic lighting elements (such as artificial light, daylight, and shadows) to replicate real-world situations.

4. Design & Visualization Phase

- Objective: Let people explore many design alternatives by interacting with the augmented reality environment.
- Virtual Furniture Placement: By positioning and modifying various pieces of furniture in the augmented reality environment, users may see how they will appear in their room.
- Customisable Elements: Allow users to change layouts, colours, textures, and even materials from within the augmented reality environment.
- Evaluation and Feedback: The technology enables real-time layout revisions based on input from clients and designers.

5. Prototyping and Testing Phase

- Objective : Use actual users to test the AR system, then make adjustments in response to their input.
- Create an AR application prototype: Create a beta or functional prototype of the AR interior design tool.
- User Testing: To find any usability problems, defects, or places for improvement, do usability testing with a variety of users, including customers, tech specialists, and interior designers.
- Get Information: Utilise analytics to monitor how users engage with the AR system and learn how well it aids in their decision-making.

6. Implementation and Integration Phase

- Objective : Deploy the AR solution for usage and incorporate it into actual design processes.
Launch of the Platform: Install the AR tool

on a few platforms (web interface, AR glasses, or mobile apps).

- **Training and Support:** Educate clients and designers on the proper usage of the AR tool. To troubleshoot, set up customer support.
- **Cooperation with Suppliers:** Connect with suppliers' catalogues to make it simple for consumers to locate actual furniture or décor goods that they see in the augmented reality system.
- **Cloud Integration:** Make it possible for designs to be stored on the cloud, guaranteeing simple access and sharing amongst interested parties.

7. Post-Implementation and Evaluation Phase

- **Objective :** Assess the AR interior design tool's effectiveness and identify areas for further development.
- **Get input:** To learn about consumers' experiences and pain issues, get input from them on a regular basis.
- **Evaluate the project's results:** Examine how well AR works in interior design in comparison to more conventional approaches (e.g., cost reduction, time savings, enhanced customer satisfaction). **Iterative Updates:** Add new features and address bugs in the tool on a regular basis depending on user input.

Outcome

The results of the interior design application are as follows:

1. User-Friendly Design Experience:

A smooth and simple interface that enables users to design and visualise spaces without the need for professional expertise;

2. Enhanced Visualisation:

It is based on user inputs and preferences, users can see their design ideas in realistic detail;

3. Customisable Options:

A variety of design elements, including furniture, wall colours, flooring, and decor, that they can alter to suit their needs and preferences; and

4. Better Decision-Making Tools

Better Decision-Making Tools that compare various layouts, colour schemes, or furniture arrangements to assist users in decision-making.

5. Cost and Time Effectiveness

Enabling consumers to autonomously produce preliminary layouts and designs, saving time and money compared to hiring experts.

6. Features of Collaboration

Options for exchanging designs for comments or cooperation with loved ones, friends, or professional designers.

7. Integration of Augmented Reality (AR)

Users may see how furniture and décor will seem in their actual environment thanks to real-time augmented reality technologies.

8. Greater Confidence and Satisfaction

A dependable tool that increases user trust in their design decisions, guaranteeing more pleasure with the space's finished result. All users, from beginners to experts, should find these results to be efficient, interesting, and easily navigable.



Conclusion

In conclusion, users may visualise and compare furniture in a real-world setting with the help of the interactive and immersive interior design application created using augmented reality technology. A selection of furniture pieces and home décor that may be seen in actual settings are available through an intuitive interface. Creativity and technology come together to create the living environments of your dreams as interior design and augmented reality merge. By offering consumers a quick and engaging experience, the augmented reality furniture application has the potential to completely transform the way we buy for furniture. The user-friendly software, which was created with Android Studio, ARCore, and Java, enables users to visually explore furniture in their living areas and integrates augmented reality technology with 3D object model rendering.

Finally, by enabling users to envision and build customised living environments in an immersive and captivating way, augmented reality (AR)-based interior design apps have the potential to revolutionise the interior design process. The app's straightforward and user-friendly design, which makes use of augmented reality technology, improves user experience and encourages creativity. Accurate and realistic placement of virtual furniture and décor in the actual world is ensured by the app's successful development, real-time spatial mapping, and object identification. Users may experiment with different design concepts and make well-informed decisions thanks to this functionality, which eventually improves

user happiness and design quality. All things considered, the AR-based interior design software represents a major breakthrough in the industry, fusing virtual and real-world settings to improve the creative process.

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