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Augmented Reality based Furniture Application for Room Planning - fARniture App

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ABSTRACT: In the modern digital transformation era, providing customers with confidence in the suitability of the furniture they choose for various situations in which it will be used is the major problem in online furniture sales. While buying furniture, purchasers must ensure the furniture's model, size, and color are appropriate for and complement the space in which they will be put. The flexibility and appropriateness of the furniture product when placed in a particular area may be seen by prospective buyers with suitable instruments. For furniture to be sold online correctly, these issues must be resolved. By using Augmented Reality, this is feasible, to do. When it comes to online product customization, certain application models in the furniture sector employ Augmented Reality and mobile technology. A 3D product visualization tool, product pricing, and an enhanced renderer are all included. For the purpose of creating AR-based furniture technology, Google ARCore is used in the development process. It provides a framework for people or teams to creatively and flexibly address challenging tasks and issues in order to generate and deliver the best performance. The study is finished using Android Studio and Google AR services. Based on the results of the studies, it is advised that this application be enhanced to have a greater degree of performance.

KEYWORDS: Augmented Reality, Google Augmented Reality Core, Quick Response Code, Three Dimensional Objects, Furniture.

I. INTRODUCTION

This India's e-commerce sector continues to grow significantly. But, it's only possible to have change with growth, thus, for the e-commerce sector to prosper, new technology developments must be periodically adopted. One such innovation might be the use of augmented Reality to draw in both current and potential clients. Hence, for the Furnished software, our team selected the Furniture business as the e-commerce sector. While there are now just a few well-known players in the furniture market, there remains a plenty of potential to expand for anybody who can provide something different with the use of augmented Reality. This application aims to use augmented Reality to give all of the things shown in their online shop to their customers in the most efficient use of time and resources. With augmented Reality, one may put objects in your surroundings, but with virtual Reality, one is transported into the world that the developer has built. Virtual Reality has been acknowledged as an excellent teaching approach for industrial people, especially those functioning in harmful circumstances, despite AR being used in many fields, such as design and modelling. To show product data, and 3D models, perform feature tracking and determine locations superimposed on top of real time environment of the actual world, the software first analyses and detect the size and location of all type of surfaces: horizontal, vertical and angled surfaces like the ground, a coffee table or walls acquired by the device's rear camera. ARCore is doing two things: tracking the position of the mobile device as it moves, and building its own understanding of the real world. This study used Augmented Reality as platform with the three factors to avoid limiting it to a particular technology. To avoid confining AR to a specific technology. This study defines Augmented Reality as systems with three qualities. First is the Combination of real with the virtual, second is the Real-Time interaction and finally, third is the Three-Dimensional Registration. We can project the forecast using augmented reality to comprehend the influence on its surroundings.



II. RELATED WORK

Pawe Nowacki and Marek Sawomir Woda examined and compared the capabilities of ARCore and ARKit in their article "ARCore and ARKit". The authors created matching criteria for both platforms, developed test apps, and executed comparative tests [1]. Akshay Singh and Sakshi Sharma's article outlines the building of an Android mobile platform application utilizing Android Studio and the PHP Framework. Mobile Development has considerable experience working on projects such as video and music players, gaming software, photo viewer and editing software, and many more [2]. The review topic of Augmented Reality, in which 3-D virtual elements are incorporated into a 3-D actual world in real time. According to the above literature review, the app should focus more on usefulness and ease of use to increase app adherence and effectiveness. This transition might be caused by the fact that most industries are now servicing a different generation of customers or by recent technological breakthroughs [3]. The Furnished application operates effectively in today's society, where client convenience is paramount. As a result, one may accomplish our aim of saving time, money, and hassles by adopting AR. Additionally, several plugins and Software Development Kits are used to optimize the user's purchasing experience [4]. We were conscious of augmented reality's abilities in terms of performance. According to research results, it is possible to create an infinite number of virtual screens by using virtual reality headset devices. Augmented Reality has the potential to impact the use of computer monitors in the information technology sector and other industries [5]. Our team found that both augmented and virtual reality use the sensors already incorporated into the device to map out their surroundings. Compared to gyroscopes, the devices equipped with a LiDAR sensor have a more accurate projection of three-dimensional objects. Laser and its reflection are used by the LiDAR sensor in order to get spatial information [6]. According to the findings of this research, there are more advantages connected with the use of AR and VR in the sector of education. Youths may use Virtual Reality headsets in conjunction with Google Maps to go to any location on the planet. Pupils are able to gain knowledge about the history, geography, and culture of a variety of locations without leaving the classroom [7]. Youngsters who spend a lot of time in the virtual environment have a better ability to grasp the realm of imagination. The fundamental areas of science, physics and chemistry, need a more in-depth knowledge in addition to the capacity for creative thought. Children are able to comprehend the mechanics behind and applications of chemistry in day-to-day life with the use of virtual reality headsets [8]. There is a diverse array of uses for augmented and virtual reality. Augmented Reality has the potential to be used in the training of pilots. This would enable the pilots to view and interact with their surroundings in a three-dimensional world. Augmented Reality makes it possible to display real-time information immediately in the line of sight of a pilot. This information may include navigation data, weather conditions, and traffic information, among other things. Also, it can direct pilots even when the weather is hazy and foggy [9]. In the event that a machine has to be repaired or maintained, AR can supply maintenance and repair instructions for any type of vehicle equipment. This makes it possible for those who have yet to gain experience to carry out maintenance activities in an efficient and accurate manner [10]. During business meetings, augmented reality may be utilized to provide virtual surroundings that replicate the atmosphere of a real workplace. Putting 3D models and presentations on display in a manner that is more interactive and interesting to the audience. During the meeting, the utilization of real-time data visualization tools, such as tables, graphs, and charts, may be of assistance in enhancing both comprehension and decision-making [11]. The team members can communicate with one another and cooperate using virtual whiteboards. They can also obtain reports and interact with each other in real-time. Architects use augmented reality to help them see their ideas in various real-world environments. In this technology, three-dimensional representations of structures may be superimposed into real-world environments. It also has the capability of being used in the creation of interactive presentations for the customer. Augmented Reality Headsets may be useful to project managers throughout a project's construction and maintenance phases. Several team members can collaborate simultaneously to make choices in real-time [12].

III. SYSTEM REQUIREMENTS

The Android or iOS smart-phone must meet the application's minimal requirements to operate the furniture application. Local storage must be authorized for the application to save images or videos. The application also runs on devices that do not meet the system requirements, but to avoid application crashes and overheating, it is recommended to meet the hardware and software requirements. In order to execute the project, the requirements mentioned above are necessary as flutter application which contains dart language has syntax that changes as the version updates.



TABLE I. FURNITURE APPLICATION REQUIREMENTS

S. No.	Software/Hardware	Version/Disk Space
1.	Random Access Memory	8GB
2.	Read-Only Memory	16GB
3.	Operating System	Windows 10/11 or higher
4.	Android Studio Version	4.1 or higher
5.	Android Emulator	7.0 or higher
6.	Flutter SDK	2.2.3 or higher
7.	Kotlin	1.7.2.0
8.	MVVM architecture	-

IV. SYSTEM ARCHITECTURE

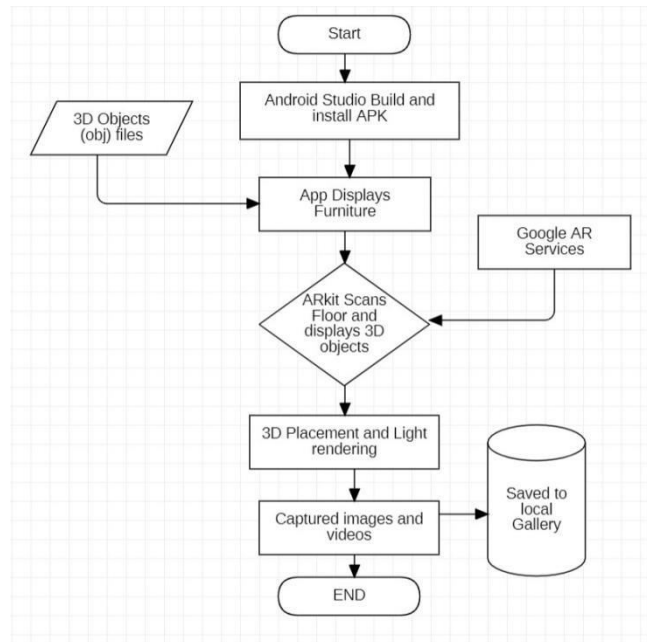


Fig. 1. Architecture Mapping

This architectural mapping explains the application's overall design to us. After the app has started, one may go through the catalog of available furniture and choose the specific item they want. In the AR mode, it is possible to get a preview of it and utilize the controls to adjust the furniture's positioning, size, and orientation. When one has finalized the product, they may take a video or picture.



V. METHODOLOGY

Stage-1: Collection of data and 3D models: The program needs a three-dimensional model in the GLB file format in order to show each item in the catalog. The required models were bought from sketchfab.com, a database of models in various formats. While an actual shop is not yet available for experimental purposes of the application, the models were nevertheless required. Models of chairs, dining sets, coffee tables, and other furniture kinds were acquired to try a range of different types of furniture.

Stage-2: Many pages make up the user interface of the application. These pages include a homepage, a classifications page, a goods page, and a product information page. Throughout development of the Interface, making it as user-friendly as possible was of the utmost importance, and contemporary design concepts were adhered to carefully.

Stage-3: After collecting product data, an interface was developed, which made the process of displaying the 3D Model much more straightforward. The result that was achieved in the software by employing GLB models is of a very high quality, and this applies to both its colors and its textures. Given the accuracy with which the light was estimated, the AR fragment has reflections and shadows of the chair that are spot on. Since Physically Based Rendering was used, the chair's leather can provide a shiny appearance. As the model was constructed while it was running, its level of complexity may be considered to be around typical. It will be possible to create models with higher degrees of complexity if the equipment used to create the models have better processing power and a database with a higher bandwidth.

Stage-4: The one feature that is accessible and is also necessary for our project is Augmented Reality Core, which employs the built-in camera, and it includes all the Google smart devices that can be utilized to run programs.

Stage-5: The Augmented Reality Core services, on devices that are compatible, render 3D images quickly and efficiently while using minimal system resources. Users may also utilize Augmented Reality Core to save the captured images or videos in a locally stored gallery that can be accessed at any time. Software Development Kits are used to speed up the user's purchasing experience.

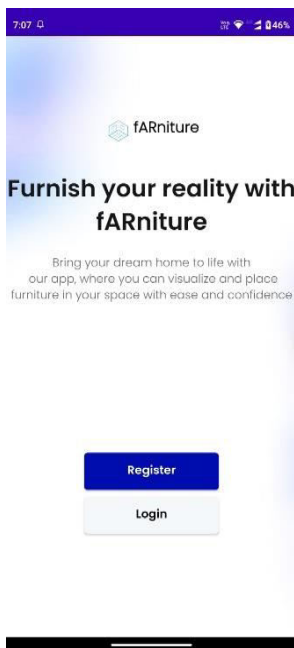


Fig. 2. Welcome Page

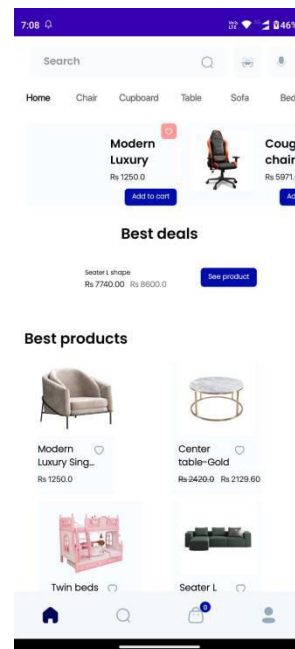


Fig. 3. Homepage

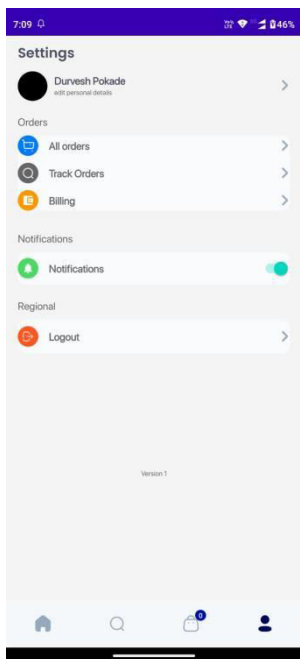


Fig. 4. Settings Page



Fig. 5. AR View Page

VI. CONSTRAINTS AND PROBLEMS FACED

During Our Team has developed the prototype of object placement using Unity 3D. To begin with, it has more cons than pros compared to Flutter Student Development Kit. The Furniture application developed in Unity cannot scan and project objects in real-time. Flutter uses the dart language that supports UI with built-in widgets. During the development phase, the software succeeded in placing scanned furniture in the actual world, but various problems developed due to older Java development kit versions, greater CPU consumption, and memory cache restrictions. The source code was enhanced using Kotlin and cache management, which resolved compatibility problems, reduced device temperature, and allowed LiDAR-enabled devices to better object placement.s

VII. RESULTS AND CONCLUSION

The outcomes of the program, created by employing OBJ models, are of a high grade, as are the colors and textures employed. Because of the detailed lighting modelling, the augmented reality fragment has a realistic chair that even includes shadows and reflections. PBR was used to give the leather on the chair a shining appearance. Given that it was built via dynamic processes, the completed model has a complexity density that is approximately average when compared to others of its kind. Devices that have more computational power and a database with a higher throughput might be used in the process of developing a more complicated model. Although the retail sector's historic success is undeniable, the modern consumer demands a more streamlined experience. Everything from going to the store to selecting a particular item. This shift could be brought on by the fact that most sectors are now serving a different generation of consumers or by recent technology advancements. Therefore, the Furnished application is ideal in this environment where client comfort comes first. By utilizing AR, people may accomplish the objective of saving time and money. Additionally, the different plugins and Software Development Kits are used to speed up the user's purchasing experience.

VIII. FUTURE WORK

Our project data-set and scope will be expandable in the future. With this program, the user may be able to entirely remodel his house or even plan interior design. The user may also try out all of the house stuff, such as kitchen items,

appliances, and so on. He may also be able to digitally test out several wall colors before having his walls painted. The application will serve as a one-stop shop for all house-related services. This application can be expanded further by developing a web application where front-end and back-end comes into play. Because of the increased speed and reliability offered by 5G networks, augmented reality (AR) technology will be able to go further. With VR headsets, large corporations may establish a virtual work environment, allowing employees to continue working from home. Precise instructions may save time and money on basic car repairs and maintenance using Augmented Reality Headsets.

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