

PROJECT REPORT
On
**MIZYNER – AN AR BASED SMART
INTERIOR DESIGNER**

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*Submitted in partial fulfillment of the requirements
for
Degree of Bachelor of Engineering*

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**S.B. JAIN INSTITUTE OF TECHNOLOGY,
MANAGEMENT & RESEARCH, NAGPUR.**

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SESSION 2019-2020

CERTIFICATE

This is to certify that the project titled "**MIZYNER – AN AR BASED SMART INTERIOR DESIGNER**" is a bonafide work of **Mr. AYUSH SHARMA, Mr. NAUSHAD DHUN, Mr. NEERAJ NEHRA, Mr. AADESH MAHULE, Mr. ANIL RATHOD** carried out for the partial fulfilment of the requirement for award of Degree Bachelor of Engineering in **Computer Science & Engineering, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.**

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DECLARATION

We hereby declare that the Project titled “**MIZYNER – AN AR BASED SMART INTERIOR DESIGNER**” submitted herein has been carried out by us in the Department of Computer Science & Engineering of S. B. Jain Institute of Technology Management and Research, Nagpur under the guidance of **Mr. NISARG GANDHEWAR**. The work is original and has not been submitted earlier as a whole or in part for the award of any degree / diploma at this or any other Institution / University.

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ABSTRACT

Being one of the hot technologies of the era Augmented reality is exponentially developing various day to day activities and home decor is one of them. Mizyner is an android application that overlays the virtual Interior in a physical environment. Markers are placed on the area (for example floor or wall) for tracking purpose to define the scale and coordinate system of the room. The user selects virtual Interior on the screen and places it into the design space. Here the concept of AR is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Smartphones are very popular, it is hoped that the proposed system will allow a large range of users. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the desired layout for a room. Thus, this saves time and efforts by avoiding the need to physically go to the store and select interiors.

Index Terms— Augmented Reality, virtual interior, tracking, view in various angles, real time, less efforts.

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LIST OF PUBLICATION/PARTICIPATIONS

Sr No	Title	Event Name/Journal Name/Conference	Date	Remarks
1	Mizyner: An AR Based Smart Interior Designer	Technodox(CSE) AXIS'20,at VNIT,Nagpur	28/02/20	3 rd Prize
2	Mizyner: An AR Based Smart Interior Designer	Sammantrana'20 Government College of Engineering Nagpur	20/02/20	Participated
3	Mizyner: An AR Based Smart Interior Designer	Pursuit 2020 A National Level Technical Symposium (Shri Sant Gajanan Maharaj College of Engineering)	29/02/20	Participated

CHAPTER NO 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

It is a difficult challenge to visualize how any piece of interior will look in a room with lot of factors left to human imagination. The size, the color, and how well it integrates with the existing environment. **Augmented reality**, a technology that overlays computer graphics on the real world has its applications in the field of **engineering and architecture** and has been used to tackle real world problems. Earlier known as **mediated reality** in which a view of reality is modified by a computer, the technology has evolved to enhance one's correct perception of the reality. Head mounted display (HMD), contact lenses, eyeglasses, monitors are some of the devices in which augmented reality has been incorporated. All these devices commonly serve professional users. Common people or the non-professional people can also exploit the augmented reality features for solving their real-life problems.

1.2 PROBLEM STATEMENT

Along with the growth of digital technology, virtual information techniques are required in decor field. Nowadays, people are busy with their work thus limiting their time to go to various stores to buy furniture and other decorative items for their everyday use. There is difficulty to fulfil the customers contentment of decorate their room without imaginary view of how the place would appear. A printed furniture or decorative item catalogue is paper based containing textual information and images which does not provide any interaction for the user. Our application will provide solution to all these problems by providing the users a virtual way of placing objects in their home, offices and other places and all this at their fingertips.

1.3 PURPOSE OF STUDY

Augmented reality has an incredible ability to solve real life problems. Problems are mainly based on two factors, time and money. The problem encountered was the overhead of interior designing and its increasing demand in today's world. Head-mounted displays and monitors require hardware implementations and are mainly designed for professional users. An augmented reality android application was one of the solutions. Since it is an android application, it is supported by all android devices or smartphones which are easily accessible to the users. The availability of various tools to implement AR as an android application, the papers on AR on the application of AR in the field of architecture and the ability to ease out the user's problem in decision making thus saving time and money was a motivation to implement an application for interior designing using augmented reality.

Mizyner is an android application that overlays the virtual Interior in a physical environment. **Markers** are placed on the area (for example floor or wall) for tracking purpose to define the scale and coordinate system of the room. The user selects **virtual Interior** on the screen and places it into the design space. Here the concept of **AR** is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Smartphones are very popular, and it is hoped that the proposed system will allow a large range of users. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the **desired layout for a room**. Thus, this saves time and efforts by avoiding the need to physically go to the store and select interiors.

Objectives

- To provide virtual experience of Home Decor to a user.
- To Optimize the cost of Interior Designing.
- To provide virtual experience to users using augmented reality.
- To provide the user the estimation of the size, look and cost of the object.
- To provide satisfaction to the user by providing features that are not available.

1.4 TECHNOLOGICAL BASE

This Project can be implemented by using various technologies like-

UNITY

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as an OS X-exclusive game engine. As of 2018, the engine has been extended to support 27 platforms. The engine can be used to create both three-dimensional and two-dimensional games as well as simulations for its many platforms. Several major versions of Unity have been released since its launch, with the latest stable version being Unity 2018.3.8.

Advantages of Unity –

- Rapid iteration**

Unity's Play Mode is an incredibly powerful development tool for rapid iterative editing. Press Play and instantly you are inside your game, playing and previewing how it will look in its platform-specific final build. Pause it and alter values, assets, scripts and other properties, and instantly see the results. And, step through your game frame by frame for easy debugging with native Visual Studio integration.

- Create rich cinematic content in Unity**

Timeline's storytelling tools enable artists to work in-context creating cut scenes and gameplay sequences right in Unity. Combined with Cinemachine's unique smart camera system, you can control shots like a movie director. More on Timeline and Cinemachine.

- Advanced profiling tools**

Continuously optimize your content throughout development with Unity's profiling features. Check to see if your content is CPU or GPU-bound, for example, and pinpoint those areas that require improvement, so you can provide your audience with a smooth-running experience.

- **Native C++ performance**

Benefit from our cross-platform native C++ performance with the Unity-developed backend IL2CPP (Intermediate Language To C++) scripting.

Scripting runtime Mono /.NET 4.6 / C# 7.3

- **High-performance multithreaded system**

Fully utilize the multicore processors available today (and tomorrow), without heavy programming. Our new foundation for enabling high-performance is made up of three sub-systems: the C# Job System, which gives you a safe and easy sandbox for writing parallel code; the Entity Component System (ECS), a model for writing high-performance code by default, and the Burst Compiler, which produces highly-optimized native code.

Limitations of Unity –

- **No decent video-playback** available across platforms. Who figured Theora decompressed into textures is sufficient, while dropping all video metadata.
- **Input manager** is awful to configure and barely functional (axis and button numbers are inconsistent across platforms, doesn't support hot-plugging controls making a mess of the IDs, no rumble or exotic controllers supported... luckily there is the excellent Rewired)
- **User interface** and text fields don't support translation or even any kind of global string tables out-of-box.
- If you want to do something exotic with the user interface like force a text field to be CAPS only, look forward to coding your custom extensions. If you make your own type of, say, a button, replacing it in the UI is painful because you can't add two Selectable components to the same game object and you can't replace the existing component and inherit its variables. Instead, you must delete the object and add the new component in its place, setting the values from scratch.

UNREAL ENGINE

The Unreal Engine is a game engine developed by Epic Games, first showcased in the 1998 first-person shooter game Unreal. Although primarily developed for first-person shooters, it has been successfully used in a variety of other genres, including stealth, fighting games, MMORPGs, and other RPGs. With its code written in C++, the Unreal Engine features a high degree of portability and is a tool used by many game developers today, with it being source-available. The most recent version is Unreal Engine 4, which was released in 2014.

Features of Unreal Engine

1. Photoreal Rendering in Real Time

Achieve Hollywood-quality visuals out of the box. Unreal Engine's physically-based rendering, advanced dynamic shadow options, screenspace reflections and lighting channels provide the flexibility and efficiency to create awe-inspiring content.

2. Full C++ Source Code Included

With complete C++ source code access, you can study, customize and debug the entire Unreal Engine, and ship your project without obstruction.

3. Blueprints: Create without Coding

With designer-friendly Blueprint visual scripting, you can rapidly prototype and ship interactive content without touching a line of code. Use Blueprints to build object behaviors and interactions, modify user interfaces, adjust input controls and so much more. Visualize gameplay flow and inspect properties while testing your work using the powerful built-in debugger

CHAPTER NO 2

LITERATURE SURVEY

CHAPTER 2

LITERATURE SURVEY

2.1 HISTORICAL STUDY

Unity 3d

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as an OS X-exclusive game engine. As of 2018, the engine has been extended to support 27 platforms. The engine can be used to create both three-dimensional and two-dimensional games as well as simulations for its many platforms.

Unity gives users the ability to create games in both 2D and 3D, and the engine offers a primary scripting API in C#, for both the Unity editor in the form of plugins, and games themselves, as well as drag and drop functionality.

Within 2D games, Unity allows importation of sprites and an advanced 2D world renderer. For 3D games, Unity allows specification of texture compression, mipmaps, and resolution settings for each platform that the game engine supports, and provides support for bump mapping, reflection mapping, parallax mapping, screen space ambient occlusion (SSAO), dynamic shadows using shadow maps, render-to-texture and full-screen post-processing effects. [1]

Unity supports the creation of custom vertexes, fragments (or pixels), tessellation, compute shaders and Unity's own surface shaders using Cg, a modified version of Microsoft's High-Level Shading Language developed by Nvidia. The Unity editor is supported on Windows and macOS, with a version of the editor available for the Linux platform, albeit in an experimental stage, while the engine itself currently supports building games for 27 different platforms. Unity formerly supported seven other platforms including its own

Unity Web Player. The Unity Web Player was a browser plugin that was only supported on Windows and macOS via Chrome, Internet Explorer 11, and Firefox, however it was deprecated in favor of WebGL. Since version 5, Unity has been offering its WebGL bundle compiled to JavaScript using a 2-stage language translator (C# to C++ and finally to JavaScript).

AR

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory. AR can be defined as a system that fulfills three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one. Although some people believe these would be counted as "glasses" they technically do not count. Augmented reality is related to two largely synonymous terms: mixed reality and computer-mediated reality.

Augmented reality is used to enhance natural environments or situations and offer perceptually enriched experiences. With the help of advanced AR technologies (e.g. adding computer vision, incorporating AR cameras into smartphone applications and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated.

VR

Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Applications of virtual reality can include entertainment (i.e. gaming) and educational purposes (i.e. medical or military training). Other, distinct types of VR style technology include augmented reality and mixed reality.

Currently standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world, move around in it, and interact with virtual features or items. The effect is commonly created by VR headsets consisting of a head-mounted display with a small screen in front of the eyes, but can also be created through specially designed rooms with multiple large screens.

One method by which virtual reality can be realized is simulation-based virtual reality. Driving simulators, for example, give the driver on board the impression of driving an actual vehicle by predicting vehicular motion caused by driver input and feeding back corresponding visual, motion and audio cues to the driver.

2.2 RELATED WORK

Homestyler

Homestyler is an interior design playground for anyone interested in decoration. In homestyler users create rooms and decorate them with a vast range of modern and stylish products from real designers and brands - in a simple and playful environment.

The Homestyler community is one of the most friendly ones out there. Everyone you will talk to in the Homestyler app will be nice and kind with you, and willing to help you moving your first step in Homestyler.

Moreover, the Homestyler Staff will make sure you will enjoy designing by organizing weekly home design related contests – Based on certain house design styles, color schemes, on a particular room remodel project or on a real-life festival to celebrate. And the coolest thing is that the Homestyler users themselves are also able to launch their own design contest!

Just like **Neybers**, Homestyler is an app that will allow you to take a picture of a room and design it, by putting the endless furniture pieces and home design accessories that you will find in our catalogue.

In addition, you can't miss the chance of trying out the Homestyler AR feature. Thanks to the augmented reality technology, in fact, you will have the opportunity to scan the space around you and decorate it as you want through it.

Homestyler has a wide selection of rooms you can design. Just like our furniture gets updated on a weekly basis, we also keep adding new rooms every week, so that you can challenge yourself with different home design ideas! [2]

Pepperfry

Pepperfry is one of best website or you can say online shopping portal where you can buy ready to use furniture for your home any time at a very low price as compare to offline market. Pepperfry offers the trending furniture for your home as well as for your office. And one of the best things by using pepperfry coupons or vouchers during your shopping you can avail extra discount.

Mumbai-based Pepperfry (Trend sutra Platform Services Pvt. Ltd) was founded in 2011 by former eBay executives Ambareesh Murty and Ashish Shah. It started out as an online furniture store but today offers over 12 million products in the furniture and home vertical with various categories like Furniture, Home Décor, Lamps & Lighting, Furnishing, Kitchen, Housekeeping, Hardware and Electricals.

Pepperfry claims to have over 4 million users. It has 480 employees, 1,000 contract staff, 10,000 merchants, and a delivery fleet of 400 vehicles that operate from 17 hubs across India and serve customers in 500 cities. It also provides free

assembly and installation support through its team of more than 250 carpenters. [1]

Havenly

If you're looking for expert interior design advice, Havenly might just be your answer. The app creates a collaborative environment where you can bat your home renovation ideas around with real interior designers for ground up projects or for simply adding finishing touches to a room, on any budget. The first step is to pick your designer (or take a quiz to get matched with one), then you personalize your design, collaborating on ideas along the way, and even receive a visualization of the finished space based on floor plans. Finally, shop a curated list of products to help you translate your ideas to reality. [1]

Housecraft

Augmented reality is totally changing the interior design world. No more do designers need to rely on back-of-the-envelope measurements or time-consuming computer renderings. With Housecraft, simply drop fully rendered furnishings into a space, scale and position them. What's more, you can walk around them in 3D to see them from any angle. Save various potential layouts to compare and come up with the best solution for your space. [1]

Build.com – Home Improvement

The app makes it easy to connect with our LIVE Project Experts for free advice and help finding the products you need to make every project a success. You'll get exclusive savings on top brands, notifications on clearance & liquidation items, and instant price-drop alerts. Track your carts, orders, and invoices and get up-to-date notifications about your shipments. Shopping for home improvement essentials has never been easier. You'll get great prices on products that match your unique style, and fast, free standard shipping on orders over \$49.

Visualize home improvement products before you buy with incredibly detailed, realistically scaled 3D models. The innovative Build.com augmented

reality lets you experience how items will look and function in your space to help you make the best choice. Experiment with styles, finishes, and placement. See how lights fixtures will illuminate a space, watch how water flows from a faucet and how the handles move. See if a ceiling fan with 3, 4 or 5 blades works best in your room. Visualize how Toilets, Tubs and Sinks would look in your bathroom remodel.

Organized to make shopping easy, the app lets you sort by room or department. Quickly find exactly what you're looking for by selecting Kitchen, Bathroom, Plumbing Fixtures, Lighting, Fans, Hardware, Decor, Appliances, Heating & Air (HVAC), Flooring, Outdoor, Designer Home, Smart Home, or Commercial Products. [1]

Neybers

Neybers, unlike similar apps, provides the range of designed room-templates additional to those, which the user can create by himself with the camera on the mobile device. The app counts numerous products from real brands and designers, provides options to change the floor, ceiling, windows and wall-textures, add lighting effects, shadows and photo filters. With Neybers, user can publish unlimited amount of rooms, share the results via Instagram, Facebook, Twitter, Pinterest, email and iMessage and interact with friends through the app. With the subscription to Neybers Plus for \$4.99/month, user gets unlimited access to all products and templates. [3]

2.3 REAL-TIME SURVEY

Party Studio (Nagpur) –

Customer Problems –

- Customers wants to imagine how their home will look after decoration, but they can't as there are more than one product for designing a single place.
- Customers must visit more than one shop to meet their kind of needs.
- Sometimes they don't like the products after buying and reaching home, and they want refunds.

Customer Review –

- Will be very helpful and time saving.
- Will reduce the load and make the experience better.

Employee Review –

- Helpful for both customers and employees.
- This will reduce the time on selection of products at shops.

CHAPTER NO 3

**METHODOLOGY / PROPOSED
SOLUTION**

CHAPTER 3

METHODOLOGY / PROPOSED SOLUTION

3.1 PROPOSED WORK

Our proposed system will be consisting of two modules:

1. Model Designing:

The most important and the challenging part for AR based interior designing is to develop the 3d objects like table, lights, vase, TV etc. All these require high amount of precision as we can view the object in 360°. Hence proper texturing of models is required. There can be many pieces of a single object which needed to be taken into consideration. As we are using AR-Core not Vuforia which uses 3d objects rather than stickers to provide better user interaction.

AR-Core is the advance technology which not only helps us to place the object using marker but also marker less, we can also create horizontal and vertical mesh using this technology. This technology provides a high level of real time processing which help us to add more and more objects in the surrounding and change the view without even bothering about its previous position.

All these objects carry some base size which increases as we increase the amount of details which directly increase the size of app, hence our app size is directly proportional to the size of objects used in the app. Due to high usage of dynamicity the objects can be merge also like a vase can be placed on the table to check weather the combination suits the interior.

2. Application:

After developing some basic objects, the next step is to develop the app the UI where user will interact and use these objects in the real world. The challenging part here is to lock the size of objects as we need to provide real life feel of the objects. We have used Unity and Android studio to develop the app because of the use of AR- CORE technology not all the available devices can support the app as it requires high GPU processing and high real time processing.

The application starts with a simple category page where user can select the category for which user is using the app, we have provided 3 wide options i.e. Home Décor, Office Décor, Celebration Hall Décor. Each of which contain specific object to the fields. This make the usage easy. The next page is to place the objects in the real world using the mesh.

Here once the object is placed the object can be traversed in the created mesh. As we have used AR-Core so the objects are not bind with the camera frame that means once the object is placed the user can move the camera freely without disturbing the position of previously placed object. The user can place as many objects as he wants without any problem.

3.2 SYSTEM ARCHITECTURE

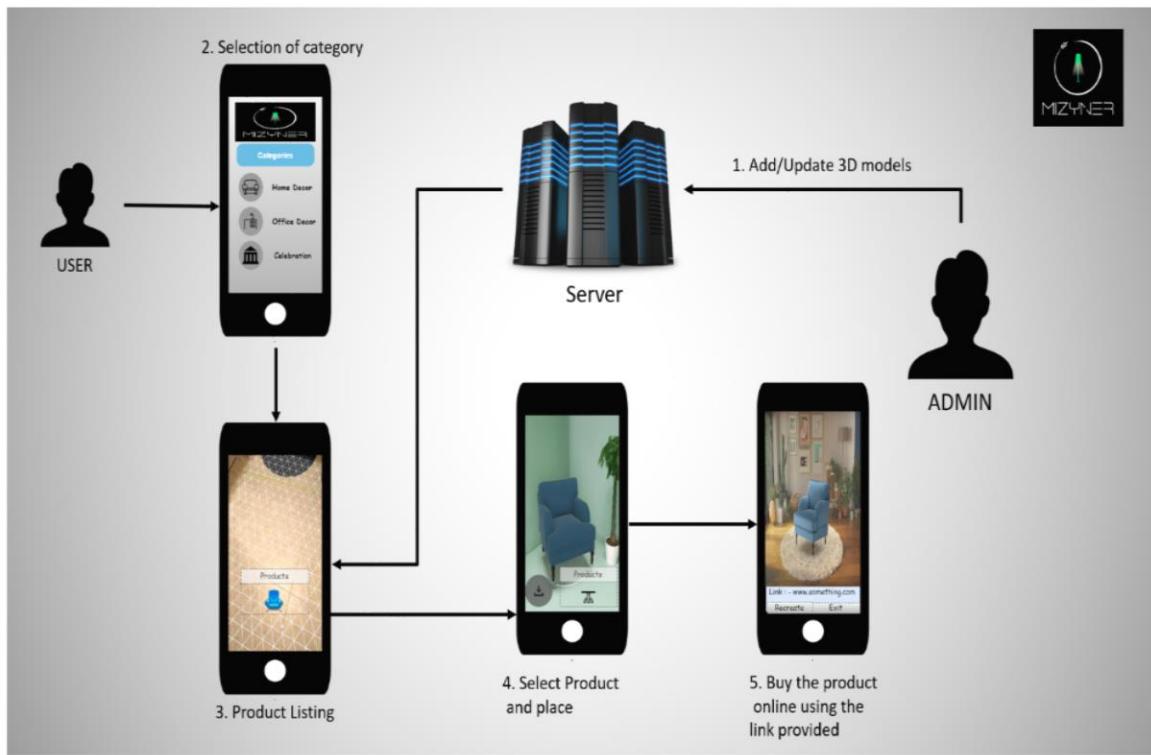


Fig 3.2 System Architecture

The major focus of the app is to make the process of interior design hassle free and cost reduction. We have achieved this by providing the 3d model of each object which can be placed in the surrounding and can be interacted. The best thing of the app which make it different from other app is the use of AR-Core technology which allow us to use real time processing rather than camera frame processing which binds the objects to camera.

Here the architecture provides the complete view of the app and its usage in the perfect manner. It also shows the working of all the actors.

3.3 FLOW CHART

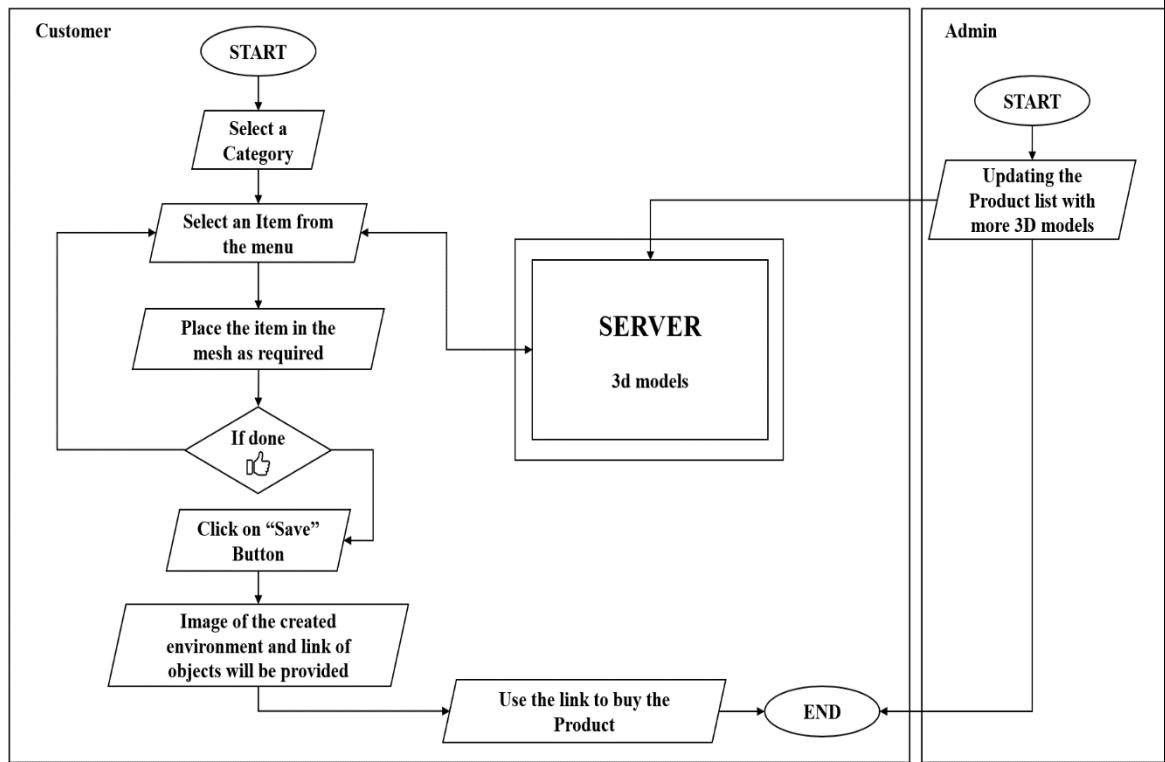


Fig 3.3 Flow Chart

Above we have shown the flow of our project. The customer is the main user which will use the app to place the objects in the real world once the object is placed the user can then save the view and can use the link to buy the product.

The major work of the admin is to create new objects and update the object inventory and make more and more objects to provide better options to user.

CHAPTER NO 4

TOOLS/PLATFORM

CHAPTER 4

TOOLS/PLATFORM

4.1 SOFTWARE REQUIREMENT

1. **OS** – Windows 10
2. **Modelling and Implementation tool** – Unity 3d
3. **IDE** – Android Studio
4. **Language** – C# & Java
5. **Designing tool** – Draw.io

1. OPERATING SYSTEM –

Any Operating System which is having architecture of 32bit or higher is supported. We have used Windows 10 64bit with NVIDIA gpu.

2. UNITY –

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as an OS X-exclusive game engine. As of 2018, the engine has been extended to support 27 platforms. The engine can be used to create both three-dimensional and two-dimensional games as well as simulations for its many platforms. Several major versions of Unity have been released since its launch, with the latest stable version being Unity 2018.3.8.

Features of Unity –

- **Reach the widest possible audience**

Unity supports all the latest and greatest platforms. Native support is now available for Oculus Rift, Steam VR/Vive, Playstation VR, Gear VR, Microsoft HoloLens, and Google's Daydream View.

- **Super-high frame rates**

Thanks to a highly-optimized stereoscopic rendering pipeline and the tools to help you further optimize your content.

- **Leading the revolution**

At Unity we're VR enthusiasts, and it shows. Our highly optimized rendering pipeline can help you achieve exceptional frame rates. That, and the Unity editor's rapid iteration capabilities, have already helped to make Unity far and away the most widely used VR development platform. Native support is available for the following platforms: Oculus Rift, Gear VR, Playstation VR, Microsoft HoloLens, Steam VR/Vive and Google Daydream.

- **Real-time rendering engine**

Produce amazing visual fidelity with Real-Time Global Illumination and Physically Based Rendering.

- **Native Graphics APIs**

Unity supports multiplatforms, but still stays close to the low level graphics API of each platform, allowing you to take advantage of the latest GPU and hardware improvements, like Vulkan, iOS Metal, DirectX12, nVidia VRWorks or AMD LiquidVR.

- **Unlock your CAD data for real-time development**

Through our partnership with PiXYZ software, the best-in-class solution for optimizing 3D data, we offer all you need to quickly import, manage and optimize your large CAD assemblies into Unity for real-time visualization projects.

PiXYZ takes the guesswork and heavy lifting out of the CAD data-prep equation, ensuring all your CAD files are optimized for Unity, regardless

of the source. Going from CAD import to real-time publishing has never been so easy!

Advantages of Unity –

- **Rapid iteration**

Unity's Play Mode is an incredibly powerful development tool for rapid iterative editing. Press Play and instantly you are inside your game, playing and previewing how it will look in its platform-specific final build. Pause it and alter values, assets, scripts and other properties, and instantly see the results. And, step through your game frame by frame for easy debugging with native Visual Studio integration.

- **Create rich cinematic content in Unity**

Timeline's storytelling tools enable artists to work in-context creating cut scenes and gameplay sequences right in Unity. Combined with Cinemachine's unique smart camera system, you can control shots like a movie director. More on Timeline and Cinemachine.

- **Advanced profiling tools**

Continuously optimize your content throughout development with Unity's profiling features. Check to see if your content is CPU or GPU-bound, for example, and pinpoint those areas that require improvement, so you can provide your audience with a smooth-running experience.

- **Native C++ performance**

Benefit from our cross-platform native C++ performance with the Unity-developed backend IL2CPP (Intermediate Language To C++) scripting.

Scripting runtime Mono /.NET 4.6 / C# 7.3

- **High-performance multithreaded system**

Fully utilize the multicore processors available today (and tomorrow), without heavy programming. Our new foundation for enabling high-performance is made up of three sub-systems: the C# Job System, which gives you a safe and easy sandbox for writing parallel code; the Entity Component System (ECS), a model for writing high-performance code by

default, and the Burst Compiler, which produces highly-optimized native code.

Limitations of Unity –

- **No decent video-playback** available across platforms. Who figured Theora decompressed into textures is sufficient, while dropping all video metadata.
- **Input manager** is awful to configure and barely functional (axis and button numbers are inconsistent across platforms, doesn't support hot-plugging controls making a mess of the IDs, no rumble or exotic controllers supported... luckily there is the excellent Rewired)
- **User interface** and text fields don't support translation or even any kind of global string tables out-of-box.
- If you want to do something exotic with the user interface like force a text field to be CAPS only, look forward to coding your custom extensions. If you make your own type of, say, a button, replacing it in the UI is painful because you can't add two Selectable components to the same game object and you can't replace the existing component and inherit its variables. Instead, you must delete the object and add the new component in its place, setting the values from scratch.

3. Android Studio –

Android Studio is the official integrated development environment (IDE) for Android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools.

To support application development within the Android operating system, Android Studio uses a Gradle-based build system, emulator, code templates, and Github integration. Every project in Android Studio has one or more

modalities with source code and resource files. These modalities include Android app modules, Library modules, and Google App Engine modules.

Android Studio uses an Instant Push feature to push code and resource changes to a running application. A code editor assists the developer with writing code and offering code completion, refraction, and analysis. Applications built in Android Studio are then compiled into the APK format for submission to the Google Play Store.

The software was first announced at Google I/O in May 2013, and the first stable build was released in December 2014. Android Studio is available for Mac, Windows, and Linux desktop platforms. It replaced Eclipse Android Development Tools (ADT) as the primary IDE for Android application development. Android Studio and the Software Development Kit can be downloaded directly from Google.

4. C# –

C# (pronounced C sharp) is a general-purpose, multi-paradigm programming language encompassing strong typing, lexically scoped, imperative, declarative, functional, generic, object-oriented (class-based), and component-oriented programming disciplines. It was developed around 2000 by Microsoft within its .NET initiative and later approved as a standard by Ecma (ECMA-334) and ISO (ISO/IEC 23270:2018). C# is one of the programming languages designed for the Common Language Infrastructure.

C# was designed by Anders Hejlsberg, and its development team is currently led by Mads Torgersen. The most recent version is C# 7.3, which was released in 2018 alongside Visual Studio 2017 version 15.7.2.

Design Goals –

The ECMA standard lists these design goals for C#:

- The language is intended to be a simple, modern, general-purpose, object-oriented programming language.
- The language, and implementations thereof, should provide support for software engineering principles such as strong type checking, array bounds checking, detection of attempts to use uninitialized variables, and automatic garbage collection. Software robustness, durability, and programmer productivity are important.
- The language is intended for use in developing software components suitable for deployment in distributed environments.
- Portability is very important for source code and programmers, especially those already familiar with C and C++.
- Support for internationalization is very important.
- C# is intended to be suitable for writing applications for both hosted and embedded systems, ranging from the very large that use sophisticated operating systems, down to the very small having dedicated functions.

5. Draw.io –

draw.io is an open source technology stack for building diagramming applications, and the world's most widely used browser-based end-user diagramming application.

4.2 HARDWARE REQUIREMENT

PROCESSOR: Intel Core 2 Duo and above (2.5+ GHz processor)

HARD DISK: Minimum 128GB

RAM: Minimum 4GB

VIDEO CARD: DirectX 10 or OpenGL 3 compatible video card.

CHAPTER NO 5

DESIGN & IMPLEMENTATION

CHAPTER 5

DESIGN & IMPLEMENTATION

5.1 SYSTEM DESIGN

5.1.1 USE-CASE DIAGRAM

Actors –

1. Customer.
2. Admin.

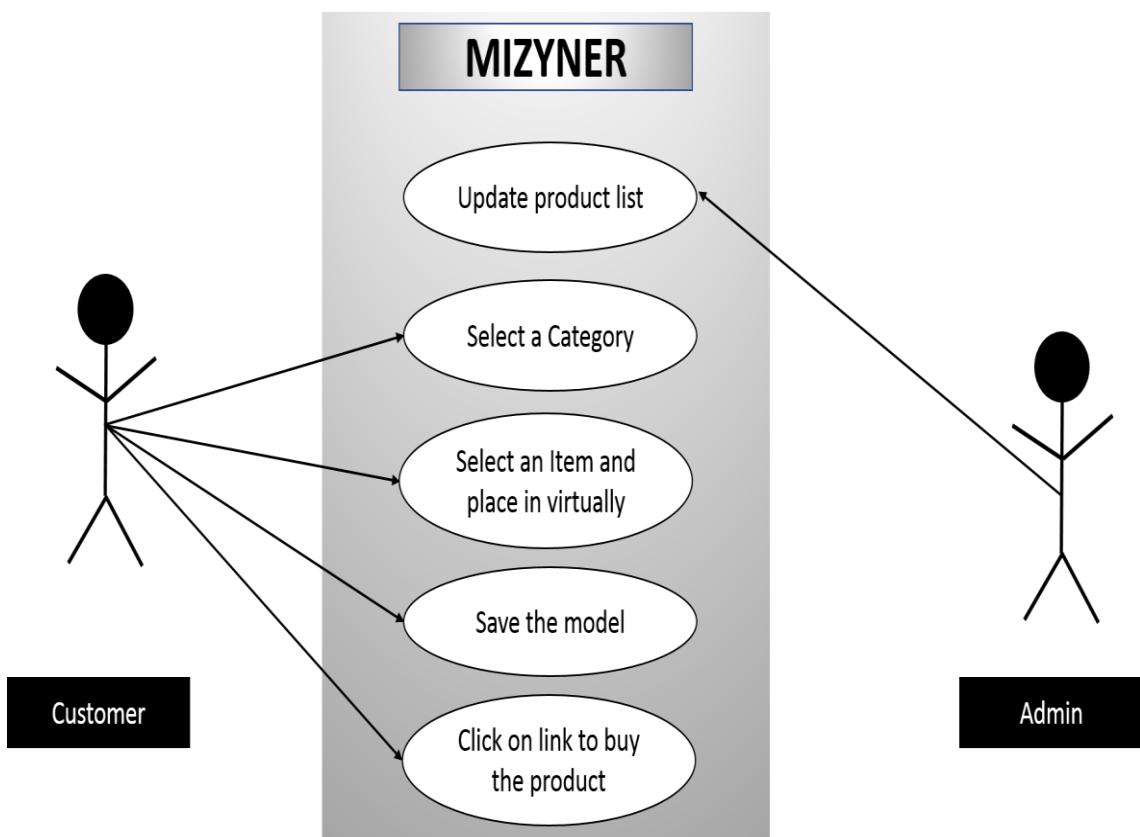


Fig. - 5.1.1: Use-Case Diagram

In Use-Case diagram, the tasks performed by the users are listed below,

1. Admin- update product list
2. Customer – select a Category, select an item and place in virtually, save the model, click on the link to buy the product.

5.1.2. CLASS DIAGRAM

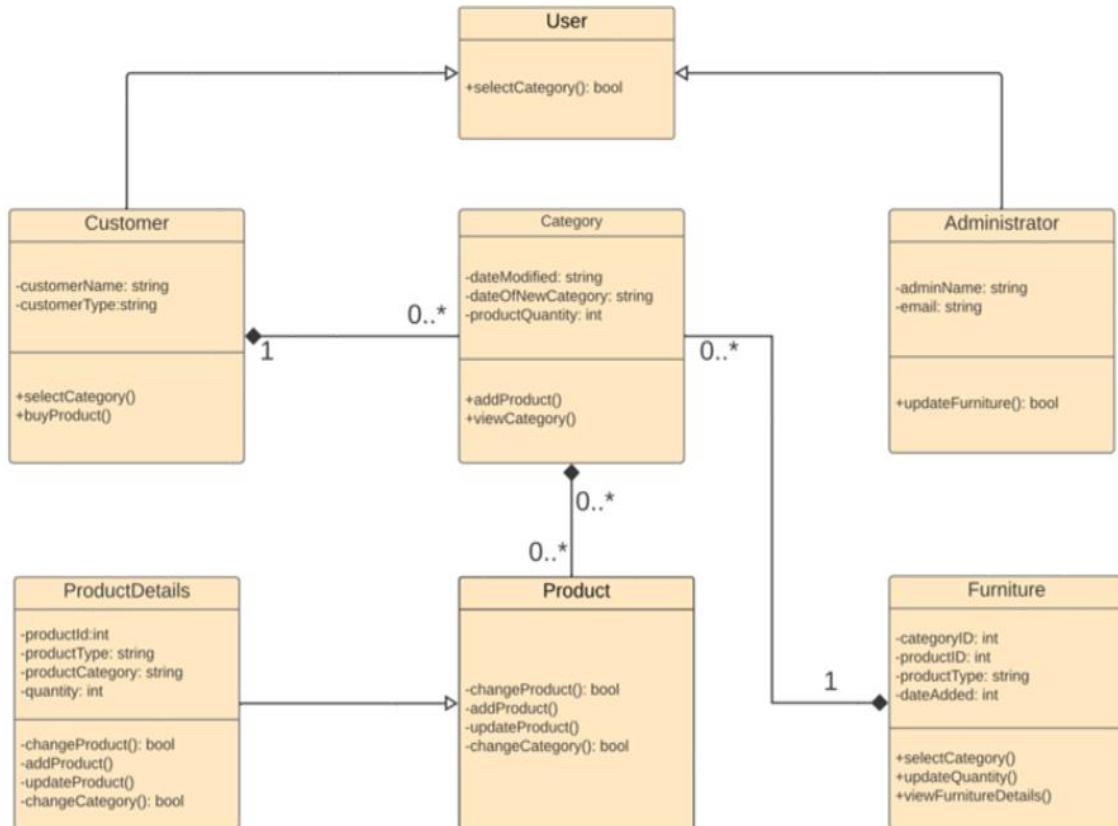


Fig. - 5.1.2: Class Diagram

In our class diagram, we have two users named as Customer and Admin. The Admin can update the list of products (models) as required. Customer will be the user who is going to use the application to get an experience of how a furniture will fit in his surroundings. The application has three categories of furniture where products can be added under each category.. The product class is an interface and it has functions like change product, add product update product and change the category. The product details class consists of the details of the product like product id, product type, product category, quantity and it can implement all the functions of the product class like change product, add product update product and change the category.

5.1.3 SEQUENCE DIAGRAM

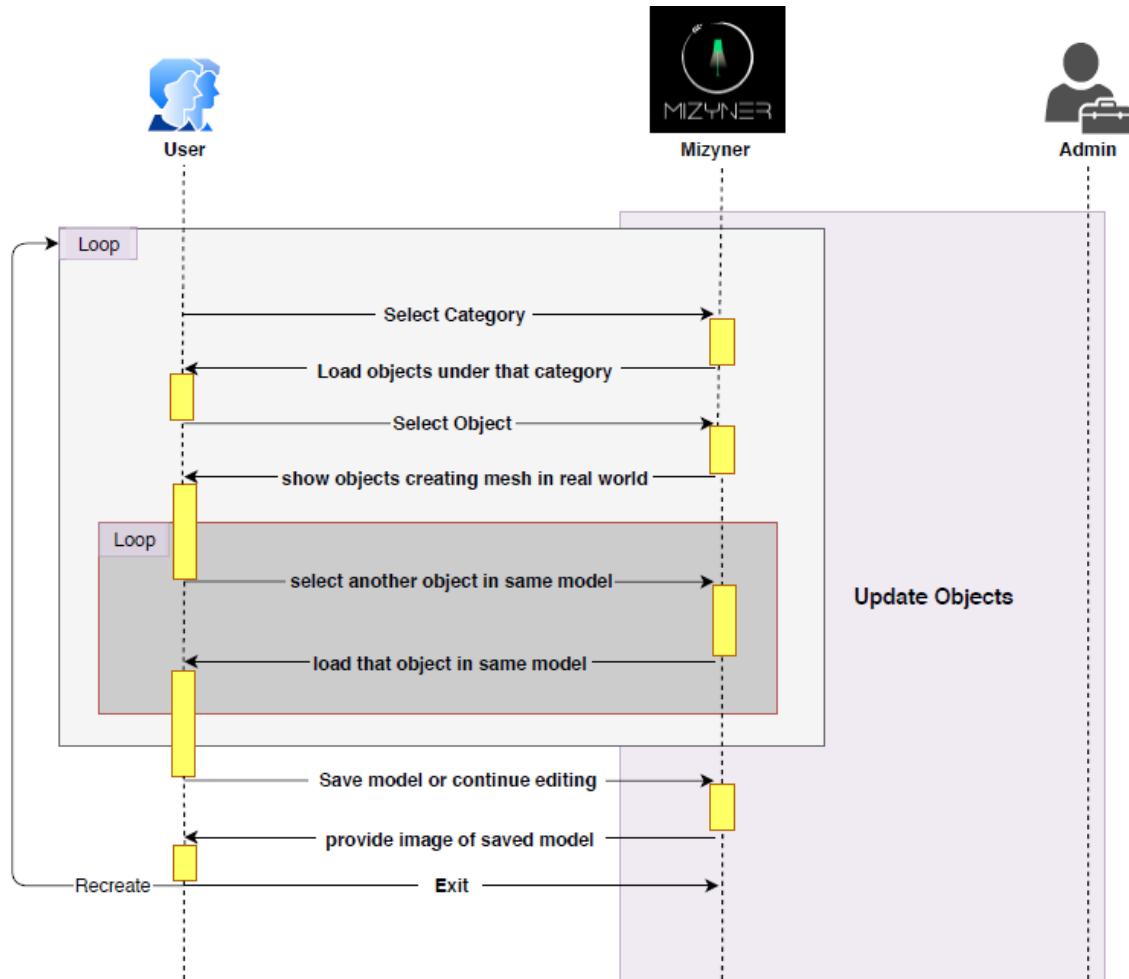


Fig. - 5.1.3: Sequence Diagram

1. Select Category-

As the application starts, it asks the user to select the category under which the user wants to select the product. Now in response to the application will provide a list of objects under that category.

2. Select Object-

Now the user gets the list of objects under the selected category and now he must select the object that he wants to load. In response to the application shows the object by creating a mesh in the real world. The user can select multiple objects under the same category in a single model and this could be done till the user is satisfied by the model he created.

3. Save model or continue editing –

User can save the model that he created by clicking on the save button. In response the application will provide the image of the model to the user. If he is not satisfied, then he could go back and continue editing.

4. Recreate or Exit-

The user could go back to the home page and could again follow the above sequence to recreate the model or can simply press the back button and can exit.

Meanwhile at any instance of time from the time of deployment of the application, the admin can update the list of objects anytime.

5.2 Implementation of System

5.2.1 Implemented Modules

1. Module 1 – Object modelling:

- We have developed basic 10-12 models and have added into respective fields.

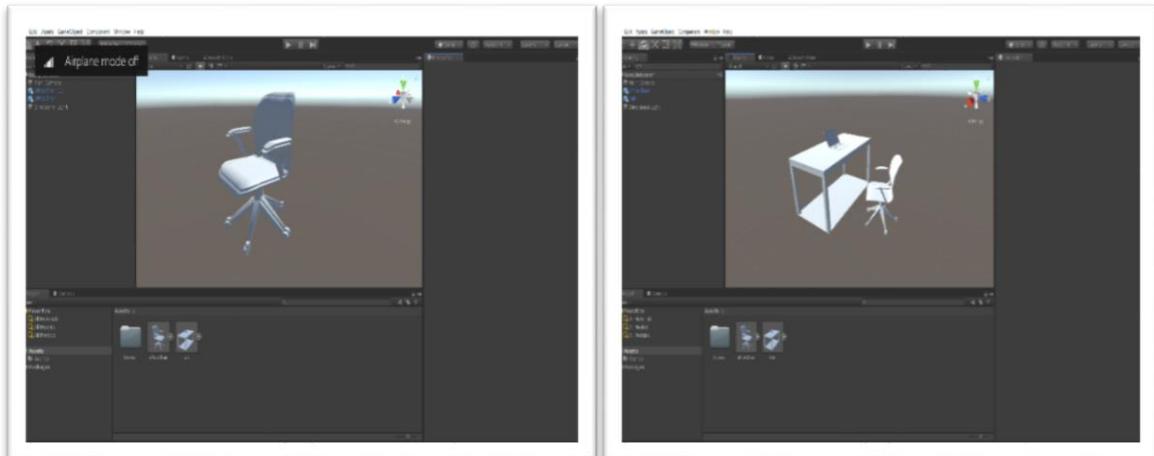


Fig. - 5.2.1.1: Module 1

2. Module 2 – Android App:

- We have implemented the main page of the app where user can put the 3d objects in environment and can interact with them.
- We have also implemented the vertical mesh to apply wall hanging items.

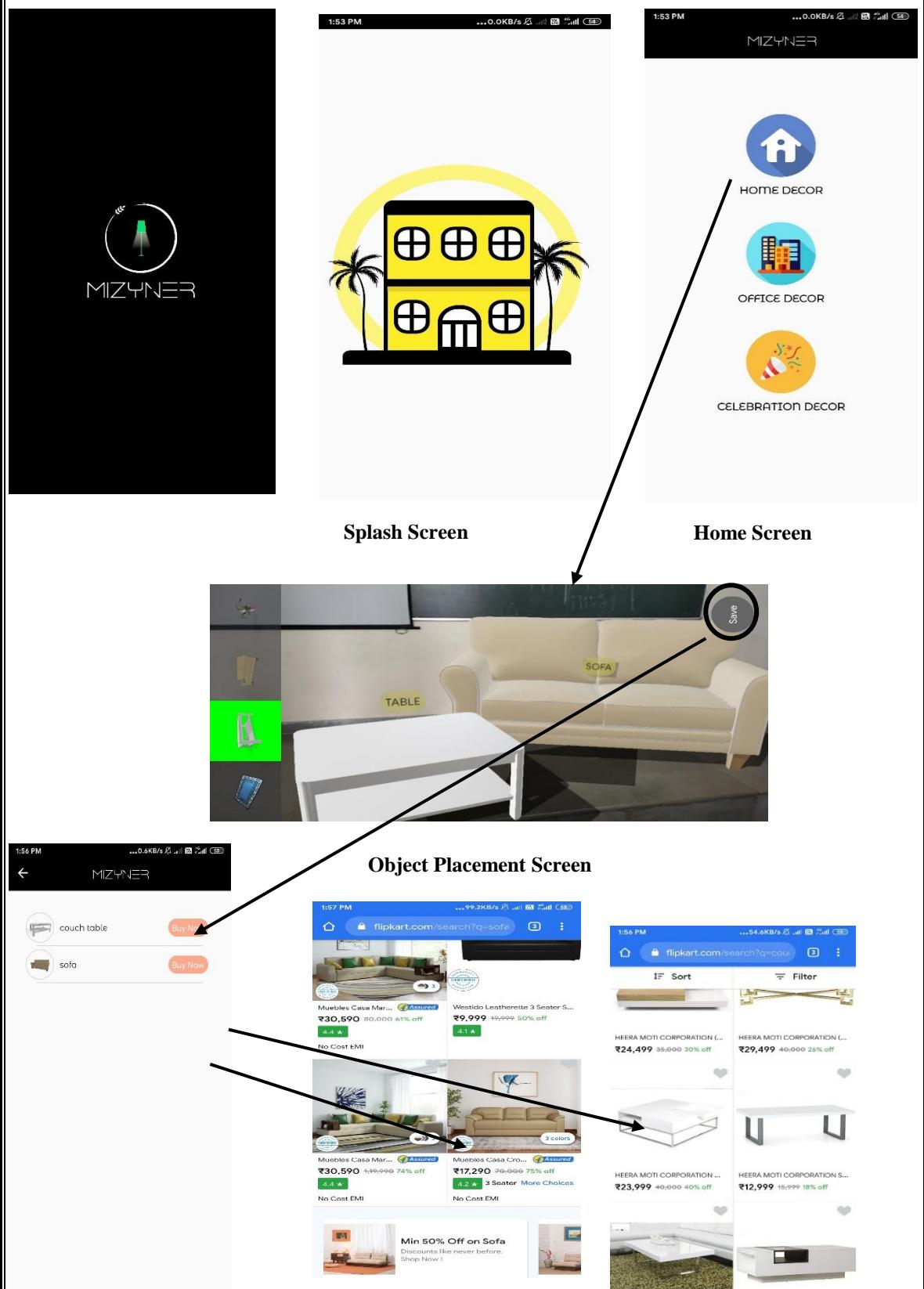


Fig. - 5.2.1.2: Module 2

5.2.2 SAMPLE CODE

HOME PAGE

```
package com.example.mizyner;

import androidx.appcompat.app.AppCompatActivity;

public class HomeActivity extends AppCompatActivity {

    LinearLayout card_view;

    @Override

    protected void onCreate(Bundle savedInstanceState) {

        super.onCreate(savedInstanceState);

        card_view=findViewById(R.id.homedecor);

        card_view.setOnClickListener(new View.OnClickListener() {

            @Override

            public void onClick(View v) {

                Intent intent = new Intent(HomeActivity.this,MainActivity.class);

                startActivity(intent);

                finish();

            }

        });

        card_view=findViewById(R.id.officedecor);

        card_view.setOnClickListener(new View.OnClickListener() {

            @Override

            public void onClick(View v) {

                Intent intent = new Intent(HomeActivity.this,OfficeActivity.class);

                startActivity(intent);

                finish();

            }

        });

    }

}
```

```
});      }
```

HOME DECOR PAGE

```
package com.example.mizyner;  
import androidx.annotation.RequiresApi;  
import androidx.appcompat.app.AppCompatActivity;  
public class MainActivity extends AppCompatActivity implements  
View.OnClickListener {  
    private ArFragment arFragment;  
    private ModelRenderable carpetRenderable,;  
    View arrayView[];  
    ViewRenderable name_object;  
    int selected = 1;  
    public static ArrayList<String> selectedMain = new ArrayList<>();  
    TextView saveButton;  
    @RequiresApi(api = Build.VERSION_CODES.N)  
    @Override  
    protected void onCreate(Bundle savedInstanceState) {  
        super.onCreate(savedInstanceState);  
        setContentView(R.layout.activity_main);  
        arFragment= (ArFragment)  
getSupportFragmentManager().findFragmentById(R.id.arFragment);  
        saveButton = findViewById(R.id.saveButton);  
        carpet = (ImageView)findViewById(R.id.carpet);  
        setClickListener();  
        setupModel();
```

```

arFragment.setOnTapArPlaneListener(hitResult, plane, motionEvent) -> {

    Anchor anchor = hitResult.createAnchor();

    AnchorNode anchorNode = new AnchorNode(anchor);

    anchorNode.setParent(arFragment.getArSceneView().getScene());

    createModel(anchorNode, selected);

});

saveButton.setOnClickListener(new View.OnClickListener() {

    @Override

    public void onClick(View view) {

        if(selectedMain.size() == 0){

            Toast.makeText(MainActivity.this,"Please select atleast one",
Toast.LENGTH_SHORT).show();

        }else{

            startActivity(new

Intent(getApplicationContext(),SelectedItemActivity.class));

        }

    }

});

}  private void setupModel() {

    ModelRenderable.builder()

        .setSource(this, R.raw.carpet)

        .build().thenAccept(renderable -> carpetRenderable = renderable)

        .exceptionally(


            throwable -> {

                Toast.makeText(this, "Unable to load Carpet Model",

Toast.LENGTH_SHORT).show();

            return null;

```

```
        }

    );

}

@Override

public void onClick(View view) {

    if (view.getId()==R.id.carpet){

        selected = 1;

        selectedMain.add("carpet");

        setBackground(view.getId());

    }

}
```

SELECTED ITEM PAGE

```
package com.example.mizyner;

import androidx.appcompat.app.AppCompatActivity;

public class SelectedItemActivity extends AppCompatActivity {

    @BindView(R.id.backImage)

    ImageView backImage;

    @Override

    protected void onCreate(Bundle savedInstanceState) {

        super.onCreate(savedInstanceState);

        setContentView(R.layout.activity_selected_item);

        ButterKnife.bind(this);

        backImage.setOnClickListener(new View.OnClickListener() {
```

```

@Override

public void onClick(View view) {
    finish();
}

});

for(int i=0;i<selectedMain.size();i++){

    Log.d("selected item", "onCreate: "+selectedMain.get(i));

    if(selectedMain.get(i).equals("carpet")){
        carpetRl.setVisibility(View.VISIBLE);
        carpetName.setText("carpet");
        carpetBuy.setOnClickListener(new View.OnClickListener() {

            @Override

            public void onClick(View view) {

                String url =
                "https://www.flipkart.com/search?q=carpet&otracker=search&otracker1=search&marketplace=FLIPKART&as-show=on&as-off";

                try {

                    Intent i = new Intent("android.intent.action.MAIN");
                    i.setComponent(ComponentName.unflattenFromString("com.android.chrome/com.android.chrome.Main"));

                    i.addCategory("android.intent.category.LAUNCHER");
                    i.setData(Uri.parse(url));
                    startActivity(i);

                }catch(ActivityNotFoundException e) {

                    Intent i = new Intent(Intent.ACTION_VIEW, Uri.parse(url));
                    startActivity(i);

                }
            }
        });
    }
}

```

CHAPTER NO 6

TESTING,

RESULTS & DISCUSSION

CHAPTER 6

TESTING, RESULTS & DISCUSSION

6.1 TESTING

6.1.1 TYPES OF TESTING

Manual Testing

Manual testing includes testing a software manually, i.e., without using any automated tool or any script. In this type, the tester takes over the role of an end-user and tests the software to identify any unexpected behavior or bug. There are different stages for manual testing such as unit testing, integration testing, system testing, and user acceptance testing.

Testers use test plans, test cases, or test scenarios to test a software to ensure the completeness of testing. Manual testing also includes exploratory testing, as testers explore the software to identify errors in it.

Following are the testing techniques that are performed manually during the test life cycle:

- Acceptance Testing
- White Box Testing
- Black Box Testing
- Unit Testing
- System Testing
- Integration Testing

Automation Testing

Automation testing, which is also known as Test Automation, is when the tester writes scripts and uses another software to test the product. This process involves automation of a manual process. Automation Testing is used to re-run the test scenarios that were performed manually, quickly, and repeatedly.

Apart from regression testing, automation testing is also used to test the application from load, performance, and stress point of view. It increases the test coverage, improves accuracy, and saves time and money in comparison to manual testing

Test Automation should be used by considering the following aspects of a software:

- Large and critical projects
- Projects that require testing the same areas frequently
- Requirements not changing frequently
- Accessing the application for load and performance with many virtual users
- Stable software with respect to manual testing
- Availability of time

6.1.2 LEVELS OF TESTING

There are four levels of testing: Unit, Integration, System and Acceptance.

1. **Unit Testing:** A level of the software testing process where individual units/components of a software/system are tested. The purpose is to validate that each unit of the software performs as designed.
2. **Integration Testing:** A level of the software testing process where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units.
3. **System Testing:** A level of the software testing process where a complete, integrated system/software is tested. The purpose of this test is to evaluate the system's compliance with the specified requirements.
4. **Acceptance Testing:** A level of the software testing process where a system is tested for acceptability. The purpose of this test is to evaluate the system's compliance with the business requirements and assess whether it is acceptable for delivery.

6.1.3 TESTING REPORT

MIZNER: An AR Based Smart Interior Designer								
SR.NO.	TEST CASE ID	TEST OBJECTIVE	STEPS	DATA	PREREQUISITE	EXPECTED RESULT	ACTUAL RESULT	STATUS
1	TC_CHECK_FOR_BEST_TECHNOLOGY_TO_MODEL_01	To check which technology is best for creating 3D model	1. Create demo 3D models in different technology 2. Compare the models made from different technologies	Images of demo object from different angles	Different Images of the demo object taken from different viewing angles	The best model should occupy least space and should be the most efficient	The best technology was found out to be Unity 3D.	Pass
2	TC_CREATE_MODEL_FOR_HOME_DECOR_DOMAIN_01	To create 3D models	1. Open Unity 3D 2. Make model for home decoration	Images of object from different angles	Different Images of different home decoration objects taken from different viewing angles	Different 3D Objects should be created.	Different 3D objects are ready.	Pass
3	TC_CREATE_MODEL_FOR_OFFICE_DECOR_DOMAIN_01	To create 3D models	1. Open Unity 3D 2. Make model for office decoration	Images of object from different angles	Different Images of different office decoration objects taken from different viewing angles	Different 3D Objects should be created.	Different 3D objects are ready.	Pass
4	TC_CREATE_MODEL_FOR_CELEBRATION_HALL_DECOR_DOMAIN_01	To create 3D models	1. Open Unity 3D 2. Make model for celebration hall decoration	Images of object from different angles	Different Images of different celebration hall decoration objects taken from different viewing angles	Different 3D Objects should be created.	Different 3D objects are ready.	Pass
5	TC_CHECKING_DIMENSIONS_OF_3D_MODEL_S	To check whether the 3D objects created are of proper dimensions	1. Open Unity 3D 2. Load model 3. check the dimensions	3d models	Created 3D models	The 3D models should have proper dimensions.	All 3D models have proper dimensions.	Pass

MIZNER: An AR Based Smart Interior Designer					
MODULE: Application Creation					
SR.NO.	TEST CASE ID	TEST OBJECTIVE	STEPS	DATA	PREREQUISITE
1	TC_REDIRECT_TO_HOME_SCREEN_FROM_SHELL_SCREEN_01	To successfully redirect to the home screen	1.Open application	Nil	Successful launch of the application
2	TC_LOAD_CARDS_VIEWS_OF_ALL_THREE_CATEGORIES_01	To load the card-views of all the three categories of decoration	1.Open application	Nil	Successful redirect from splash screen to home page
3	TC_LOADING_OBJECTS_FROM_HOME_DECOR_CATEGORY_01	To load 3D objects from home decor category	1.Open application 2.Click on home decoration category	3d models from home décor category	Added 3D models on the application
4	TC_CAMERA_LAUNCH_FOR_HOME_DECOR_CATEGORY_01	To launch camera (Home Decor)	1.Open application	Nil	Integrated camera in the mobile phone
5	TC_CREATING_HORIZONTAL_MESH_IN_HOME_DECOR_CATEGORY_01	To create horizontal Mesh (Home Decor)	1.Open application 2.Click on home decoration category	Nil	Camera should be successfully launched

6	TC_CREATING_VERTICAL_MESH_IN_HOME_DECOR_CATEGORY_0 CAL_MESH_IN_HOME_DECOR_CATEGORY_0	To create vertical Mesh (Home Decor)	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the wall for creating mesh.	NIL	Launched camera	Mesh should be successfully created. Mesh creation was unsuccessful.
7 Y 01	TC_PLACING_OBJECTS_ON_MESH_FOR_HOME_DECOR_CATEGORY_0	To place the object and check whether it remains on the same place after moving the camera.	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created.	3D model	Created mesh	Object should be placed successfully and it should remain on the same place after moving the camera. Object placed successfully and it remained on the same place after moving the camera.
8 E DECOR_CATEGORY_0	TC_PLACING_COLLIDING_OBJECTS_IN_HOME_DECOR_CATEGORY_0	To place one object above another object	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Select another object 7. Place it above the already placed object.	3D model	Atleast one already placed object	Object should be placed successfully above the already placed object. Object was unable to be placed above the already placed object.
9 Y DECOR_PAGE_01	TC_REDIRECT_TO_BU_Y_PAGE_FROM_HOME_DECOR_PAGE_01	To successfully redirect to the buy page after clicking on the buy button	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Click on buy button.	List of objects selected.	At least one Object selected.	After clicking on the buy button, it should be successfully redirected to the buy page which should consist of a list of objects with that objects' specific buy button. Page successfully redirected to the buy page where there was a list of objects with that objects' specific buy option.

	Category 2: Office décor						
10	TC_LOADING_OBJECTS_FROM_OFFICE_DECOR_CATEGORY_01	To load 3D objects from office décor category	1. Open application 2. Click on office decoration	3d models from office décor category	Added 3D models on the application	The 3D models should be properly loaded	Different 3D objects loaded on the page
11	TC_CAMERA_LAUNCH_FOR_OFFICE_DECOR_CATEGORY_01	To launch camera (Office Decor)	1. Open application 2. Click on office decoration	NIL	Integrated camera in the mobile phone	Camera should be successfully launched	Camera launched successfully
12	TC_CREATING_MESH_IN_OFFICE_DECOR_CATEGORY_01	To create horizontal Mesh(Office Hall Decor)	1. Open application 2. Click on Office décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh.	NIL	Launched camera	Mesh should be successfully created.	Mesh created successfully
13	TC_CREATING_VERTICAL_MESH_IN_OFFICE_DECOR_CATEGORY_01	To create vertical Mesh(Office Decor)	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the wall for creating mesh.	NIL	Launched camera	Mesh should be successfully created.	Mesh creation was unsuccessful
14	TC_PLACING_OBJECTS_ON_MESH_FOR_OFFICE_DECOR_CATEGORY_01	To place the object and check whether it remains on the same place after moving the camera.	1. Open application 2. Click on Office décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created.	3D model	Created mesh	Object should be placed successfully and it should remain on the same place after moving the camera.	Object placed successfully and it remained on the same place after moving the camera. Pass
15	TC_PLACING_COLLIDING_OBJECTS_IN_HOME_DECOR_CATEGORY_01	To place one object above another object.	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Select another object 7. Place it above the already placed object.	3D model	Atleast one already placed object	Object should be placed successfully above the already placed object.	Object was unable to be placed above the already placed object.

	Category 2: Office decor						
10	TC_LOADING_OBJECTS_FROM_OFFICE_CATEGORY_01	To load 3D objects from office decor category	1. Open application 2. Click on office decoration	3d models from office décor category	Added 3D models on the application	The 3D models should be properly loaded	Different 3D objects loaded on the page
11	TC_CAMERA_LAUNCH_FOR_OFFICE_DECO_CATEGORY_01	To launch camera (Office Decor)	1. Open application 2. Click on office decoration	NIL	Integrated camera in the mobile phone	Camera should be successfully launched	Pass
12	TC_CREATING_MESH_IN_OFFICE_DECOR_CATEGORY_01	To create horizontal Mesh(Office Hall Decor)	1. Open application 2. Click on Office décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh.	NIL	Launched camera	Mesh should be successfully created.	Pass
13	TC_CREATING_VERTICAL_MESH_IN_OFFICE_DECOR_CATEGORY_01	To create vertical Mesh(Office Decor)	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the wall for creating mesh.	NIL	Launched camera	Mesh should be successfully created.	Mesh creation was unsuccessful
14	TC_PLACING_OBJECTS_ON_MESH_FOR_OFFICE_DECOR_CATEGORY_01	To place the object and check whether it remains on the same place after moving the camera.	1. Open application 2. Click on Office décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created	3D model	Created mesh	Object should be placed successfully and it should remain on the same place after moving the camera.	Object placed successfully and it remained on the same place after moving the camera.
15	TC_PLACING_COLLIDING_OBJECTS_IN_HOME_DECOR_CATEGORY_01	To place one object above another object	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Select another object 7. Place it above the already placed object.	3D model	Atleast one already placed object	Object should be placed successfully above the already placed object.	Object was unable to be placed above the already placed object.

16.1	TC_REDIRECT_TO_BUYPAGE_FROM_OFFICE_DECOR_PAGE_0 To successfully redirect to the buy page after clicking on the buy button	1. Open application 2. Click on Office décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Click on buy button.	List of objects selected.	After clicking on the buy button, it should be successfully redirected to the buy page which should consist of a list of objects with that objects specific buy button.	Page successfully redirected to the buy page where there was a list of objects with that objects specific buy option
17.1	Category 2 : Celebration Hall décor		At least one object selected.		Pass
18.1	TC_LOADING_OBJECTS_FROM_CELEBRATION_HALL_DECOR_CATEGORY_01 To load 3D objects from celebration hall decoration category	1. Open application 2. Click on celebration hall decoration	3d models from celebration hall décoration category	Added 3D models on the application	The 3D models should be properly loaded
19.1	TC_CAMERA_LAUNCH_FOR_CELEBRATION_HALL_DECOR_CAT_01 To launch camera (Celebration hall Decor)	1. Open application 2. Click on celebration hall decoration	NIL	Integrated camera in the mobile phone	All 3D models have proper dimensions.
20.1	TC_CREATING_MESH_IN_CELEBRATION_HALL_DECOR_CATEGORY_01 To create vertical Mesh(Celebration Hall Decor)	1. Open application 2. Click on Celebration Hall décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh.	NIL	Launched camera	Camera should be successfully launched
21.1	TC_CREATING_VERTICAL_MESH_IN_CELEBRATION_HALL_DECOR_CATEGORY_01 To create vertical Mesh(Celebration Hall Decor)	1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the wall for creating mesh.	NIL		Camera launched successfully

		1. Open application 2. Click on Home décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Select another object 7. Place it above the already placed object.	Atleast one already placed object	Object should be placed successfully above the already placed object.	Object was unable to be placed above the already placed object.	FAIL
TC_PLACING_COLLIDI NG_OBJECTS_IN_HOM E_DECOR_CATEGORY 22	To place one object above another object	1. Open application 2. Click on Celebration hall décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Click on buy button.	List of objects selected.	Atleast one object selected.	After clicking on the buy button, it should be successfully redirected to the buy page which should consist of a list of objects with that objects' specific buy button.	Page successfully redirected to the buy page where there was a list of objects with that objects' specific buy option.
TC_REDIRECT_TO_BU Y_PAGE_FROM_CELEBR ATION_HALL_DECOR_23 PAGE_01	To successfully redirect to the buy page after clicking on the buy button.	1. Open application 2. Click on Celebration hall décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Click on buy button.	Nil		After clicking on the buy button, it should be successfully redirected to the online shopping platform which provides option to buy the selected object.	Page successfully redirected to the online shopping platform which provides option to buy the selected object.
TC_REDIRECT_TO_ONL INE_SHOPPING_PLATF ORMS_FOR_BUYING_O PTION 24	To successfully redirect to online shopping platforms	1. Open application 2. Click on Celebration hall décor 3. Select an object 4. Move mobile phone such that camera should be facing the ground for creating mesh. 5. Click on the mesh created. 6. Click on buy button. 7. Click on the buy button in front of the object that you want to buy.	Nil	Buying links of the particular objects.		Pass

6.2 RESULTS AND DISCUSSIONS



Fig 6.1 Splash Screen

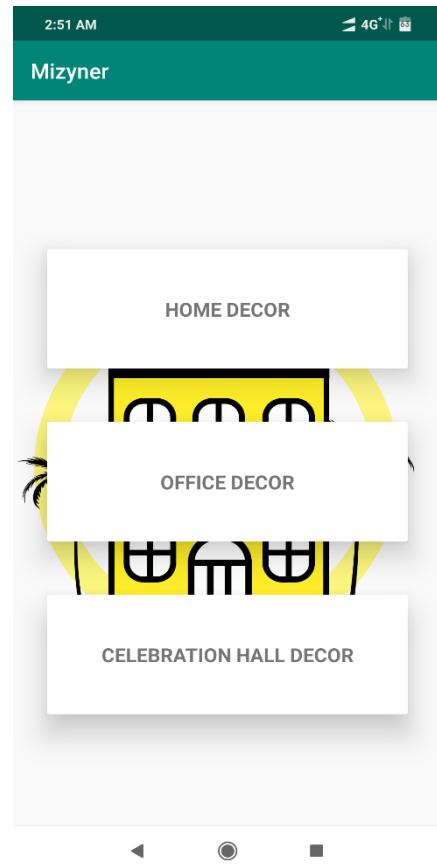


Fig 6.2 Startup Screen

On starting the application, the first scene that appears is as shown in fig 6.1 & fig 6.2.

Here the user will get 3 categories to choose from which he can select based on whether he wants to decorate the House, Office or a Celebration Hall.



Fig 6.3 Mesh Creation

After entering a category, the system will generate a mesh on the ground as shown in fig 6.3 and a list of objects related to that category will be displayed on the top of the screen.



Fig 6.4 Object Placement

After successfully creating a mesh in the real world, the user can select an object and place it wherever it suits him the best.



Fig 6.5 Object Deletion and Movement

If the user doesn't like the position of an object, he can delete it by simply clicking on it, or move it from one place to another by dragging it.

A user can place multiple objects at the same time to have a greater idea how the room will look like.

CHAPTER NO 7

ADVANTAGES AND

APPLICATIONS

CHAPTER 7

ADVANTAGES AND APPLICATIONS

7.1 ADVANTAGES

1. Use of **AR Core** helps us in making the product position static in the environment.
2. Most of the similar apps uses '**Vuforia**' as the major implementation this led to a *2D implementation* of the work, but as we are using AR-Core we will be dealing with *3D objects*.
3. All the other apps *only deal in furniture* as the only product whereas we are *providing most of the other décor options*.
4. User can put multiple objects in a same mesh.
5. User can roam around the mesh without caring about the previous location of objects.
6. User can create both vertical as well as horizontal mesh.

7.2 APPLICATIONS

1. Celebration Halls can be decorated as per the customer requirements and the customer can also see the result before even investing too much.
2. This will be a one stop solution for most of the décor job such as 'Home Decor', 'Office Decor', 'Celebration' and many more.
3. Builders can provide a virtual tour to their long distant consumers by sharing the 3d model, any updates by consumers can be done in few clicks.

CHAPTER NO 8

**CONCLUSION & FURTHER
SCOPE**

CHAPTER 8

CONCLUSION

8.1 CONCLUSION

We have **designed** a mobile application and completed its partial development. Our application will amend the mode of current Décor system by providing an Augmented Reality based décor solution. This application can also be custom build according to the customer requirements by providing some 3D models. We have applied **engineering knowledge** to **analyze** the **societal problem** of interior designing of home, office and celebration halls and other places and provide a modern engineering solution. Then we have designed the application in two modules. We have **investigated** the available application to find out the new solutions and updates. We have used **modern tool** Unity 3D and AR-Core for the implementation of the application. During this project tenure we have applied **professional ethics** and understood the importance of **team work** and **communication** while presenting project in various competitions and conferences for **project management** which helped us to get **life-long learning**.

8.2 FURTHER SCOPE

- The app can be customized for a particular vendor providing only items he/she wants.
- The app can be embedded with an AI system for recommending objects according to the walls.
- Vertical Mesh can be implemented.
- A fully developed room can be shown at starting as recommendation.

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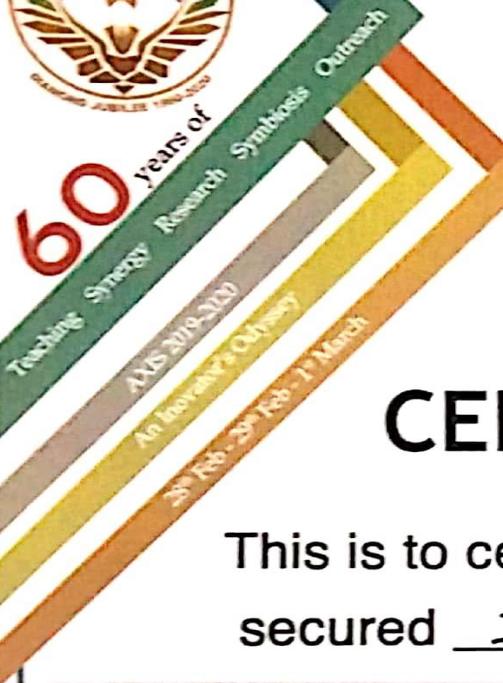
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3. <https://www.crunchbase.com/organization/neybers> [3]

APPENDIX I



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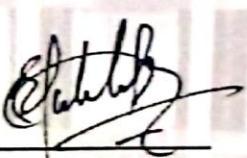
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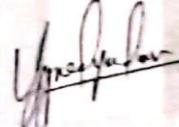


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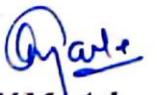
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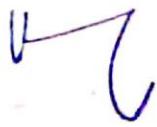
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APPENDIX II

Mizyner: An AR based Smart Interior Designer

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Abstract— Being one of the hot technologies of the era Augmented reality is exponentially developing various day to day activities and home decor is one of them. Mizyner is an android application that overlays the virtual Interior in a physical environment. Markers are implanted on the mesh (floor or wall) for tracking to define the scale and coordinates of the room. The user selects virtual Interior on the screen and places it into the design space. Here the concept of AR is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Smartphones are very popular; it is hoped that the proposed system will allow a large range of users. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the desired layout for a room. Thus, this saves time and efforts by avoiding the need to physically go to the store and select interiors.

Keywords— *Augmented Reality, virtual interior, tracking, view in various angles, real time, less efforts.*

I. INTRODUCTION

It is pretty difficult to anticipate how any piece of interior will look inside a room with lot of artefacts left to human imagination. The size, the color, and the way it integrates with the prevailing environment. Augmented reality, a technology that overlays infographics on the concrete world has its applications within the field of engineering and architecture and has been employed to tackle real world problems.

Mizyner is an android application that overlays the virtual Interior in a physical environment. Markers are implanted on the mesh (floor or wall) for tracking to define the scale and coordinates of the room. The user selects virtual Interior on the screen and places it into the design space. Here the concept of AR is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the desired layout for a room. Thus, this saves time and effort by avoiding the need to physically go to the store and select interiors.

Some similar systems have already been presented but the system proposed includes additional functions for the user interface and an improved implementation. For example, the user can interact with implicit interior using Palpable Augmented Reality in real time allowing complex and diverse designs to be explored and visualized, making AR technology for interior design accessible to both professionals and amateurs.

Goals or Objectives

- To provide virtual experience of Home Decor to a user.
- To Optimize the cost of Interior Designing.
- To provide virtual experience to users using augmented reality.
- To provide the user the estimation of the size, look and cost of the object.
- To provide satisfaction to the user by providing features that are not available.

II. LITERATURE SURVEY

“Interior Design using Augmented Reality Environment: (International Journal of Innovative Research in Science, Engineering and Technology)”— This paper presents an application of Augmented Reality technology for interior design. Nowadays, people are busy with their work thus limiting their time to go to various stores to buy furniture for their everyday use. [1] There is difficulty to fulfil the customers contentment of decorate their room without imaginary view of how the place would appear. A printed furniture catalogue is paper based containing textual information and images which does not provide any interaction for the user. [1] We intend to use marker-based AR for implementing a new design approach for interior design. This AR environment will allow the user to select from a range of furniture and then display the virtual furniture selected on the real environment. [1] The user can also modify the virtual furniture in real-time on the screen allowing the user to have an interactive experience with the furniture in a real-world environment. [1] This will provide a better view of the furniture placement and simplify the process of interior designing for users to save their time and effort.[1]

“Augmented Reality Application for Architects and interior designers: Interno A cost effective solution (IEEE)”- Nowadays with excessive workload and busy life, many professional face problems that results in the loss of their clients or the certain overheads that spoil the process of satisfying the client. [2] The proposed software will be used by interior designers or architects. This proposed research most likely acts as an effective tool which can decrease the gap between industrial company and customer in addition to other applicable business communities. [2] It will help in visualizing architect plans and interior designs. A virtual model of real environment can be designed before its physical implementation, it will allow interior designers to implement their idea in the given workspace virtually and then view it in real environment, it will also allow architects to view their 3D visualizations on their 2D drawings.[2] Application is based on my findings of user's expectations of an augmented reality interior design service, a service which is a combination of various functionality of social media, augmented reality (AR) and 3-D modeling that encloses the concept of home design. This study distinctively bridges all users of relevant businesses to the user-intensive design of an augmented reality. [2] The paper provides you with the inner depth on how the augmented reality can be implemented to facilitate the architects and interior designers as well it discusses the algorithm used to achieve the functionalities. [2] The proposed application exhibits two types of Augmented reality, Marker less and marker based. The novelty of the project is that it does not require any sort of expensive gadgets.[2] It can easily be used via smartphones and tablets. It is also operable on any operating system. [2] This is a cost-effective solution that primarily reduces the overheads that interior designer and architects confronts on daily basis. The software exhibits all the features that might be required by interior designers and architects respectively. [2]

“AR Furniture: Integrating Augmented Reality Technology to Enhance Interior Design using Marker and Marker less tracking”— Purchasing products for interior design always has a problem that the purchased products may not satisfy customers because they cannot put them in their own place before buying.[3] The purpose of this research is to study and develop an android application called 'AR Furniture' with the use of Augmented Reality technology for design and decoration that will help customers visualize how furniture pieces will look and fit (to scale) in their homes and also can provide details of products to support customer decision. [3] This application is a prototype to find out factors affecting the design and tracking of AR applications.[3]

III. PROPOSED WORK

The intent of our project is that the users should be able to take virtual experience of home decoration by using augmented reality and optimizing the cost and time required for interior decoration. Our product is an AR based application that is remarkably customer friendly and clientele oriented.

The philosophy of the application starts with examining images from the rear camera of a smartphone or tablet using marker tracking technique for displaying product's details and marker-less tracking technique for displaying 3D models, performing feature tracking, and calculating positions to display a 3D model over the real-world image.

A. Flow Chart

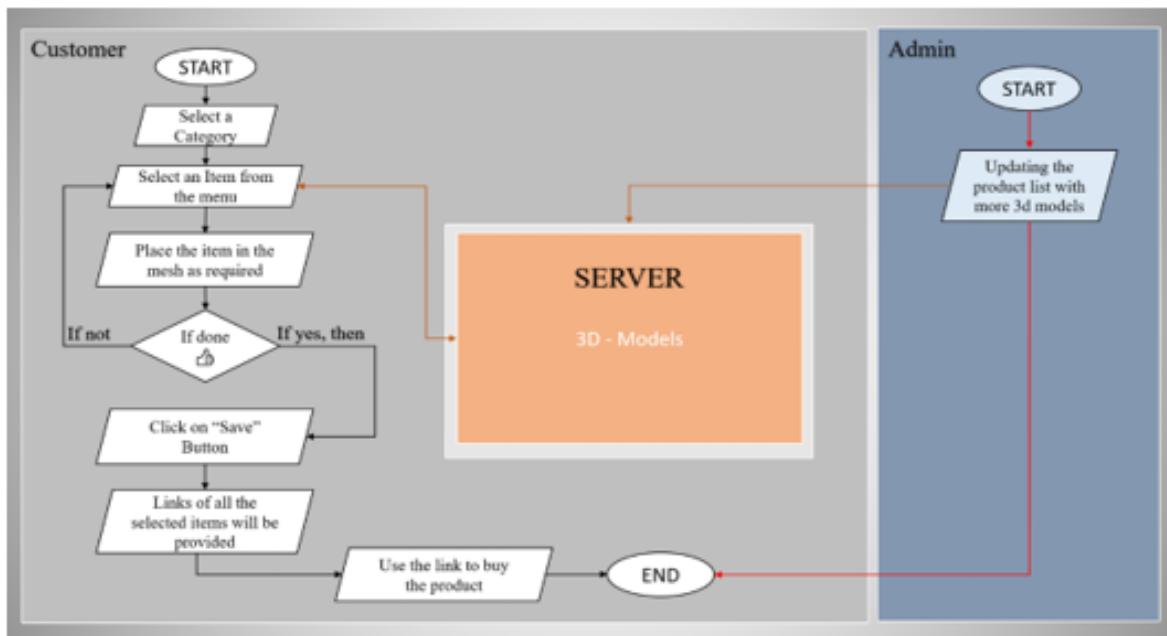


Fig. 1 Flow Chart

B. Flow of the System:

- There is no login section as we are not taking any kind of information from our user.
- User has to select a category from the main menu and the application will redirect the user to the list of items for that particular category.
- User needs to create a mesh before they can place an object.
- To create mesh, user needs to just move the smartphone around an empty space and mesh will be created and shown by pixels on the screen.
- Henceforth user just needs to select a product from the list of items and place them virtually.
- After successful creation of virtual environment, user will have an option to download the 3d model file for the created environment.
- At last links for all the items will be provided by the application to the user to buy those products.

C. Modules:

Module 1: - Creating 3D Models using Autodesk 3Ds Max

- I. Creating objects for Home Decoration.
- II. Creating objects for Office Decoration
- III. Creating objects for Celebration Hall.

Module 2: - Developing the application using Unity3D, Android Studio and ~~Sceneform~~ Augmented Reality SDK as an engine for image analysis, image processing and 3D model rendering.

IV. IMPLEMENTED WORK

A. Module 1:

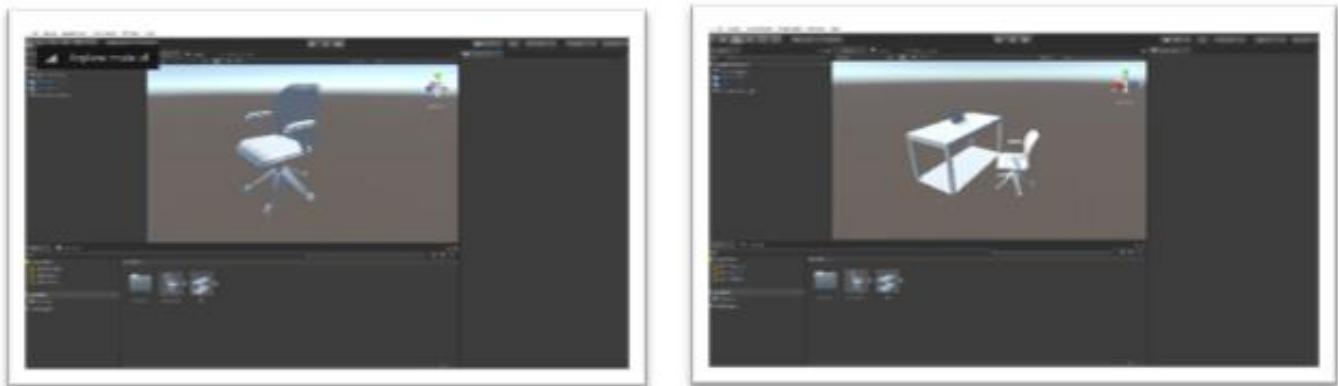


Fig. 2 Creation of 3D Objects

B. Module 2:

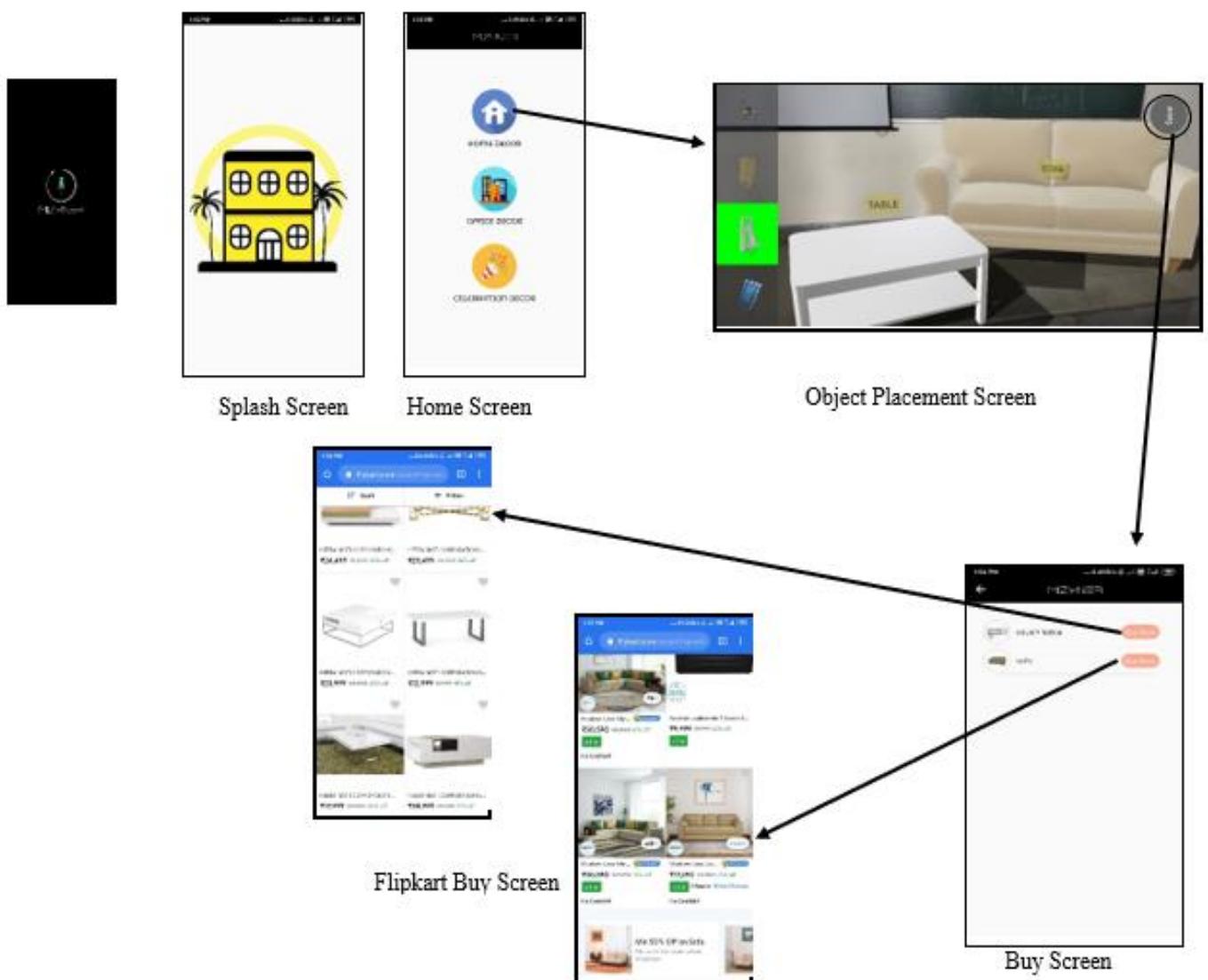


Fig. 3 Working of Application

V. APPLICATIONS & ADVANTAGES

A. Applications:

- Celebration Halls can be decorated as per the customer requirements and the customer can also see the result before even investing too much.
- This will be a one stop solution for most of the décor job such as ‘Home Decor’, ‘Office Decor’, ‘Celebration’ and many more.
- Builders can provide a virtual tour to their long distant consumers by sharing the 3d model, any updates by consumers can be done in few clicks.
-

B. Advantages:

- Use of AR Core helps us in making the product position static in the environment.
- Most of the similar apps uses ‘Vuforia’ as the major implementation this led to a 2D implementation of the work, but as we are using AR-Core we will be dealing with 3D objects.
- All the other apps only deal in furniture as the only product whereas we are providing most of the other décor options.

VI. CONCLUSION

We have developed an application, which amends the mode of current Décor system by providing an Augmented Reality based décor solution. This application can also be custom built according to the customer requirements by providing some 3D models. We have applied engineering knowledge to analyze the societal problem of interior designing of home, office and celebration halls and other places and provide a modern engineering solution. Henceforth, we have designed the application in two modules. We will investigate the trends in application development to find out the new solutions and updates. We have used modern tools viz. Unity 3D and AR-Core for the implementation of the app. During this project tenure we applied professional ethics and understood the importance of teamwork and communication while presenting project at various competitions and conferences for project management, which led us to engage ourselves in lifelong learning.

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APPENDIX III

PLAGIARISM REPORT



PLAGIARISM SCAN REPORT



Date 2019-10-11

Words 201

Characters 1180

Exclude Url None

Content Checked For Plagiarism

Being one of the hot technologies of the era Augmented reality is exponentially developing various day to day activities and home decor is one of them. Mizyner is an android application that overlays the virtual Interior in a physical environment. Markers are placed on the area (for example floor or wall) for tracking purpose to define the scale and coordinate system of the room. The user selects virtual Interior on the screen and places it into the design space. Here the concept of AR is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Smartphones are very popular, it is hoped that the proposed system will allow a large range of users. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the desired layout for a room. Thus, this saves time and efforts by avoiding the need to physically go to the store and select interiors.

APPENDIX IV

Instructional Manual

On

“MIZYNER – AN AR BASED SMART INTERIOR DESIGNER”

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1. Abstract

Being one of the hot technologies of the era Augmented reality is exponentially developing various day to day activities and home decor is one of them. Mizyner is an android application that overlays the virtual Interior in a physical environment. Markers are placed on the area (for example floor or wall) for tracking purpose to define the scale and coordinate system of the room. The user selects virtual Interior on the screen and places it into the design space. Here the concept of AR is used to integrate that selected virtual Interior with an environment where the actual Interior is present. The user can also manipulate the location of the selected Interior and view it in various angles. All the operations are performed in real time. It is implemented for android devices where the mobile camera is an important component. Smartphones are very popular; it is hoped that the proposed system will allow a large range of users. Also, the most difficult challenge of decision making can be easily resolved when the user gets to choose the desired layout for a room. Thus, this saves time and efforts by avoiding the need to physically go to the store and select interiors.

Index Terms— Augmented Reality, virtual interior, tracking, view in various angles, real time, less efforts.

2. Implemented Modules

1. Module 1 – Object modelling:

- We have developed basic 10- 12 models and have added into respective fields

2. Module 2 – Android App:

- We have implemented the main page of the app where user can put the 3d objects in environment and can interact with them.
- We have also implemented the vertical mesh to apply wall hanging items.

3.1 Software Requirements

Operating System: Windows 7 / 10, MacOS.

Coding Language: Java, C#.

Client-Side Technology: Android 6.0 and ARcore enabled device.

IDE Used: At least Android Studio 4.1.2.

3.2 Hardware Requirements

Processor: Intel i5 and above.

RAM: Minimum 4GB.

Mobile Phone: Smartphone with Android (6.0.0 and above).

3.2.1 Flowchart

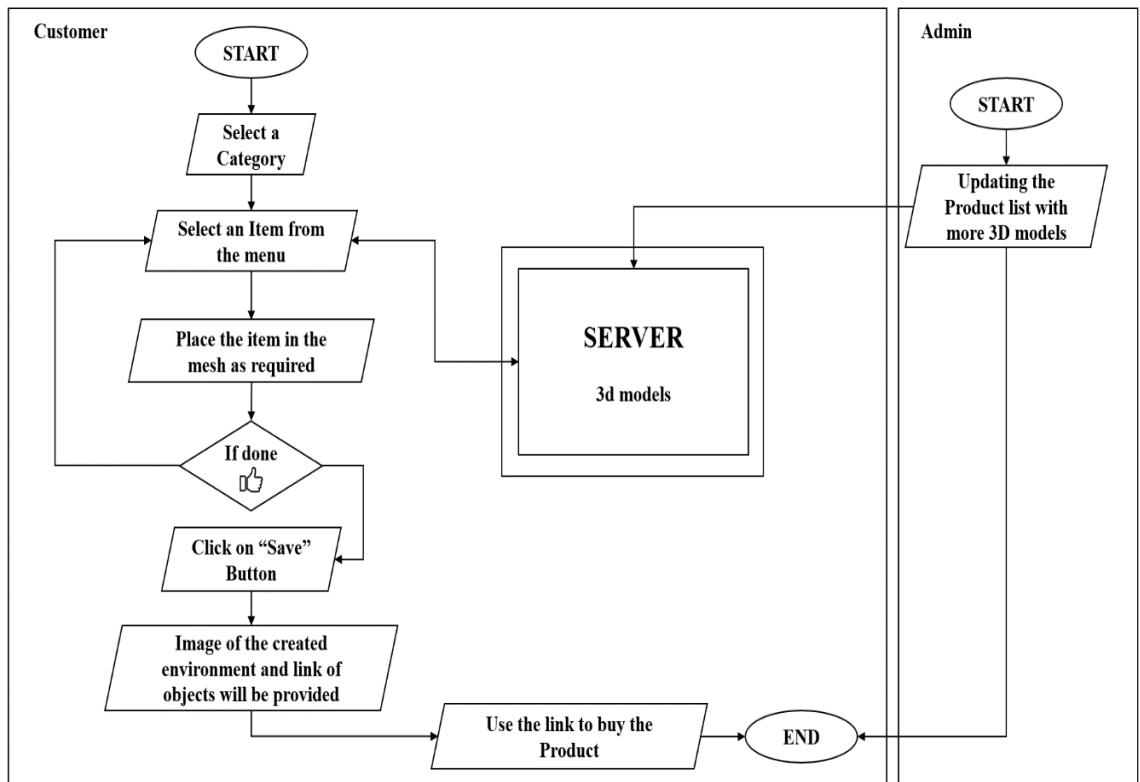


Fig. - 3.2.1: Flowchart

4. Steps to Run the Project

1. Install the app.
2. Click on app logo and start the app.
3. Select a category from the category window.
4. Create a mesh.
5. After mesh creation select the item from the slider present at the top of the screen.
6. Place the item in the created mesh.
 - a. If you want to delete the item click on the item name.
 - b. If you want to move or rotate the item hold the item and rotate.
7. Once satisfied with the placement click on save.
 - a. To add items from another category repeat from step 3.
8. Once done click on save and go to buy links and buy the product.
9. Close the app.

5. Future Scope

- The app can be customized for a particular vendor providing only items he/she wants.
- The app can be embedded with an AI system for recommending objects according to the walls.
- Vertical Mesh can be implemented.
- A fully developed room can be shown at starting as recommendation.

6. Limitations

- Vertical mesh creation.
- Mesh creation from a distance more than 1.5meter