Synopsis of Project work on,

"Furniture E-Commerce Store Based on Augmented Reality"

Submitted in partial fulfillment of the requirements

of the degree of

(Bachelor of Engineering)

by

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(2019-2020)

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CERTIFICATE

This is to certify

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Have satisfactorily completed the requirements of the Synopsis

On

**"Furniture E-Commerce Store Based on
Augmented Reality"**

As prescribed by the *University of Mumbai for academic year* **2018-19**
Under the guidance of

Prof. Bhavna Arora
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Abstract

Electronic Commerce is process of doing business through computer networks. A person sitting on his chair in front of a computer can access all the facilities of the Internet to buy or sell the products.

Unlike traditional commerce that is carried out physically with effort of a person to go & get products, ecommerce has made it easier for human to reduce physical work and to save time. E-Commerce which was started in early 1990's has taken a great leap in the world of computers, but the fact that has hindered the growth of e-commerce is security. Security is the challenge facing e-commerce today & there is still a lot of advancement made in the field of security.

The main advantage of e-commerce over traditional commerce is the user can browse online shops, compare prices and order merchandise sitting at home on their PC.

For increasing the use of e-commerce in developing countries the B2B e-commerce is implemented for improving access to global markets for firms in developing countries. For a developing country advancement in the field of e-commerce is essential. The research strategy shows the importance of the e-commerce in developing countries for business applications.

1.Introduction

1.1 Need and Motivation

There's a definite need for a technical solution for this problem since the furniture e-commerce industry, as of now, appears to be growing but soon there will be a need for a breakthrough in technology which can replace the touch and feel factor involved for the customers while buying furniture in order to reduce their hesitation while buying such high ticket and larger-sized products online.

Motivation for developing an application like this is to introduce a new technology factor to the already existing e-commerce platforms, which due to the widespread adoption of e-commerce are becoming increasingly common.

1.2 Basic Concept

The base concept is to build an android platform with AR functionality. This app will provide customers with the option to check the eligibility of a certain product with their needed specifications, which will involve factors such as dimensions & colour schemes.

1.3 Applications

1. Prospective furniture customers can use this application to gain more insight towards the actual product description.
2. Existing Furniture e-commerce websites & applications can include this technology to boost sales.
3. The technology can be further extended to be used in other industries such as textiles, electronics etc.

2. Review of Literature

1. ARKit and ARCore in serve to augmented reality [1]

   In this paper we have seen the basic understanding about the open-source libraries to be used in building this project, their main features and functionalities for a better implementation in the real world.

2. "Mobile Augmented Reality Survey: FromWhere We Are to Where We Go – IEEE Access" [2]

   This paper introduces the concept of MAR (Mobile Augmented Reality) and provides the basic understanding about the same. It also provides the reader with the categorization of the application fields together with some representative examples. It also introduces the reader to the user interface and experience in MAR applications and continues to describe the core system components of the MAR systems.

3. E-commerce Smartphone Application ((IJACSA) International Journal of Advanced Computer Science and Applications,)[3]

   This paper provides a new perspective on the types of applications that can be used for e-commerce. It describes and analyses device requirements, provides a review of important aspects of mobile devices that can use such applications and the requirements of websites designed for m-commerce. The design and security aspects of mobile devices are also investigated. As an alternative to existing m-commerce applications, this paper also investigates the characteristics and potential of the PhoneGap cross-mobile platform application

4. ''Creating open source repository of 3D models of laboratory equipments using Blender" IEEE-2010

   In this paper we are provided with the key design goals and are presented a methodology to create a repository of 3D models. This methodology can be used to create a significant number models in Blender in less amount of time. These models can be downloaded and directly used by anyone. Anyone can use this methodology to create their own model repository.

5. "Capabilities of ARCore and ARKit Platforms for AR/VR Applications"-International Conference on Dependability and Complex Systems

   In this paper ARCore and ARkit capabilities are scrutinized and compared. Authors establish comparison criteria for both platforms, provide the example of test applications and results of comparison tests. Obtained results can be a help in choosing the right framework to speed up prototyping and development of modern AR/VR applications. This paper consists of a comprehensive comparison of said new frameworks in the following respects: general performance (CPU/memory use), mapping of planes on various surface types, influence of light and movement on mapping quality etc.

6. "The Use of ARCore Technology for Online Control Simulations" IEEE 2020

   The paper describes an educational mobile application that controls the 3D model of towercopter using augmented reality for smartphones. The app is developed using the ARCore technology that allows insertion of 3D objects into a real space via smartphone or tablet. The application serves as a simple guide for a real device which is placed in a laboratory and enables to create simulations based on user input data. The application interface is connected with Scilab API simulation module that provides data for 3D model animations. Users can set their own controller parameters into the predefined control structures. Application is a part of virtual laboratory and can help students with understanding of problems connected with the education process.

7. "Android Application Development using Android Studio and PHP Framework" [5]
   In this paper "Android Application Development using Android Studio and PHP Framework" The author described that this era is very great and exciting for mobile developers. Android supplies a well-off application structure that permits you to develop imaginative applications and amusements for android cell phones utilizing Java dialect condition. Android proposes a brought together approach for application advancement

on cell phones which implies that engineers require produce for the Android, and their applications ought to have the capacity to keep running on various gadgets controlled by Android.

8. "Web AR: A Promising Future for Mobile Augmented Reality—State of the Art, Challenges, and Insights" IEEE 2019

This paper differentiates between hardware-based mobile AR and app-based Mobile AR. It describes how hardware-based Mobile AR implementation is known to be costly and lacks flexibility, while the App-based one requires additional downloading and installation in advance and is inconvenient for cross-platform deployment. It provides the advantages of Web-Based AR implementation than hardware based AR by providing information that webAR is a lightweight and cross-platform service provisioning platform. It also discusses the emergence of 5G mobile communication networks and it's potential to enhance the communication efficiency of Mobile AR dense computing in the Web-based approach.

9. "Systematic review and meta-analysis of augmented reality in medicine, retail, and games" Springer 2020

This paper presents a detailed review of the applications of augmented reality (AR) in three important fields where AR use is currently increasing. The main focus if this paper was to highlight how AR improves and enhances the user experience in entertainment, medicine, and retail. The authors briefly introduce the topic of AR and discuss its differences from virtual reality. They also explain the software and hardware technologies required for implementing an AR system and the different types of displays required for enhancing the user experience.

10. "Research on Development of Android Applications" IEEE 2011

This paper introduces the Android platform and the features of Android applications, gave a detailed description of Android application framework from the prospective of developers. A simple music player is provided as an example to illustrate the basic working processes of Android application components. This paper provides the required insight to understand the operation mechanism of Android applications to help develop applications on the Android platform.

3. Report on the Present Investigation

Existing System

There are multiple existing applications based on furniture e-commerce like UrbanLadder, Homecentre & Pepperfry. For this particular study, we will analyze the Pepperfry application.

Features

Features of this application are-

1. Sign up/Login with social media websites as well as phone number verification
2. Decent user interface
3. Furniture products are well categorized
4. Multiple product images
5. 2d Product view in AR

General Working

The end user has to download the application from google play store/Apple app store. Upon opening the application for the first time, it requests login information and provides the user the option to register their account if they haven't already registered. Upon successful login, the application displays categories of furniture and the user can select the product colours, product images and can even check a 2d model of the product with their ar enabled device cameras.

Limitations

1. 2D representation of the product does not offer a comprehensive idea of the product.
2. Representation of the product in a 2D manner in AR feels overall cheap.
3. Products delivered may be different from the ones in the image as they are displayed in a fancy manner in the images.
4. High prices of the products makes the customer hesitant while completing checkout.
5. High probability of product returns.
6. The problem described in point 2 might also cause the brand image of pepperfry to be tarnished.

4. Aim and Objectives

Aim

Our Aim is to use softwares like Blender & Cinema4d to create the most realistic rendition of the furniture products present in the e-commerce store. We plan to import the objects created to Android studio and create an app which includes an e-commerce store with AR functionality.

This app will provide users with a more accurate representation of the said products and will reduce the rate of returns, thereby saving shipping costs. It also provides the user with a substitute (to a certain degree) for the touch and feel aspect while buying furniture, which also increases their trust in the store.

Objectives

1. Use of this application will enable the user to visualize how the furniture would look in the real world, offering preview of furniture in one's real environment.

2. By the usage of this application, the furniture sellers can win competitive edge in the market.

3. It also aims to prevent revenue loss to the business, spoilt brand image of the store, customer attrition and deterioration of stakeholders' interests as the customers can try visualizations of furniture placements in the available space before purchasing them.

4. It aims to put the sentence "What you see is what you get" in practice.

5. Problem Statement

Purchasing products for interior design is a challenging task.

It is essentially connected with the problem that the product cannot be put into its place before it is purchased.

Customers may wonder how the furniture would look in its tentative place

People end up buying furniture with incorrect measurements, inaccurate colours or different designs from the ones that they see in their product images.

This creates a problem for customers as returns in such online stores is also a hassle and generally a bad idea, since it is not easy to ship furniture due to the high prices involved in shipping.

Visualizing the furniture in the real world can be made possible through Augmented Reality applications.

5. Proposed System for Project
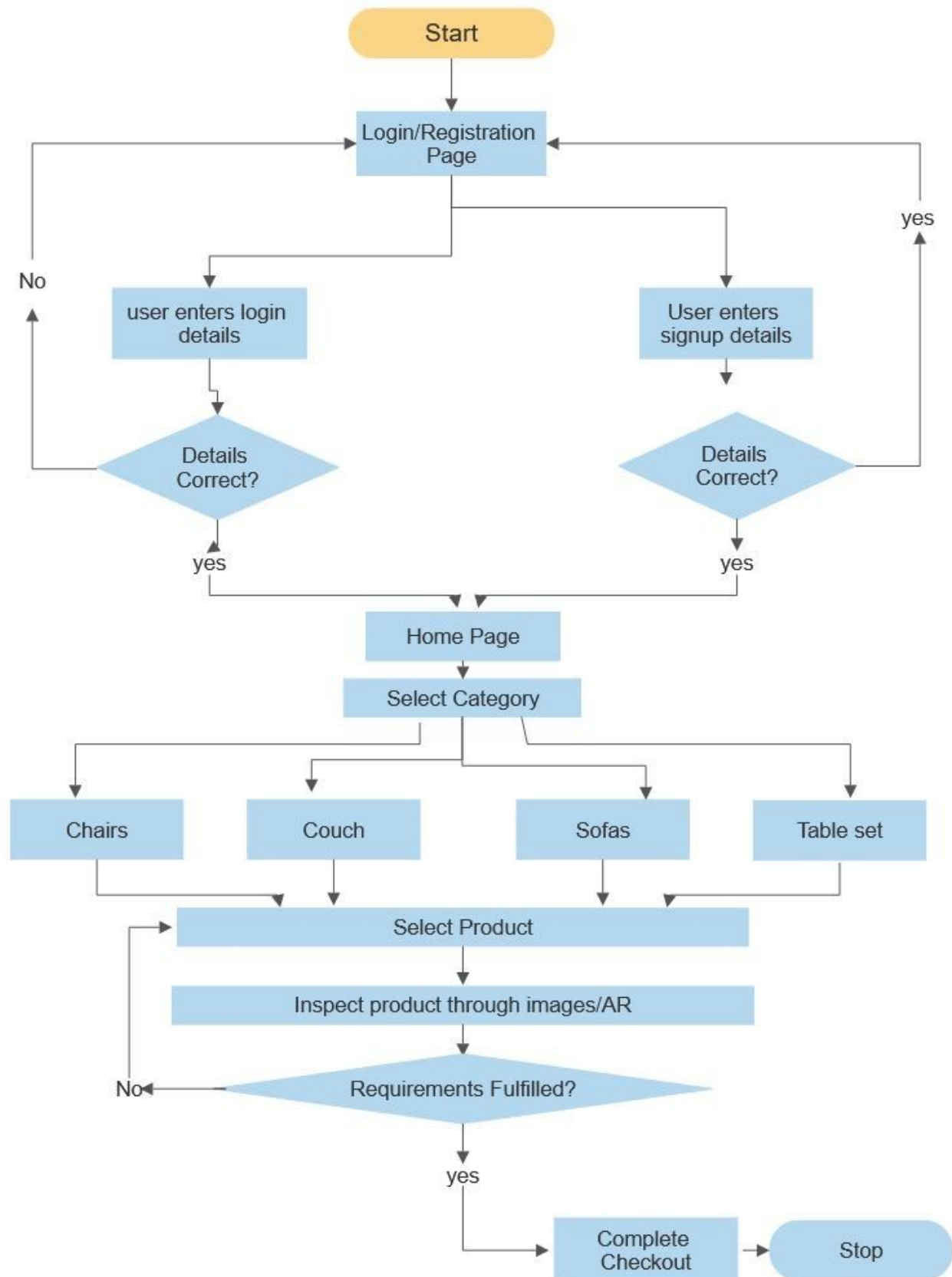
Explaination

After the application is downloaded from the play store, the user will be greeted with the login/registration page.

If the user has an existing account, he/she will be able to login with their respective credentials. If the user is not registered, he/she can enter their information to signup/register.

Upon successful login, the user will be greeted with the home page. The home page will consist of Categories of furniture from which the user can choose from. When the user selects a category, he/she will be provided with a list of products from that specific category.

The user can then check if the product meets their requirements of certain factors such as colour/size/designs from the images and will also be able to check the layout of the particular product through their cameras on their AR enabled mobile devices.

After the user is convinced about the product specifications and other requirements, the user can place their orders by choosing any of the payment options available in the application.

Upon successful completion of the checkout process and capturing the payment, the order will be delivered to the customer within said number of days.

8.1   Scope

- The current application will be used at City level i.e. Mumbai, after testing and after some analysis of how the application is sustaining, we'll be able to launch this application nationwide.
- We can furthermore add more unique features in the application to help with increasing the brand trust among our customers.

8.1 Feasibility

8.2.1

8.2.2 Operational Feasibility

Operational Feasibility of this application is aimed towards providing an accurate alternative to the touch and feel factor involved in the niche of furniture trade. With accurate rendition of the furniture present in the store, we will be able to provide the user with the above said experience with maximum efficiency.

8.2.3 Technical Feasibility

Technical Feasibility, includes the development of a working prototype of the final product. In today's world, most people in any community own a smartphone. Nowadays, even the smartphones with good computational capabilities and processing power are inexpensive and are available at a reasonable price. Due to this power, these smartphones are able to run AR applications without much hassle, which our application will take advantage of.

8.2.4 Economic Feasibility

The process of building the application will only require softwares like android studio, AR Core & Sceneform library, which are absolutely free of cost. The cost of the project would be only to deploy the application on google play store, which is their standard fees.

8. Design Details

The design includes:

      a. Context Level diagram

   b. DFD Diagram

9.1 Context Level diagram

      The Context Diagram shows the system under consideration as a single high-level process and then shows the relationship that the system has with other external entities (systems, organizational groups, external data stores, etc.). Another name for a Context Diagram is a Context-Level Data-Flow Diagram or a Level-0 Data Flow Diagram.
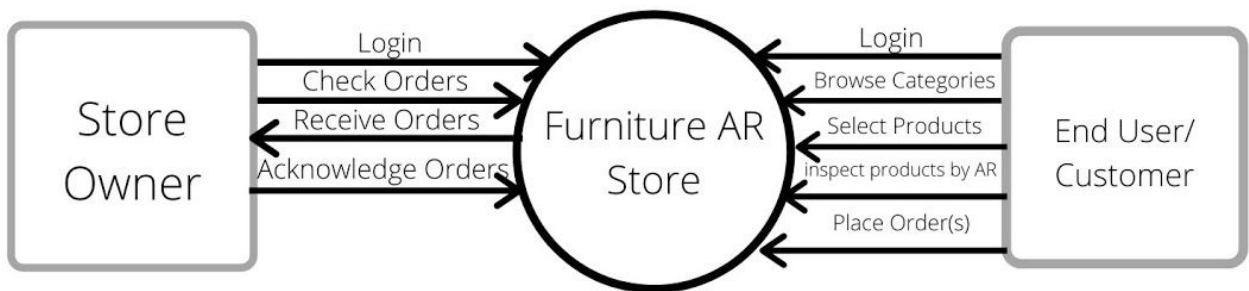
9.2 DFD Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one.
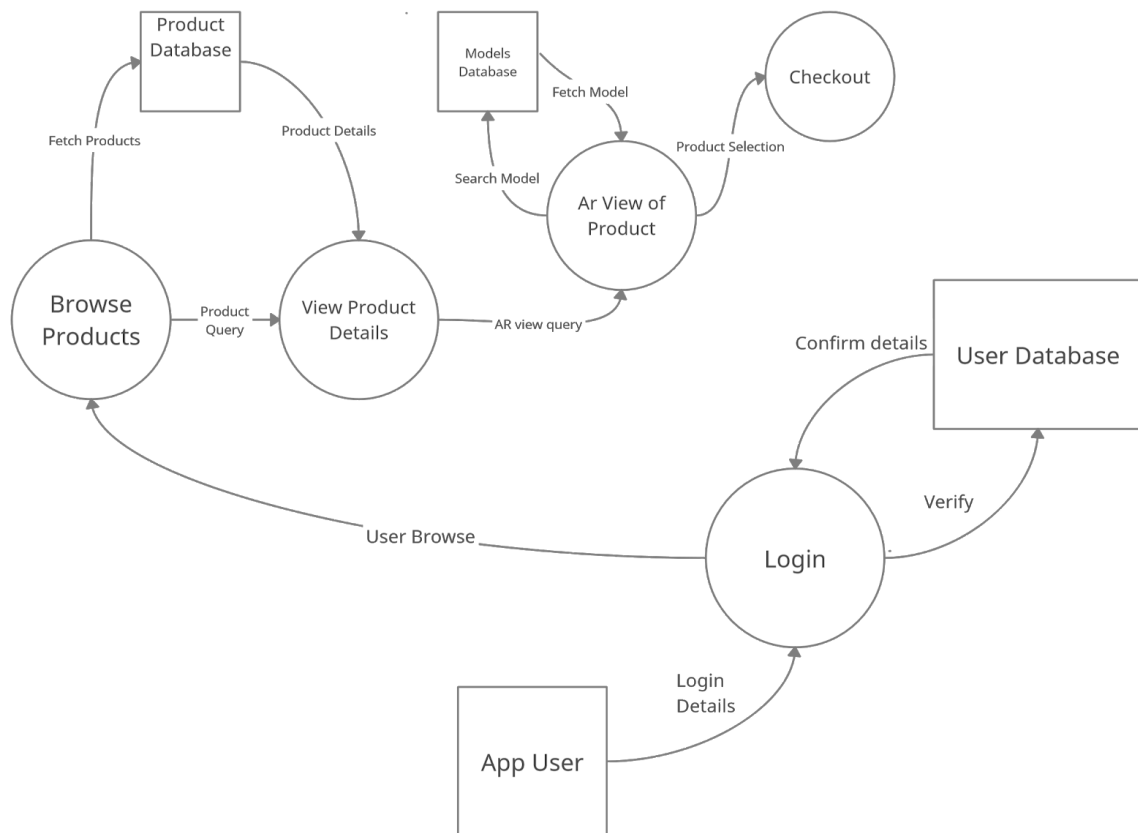
10.Implementation Plan

10.1 Hardware Requirements

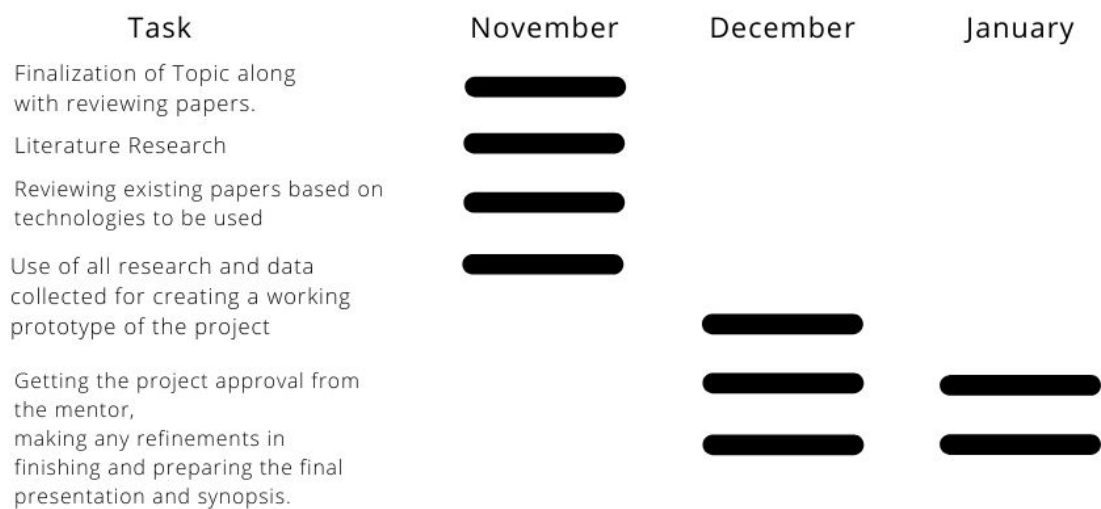User Operating System: Android 5.0 and above

- Development Operating System: Windows
- User System RAM: 2 GB and above
- Development RAM: 8 GB and above
- ROM: 10 GB HDD for Android Studio and Emulator
- Dev Processor: Intel i5 and above

10.2 Software Requirements

- Development Environment : Android Studio, Sceneform Library
- Database :
- Language : Java
- Designing Tools : Blender, Cinema4d, SketchFab

10.3 Gantt Chart

BE Project Gantt Chart

Task	November	December	January
Finalization of Topic along with reviewing papers.	▬▬▬		
Literature Research	▬▬▬		
Reviewing existing papers based on technologies to be used	▬▬▬		
Use of all research and data collected for creating a working prototype of the project	▬▬▬	▬▬▬	
Getting the project approval from the mentor, making any refinements in finishing and preparing the final presentation and synopsis.		▬▬▬ ▬▬▬	▬▬▬ ▬▬▬

11. Methodology

11.1 Agile Methodology Application Development

For this project , we will be using Agile methodology, which will comprise several short cycles (2-3 weeks each) thus ensuring risk minimization.

After the completion of each cycle, the team will hold meetings to check their subsequent results and if needed do the changes if they are needed. Thus, allowing the team to have the full control of the development process.

It takes more than one cycle to build a fully-fledged product, but each iteration shows part of the functionality that can be tested and changed. After each cycle, the development team will summarize the results and mentor feedback to make the necessary adjustments to the development plan.

The application will comprise of the following major modules-

1. **E-commerce store**

   The app will be built using the Android Studio software which is the official Google IDE for Android development.

   It is an open source software thus increasing cost efficiency, and provides various tools for app development on every android device possible. The main advantage of this software is the availability of the real-time platform called emulator tool to test our app. Apart from that, the app can also be tested on smartphones through USB debugging.

   The app will consist of many pages created by android studio xml files, accompanied by their main activities to construct a robust store with components including -

   1. Categories page
   2. Product page
   3. Navigation Bar
   4. Search page
   5. Cart page

6. Checkout page

7. Payment gateway page

2. Ar Camera product view

    To display the models created in an AR environment, we will be using google's ARCore along with it's Sceneform Library.

ARCore-

ARCore provides SDKs for many of the most popular development environments. These SDKs provide native APIs for all of the essential AR features like motion tracking, environmental understanding, and light estimation. With these capabilities it is possible to build entirely new AR experiences or enhance existing apps with AR features.

Sceneform Library-

Sceneform makes it straightforward to render realistic 3D scenes in AR and non-AR apps, without having to learn OpenGL. It includes:

1. A high-level scene graph API

2. A realistic physically based renderer provided by Filament

3. An Android Studio plugin for importing, viewing, and building 3D assets

12.Conclusion

In this project, the design of an android application that uses the Augmented Reality techniques has been presented that helps the user envision the furniture item before buying it. The application utilizes the Sceneform Library to provide an accurate model represented augmented reality solution. A direction for the future work of this project is to include user logins with search history. User logins can help the user to see their search history. The application can be made intelligent to give suggestions to the user about the other suitable furniture that can be bought along with the furniture that is being planned to buy. This classification of furniture can be based on the type of the furniture opted for purchase and the area of the house where the furniture is to be placed.

13.Acknowledgement

We owe sincere thanks to our college Atharva College Of Engineering for giving us a platform to prepare a project on the topic "Furniture E-Commerce Store Based on Augmented Reality" and would like to thank our Principal Dr. Shrikant Kallurkar for instigating within us the need for this research and giving us the opportunities and time to conduct and present research on the topic. We are grateful to have Prof. Bhavna Arora as our guide and Prof. Suvarna Pansambal, HOD Computer engineering and our project co-ordinators Prof. Shweta Sharma & Prof. Samidha Kurle with our research.

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