

A PROJECT REPORT ON

**“DESKKART - FURNITURE MALL WITH
AUGMENTED REALITY”**

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(COMPUTER ENGINEERING)**

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2018 - 2019



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This is to certify that the project report entitles

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Abstract

It is a trend that long has been making, thanks to the success of e-commerce sites like Amazon, E-bay, Urban Ladder, and other, and has motivated traditional interior designers brands, sellers and buyers to change the way they operates. More options are offered online than in store, and it's becoming more common for retailers to leverage their physical locations as logistics centers and showrooms places where consumers can collect online orders or view products.

But like any other products, online purchasing of product related to interior is quite challenging. It would be difficult for consumers to get the feel of interior products and raises so many questions before purchasing such as "How the Sofa will look?", "How it will fit in the living room?". "Is it matching with other interior?". All these questions will be answered by "Deskkart" system using Augmented Reality.

The System will consist of two major parts i.e. Mobile Application with Augmented Reality support and bringing interior decorators/sellers/end user customer on single platform based on Cloud. Product Creators can upload 3D Models and Images to the System with product details like dimensions, availability locations, price etc. End User can see all these products on the Android app. Using uploaded 3D models and in-built mobile camera, end user can get the look and feel of products with the help of AR. The system will also help end user to give a review or contact the vendors for extra details.

List of Abbreviations

- AR: Augmented Reality
- CnS: Consumers and Sellers
- API: Application Program Interface
- GUI: Graphical User Interface
- APP: Application

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CHAPTER 1

INTRODUCTION

Interior designing is a very delicate and personalized process based on each individual. Everyone wants to visualize how their apartment or house will look before it is actually implemented. Nowadays a new and upcoming technology known as "Augmented Reality" is being used in many applications to give the user a more enriching experience while using an application.

The proposed system allows multiple vendors of different brands to upload their models so as to give the customer a variety of choices to pick from. After the vendors have uploaded their 3D models with the dimensions, the customer will be able to see it in the list. The working is very easy and simple to understand.

First task is to allow camera access from your smart phone and then you will see a display of different models. Once you select a model to your liking you can simply click on "add object" and the object will be placed virtually in the center of your room through your camera.

1.1 MOTIVATION

A common issue that occurs is that a lot of times, explaining your vision or ideas to an interior designer can be difficult and time confusing and also costly. The main motivation behind this system is to give the consumer a direct and faster access to design a home virtually so that consumer can straight away see how his interior will look just by a few touches and swipes on his or her smartphone. With the incorporation of "Augmented Reality" in the proposed system will make the application simple yet efficient to use.

1.2 PROBLEM DEFINITION

Implementing interior design application using Augmented Reality which provides a single platform for the user and vendor. On the user side, buying furniture becomes more realistic and easier. On the vendor side a larger platform to increase sales.

1.3 AIM

Our main aim of designing this system is to make furniture shopping a much easier and faster process, also providing an enriching, hands on experience to the user. Also to give the furniture vendors a virtual platform to increase their sales through our application and reach out to more consumers on a large scale.

1.4 OBJECTIVES

- Use of Augmented Reality for visualizing of furniture products in interior designing.
- Consumer gets a direct and faster access to design a home virtually.
- Vendors can sell products on large scale.
- Same platform for consumers and vendors for buying and selling of interior products.
- Product information and availability.

CHAPTER 2

LITERATURE SURVEY

- 1. Yoon Jung Park, Yoonsik Yang, Seungho Chae, Inhwan Kim, Tack-don Han "Design AR: Portable Projection-based AR system specialized in interior design" pp. 2879-2884, Oct. 2017**

This paper proposes a system for interior design prototyping based on portable-type projection-based AR(Augmented Reality). The DIY (do it yourself) interior designing process takes much time, monetary resources and labor. To overcome such difficulties, many research studies have been undertaken in the field of AR. Among those studies, projection-based AR technology provides users virtual information that is very real by projecting new digital information onto things and spaces. Most of those studies employing projection-based AR technology have been carried out in predefined spaces. In this paper, a projection-based AR system that can be used to design interiors of non-predefined spaces was proposed. In order to evaluate the effectiveness of the proposed system, we set up a scenario for interior design prototyping. A usability evaluation was conducted by questionnaire after users performed tasks based on a preset scenario.

Advantages:-

Additional features such as a shadow and a multi-freezing mode to create realistic augmented reality contents efficiently.

Disadvantage:-

In order to increase the usability of the visibility attribute, both a 2D-based virtual interior design and a higher-dimensional interior design should be performed. Further studies will be undertaken to explore interior design with a more realistic AR system while linking the system with various devices, in-

cluding as mobile devices.

2. **Tanikawa, T.,Uzuka, H.,Narumi, T., “Integrated view-input interaction method for mobile AR,” 3D User Interfaces (3DUI), pp. 187-188, March 2015**

Mobile AR is very popular and used for many commercial and product promotional activities. However, in almost all mobile AR application, user only view annotated information or preset virtual objects motion in AR environment and cannot interact with virtual objects as if he/she interact real objects in the real environment. In this paper, we propose novel interaction method, called integrated view-input interaction method, which integrate viewpoint moving and virtual objects handling only by handling mobile AR device.

Advantages:-

The proposed method has a prediction for popular touch mobile device, such as smart phone or tablet. It does not need any additional sensor for sensing manipulation target. The system has implemented three integration types and evaluated efficiency in object handling task.

Disadvantage:-

Implementation algorithm is missing which makes the system less effective.

3. **Han Kyu Yoo,Jong Weon Lee, “Mobile augmented reality system for in-situ 3D modeling and authoring,” Big Data and Smart Computing (BIG-COMP), pp. 282-285, Jan. 2014**

This paper proposes a mobile augmented reality system that can model 3D virtual objects and author augmented reality contents on site. The differences of the proposed system from the existing ones are an interaction approaches used to generate and manipulate primitives.

Advantages:-

Additional features such as a shadow and a multi-freezing mode to create realistic augmented reality contents efficiently.

Disadvantage:-

The implementation of primitive models is missing.

4. **Chaohui Lv, Xingyun Yang and Jiayao Yu., “Interaction Design in Augmented Reality on the Smartphone”, pp. 1279-1288, July 2016.**

Augmented Reality (AR) is aimed at integrating virtual information into real world to enhance the perception ability of reality. The paper mainly presents an AR system that can complete some interactions between the user and the smartphone based on touch screen and body motion. There are three contents in this system. The first part is the building of AR scenes in Unity3D on the basis of real-time mapping access to the WebCamTexture Class. The second part is the interaction based on the touch screen with the method of Raycast. The third part is the interaction based on the body motion with the help of Gyro Sensor in the smartphone.

Advantages:-

Experimental results show that there is a good effect in the touch-screen interaction to realize some actions such as translation, rotation, scaling, or any combination of these. And it is also effective in the body-motion interaction to control the virtual objects acting according to the user's body motion.

Disadvantage:-

The implementation of vendor side is missing which restricts the user to only a certain choice of products to choose from.

CHAPTER 3

SOFTWARE REQUIREMENTS SPECIFICATION

3.1 INTRODUCTION

Software requirements are expressed in a software requirement document. The software requirement specification (SRS) is the official statement of what is required of the system developers. This requirement document includes the requirement definition and the requirement specification. The software requirement document is not the designed document. It should set out what the system should do without specifying how it should be done. The requirement set out in this document is complete satisfies the following: It specifies the external system behaviours. Also it specifies constraints on the implementation and it is easy to change.

3.2 ASSUMPTIONS AND DEPENDENCIES

- The seller as well as the buyer both have knowledge of using android application.
- Smart phone used has a good quality camera as well as good internet connection.
- Surrounding light should be good enough
- It may be possible that the model will not be able to fit in the room.

3.3 FUNCTIONAL REQUIREMENTS

3.3.1 Registration

The registration module contains mainly two components, the first one is Consumer and the second one is Seller. Both the users are provided with the functionality of user registration and their information. They can login using their registered valid username as well as password.

3.3.2 Information Update

The system will be able to provide the functionality of product information update to the seller. He/She can update the number of products as per the selling and the price of product.

3.3.3 Android App

The customer should be able to view all public 3D models, place the models in camera view, capture the placed model. The customer should also be able to view the gallery with all the 3D models.

3.3.4 Web App

The vendor should be able to add, modify and delete product, 3D model. The vendor should also be able to set the price, mention the brand and update other details of the product.

3.4 EXTERNAL INTERFACE REQUIREMENTS

3.4.1 User Interfaces

- Front-end software: Android Studio, Bootstrap.
- Back-end software: MYSQL 5.0, API, Spring boot, Unity 3D.

3.4.2 Hardware Interfaces

- Windows OS.

- Android device with version 5.0 and above.

3.4.3 Software Interfaces

- **Operating system** : We have chosen Windows operating system for its best support and user-friendliness.
- **Database** : To save the user records we have chosen MYSQL database.
- **Android Studio** : To implement the project we have chosen Android Studio IDE for its more interactive support.
- **Unity 3D** : For interfacing 3D models with real time environment we have used unity 3D.

3.4.4 Communication Interfaces

- Our Project belongs to Android Application by which we are connecting users at online with request and response form. For that we are going to use HTTP protocol. That is provided by Apache Tomcat Server 8.
- **HTTP protocol:** The Hypertext Transfer protocol is an application protocol for distributed, collaborative, and hypermedia information systems.

3.5 NON-FUNCTIONAL REQUIREMENTS

3.5.1 Performance Requirements

For good performance, the customer should be able to launch an application within 30 sec on device. Multiple customers and vendors should be able to login to the system at a time. The Android app should be compatible with the latest Android devices. Web Application should work on the latest browsers.

3.5.2 Safety Requirements

For the safety purpose backup of the database must be required. To avoid illegal use of the system, while using this Application user must do following things:

- At the time of deploying this Android Application user have to register to system.
- To use Application user have to login and logout each time.

3.5.3 Security Requirements

- **Secure Functional Requirements:** This is a security related description that is integrated into each functional requirement. Typically, this also says what shall not happen. This requirement artifact can for example be derived from misuse cases.
- **Functional Security Requirements:** These are security services that need to be achieved by the system under inspection. Examples could be authentication, authorization, backup, server clustering, etc. This requirement artifact can be derived from best practices, policies, and regulations.
- **Non-Functional Security Requirements:** These are security related architectural requirements, like robustness, minimal performance and scalability. This requirement type is typically derived from architectural principals and good practice standards.
- **Secure Development Requirements:** These requirements describe required activities during system development which assure that the outcome is not subject to vulnerabilities. Examples could be data classification coding guidelines or test methodology

3.5.4 Software Quality Attributes

- **Correctness:** System is planned in such way that it will give most correct output.
- **Reusable:** This software is reusable.
- **Portable:** As our application is Android based it automatically introduces portability.

3.6 SYSTEM REQUIREMENT

3.6.1 Database Requirements

- **Logical Database Requirements:** A logical database can stretch over multiple physical hard disks and information files. The data storage unit is still a single database for information retrieval purposes. To have a logical database, all given hard disks and information files must be accessible from a single source.
- **Physical Database Requirements:** A physical database is technically a smaller unit of storage referred to as a company, field, record or table, depending on how much information the physical storage device contains. A field is the smallest unit of storage housing only a single file.

3.6.2 Software Requirements

- Windows OS.
- Application Server : Tomcat 9.0
- Web App : HTML, CSS, bootstrap
- Front End : Android Studio, XML, intelliJ IDEA, Unity 3D, Spring API's, Java, 3D Max/ Blender, Photoshop.
- Database : MySQL 5.0

3.6.3 Hardware Requirements

- Processor : Intel Core i5 or advanced
- RAM : 8 GB (min)
- Hard Disk : 200 GB (min)

3.7 SOFTWARE ENGINEERING METHODOLOGY

3.7.1 Software Development Life cycle Model used in this Project

The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model is basically used for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.

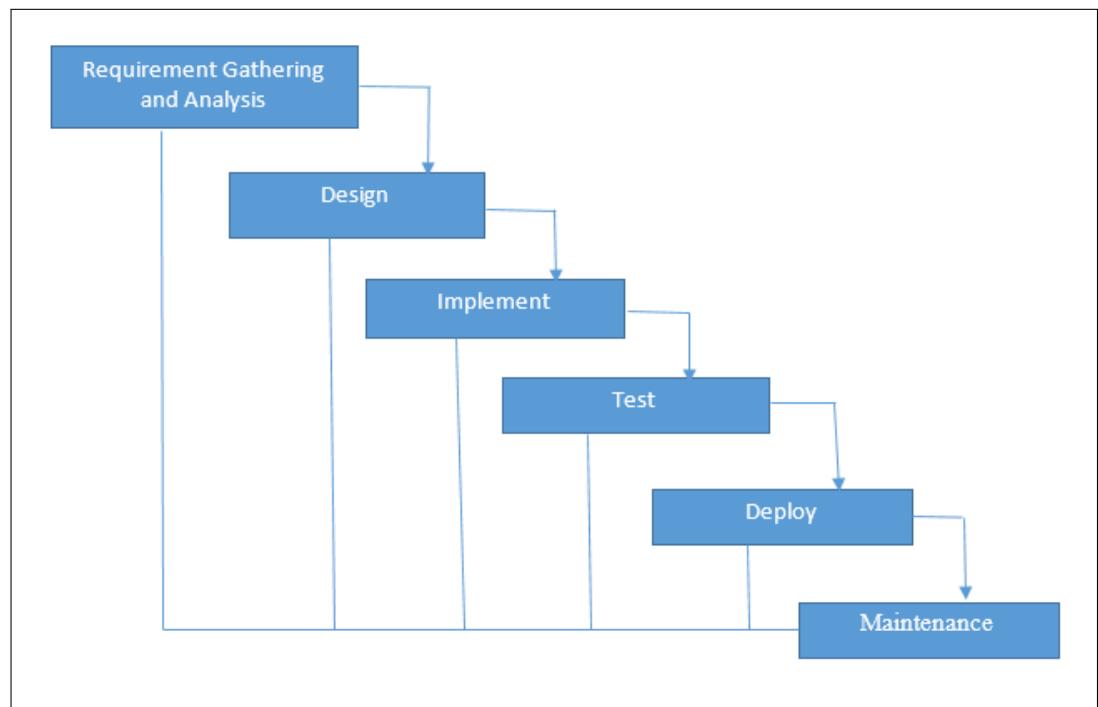


Figure 3.1: Waterfall Model

- **Applications**

1. This model is simple and easy to understand and use.
2. It is easy to manage due to the rigidity of the model - each phase has specific deliverables and a review process.
3. In this model phases are processed and completed one at a time. Phases do not overlap.
4. Waterfall model works well for smaller projects where requirements are very well understood.

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

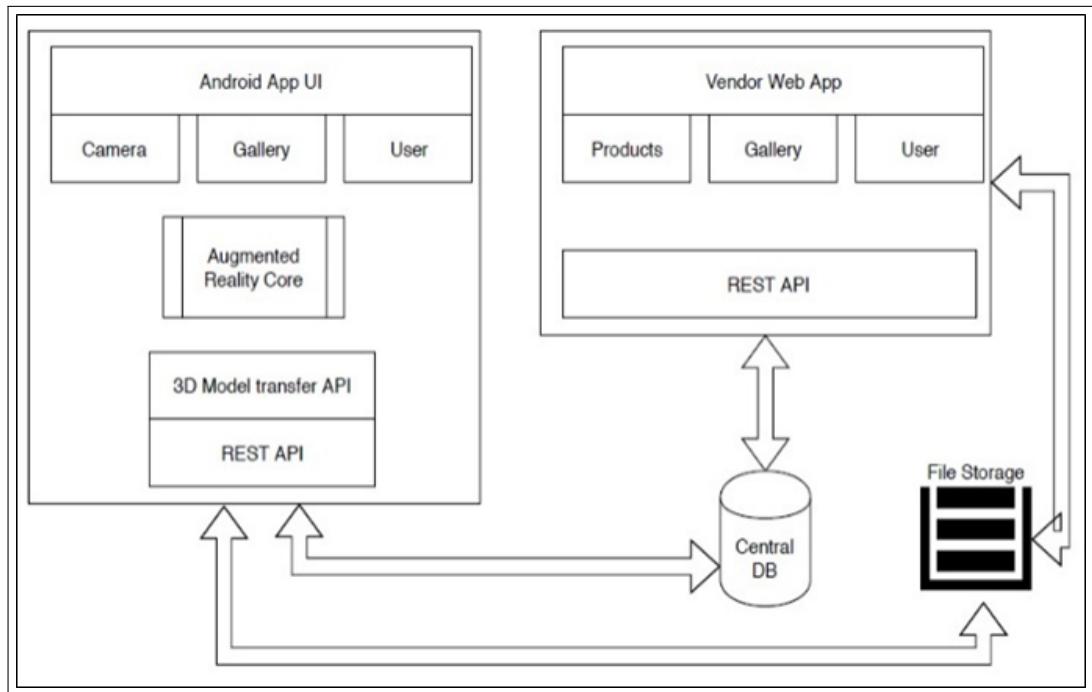


Figure 4.1: System Architecture

- **Customer:** These will be the people using the application, before being able to use the app, they will have to register with their email address or phone number so their profile is stored in our database. After successfully registering the consumer will be able to use the app to design their house or room to their liking. One mandatory requirement from the customers side is that they must have a phone with has camera access so as to scan the room and place different furniture pieces.
- **Vendor:** Vendors will be the companies who will be uploading their furniture

models on our database so our consumers have a variety to choose from. Like customer, the vendor also has to register before being able to upload their models. Once registered they can view a list of their current uploaded models and will be able to provide dimensions, update stock and any new models they wish to.

4.2 MATHEMATICAL MODEL

- The mathematical model is illustrated properly that defines the problem statement of project, input data, output data, and all the necessary constraints regarding project. Solution perspective for proposed scheme,
 $S = I, O, P, S, F$

where,

- $I =$ Initial State of System.
- $O =$ Output State.
- $P =$ Functions or Modules for Technical process.
- $S =$ Success Condition.
- $F =$ Failure condition.

Initial State:

- $I =$ INITIAL STATE
- $I = I_1, I_2$

where,

- $I_1 =$ Registration of Customer
- $I_2 =$ Registration of Vendor
- $I_1 =$ Name, Details, Contact

- I2= Name, Details, Location Availability, Product Details, 3D Models

Output:

- O=output State,
- O= O1,O2

Where,

- O1= Registration Done, AR Ready Application, View latest products
- O2= Registration Done, Upload 3D Models, Contact Details Stored
- P = Functions or modulator for technical process
- P = Augmented Reality with in built Camera, Review, View 3D Models, Contact Distributor

4.3 DATA FLOW DIAGRAM

A data-flow diagram (DFD) is a way of representing a flow of a data of a process or a system (usually an information system). The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow, there are no decision rules and no loops.

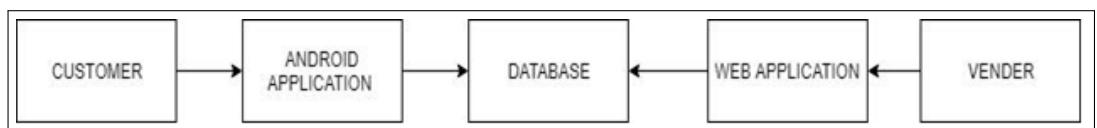


Figure 4.2: Data Flow Diagram Level 0

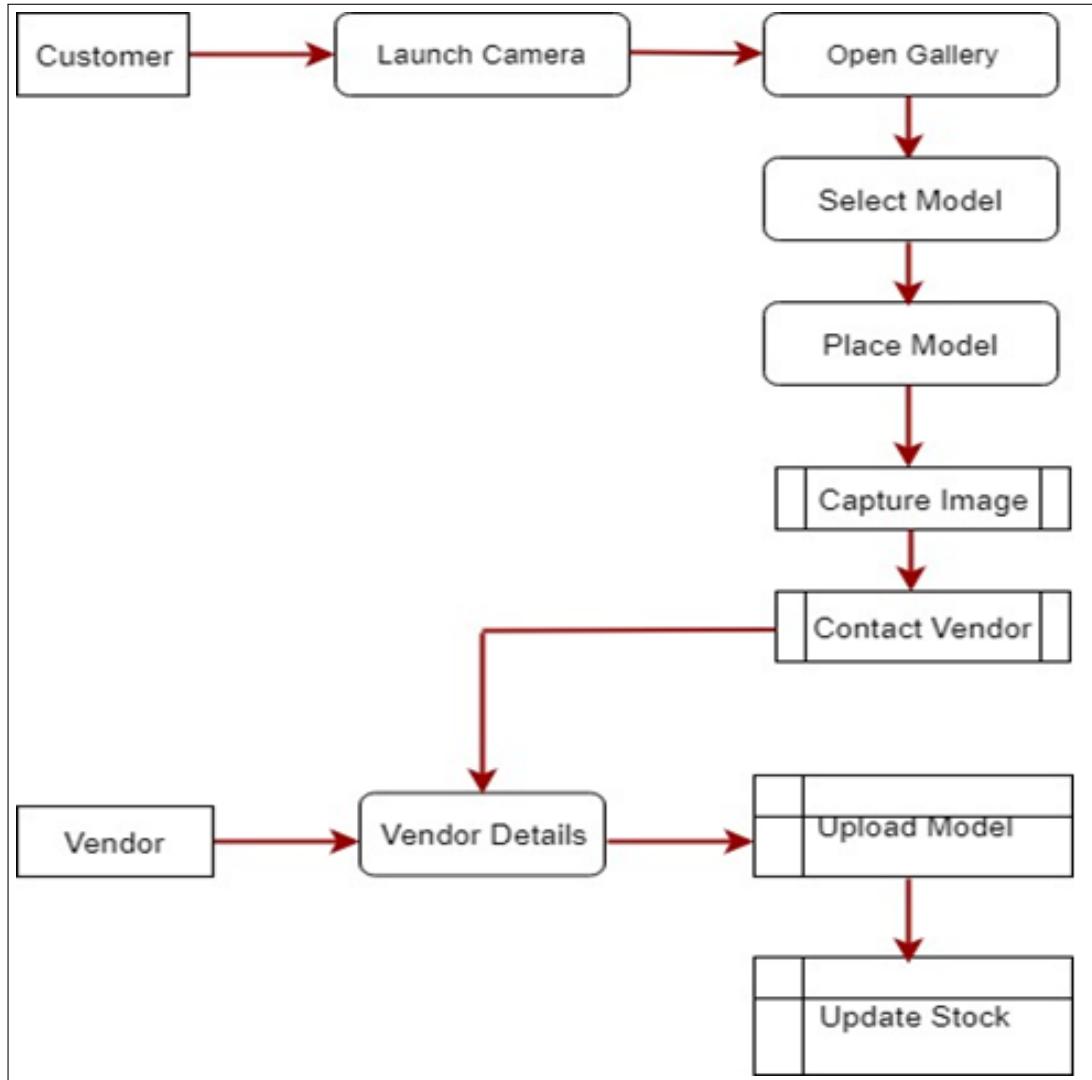


Figure 4.3: Data Flow Diagram Level 1

4.4 UML DIAGRAMS

UML stands for Unified Modeling Language. UML 2.0 helped extend the original UML specification to cover a wider portion of software development efforts including agile practices. Improved integration between structural models like class diagrams and behaviour models like activity diagrams. There are a number of goals for developing UML but the most important is to define some general purpose modeling language, which all modelers can use and it also needs to be made simple to understand and use. UML diagrams are not only made for developers but also for business users, common people, and anybody interested to understand the system. The system can be a software or non-software system. Thus it must be clear that UML is not a development method rather it accompanies with processes to make

it a successful system. In conclusion, the goal of UML can be defined as a simple modeling mechanism to model all possible practical systems in today's complex environment.

4.4.1 Class Diagram

Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of object-oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages.

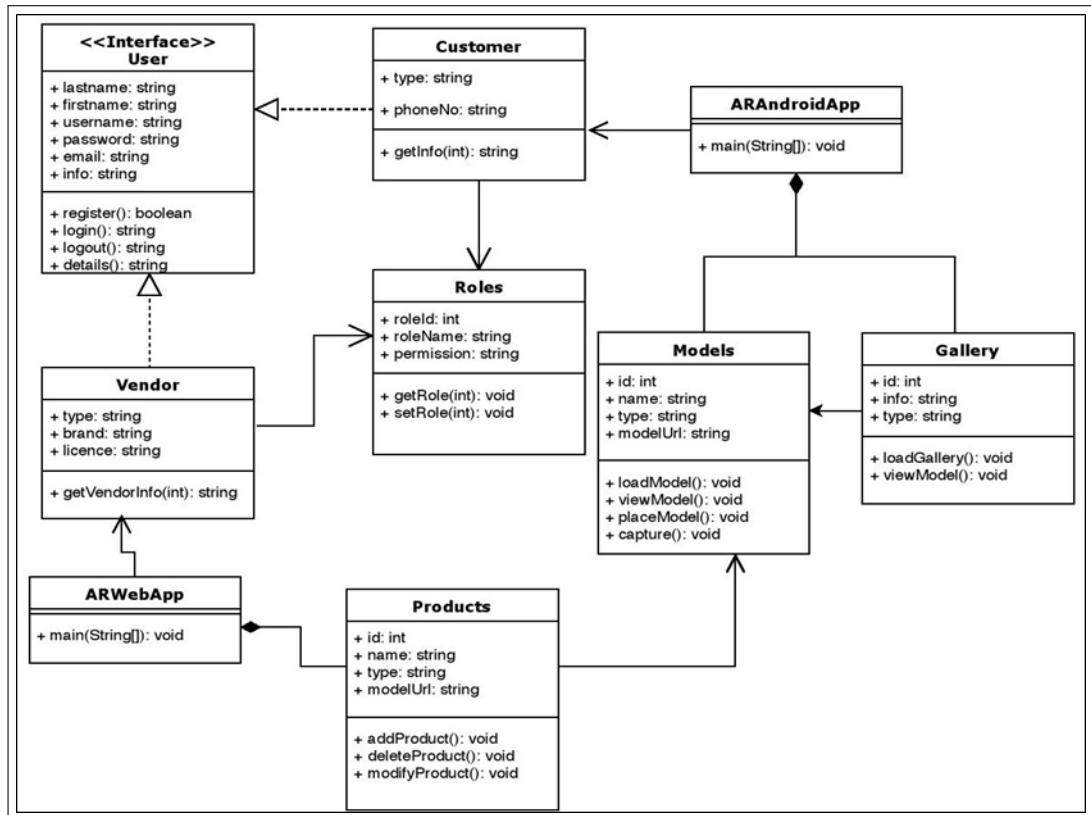


Figure 4.4: Class Diagram

4.4.2 Activity Diagram

Activity diagram focuses on flow of control from activity to activity. It shows work flow of our model. Above figure shows activity states, transitions, loops, decision nodes and concurrent activities use by our proposed system.

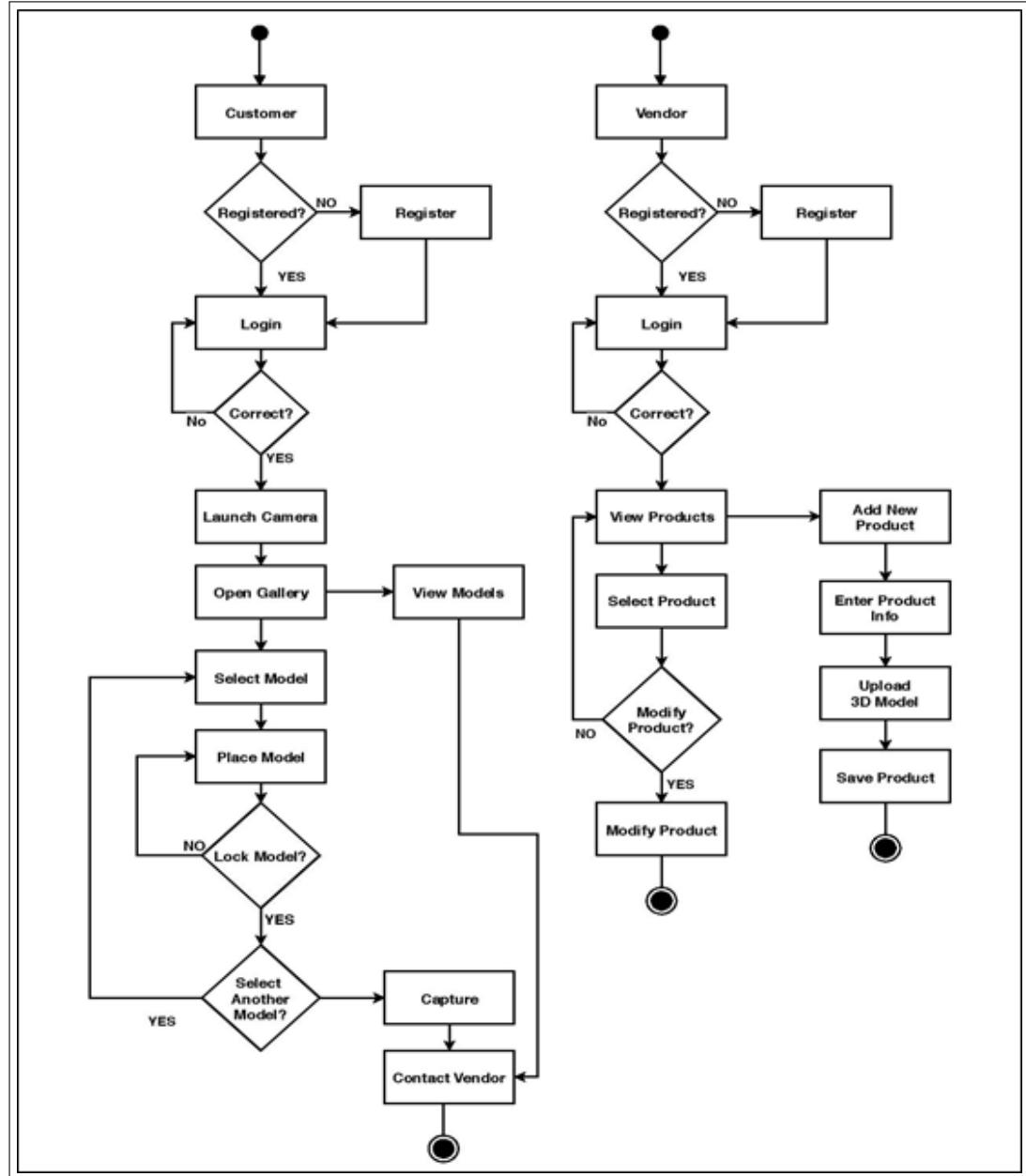


Figure 4.5: Activity Diagram

4.4.3 Use Case Diagram

Use Case Diagram. Example is given below It shows a set of use cases and actors (a special kind of class and their relationship). Use case diagrams address the static use case view of system. These diagrams are especially important in organizing and modelling the behaviour of a system.

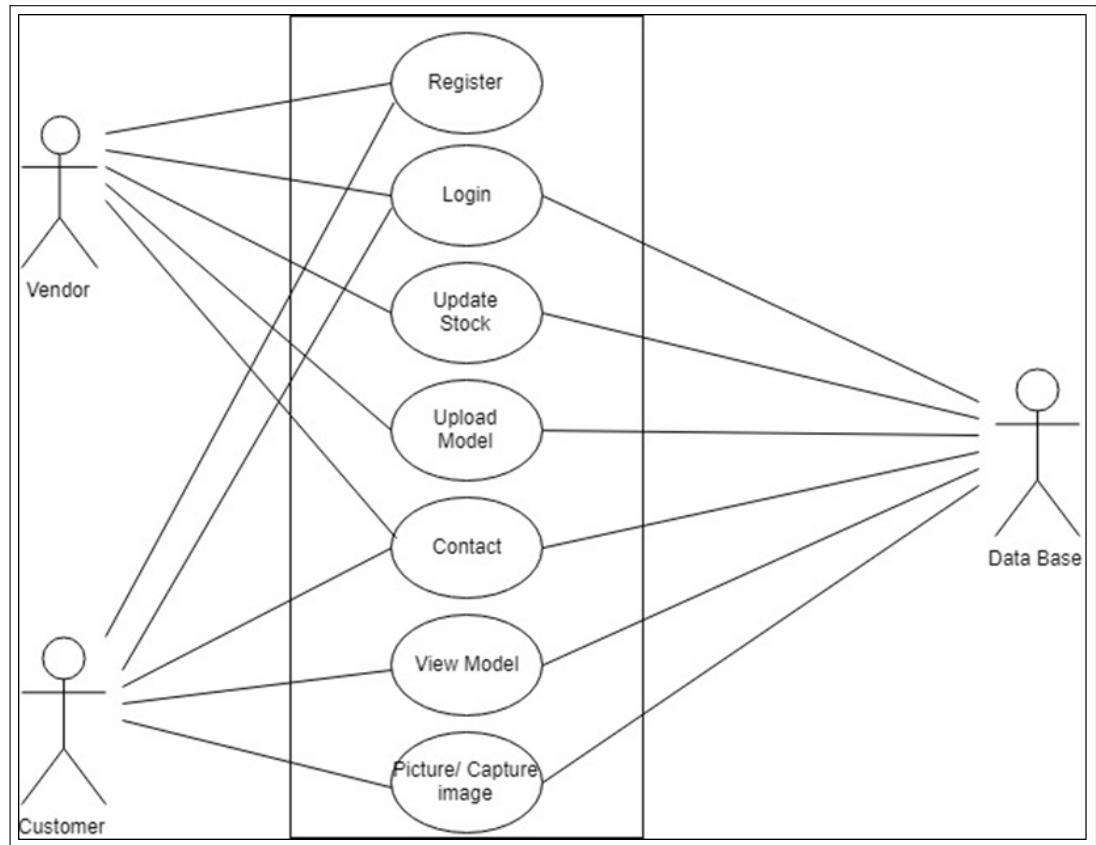


Figure 4.6: Use case diagram

- **User:** User execute application. Do registration. Machine learning: Machine learning learn about infected file signature for future use.
- **Database:** Database stores registration information of user
- **Extractor:** Collects features

4.4.4 Sequence Diagram

Sequence diagrams provide a graphical representation of object interactions over time. These typically show a user or actor, and the objects and components they interact with in the execution of a use case. One sequence diagram typically represents a single Use Case 'scenario' or own of events. Sequence diagrams are an excellent way of documenting usage scenarios and both capturing required objects early in analysis and verifying object use later in design. The diagrams show the flow of messages from one object to another, and as such correspond to the methods and events supported by a class/object.

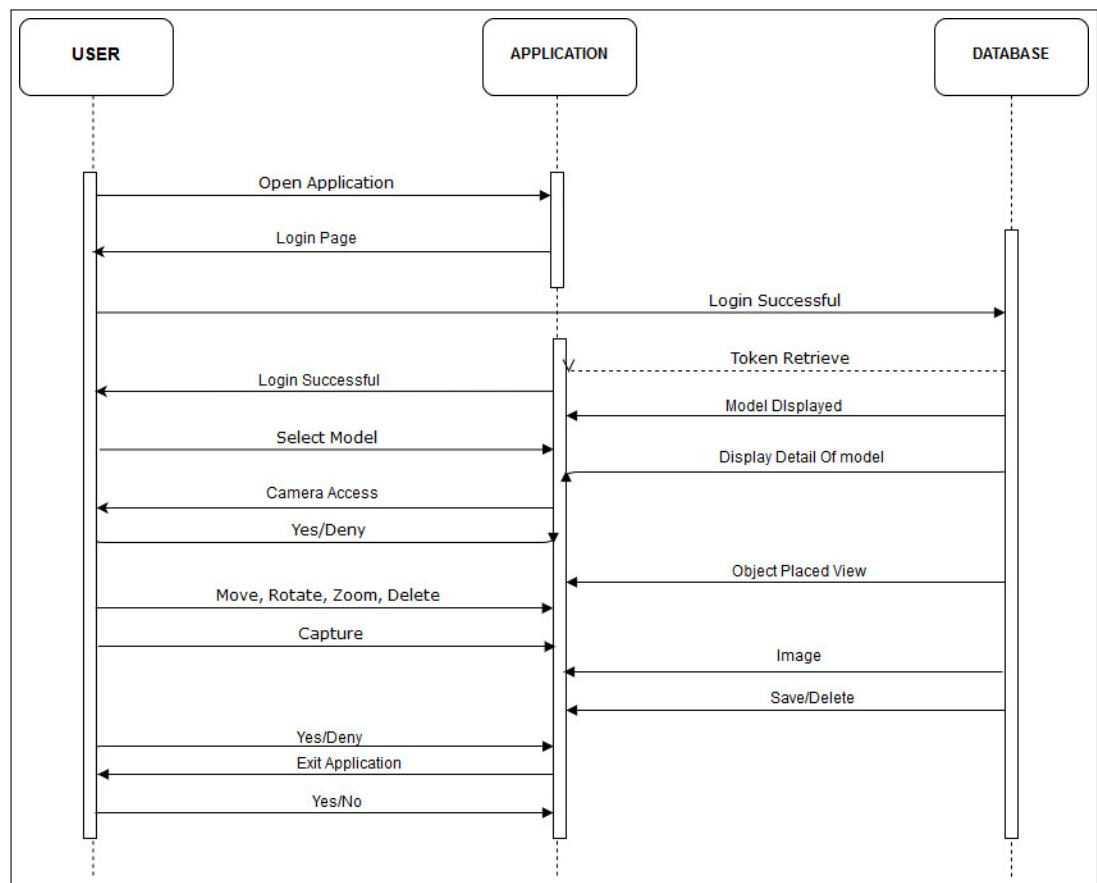


Figure 4.7: Sequence Diagram for Android Application

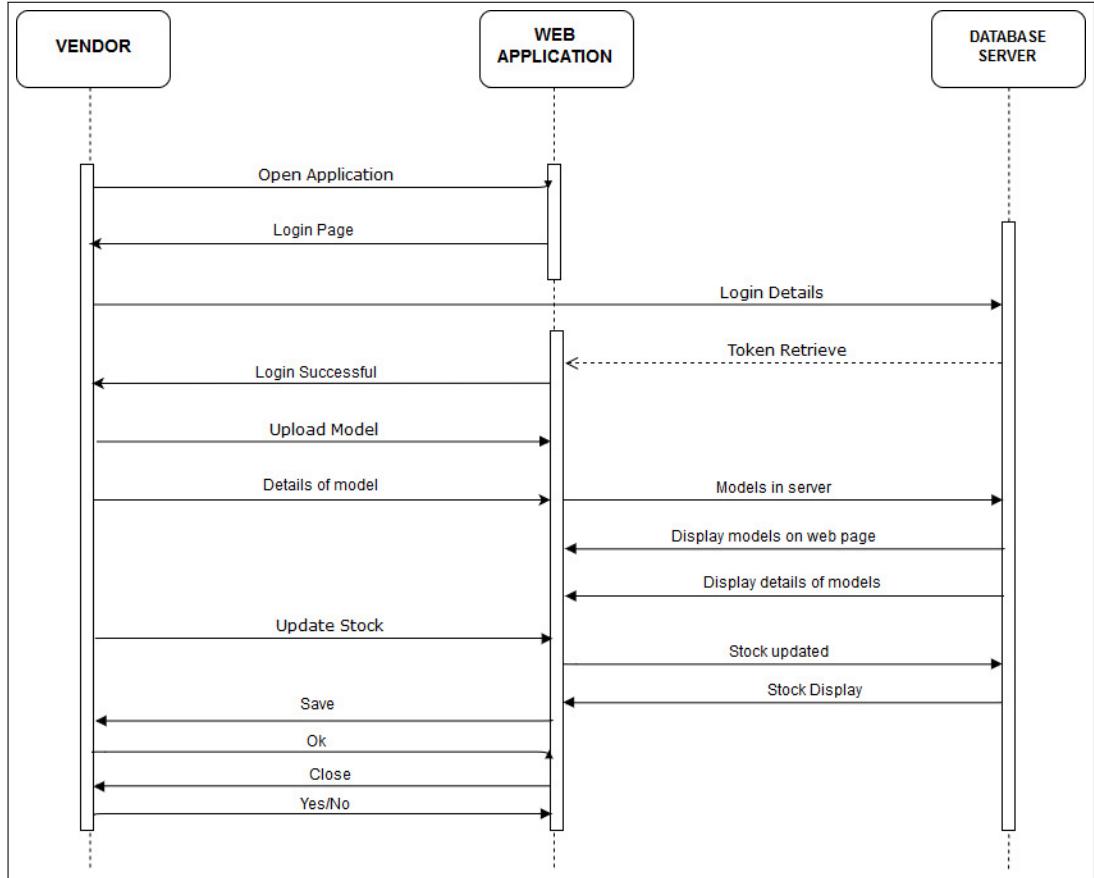


Figure 4.8: Sequence Diagram for Web Application

4.4.5 System Flow Diagram

System Flow Diagram is basically a graphical and sequential representation of the major steps involved in a systematic process. A SFD(System Flow Diagram) shows what kind of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It gives a clear idea about the whole process, say it an application or a normal data flow.

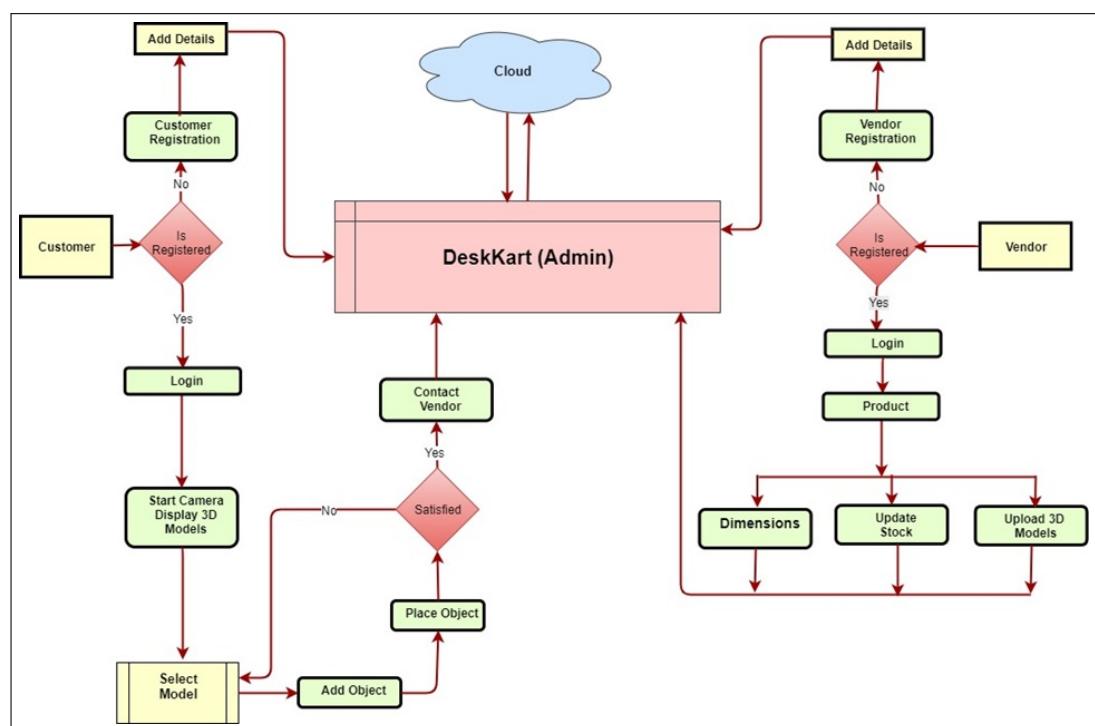


Figure 4.9: System Flow Diagram

CHAPTER 5

PROJECT PLANNING

5.1 PROJECT ESTIMATE

Use Agile model and associated streams derived from assignments 1,2, 3, 4 and 5 for estimation.

5.1.1 Reconciled Estimates

5.1.1.1 Cost Estimate

The Constructive Cost Model (COCOMO) is generally used estimation measures of cost,project duration,man power etc like all estimation model,the COCOMO model requires sizing information. This information can be specified in the form of Object point (OP) function point (FP) Line of Source Code (KLOC) for our project,we use the sizing information in the form of Lines of source code.

Equations: Equation for calculation of effort in persons-month for the COCOMO model is:

$$E = a * (KLOC)b$$

where, a=4:1

b=1:05,for semi-detached projects

E=Efforts in persons months

D=E=N

where, E=Efforts in persons months.

N=Number of person required.

D=Duration of projects in months.

Total number of code required to estimate to be 1.1 KLOC.

5.1.1.2 Time Estimates

Efforts are calculated by using formula:

E=4:1 (KLOC) 1:05 (Bohem simple model)

E=4:2 (3:1) 1:05 E=20.04 person-month

5.1.2 Project Resources

- Developers-2
- Testers-2
- At least 1 laptops
- At least 1 mobile

5.2 RISK MANAGEMENT

5.2.1 Risk Identification

NP:-

NP is the set of all decision problems (question with yes-or-no answer) for which the 'yes'-answers can be verified in polynomial time ($O(n^k)$ where n is the problem size, and k is a constant) by a deterministic Turing Machine. Polynomial time is sometimes used as the definition of fast or quickly. NP stands for **Nondeterministic Polynomial-time**.

P Class:-

P is the set of all decision problems which can be solved in polynomial time by a deterministic Turing machine. Since it can solve in polynomial time, it can also be varied in polynomial time. Therefore P is a subset of NP. They are solvable in

$O(p(n))$, where $p(n)$ is a polynomial on n . A deterministic algorithm is (essentially) one that always computes the correct answer.

NP-Complete:-

A given problem is said to be NP-Complete, if it can be solved within the determined polynomial time. The attribute values should completely satisfy the given polynomial expression. In computational complexity theory, a decision problem is NP-complete when it is both in NP and NP-hard.

A problem x that is in NP is also in NP-Complete if and only if every other problem in NP can be quickly (i.e. in polynomial time) transformed into x . In other words:
 x is in NP, and Every problem in NP is reducible to x

So what makes NP-Complete so interesting is that if any one of the NP-Complete problems was to be solved quickly then all NP problems can be solved quickly.

NP-Hard:-

NP-Hard are problems that are at least as hard as the hardest problems in NP. Note that NP-Complete problems are also NP-hard. However not all NP-hard problems are NP (or even a decision problem), despite having 'NP' as a prefix. That is the NP in NP-hard does not mean 'non-deterministic polynomial time'. Yes this is confusing but its usage is entrenched and unlikely to change.

Non-deterministic algorithms produce an answer by a series of "correct guesses". Deterministic algorithms (like those that a computer executes) make decisions based on information.

What steps do we have to take to prove a problem Q is NP-Complete? Pick a known NP-Complete problem P Reduce P to Q Describe a transformation that maps instances of P to instances of Q , st. "yes" for Q = "yes" for P Prove the transformation works Prove it runs in polynomial time

NP hard and NP Complete for our problem. Certainty Analysis of Algorithm:

Conclusion:-

Our Project supports only NP-Complete Class problem because we will get the expected output after implementing this project.

5.2.2 Risk Analysis

The risks for the Project can be analyzed within the constraints of time and quality

ID	Risk Description	Probability	Impact		
			Schedule	Quality	Overall
1	Description 1	Low	Low	High	High
2	Description 2	Low	Low	High	High

Table 5.1: Risk Table

Probability	Value	Description
High	Probability of occurrence is	> 75%
Medium	Probability of occurrence is	26 – 75%
Low	Probability of occurrence is	< 25%

Table 5.2: Risk Probability definitions

Impact	Value	Description
Very high	> 10%	Schedule impact or Unacceptable quality
High	5 – 10%	Schedule impact or Some parts of the project have low quality
Medium	< 5%	Schedule impact or Barely noticeable degradation in quality Low Impact on schedule or Quality can be incorporated

Table 5.3: Risk Impact definitions

5.2.3 Overview of risk Mitigation,Monitoring,Management

Following are the details for each risk.

Risk ID	1
Risk Description	Distribution Modules
Category	Development Environment.
Source	Software requirement Specification document.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Strategy
Risk Status	Occurred

Risk ID	2
Risk Description	Connectivity
Category	Technology
Source	This was identified during early development and testing.
Probability	Low
Impact	Very High
Response	Accept
Strategy	Providing the local database
Risk Status	Identified

5.3 PROJECT SCHEDULE

5.3.1 Project task set

Major Tasks in the Project stages are:

- Task 1: Dividing the project into modules
- Task 2: Distributing the modules to the Team members
- Task 3: Completing the Documentation simultaneously with Implementation
- Task 4: Presenting the proposed system as and when required.
- Task 5: Evaluating the Implementation (Testing of the proposed system)

5.3.2 Timeline Chart

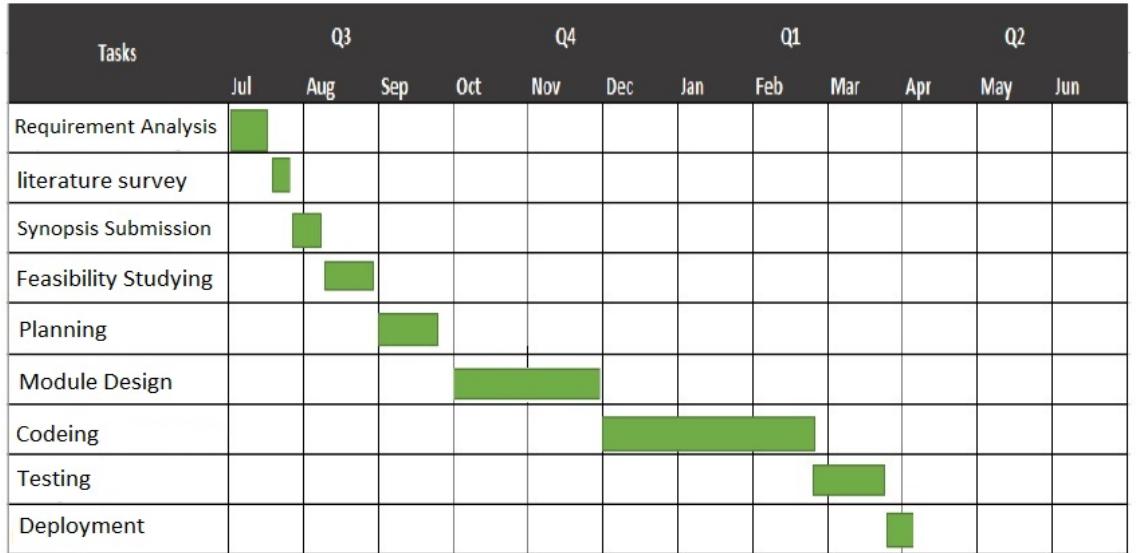


Figure 5.1: Project Planning

5.4 TEAM ORGANIZATION

Project Guide : Prof. Sayali Shivarkar

Team Leader : Praveen Panikar

Team Members: Mintu Baruah, Vishal Khose, Ashraf Shaikh

Technical Guides : Prof. Sayali Shivarkar

5.4.1 Team Structure

The team structure for the project is identified. Roles are defined as follows.

Team Leader - Praveen Panikar : Managing project tasks and coding.

Vishal Khose: System Design and Module design.

Mintu Baruah: Coding and Work flow.

Ashraf Shaikh: Documentation and Module Design.

5.4.2 Management reporting and communication

1. Inter Group Meetings : Weekly two meetings of project group members for task distribution and progress of the weekly tasks.
2. Meeting with Guides: Once in a week meeting with guide with whole project group and preparation of the weekly report as per the task status.
3. Meeting with Technical Guides: Once in two weeks for error finding and further scope of working

CHAPTER 6

PROJECT IMPLEMENTATION

6.1 OVERVIEW OF PROJECT MODULES

The system involves three major modules.

6.1.1 Customer Management

- Registration:

Using spring security following registration information is gathered:

- Username
- Password
- Mobile number
- Location

After registering user will attempt to login.

- Login:

Customer logs in using username and Password.

- Gallery:

The user can select products/ 3D models from the gallery.

- Camera Access:

Giving access to the application for capturing the 3D object using android camera APIs.

- Select Object:

Select object from already provided models from different categories.

- Place Object:

Place mobile phone on the desired surrounding area.

Place the selected object.

- Move Object:

The user can move the selected object to the desired destination.

- Zoom Object:

User can zoom in or zoom out the selected object.

6.1.2 Vendor Management

- Registration:

Using spring security following registration information is gathered:

- Username
- Password
- Mobile number
- Location

After registering Vendor will attempt to login.

- Login:

Vendor logs in using username and Password.

- Upload :

Vendor has to upload the 3D models for the specified products in the cloud.

- Stock:

Real time products availability check.

Products availability will be updated by the vendor

- Price:

Price of the products as per the vendor

- Edit:

Vendor can give the product details. Specifying the availability of the product.

Specifying the price of the product.

- Dimensions:

Vendor has to specify the following product information:

Length, height, width, weight, material, brand, color etc.

6.1.3 Administrator

- Vendor has to be approved by Admin.
- Admin has the right to delete and approve Vendor

6.2 TOOLS AND TECHNOLOGIES USED

6.2.1 Technologies used for development

ARCore

ARCore is Google's platform for building augmented reality experiences. Using different APIs, ARCore enables your phone to sense its environment, understand the world and interact with information. Some of the APIs are available across Android and iOS to enable shared AR experiences.

ARCore uses three key capabilities to integrate virtual content with the real world as seen through your phone's camera:

- **Motion tracking** allows the phone to understand and track its position relative to the world.
- **Environmental understanding** allows the phone to detect the size and location of all type of surfaces: horizontal, vertical and angled surfaces like the ground, a coffee table or walls.
- **Light estimation** allows the phone to estimate the environment's current lighting conditions.

6.2.2 Tools used for development

Android Studio Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development.

6.3 ALGORITHM DETAILS

Flow of Augmented reality is divided in following four steps

1. A real world information is obtained through input devices.
2. Use image recognition technology to analyze the real world and camera position information.
3. Generate a virtual model with graph system.
4. Finally integrate virtual model into video display on terminal display.

CHAPTER 7

TESTING

7.1 TYPES OF TESTING USED

7.1.1 Introduction to testing

Software testing is an activity aimed at evaluating an attribute or capability of a program or system and determining that it meets its required results. It is more than just running a program with the intention of finding faults. Every project is new with different parameters. No single yardstick maybe applicable in all circumstances. This is a unique and critical area with altogether different problems. Although critical to software quality and widely deployed by programs and testers. Software testing still remains an art, due to limited understanding of principles of software. The difficulty stems from complexity of software. The purpose of software testing can be quality assurance, verification and validation or reliability estimation. Testing can be used as a generic metric as well. Software testing is a trade-off between budget, time and quality.

7.1.2 Testing Process

After designing phase there is the coding phase. In this phase, every module identified and specified in the design document is independently coded and Unit is tested. Unit testing (or module testing) is the testing of different units or modules of a system. In this phase, the physical design of the system is converted into the logical programming language.

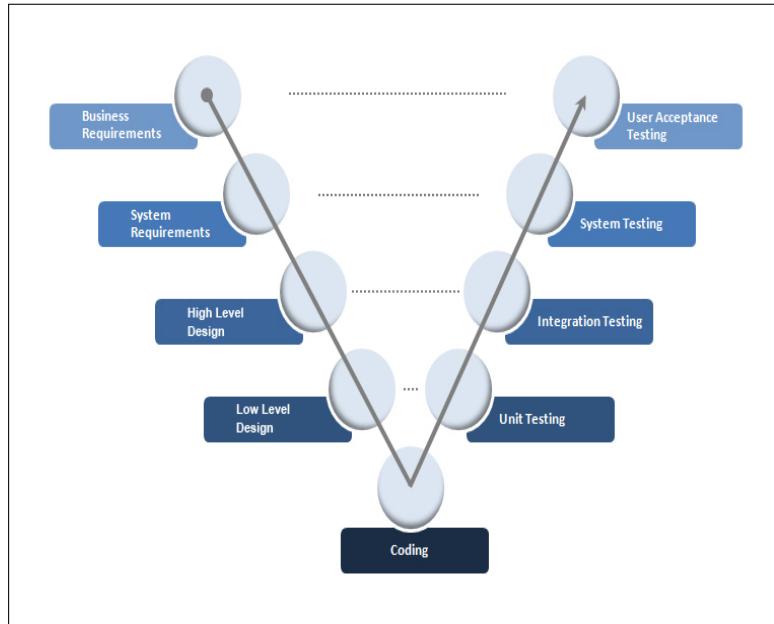


Figure 7.1: V Model For Software Testing

7.1.3 Testing Objectives

We have tried to follow some coding standards and Guidelines.

The coding standards are: -

- Naming standards for the java Classes and variables etc.
- Screen design standards.
- Validation and checks that need to be implemented.

The Guidelines are: -

- Code should be well documented.
- Coding style should be simple.
- Length of function should be short.

7.1.4 Levels of Testing

- Unit Testing

In this, the programs that made up the system were tested. This is also called as program testing. This level of testing focuses on the modules, independently of one another. Unit testing is conducted to check if individual modules are working correctly. In unit testing, code testing strategy is adopted which initially examines the logic of the program and all the syntax errors will be checked for, during the development process itself. In this test case every instruction or module is checked in the program i.e. during testing every path is checked and even the loops. In this case we take random values and check if the program executes properly. Unit testing includes a detailed explanation of test cases, management of test cases and testing criteria. (Lambert M. Surhone, 2010).

– User Input

In User interface the data entry is done through GUI and tested. Each element is tested for valid range and invalid range of data.

– Error Handling

In this system we have tried to handle all the errors that are occurred while running the GUI forms. The common errors we saw are reading the empty record and displaying a compiler message, etc. We have handled errors using exception handling. Many errors have been handled using try catch blocks provided by java. Most of the errors occurred while omitting data into database these have been handled with utmost care.

● Integration Testing

In this process of testing all the modules which are developed by different people are integrated using an integration plan. Integration plan is nothing but the plan which is used to combine all the small modules together to recognize the full system. In this methodology the modules are checked after every partly integrated system is combined. Integration testing mainly checks for interfaces between units. (John Watkins, 2011) Module dependency graph is the most significant factor which monitors the integration plan. The way of

different modules calling each other in an order explains the module dependency graph. Structured chart is also a form of module dependency graph. So we can develop integration plan based on structure chart using any of the following approaches.

- Big-bang approach.
 - Top-down approach.
 - Bottom-up approach.
 - Mixed approach.
- Bottom up Integration Testing

In this methodology, every subsystem is tested distinctly and after integration the complete system is tested. Subsystem consists of several modules that communicate with each other using well defined interfaces.” The key purpose of testing every subsystem is to check the interface between various modules; here both the data and control interface is tested. The primary benefit of bottom-up integration testing is that numerous separate subsystems are tested concurrently and the disadvantage of this approach is the complexity involved because of the large number of small subsystems.

In Main module, individual programs are tested initially then after obtaining successful results we move on further for integration. After integrating certain parts it’s tested again until we obtained the good results later on the whole system is combined and tested for system testing.

7.1.5 System Testing

System testing is the process in which the overall system is checked if the interactions between components are working properly. It is also used to find inconsistencies between specification and implementations. It also involves reliability, performance, load and security testing.

In this stage the system is checked experimentally so that all the user requirements

are fulfilled. The testing of system takes places in different levels to ensure that system is free from failure. System testing is usually done by the test team who ensures the complete working of the system. (Glenford J. Myers, 2012) System testing is usually performed on system test machines in simulated environments like VMware. System is provided to the user for entry validations and the values are provided to ensure the correctness at each and every stage. The values are provided to user to make sure he doesn't enter unrelated data. These tests are done to make sure it produces correct outputs. All the output was checked and was found to be correct. After checking for all the tests, sessions are conducted for feedback and sent finally for acceptance test. Finally system gets accepted and is checked with live data.

There are actually 3 different kinds of system testing they are:-

- Alpha testing- This type of testing is actually carried out by a test team related with organization
- Beta testing- This type of testing is carried out by a selected group of customers.
- Acceptance testing- This test is carried out by the customer to decide whether to accept the system delivery or not.

7.1.5.1 Black Box Testing:

The term black box refers to the software which is treated as a black box. By treating it as a black box, we mean that the system or the source code is not checked at all. It is done from customers view point. The test engineer in black box testing only knows the set of inputs and the expected outputs and is unaware how those inputs are transformed into outputs by the software.

Various Black Box testing techniques are:

1. Boundary Value Analysis(BVA)
2. Robustness testing
3. Worst case testing

7.1.5.2 White Box Testing:

White box testing is a way of testing the external functionality of the code by examining and testing the program code that realizes the external functionality. It is a methodology to design test cases that uses the control structure of the application to design the test. White box testing is used to test the program code, code structure and internal design flow.

White box testing types:

1. Static white box testing
2. Dynamic white box testing

7.1.5.3 Gray Box Testing:

Gray box testing consists of methods and tools derived from the knowledge of the application internals and the environment with which it interacts, that can be applied in black box testing to enhance testing productivity, bug finding and bug analyzing efficiency. It incorporates the elements of both black box as well as white box testing. It considers the outcome on the user end, system specific knowledge and the operating system.

7.2 TEST CASES AND TEST RESULTS

A test case is a specification of the inputs, execution conditions, testing procedure, and expected results that define a single test to be executed to achieve a particular software testing objective, such as to exercise a particular program path or to verify compliance with a specific requirement. Test cases underlie testing that is methodical rather than haphazard. A battery of test cases can be built to produce the desired coverage of the software being tested. Formally defined test cases allow the same tests to be run repeatedly against successive versions of the software, allowing for effective and consistent regression testing.

7.2.1 Unit Test

Test Id	Unit to test	Test Data	Execution Steps	Expected Result	Actual Result	Pass or Fail	Quality
1	Home Page of Android App	Android App	1. Start MySQL 2. Build and Start Backend Server 3. Install Android App 4. Open Android App	Home Page will be open	Page Open Successfully	Pass	Best
2	Login Page	Android App Valid User	1. Open Android App 2. Login with valid user	Login with valid user works properly	Login with valid user works successfully	Pass	Best
3	Galley Page	Android App Valid User	1. Open Android App 2. Login with valid user 3. Open Model Gallery	Gallery Page opens with proper data	Gallery page open successfully	Pass	Best
4	Augmented Page	Android App Valid User	1. Open Android App 2. Login with valid user 3. Open Model Gallery 4. Click on any model	Camera opens with proper 3d model	Camera open successfully	Pass	Best

Figure 7.2: Unit Test Case

Test Id	Integration to test	Test Data	Execution Steps	Expected Result	Actual Result	Pass or Fail	Quality
1	After Login with valid user gallery opens	Android App Valid User	1. Open Android App 2. Login with valid user 3. Open Model Gallery	User should able to view the gallery	Gallery is visible	Pass	Best
2	Augmented reality should work After Selecting model	Android App Valid Use	1. Open Android App 2. Login with valid user 3. Open Model Gallery 4. Select Model	User Should able to view Augmented Reality	Augmented reality is working	Pass	Best
3	User should be able to add multiple models	Android App Valid Use	1. Open Android App 2. Login with valid user 3. Open Model Gallery 4. Select new Model	User Should be able to add multiple models	Multiple Model added successfully	Pass	Best

Figure 7.3: Integration Test Case

Test Id	Unit to test	Test Data	Execution Steps	Expected Result	Actual Result	Pass or Fail	Quality
1	All proposed system working fine or not	Required steps build and start the application	1. Launch Application 2. Login with valid Data 3. Go to Gallery 4. Select new Model 5. Move Camera 6. Place 3D Model at particular location 7. Capture the screenshot 8. Add new Model 9. Place the Model	All the modules should work properly	All the modules are working properly	Pass	Best <input checked="" type="checkbox"/>

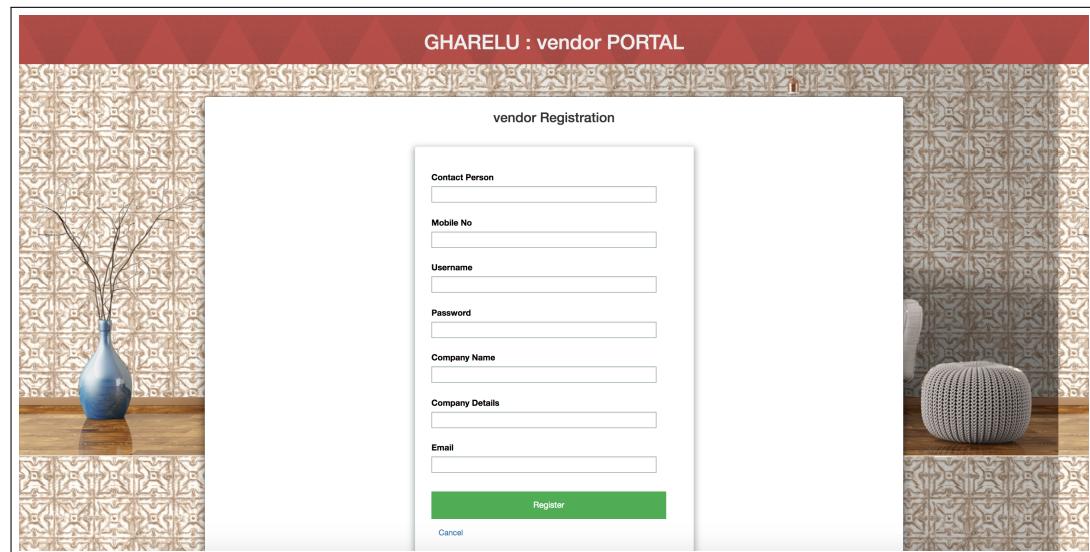
Figure 7.4: System Test Case

CHAPTER 8

RESULT

8.1 SCREENSHOTS

8.1.1 Vendor Registration



The screenshot shows the vendor Registration page of the GHARELU vendor PORTAL. The page has a red header bar with the text "GHARELU : vendor PORTAL". Below the header is a decorative background featuring a patterned tile wall and a wooden floor with a blue vase containing dried branches on the left and a white textured stool on the right. The main form area is titled "vendor Registration" and contains the following fields:

Contact Person	<input type="text"/>
Mobile No	<input type="text"/>
Username	<input type="text"/>
Password	<input type="text"/>
Company Name	<input type="text"/>
Company Details	<input type="text"/>
Email	<input type="text"/>

At the bottom of the form are two buttons: a green "Register" button and a blue "Cancel" button.

Figure 8.1: Vendor Registration

8.1.2 Vendor Login

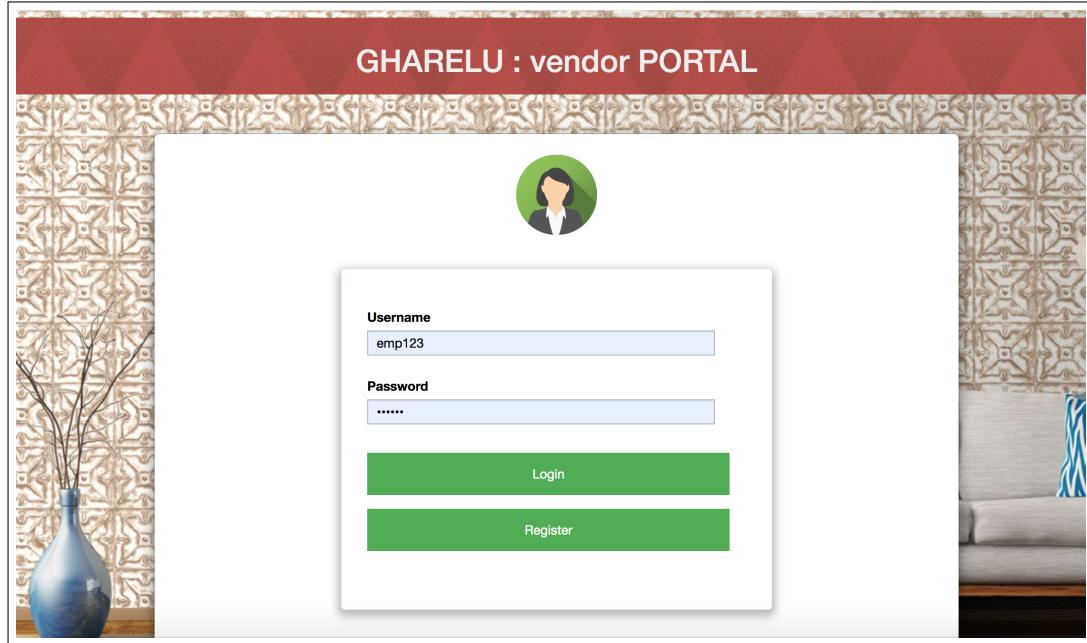


Figure 8.2: Vendor Login

8.1.3 Vendor Dashboard

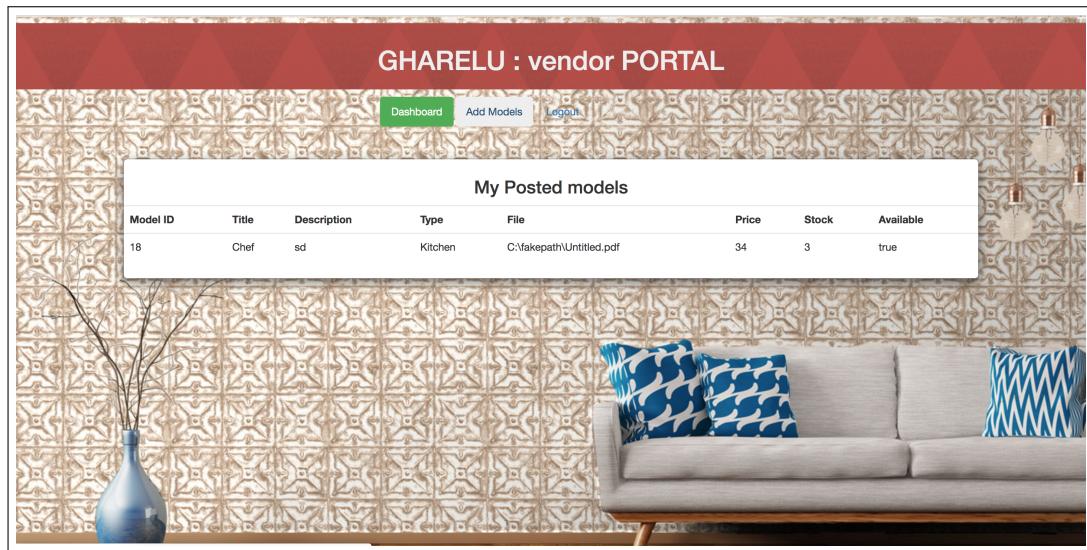


Figure 8.3: Vendor Dashboard

8.1.4 Model Adding Page

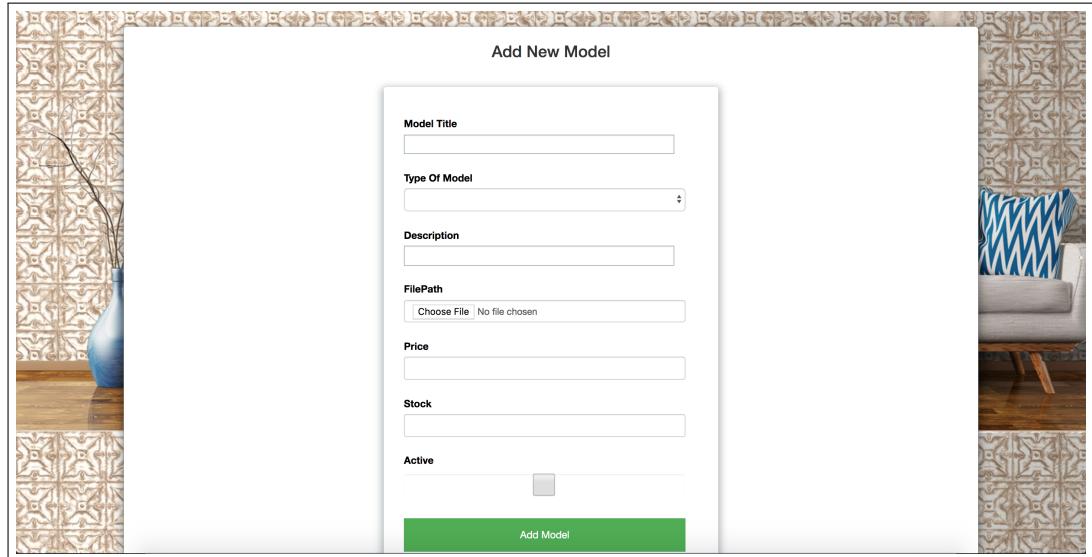


Figure 8.4: Model Adding Page

8.1.5 Application Start Up Page



Figure 8.5: Application Start Up Page

8.1.6 Application Login

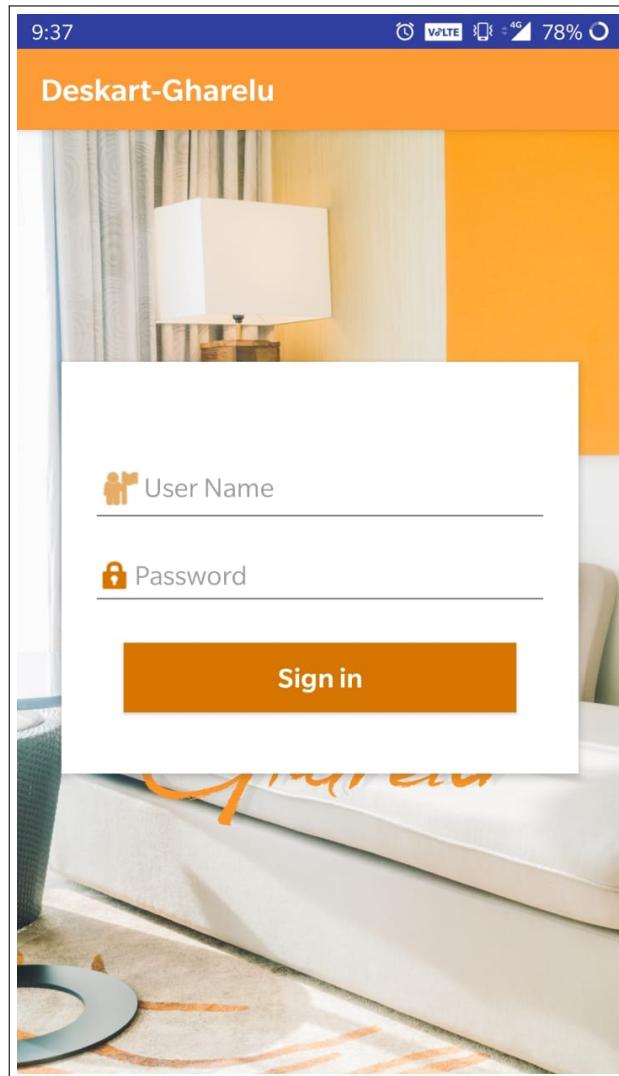


Figure 8.6: Application Login

8.1.7 Select Model

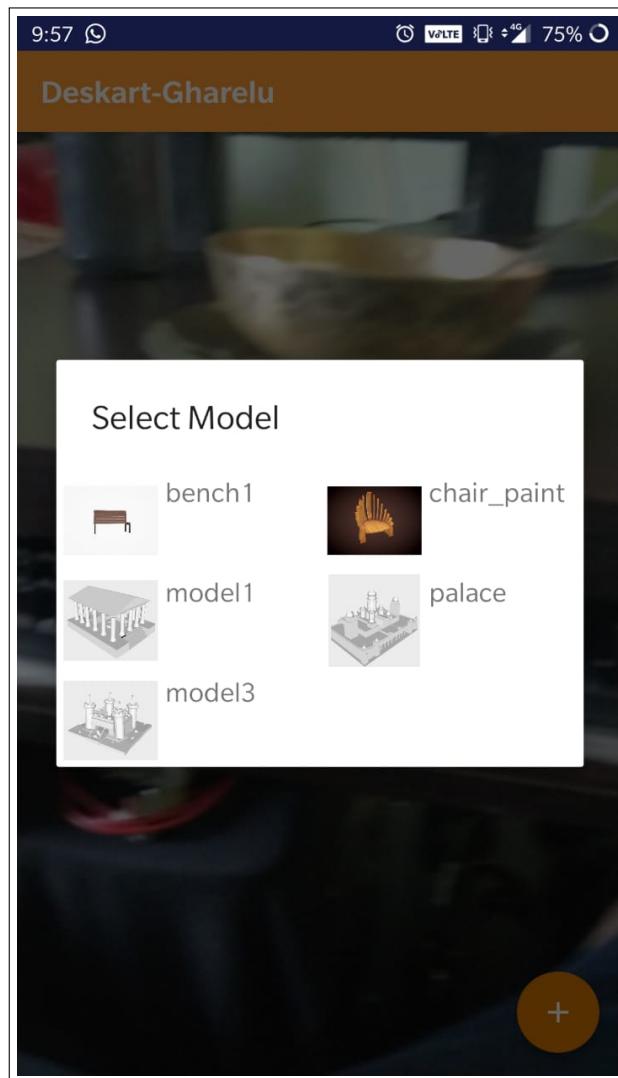


Figure 8.7: Select Model

8.1.8 Start Camera



Figure 8.8: Start Camera

8.1.9 Place One Model



Figure 8.9: Place One Model

8.1.10 Place Multiple Model

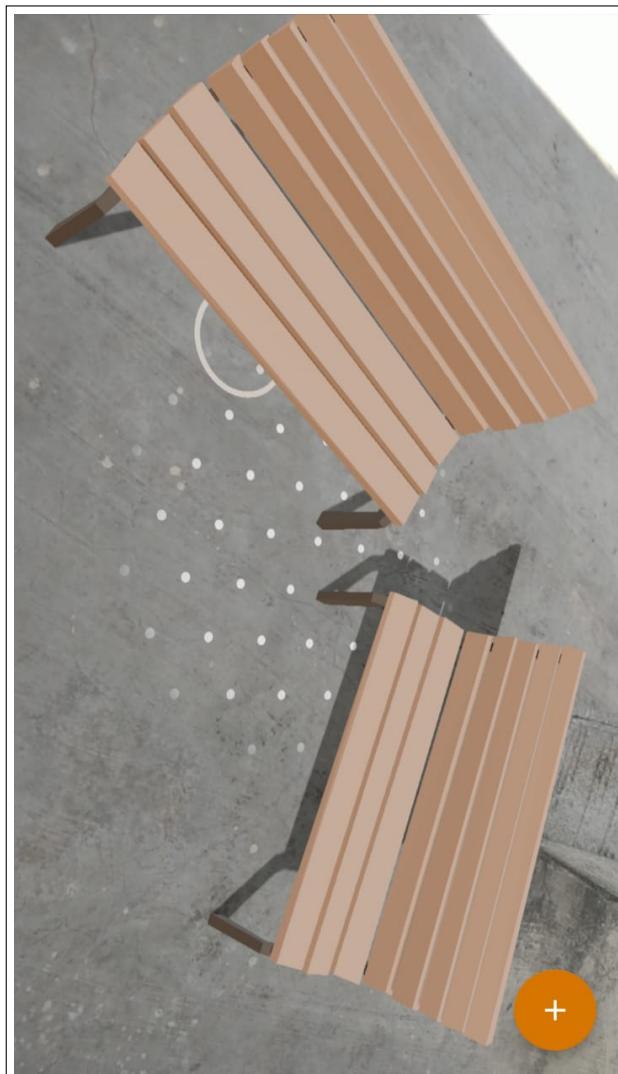


Figure 8.10: Place Multiple Model

CHAPTER 9

CONCLUSION

9.1 CONCLUSION

The Consumers as well as the sellers are taken together on a single platform which helped in improving the efficiency of the product. The precious time as well as the money of both the consumers as well as the buyers is saved in huge amount which helped in increased productivity.

Using this technology, users will be able to perform multiple functions on pre-loaded 3D models of various pieces of furniture. In order to increase the variety, third party vendors will be able to upload their 3D models with dimensions and prices provided, on our application which will be stored in a cloud as our database. Final screenshot will be provided to user of how his/her room will look virtually after they have selected the models as per their liking. By incorporating Augmented Reality, the user gets a realistic and enriching experience of designing with satisfactory results.

9.2 FUTURE WORK

In future we can add more functionalities for the users such as Online Payment Systems, improved GUI, etc. Future scope is to provide Online chat System for question and answer and will work on handling large dataset.

9.3 APPLICATION

- Interior Designing
- Furniture Marketing
- Real Estate: Supply-side Benefits
- Real Estate: Demand-side Benefits

ANNEXURE A

PROBLEM STATEMENT

Implementing interior design application using Augmented Reality which provides a single platform for the user and vendor. On the user side, buying furniture becomes more realistic and easier. On the vendor side a larger platform to increase sales.

A.1 MATHEMATICAL MODEL

- The mathematical model is illustrated properly that defines the problem statement of project, input data, output data, and all the necessary constraints regarding project. Solution perspective for proposed scheme,
 $S = I, O, P, S, F$

where,

- I = Initial State of System.
- O =Output State.
- P =Functions or Modules for Technical process.
- S =Success Condition.
- F =Failure condition.

Initial State:

- I = INITIAL STATE
- I = I_1, I_2

where,

-
- I1= Registration of Customer
 - I2= Registration of Vendor
 - I1= Name, Details, Contact
 - I2= Name, Details, Location Availability, Product Details, 3D Models

Output:

- O=output State,

- O= O1,O2

Where,

- 01= Registration Done, AR Ready Application, View latest products
- 02= Registration Done, Upload 3D Models, Contact Details Stored
- P = Functions or modulator for technical process
- P = Augmented Reality with in built Camera, Review, View 3D Models, Contact Distributor

ANNEXURE B

PROJECT ASSIGNMENT

ASSIGNMENT :- 1

Title:-

To develop the problem under consideration and justify feasibility using concepts of knowledge canvas and IDEA Matrix.

Problem Statement:-

Implementing interior design application using Augmented Reality which provides a single platform for the user and vendor. On the user side, buying furniture becomes more realistic and easier. On the vendor side a larger platform to increase sales.

I	D	E	A
INCREASE: Accuracy of the data retrieved and processed	DRIVE: Interaction between Hardware and Software	EDUCATE: The System can be used by small scale, goods company.	ACCELERATE: uploading of 3D models.
IMPROVE: Relevant and speed of detecting	DELIVER: High Performance	EVALUATE: The collected information or data accurately	ASSOCIATE: More than one robot
IGNORE: Unknown result	DECREASE: Manual Efforts	ELIMINATE: Go through every model finish work.	AVOID: System failure

IDEA:

I:		
INCREASE:	Accuracy of the model placement.	Model placement depends on the environment Providing better automation solutions.
IMPROVE:	System will be able to provide accurate result.	Increase in speed Improved performance
IGNORE:	environment not identified	No models found

IDEA:**D:**

DRIVE:	Interaction between Hardware and software	Developer will interact with Unity 3D and Android Studio.
DELIVER:	Faster analysis and return desired object/ 3D Model	High performance means: Provide accurate data Increase in speed
DECREASE:	Manual Efforts	Reduce manual efforts.

IDEA:**E:**

EDUCATE:	The API can be used by the digital industries, home interior, exterior design	We need to educate: Business people. Industry People
EVALUATE:	(API) Aims to evaluate the content accurately.	Evaluated must be accurately.
ELIMINATE:	API eliminates the manually file searching for finding object.	It uses: Self-communication Finish work

IDEA:**A:**

ACCELERATE:	The system aims to accelerate the finish the work.	During no any watching the working finish in company.
ASSOCIATE:	As it is in distributed platform many users and vendors can use it.	Multiple vendor/company can use it
AVOID:	Repetitive send value	avoid low light conditions.

ASSIGNMENT :- 2

Title:-

Project problem statement feasibility assessment using NP-Hard, NP- Complete or satisfiability issues using modern algebra and/or relevant mathematical models

Abstract:-

It is a trend that long has been making, thanks to the success of e-commerce sites like Amazon, E-bay, Urban Ladder, and other, and has motivated traditional interior designers brands, sellers and buyers to change the way they operates. More options are offered online than in store, and its becoming more common for retailers to leverage their physical locations as logistics centers and showrooms places where consumers can collect online orders or view products. But like any other products, online purchasing of product related to Interior is Quiet Challenging. It would be difficult for consumers to get feel of interior products and so many questions emerge before purchasing e.g. How the Sofa will look? How it will fit in the living room? Is it matching with other interior? We are trying to get rid of all these questions by introducing a system using Augmented Reality. The System will consist of two major parts i.e. Mobile Application with Augmented Reality support and bringing interior decorators/sellers/end user customer on single platform based on Cloud. Product Creators can upload 3D Models and Images to the System with product details like dimensions, availability locations, price etc. End User can view all these products on the Android app. Using uploaded 3D models and in build mobile camera, end user can get look and feel of products with the help of AR. The system will also help end user to give review or contact the retailers for extra details.

MATHEMATICAL MODEL

Sr. No.	Description	Observation
1.	<p>Problem Description and System</p> <p>Let S be Closed system defined as, $S = \{ Ip, Op, Ss, Su, Fi, A \}$</p> <p>To select the training documents and give the path of the folder and perform various actions from the set of actions A so that Su state can be attained.</p>	System
	<p>$S = \{Ip, Op, Ss, Su, Fi, A\}$</p> <p>Where,</p> <p>$Ip_1 = \{\text{Username, Password}\}$</p> <p>Where,</p> <p>Dtr - Set of training data</p> <p>Dts – Set of testing data</p>	Application for training and testing
2.	<p>Set of actions = $A = \{F1, F2, F3, F4\}$</p> <p>Where,</p> <p>F1 = Registration of Customer</p> <p>F2 = Registration of Vendor</p> <p>F3 = Name, Details, Contact</p> <p>F4 = Details, Location Availability, Product Details, 3D Models</p> <p>Ss- Set of User's states</p> <p>Su- System is successful when the 3D model is placed.</p> <p>Fi- failure state is when a 3D model is not placed</p>	System goes through a set of different states

Definitions:

P, NP, NP-Hard, NP-Complete Problems:

P Class of problems: Solutions to P class of problems have deterministic algorithms running in polynomial.

NP Class of problems: Solutions to NP class of problems have non-deterministic algorithms running in polynomial.

NP-Hard class of problems: A problem is in NP-Hard class if an already proved NP-Hard problem reduces to it.

NP-Complete class of problems: A problem is NP-Complete if it is NP-Hard and it is NP (i.e. there exists a non-deterministic algorithm running in polynomial time which solves it).

Therefore, our system is NP-Complete.

ASSIGNMENT :- 3

Title:-

Use of divide and conquer strategies to exploit distributed/parallel/concurrent processing of the above to identify objects, polymorphisms, overloading in functions (if any), and functional relations and any other dependencies (as per requirements).

System S is defined as collection of following set:

$$S = \{Ip, Op, Ss, Su, A\}$$

Mapping Functions f(x)	X	Y
F2(Ip1) → Op1	Ip1	Op1
F3(Ip2) → Op2	Ip2	Op2
F4(Op2) → Op3	Op2	Op3
F6(Ip2) → Su	Op2	Su

Objects:-

1. Input1: Ip1 = {Username, Password}
 2. Input2 : Ip2= {Select the model }
 3. Input3 : Ip3={Place the model}
-
1. Output1 : Op1 = {User logged in}
 2. Output2 : Op2 = {Model displayed on the screen}
 3. Output3 : Op3 = {Model placed on the selected area}

Functional Dependency Graph:-

1. Function 1 = F1 = Collect_Sensor_Value
2. Function 2 = F2 = Activate
3. Function 3 = F3 = Server_communication
4. Function 4 = F4 = Application_functioning
5. Function 5 = F5 = selects_model
6. Function 6 = F6 = View_Output

ASSIGNMENT :- 4

Title: Use of above to draw functional dependency graphs and relevant Software modeling methods, techniques including UML diagrams or other necessities using appropriate tools.

UML diagrams: The "Unified Modeling Language" (UML) is a graphical language for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system. The UML offers a standard way to write a system's blueprints, including conceptual things such as business processes and system functions as well as concrete things such as programming language statements, database schemas, and reusable software components.

In this assignment we have drawn following UML diagrams.

1. Use case Diagram
2. Class Diagram
3. Activity Diagram
4. Sequence Diagram

User Case Diagram:

A Use Case Model describes the proposed functionality of a new system. A Use Case represents a discrete unit of interaction between a user and the services provider. This interaction is a single unit of meaningful work, such as start and stop in our car. Each Use Case describes the functionality to be built in the proposed system, which can include another Use Case's functionality or extend another Use Case with its own behavior. A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well.

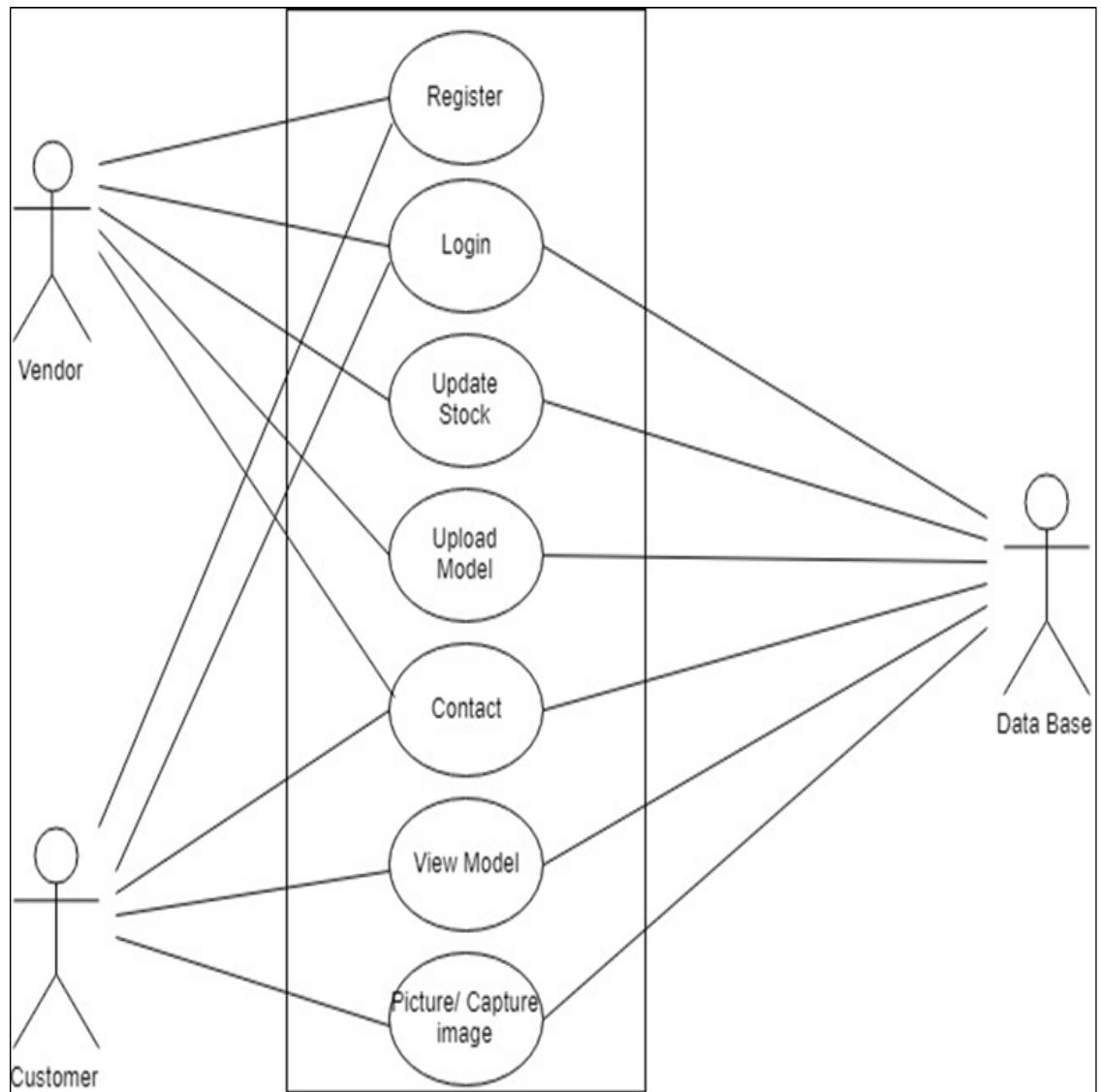


Figure 1: Use Case Diagram

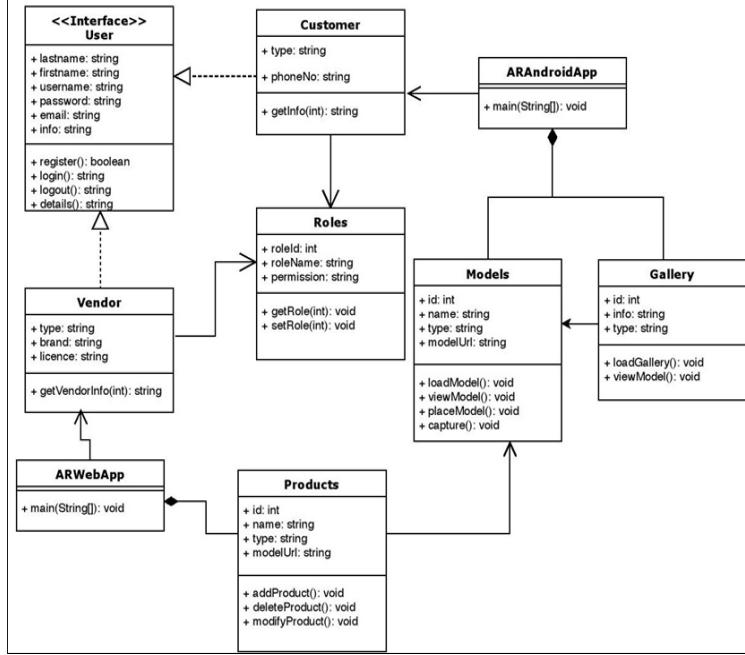


Figure 2: Class Diagram

Class Diagram:

Class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects.

The class diagram is the main building block of object oriented modeling. It is used both for general conceptual modeling of the systematic of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main objects, interactions in the application and the classes to be programmed. A class with three sections.

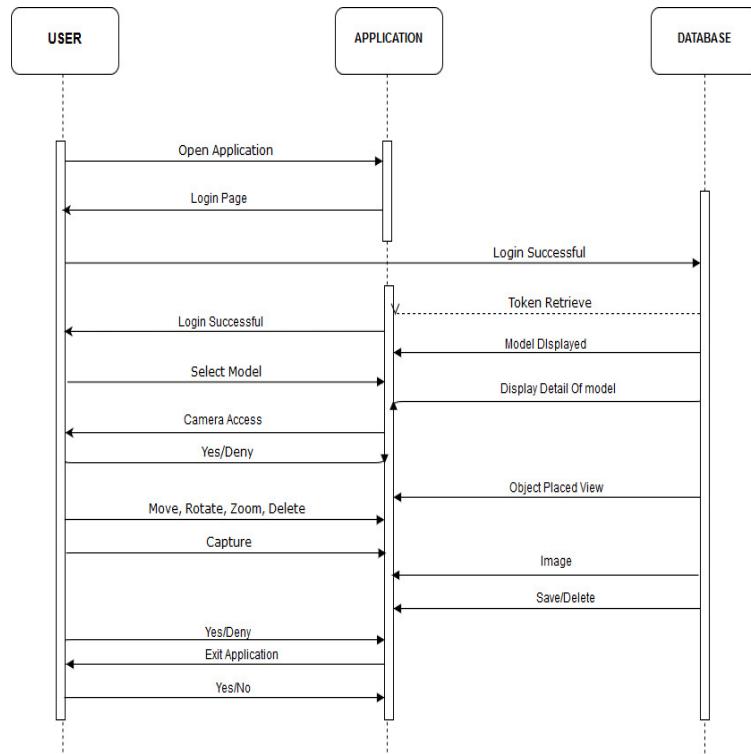


Figure 3: Sequence Diagram for Mobile Application

Sequence Diagram:

Sequence diagrams provide a graphical representation of object interactions over time. These typically show a user or actor, and the objects and components they interact with in the execution of a use case. One sequence diagram typically represents a single Use Case 'scenario' or own of events.

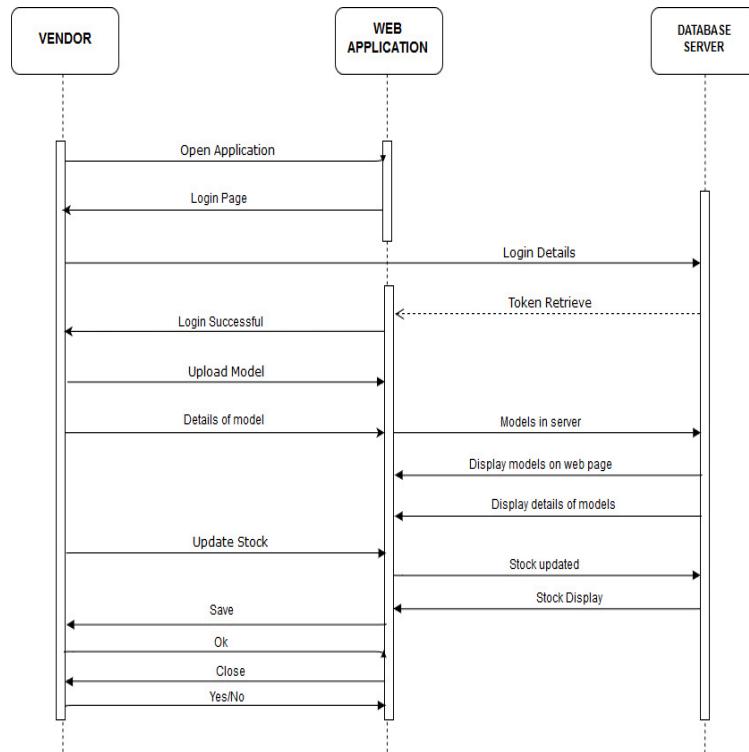


Figure 4: Sequence Diagram for Web

Activity Diagram:

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all type of flow control by using different elements such as fork, join, etc. The basic purposes of activity diagrams is similar to other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing the dynamic nature of a system, but they are also used to construct the executable system by using forward and reverse engineering techniques. The only missing thing in the activity diagram is the message part. It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not. It shows different flows such as parallel,

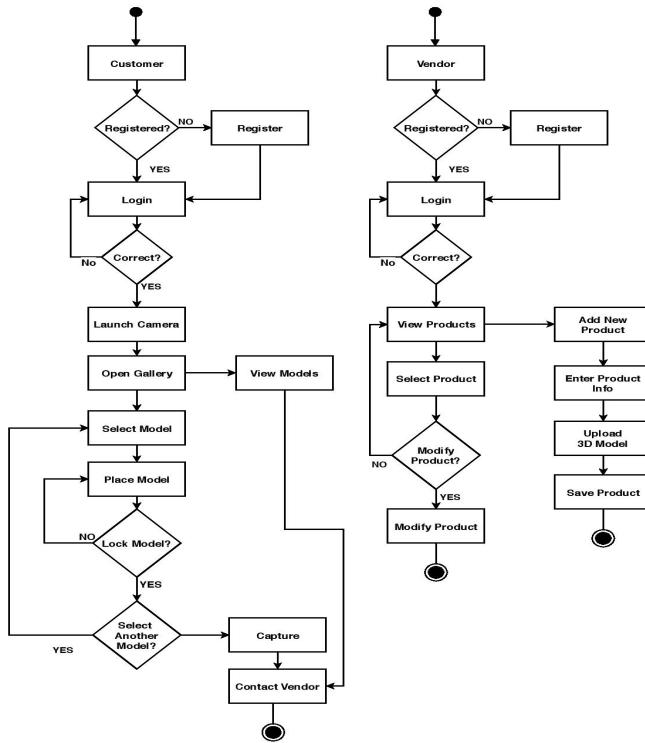


Figure 5: Activity Diagram

branched, concurrent, and single.

The purpose of an activity diagram can be described as:-

- Draw the activity flow of a system.
- Describe the sequence from one activity to another.
- Describe the parallel, branched and concurrent flow of the system.

Conclusion: In this article we have explored a few of the notational elements that UML supplies for static soft-ware design. In future columns we will expand upon this notation by showing how to use it for solving some real soft-ware problems. We will also examine UML as contingent of tools for modeling dynamic design.

ASSIGNMENT :- 5

Title:-

Testing of project problem statement using generated test data (using mathematical models, GUI, Function testing principles, if any) selection and appropriate use of testing tools, testing of UML diagram's reliability

Theory:-

Software Testing:

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of A software item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

Verification:

Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

Validation:

Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

Basics of software testing:

There are two basics of software testing: black-box testing and white-box testing.

Black-box Testing:

Black box testing is a testing technique that ignores the internal mechanism of the system and focuses on the output generated against any input and execution of the system. It is also called functional testing.

White-box Testing:

White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and glass box testing. Black box testing is often used for validation and white box testing is often used for verification.

Types of testing:

There are following types of testing:

1. Unit Testing

2. Integration Testing
3. Functional Testing
4. System Testing
5. Stress Testing
6. Performance Testing
7. Usability Testing
8. Acceptance Testing
9. Regression Testing
10. Beta Testing

Unit Testing:

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

Integration Testing:

Integration testing is testing in which a group of components are combined to produce output. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation. It may fall under both white box testing and black box testing.

Functional Testing:

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.

System Testing:

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

Stress Testing:

Stress testing is the testing to evaluate how system behaves under unfavorable conditions. Testing is conducted at beyond limits of the specifications. It falls under the class of black box testing.

Performance Testing:

Performance testing is the testing to assess the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements. It falls under the class of black box testing.

Usability Testing:

Usability testing is performed to the perspective of the client, to evaluate how the GUI is user-friendly? How easily can the client learn? After learning how to use, how proficiently can the client perform? How pleasing is it to use its design? This falls under the class of black box testing.

Acceptance Testing:

Acceptance testing is often done by the customer to ensure that the delivered product meets the requirements and works as the customer expected. It falls under the class of black box testing.

Regression Testing:

Regression testing is the testing after modification of a system, component, or a group of related units to ensure that the modification is working correctly and not damaging other modules to produce unexpected results. It falls under the class of black box testing.

Beta Testing:

Beta testing is the testing which is done by end users, a team outside development, or publicly releasing full pre-version of the product which is known as beta version. The aim of beta testing is to cover unexpected errors. It falls under the class of black box testing.

TEST CASES:-

Test Case ID	1
Test Case Description	Register button on homepage of application
Test Case Result	After clicking on the submit button, the system should perform the required operation.
Action Result	Perform required operation.
Status	Pass
Test Case ID	2
Test Case Description	Login button show on home page of application.
Test Case Result	Login Successfully
Actual Result	Login Successfully
Status	Pass
Test Case ID	3
Test Case Description	System should verify password and user-name.
Test Case Result	Pass
Actual Result	Pass
Status	Pass

Conclusion:

Thus, above test cases we have successfully carried out on implanting our project.

ANNEXURE C

PAPER

DESKKART- FURNITURE MALL WITH AUGMENTED REALITY

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¹Assistant Professor, Department of Computer Engineering, Dhole Patil College of Engineering, Kharadi, Pune, India

^{2,3,4,5}U.G. Student, Department of Computer Engineering, Dhole Patil College of Engineering, Kharadi, Pune, India

Abstract : It is a trend that long has been making, thanks to the success of e-commerce sites like Amazon, Ebay, Urban Ladder, and other, and has motivated traditional interior designers brands, sellers and buyers to change the way they operates. More options are offered online than in store, and it's becoming more common for retailers to leverage their physical locations as logistics centers and showrooms places where consumers can collect online orders or view products. But like any other products, online purchasing of product related to interior is quiet challenging. It would be difficult for consumers to get feel of interior products and so many questions emerge before purchasing e.g. How the Sofa will look? How it will fit in the living room? Is it matching with other interior? In this paper we are trying to get rid of all these questions by introducing a system using Augmented Reality. The System will consist of two major parts i.e. Mobile Application with Augmented Reality support and bringing interior decorators/sellers/end user customer on single platform based on Cloud. Product Creators can upload 3D Models and Images to the System with product details like dimensions, availability locations, price etc. End User can we all these products on the Android app. Using uploaded 3D models and in build mobile camera, end user can get look and feel of products with the help of AR. The system will also help end user to give review or contact the retailers for extra details.

Index Terms – Augmented Reality, Cloud computing, Mobile information processing systems, Camera calibration, 3D imaging.

I. INTRODUCTION

It seems that every few years, people all over the world are increasingly using Augmented Reality and 3D technology in their daily life. As computer technology getting better, augmented reality and 3D technology developed more rapidly. Augmented Reality (AR) is a branch of computer science research and Virtual Reality(VR) are deals with augmenting the environment with computer-generated information. It is the technology that strengthens the view of the real world of the user with computer-generated information. AR is a field of research which deals with the combination of real-world and virtual reality. Most often, the augmentation is visual. It is not just that visual augmentation is important, but it is also necessary to possess auditory augmentation (computerized earpiece whispers information into a person's ear), touch augmentation or augmentation via a personal digital assistant.

While for 3D, refer to the Wikipedia description, 3D computer graphics are graphics that use a three-dimensional representation of geometric data that is stored in the computer for the purposes of performing calculations and rendering 2D images. In 3D computer graphics, 3D modelling is the process of developing a mathematical representation of any 3D surface of object through specialized software. The product is called a 3D model which gives a better graphics of visualization.

In this paper we are trying to achieve effective way of Furniture Online Shopping by introducing a system using Augmented Reality. The System will consist of two major parts i.e. Mobile Application with Augmented Reality support and bringing interior decorators/sellers/end user customer on single platform based on Cloud. Product Creators can upload 3D Models and Images to the System with product details like dimensions, availability locations, price etc. End User can we all these products on the Android app. Using uploaded 3D models and in build mobile camera, end user can get look and feel of products with the help of AR. The system will also help end user to give review or contact the retailers for extra details. In figure 1 The input scene is acquired by the smart phone camera. The Touch-Screen interaction for 3D object is based on the input scene and the result of combining the 3D object with real scenes is shown in figure 2.



Figure 1: Input Scene

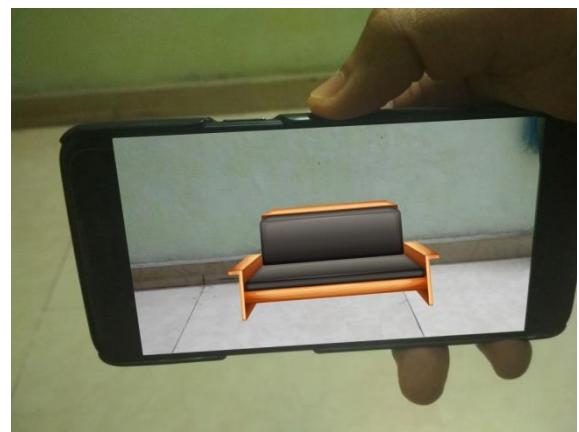


Figure 2: Output scene

II. RELATED WORK

1. Interaction Design in Augmented Reality on the Smartphone.

In this paper [1], Augmented Reality (AR) is aimed at integrating virtual information into real world to enhance the perception ability of reality. The paper mainly presents an AR system that can complete some interactions between the user and the smart phone based on touch screen and body motion. There are three contents in this system. The first part is the building of AR scenes in Unity3D on the basis of real-time mapping access to the Web Cam Texture Class. The second part is the interaction based on the touch screen with the method of Ray cast. The third part is the interaction based on the body motion with the help of Gyro Sensor in the smart phone. Experimental results show that there is a good effect in the touch-screen interaction to realize some actions such as translation, rotation, scaling, or any combination of these. And it is also effective in the body motion interaction to control the virtual objects acting according to the user's body motion.

2. Integrated View-Input Interaction Method for Mobile AR

In this paper [2], mobile AR is very popular and used for many commercial and product promotional activities. However, in almost all mobile AR application, user only view annotated information or preset virtual objects motion in AR environment and cannot interact with virtual objects as if he/she interact real objects in the real environment. In this paper, we propose novel interaction method, called integrated view-input interaction method, which integrate viewpoint moving and virtual objects handling only by handling mobile AR device. Our proposed method has a predilection for popular touch mobile device, such as smart phone or table, does not need any additional sensor for sensing manipulation target. We implemented three integration types and evaluate efficiency in object handling task.

3. Mobile Augmented Reality System for In-situ3DModeling and Authoring

In This Paper [3], This paper proposes a mobile augmented reality system that can model 3D virtual objects and author augmented reality contents on site. The differences of the proposed system from the existing ones are an interaction approaches used to generate and manipulate primitives and additional features such as a shadow and a multi-freezing mode to create realistic augmented reality contents efficiently.

4. Design AR: Portable Projection-based AR system specialized in interior design

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III. SYSTEM ARCHITECTURE

Our interior design system includes 3 main sections: Customer, Vendor and Cloud.

1) Customer will be the people using the application, before being able to use the app, they will have to register with their email address or phone number so their profile is stored in our database. After successfully registering the consumer will be able to use the app to design their house or room to their liking. One mandatory requirement from the customers side is that they must have a phone with has camera access so as to scan the room and place different furniture pieces.

2) Vendor will be the companies who will be uploading their furniture models on our database so our consumers have a variety to choose from. Like customer, the vendor also has to register before being able to upload their models. Once registered they can view a list of their current uploaded models and will be able to provide dimensions, update stock and any new models they wish to.

3) Cloud is the main database method we are proposing to use. As it can be easily accessed online from any place. To maintain security of the details of both customer and vendor the admin will have to give permissions to the vendor after they register. Once the admin approves then only vendor will be able to upload their models. The admin will be the developers of the application. Hence as shown in the system architecture figure, the admin is the core and has access to both customer and vendor registration.

1. Proposed System work:

In this project we propose a new way of interior designing with the help of augmented reality. We propose the use of Augmented Reality as mentioned which is a new and upcoming technology and can solve day to day problems much efficiently and give the customer an enriching and realistic experience through his smart phone. We propose the method of not only restricting the application to one vendor but allowing vendors of different brands to upload their models so as to give the customer a variety of choices to pick from.

The working is very easy and simple to understand. On one side customers will be registered and vendors on the other hand. Once the vendors have uploaded their 3D models with the dimensions, the customer will be able to see it in the list. First task is to allow camera access from your smart phone and then you will see a display of different models. Once you select a model to your liking you can simply click on add object and the object will be placed virtually in the center of your room through your camera. Once you place an object, you may move it around and rotate it to your liking to see where it fits best. A small pop up box will appear asking the customer if they are satisfied and want to continue. Once the customer adds all the objects he wishes and is satisfied, he will then be provided with the object details such as price and dimension and also the contact number of the vendor selling the product. The customer can then place the order at his/her own convenience.

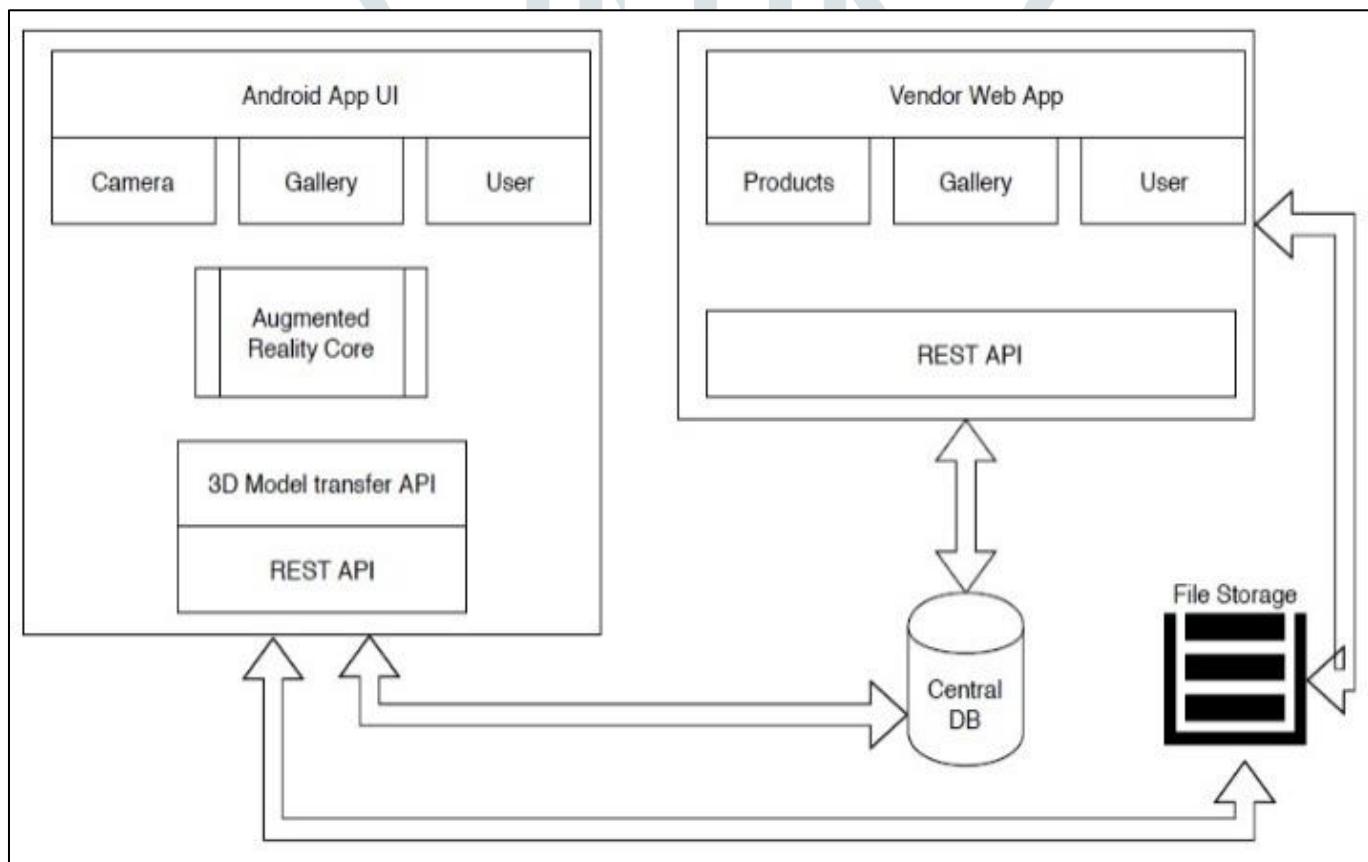


Figure 3: System Architecture

This is a fairly simple yet efficient method of buying furniture and it saves time and feels more realistic than traditional method, within a few clicks and swipes one can design his entire house virtually.

III. CONCLUSION

In this paper we propose an interior designing application using Augmented Reality technology. Using this technology, users will be able to perform multiple functions on pre-loaded 3D models of various pieces of furniture. In order to increase the variety, third party vendors will be able to upload their 3D models with dimensions and prices provided, on our application which will be stored in a cloud as our database. A final screenshot will be provided to user of how his/her room will look virtually after they

have selected the models as per their liking. By incorporating Augmented Reality, the user gets a realistic and enriching experience of designing with satisfactory results.

IV. REFERENCES

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- [2] Tanikawa, T., Uzuka, H., Narumi, T., "Integrated view-input interaction method for mobile AR," 3D User Interfaces (3DUI), pp. 187-188, March 2015.
- [3] Han KyuYoo,JongWeon Lee, "Mobile augmented reality system for in situ 3D modeling and authoring," Big Data and Smart Computing (BIGCOMP), pp. 282-285, Jan. 2014.
- [4] Yoon Jung Park, Yoonsik Yang, SeunghoChae, Inhwan Kim, Tack-don Han "Design AR : Portable Projection-based AR system specialized in interior design", October 2017.



Deskkart- Furniture Mall with Augmented Reality

Mintu Baruah¹, Praveen Panikar², Vishal Khose³, Ashraf Shaikh⁴, Prof. Sayali Shivarkar⁵

^{1, 2, 3, 4}U.G. Student, ⁵Assistant Professor, Department of Computer Engineering, Dhole Patil College of Engineering, Kharadi, Pune, India

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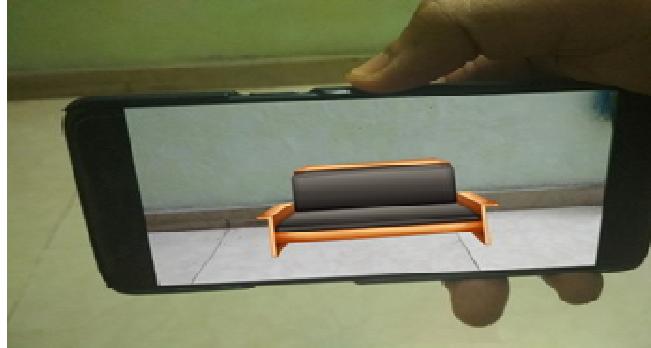


Fig. 2 Output Scene

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III.PROBLEM DEFINITION

Implementing interior design application using Augmented Reality which provides a single platform for the user and vendor. On the user side, buying furniture becomes more realistic and easier. On the vendor side a larger platform to increase sales.

IV.SYSTEM ARCHITECTURE

Our interior design system includes 3 main sections: Customer, Vendor and Cloud.

- 1) Customer will be the people using the application, before being able to use the app, they will have to register with their email address or phone number so their profile is stored in our database. After successfully registering the consumer will be able to use the app to design their house or room to their liking. One mandatory requirement from the customers side is that they must have a phone with camera access so as to scan the room and place different furniture pieces.
- 2) Vendor will be the companies who will be uploading their furniture models on our database so our consumers have a variety to choose from. Like customer, the vendor also has to register before being able to upload their models. Once registered they can view a list of their current uploaded models and will be able to provide dimensions, update stock and any new models they wish to.
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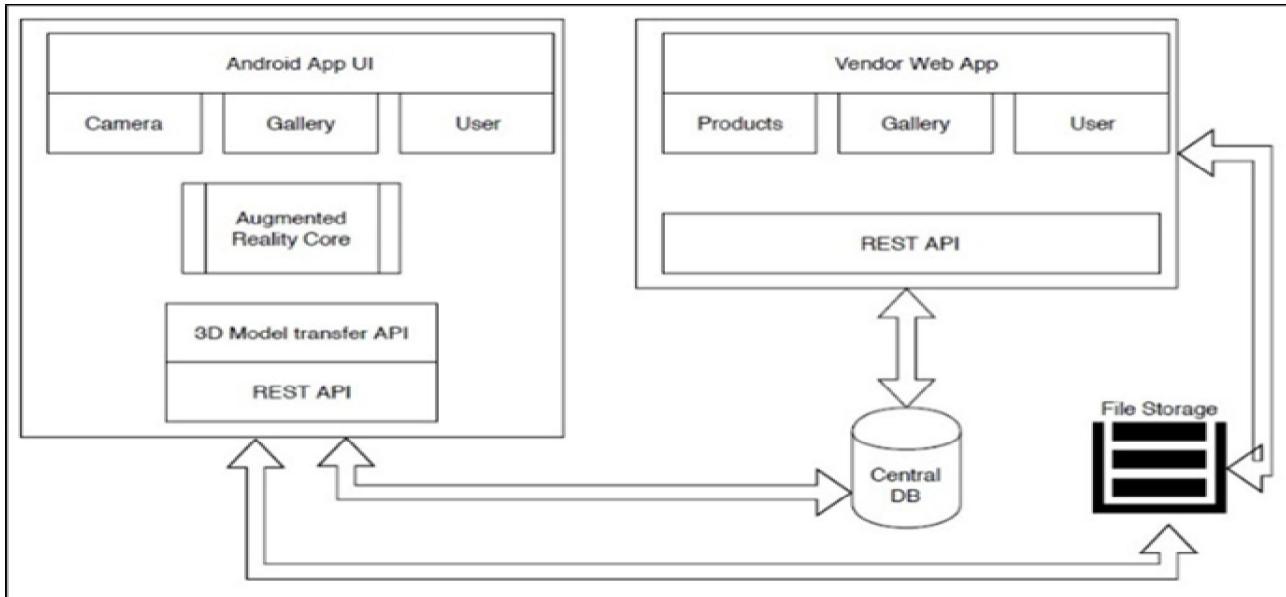


Fig. 3 System Architecture

A. Proper System Work

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The customer can then place the order at his/her own convenience.

This is a fairly simple yet efficient method of buying furniture and it saves time and feels more realistic than traditional method, within a few clicks and swipes one can design his entire house virtually.

V. SYSTEM MODULES

A. User Management

At one-point multiple users will be allowed to access the application and will have to register before using the app to maintain security.

B. 3D Model/Products

Using AR, a 3d model will be generated of the product and the user will be able to see it virtually in his surrounding, side by side on vendor side he/she will also be able to upload, edit, delete new 3d models of his products.

C. Augmented Reality Modules

AR brings together the real and virtual world. It takes our current reality and adds something to it. With the help of AR, we can solve everyday problems we encounter. Such as placing a piece of furniture in an empty space or looking at a 3D model of a building we want to construct. We can do much more which we couldn't have imagined of doing before AR. Essentially in AR we can interact with virtual objects as if they're in our surroundings. AR enhances your natural environment and offers an enriched experience. Examples PokéMon go and Snapchat.

D. Vendor Management

The vendors will be able to upload their 3d models and update stock and product information so that user can have enough information while deciding to buy or not.

E. Product Management

Using a vendor management system as a web application is highly beneficial as it helps in keeping track of various vendors and stock of each product. Also, the vendors can update their stock accordingly whenever they feel like if they also have a registered account. This is an efficient way of keeping track of authentic vendors and also gives them faster and easier access to the consumers on a larger platform.

VI.ALGORITHM

Flow of Augmented reality is divided in following four steps:

- A. A real-world information is obtained through input devices.
- B. Use image recognition technology to analyse the real world and camera position information.
- C. Generate a virtual model with graph system.
- D. Finally integrate virtual model into video display on terminal display.

VII. CONCLUSION

In this paper we propose an interior designing application using Augmented Reality technology. Using this technology, users will be able to perform multiple functions on pre-loaded 3D models of various pieces of furniture. In order to increase the variety, third party vendors will be able to upload their 3D models with dimensions and prices provided, on our application which will be stored in a cloud as our database.

A final screenshot will be provided to user of how his/her room will look virtually after they have selected the models as per their liking. By incorporating Augmented Reality, the user gets a realistic and enriching experience of designing with satisfactory results.

VIII. RESULTS

A. Android Application (Customer)



Fig 4: Home Page

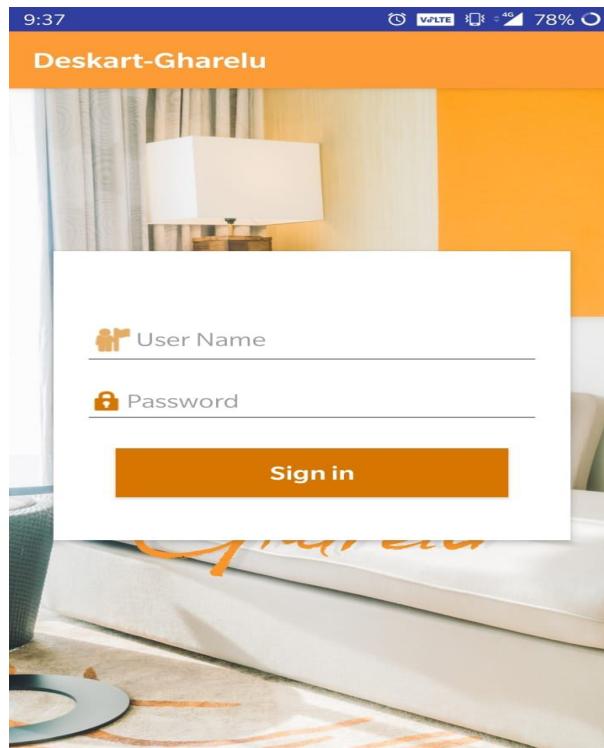


Fig 5: Login Screen

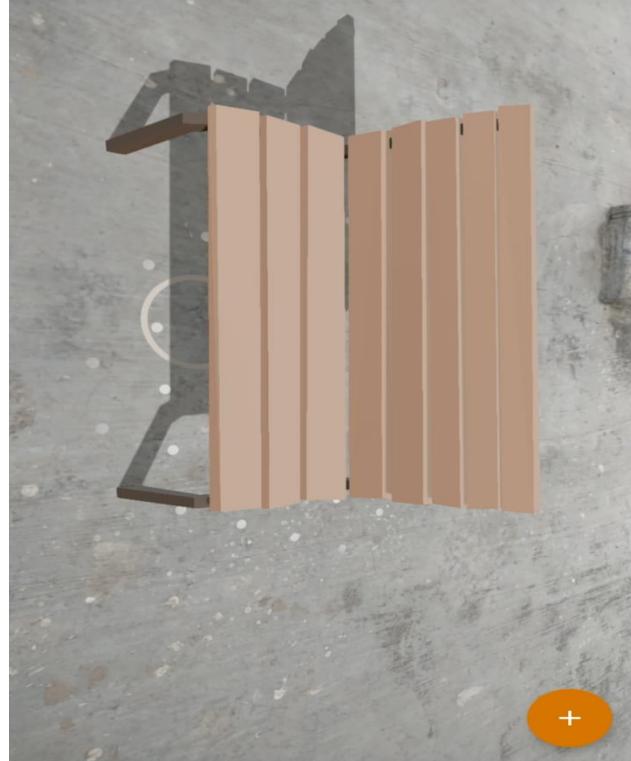
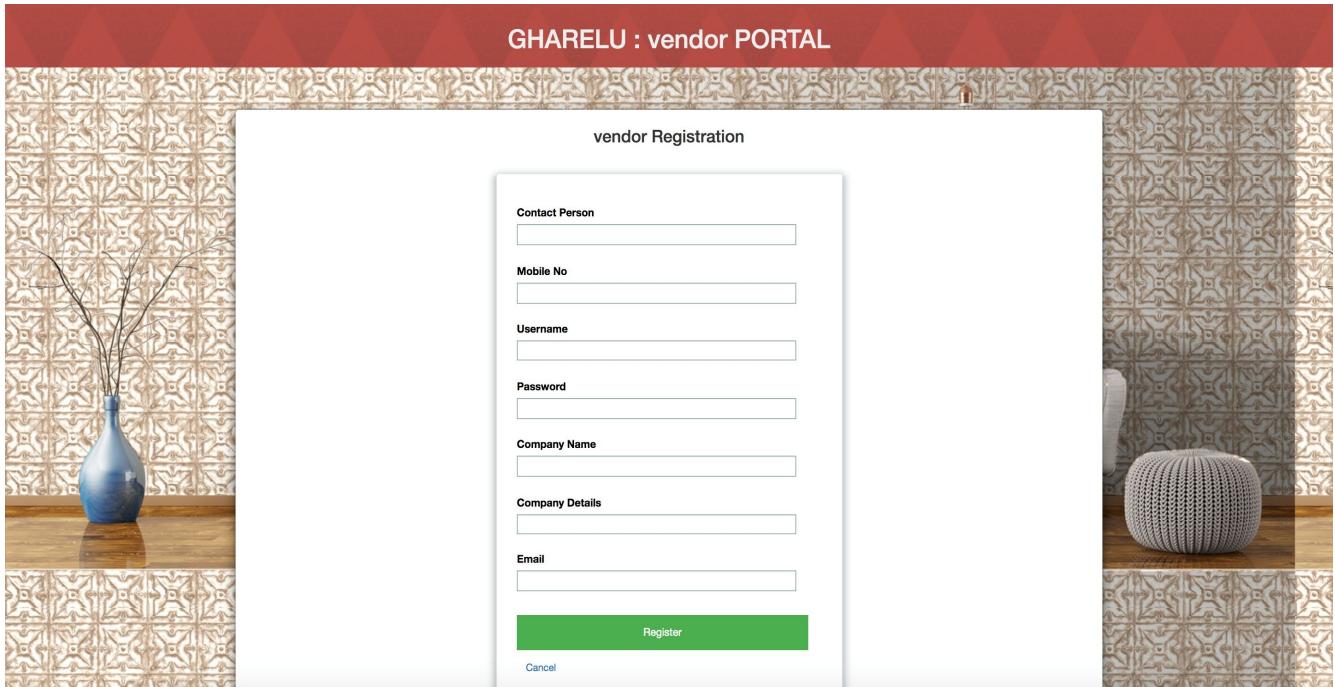


Fig 6: Scene 1(with one model)



Fig 7: Scene 2 (multiple models)

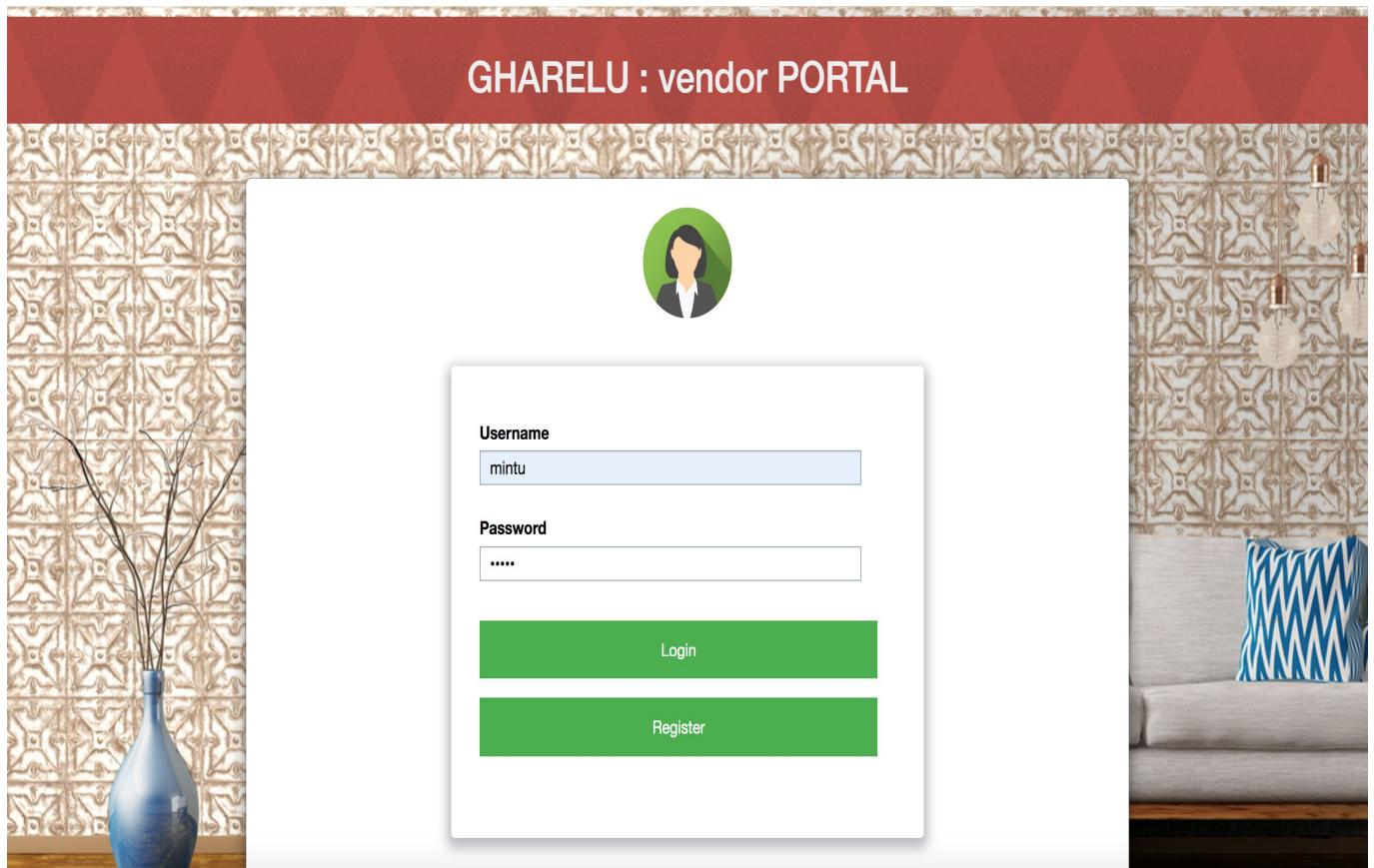
B. Web Application (Vendor)

The screenshot shows the vendor registration page titled "GHARELU : vendor PORTAL". The form is titled "vendor Registration" and contains the following fields:

- Contact Person (text input field)
- Mobile No (text input field)
- Username (text input field)
- Password (text input field)
- Company Name (text input field)
- Company Details (text input field)
- Email (text input field)

At the bottom of the form are two buttons: a green "Register" button and a blue "Cancel" button.

Fig 8: Vendor Registration



The screenshot shows the vendor login page titled "GHARELU : vendor PORTAL". At the top center is a placeholder profile picture icon. Below it is the login form:

Username
mintu

Password
.....

At the bottom of the form are two buttons: a green "Login" button and a green "Register" button.

Fig 9: Vendor Login

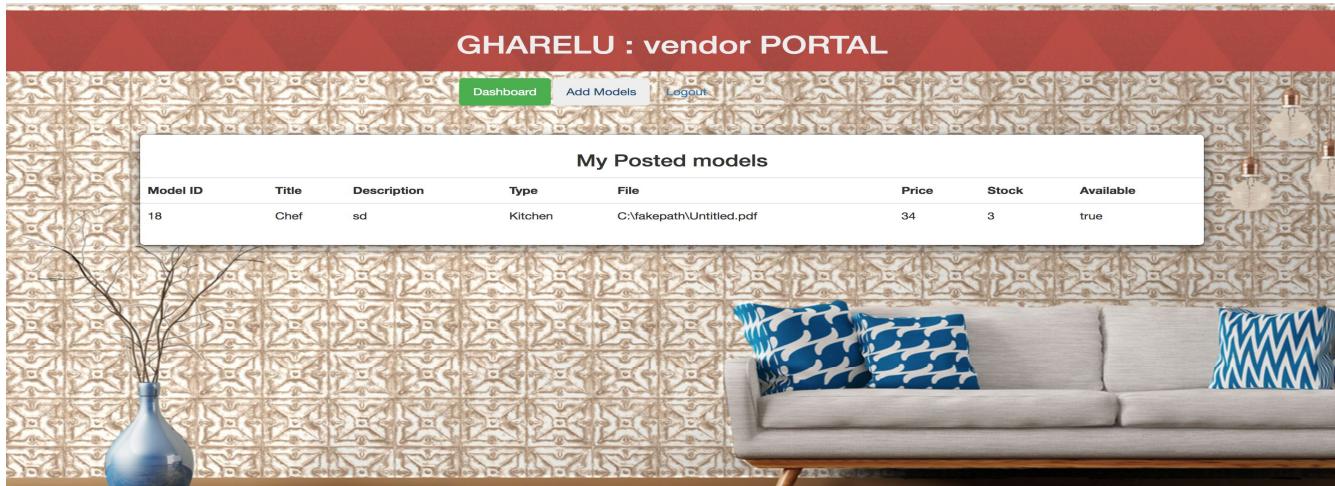


Fig 10: Home Screen

The screenshot shows the 'Add New Model' form. It includes fields for Model Title, Type Of Model (dropdown), Description, FilePath (choose file button), Price, Stock, Active (checkbox), and a green 'Add Model' button.

Fig 11: Add Model

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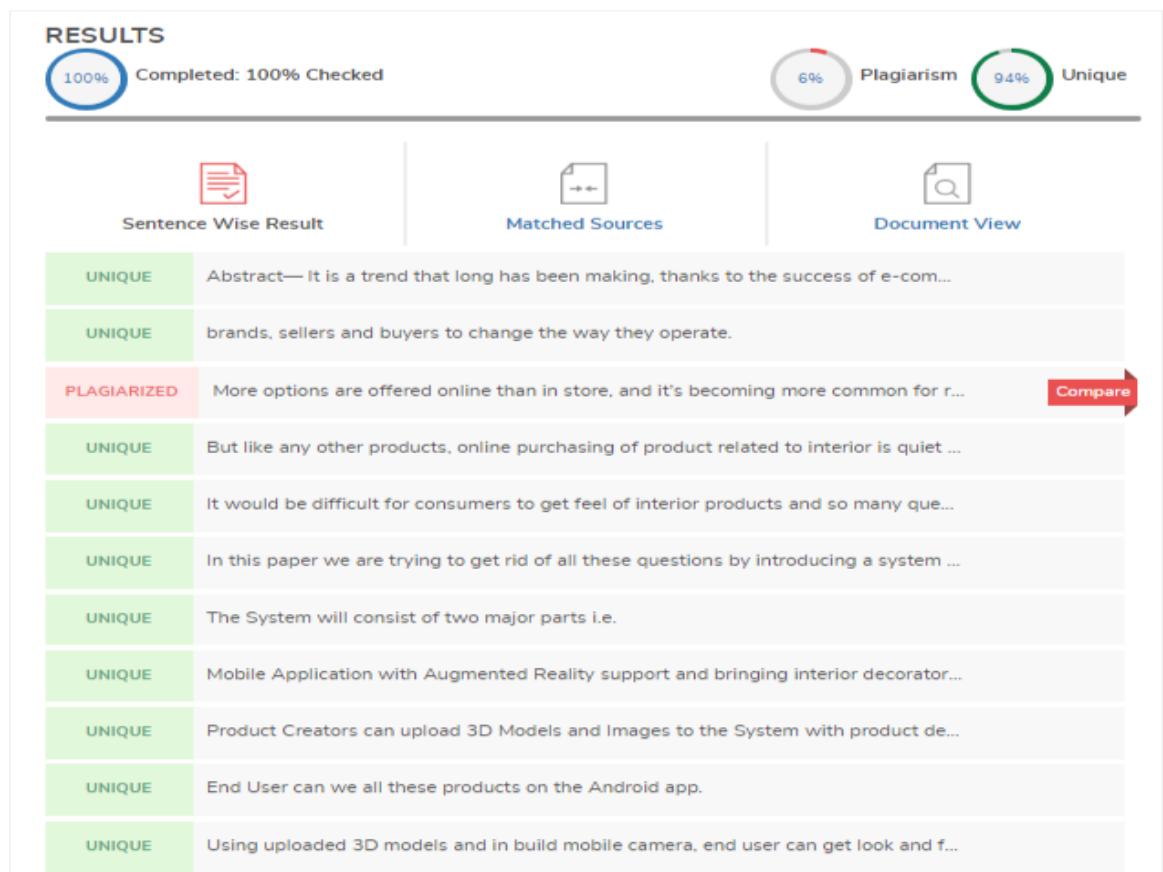
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ANNEXURE D

PLAGIARISM REPORT



The image above is the snapshot of the plagiarism Report.

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