

Software Requirement Specification Document for Online Fitting Room

Mohamed Osama, Mohamed Ayamn , Mohamed Abdelaziz , Tarek Medhat
Supervised by: Prof.Khaled Hussien

December 28, 2020

Table 1: Document version history

Version	Date	Reason for Change
1.0	12-Dec-2020	SRS First version's specifications are defined.
1.1	13-Dec-2020	Added Non-functional requirements and functional requirements
1.2	14-Dec-2020	Added database schema and ER diagram
1.3	20-Dec-2020	Added Block diagram and Context diagram
1.4	22-Dec-2020	Added Business model and modified system scope
1.5	27-Dec-2020	Added Class Description
1.6	28-Dec-2020	Added Definitions

GitHub: https://github.com/tarek-halaby/graduation_project

Abstract

Users encounter major problems when they shop online. These problems can be summarized in two main points; choosing suitable size and style of their clothes and returning these items if they find out they don't fit. Accordingly merchants' profit is affected severely. Our project aims to help decrease the negative impact of this problem on merchants and let these users find their perfect fitted clothes virtually from their home by taking two images with different positions (front position and side position) or client enter his measurements. After taking these images and processing clients measurements, a 3D model for the user with perfect sizes will be generated. So client can try on any items that converted it to 3D model with client 3D model with his suitable measurements.

1 Introduction

1.1 Purpose of this document

The purpose of this documentation is to represent a detailed description of our system (Online Fitting Room). online Fitting Room mainly help client to fit chosen items virtually This documentation will present a fully description about our system's mobile application using Flutter and Python. We also provide a fulfilled description about each stage inputs and outputs

1.2 Scope of this document

Reports show that design items are the second generally mainstream among online buys. However, purchasers are facing numerous problems which may prevent them from buying clothes on the web. some of these problems, proposed by GSI1 Business, they can't try on clothes and can't see their quality before buying them,[1] Online Fitting Room scope is to help brand owners to increase their sales and clients for try their items online and preventing from go to stores to avoid COVID-19. Online purchases rose because of the lockdown as shown in [2] Fig[1] a lot of countries' economy was extremely affected because of COVID-19 which spread rapidly, so all countries closed their airports and stopped travelling which is one of the main sources of country's income.

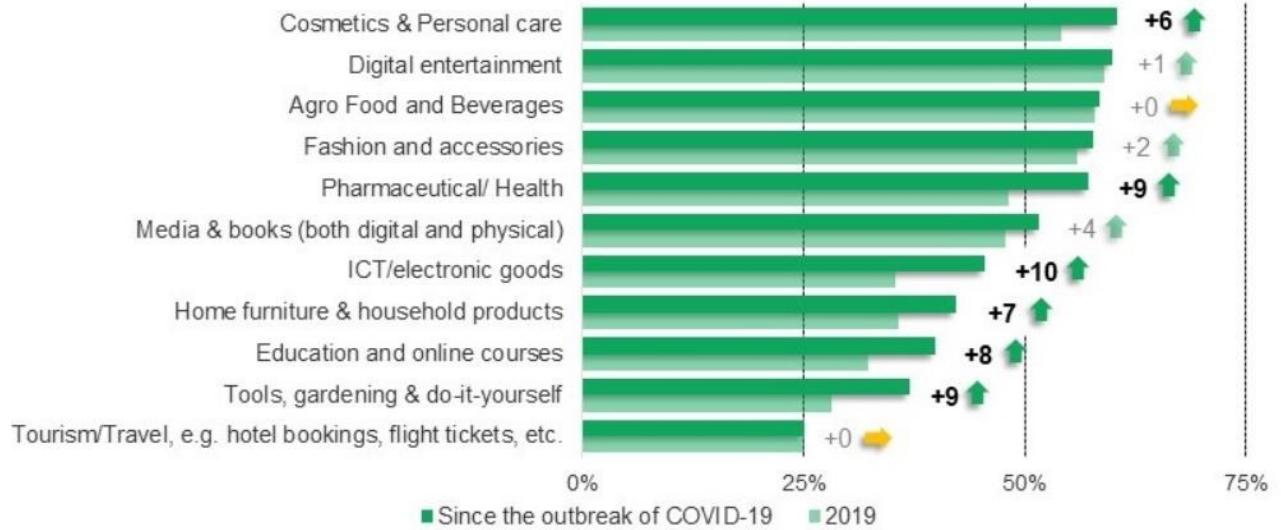


Figure 1: Percentage of online shoppers making at least one online purchase every two months

1.3 System Overview

First of all, We can take two input images with different positions front and side image or user can enter his body measurements if he knows them or user can enter both of them to increase accuracy of body measurements detection and then store it in database using mobile application. Then, images will go through image pre-processing stage which starts with body detection of client from the images afterwards, extraction of upper body parts and lower body parts from the detected body using Detectron2. Moreover, We retrieve from Database body measurements that client entered and send it to Heroku server to generate 3D model from this measurements.

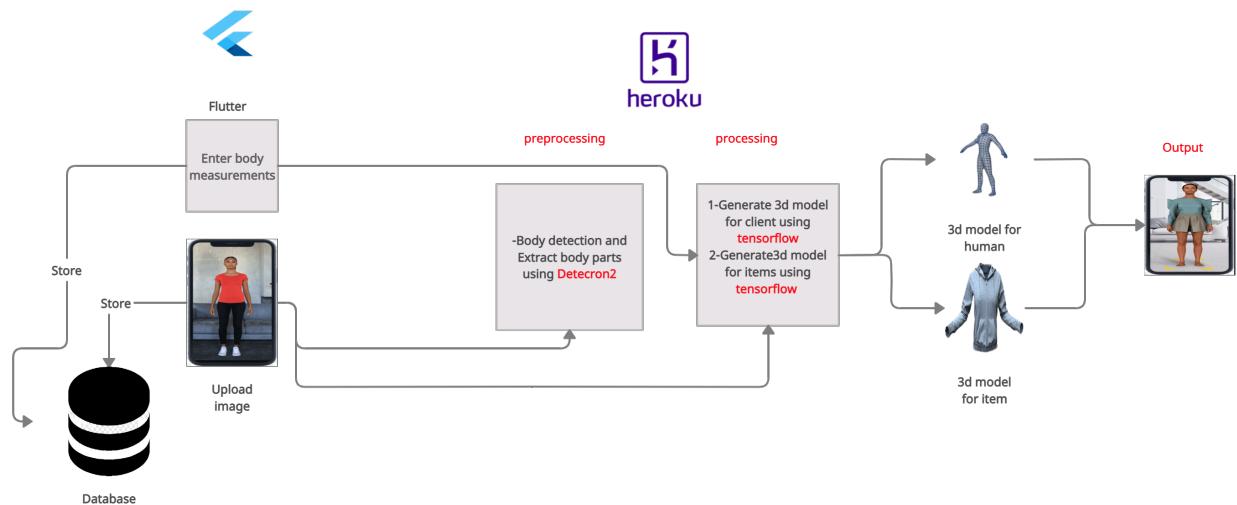


Figure 2: System overview

1.4 System Scope

The scope of the system includes several things:

1. The user will input two images with different positions; front and side images or user can enter his body measurements if he knows them or user can enter both of them to increase accuracy of body measurements detection using mobile application.
2. The system will take user measurements and user images to generate 3D model.
3. The system will take items from vendor and generate 3D model for each item.
4. Client can choose selected items and see if the selected item fits him or not.

1.5 Business Context

The vendor adds the brands and their items then a 3d model is generated for each item on other hand the client uploads images or enter his measurements to be stored in Database and using these measurements a 3d model is generated .

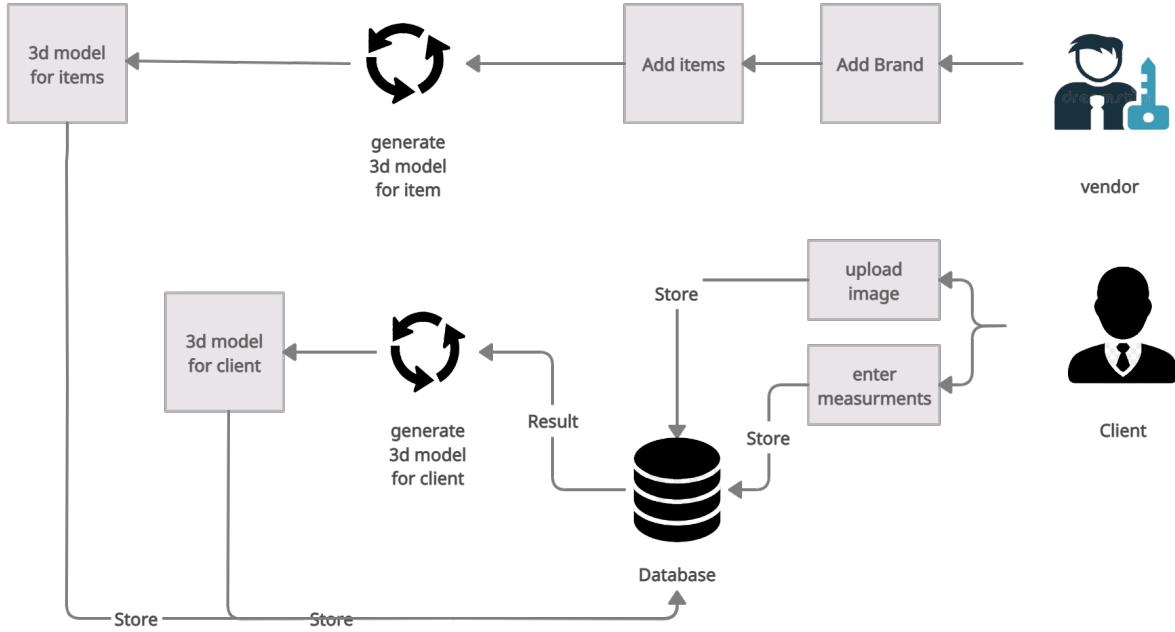


Figure 3: Business Model

2 Similar Systems

2.1 Academic

We list papers that discussed our idea and used different algorithms in their work and get experience of how efficient each algorithm is. We will demonstrate the main points of each paper:

Umut et al.[3] expressed in this paper that the main issue in trying on clothes is that it was considered one of the most time consuming stages of apparel shopping, which isn't even conceivable in online shopping. With propels in increased reality advances, virtual fitting rooms are gradually having their spot in both genuine and virtual stores to improve the nature of clothing preliminary experience while making it quicker. In this paper, they developed a system that was able to measure the user's dimensions in real time rather than offline and use these measurements to simulate the apparel on a virtual avatar rather than on the RGB image of the user. The results can be used in many applications, ranging from virtual fitting rooms in shopping malls to massively multiplayer online role-playing games with realistic avatars. The results in this paper is that experiments are

performed on a very good quality PC with Intel i7-2600 and NVIDIA GeForce GTX560Ti. The absolute time for the estimation of body boundaries and resizing the dress does not surpass 1.005 seconds considering the ideal opportunity for obtaining 30 edges of contribution from the profundity sensor is 1.0 second, it is sheltered to state that the estimation calculation doesn't present any deferrals for a genuine time application since it needs to run just a single time towards the start of the reproduction. The real recreation runs at 600 fps at 1920-1080 goal. The body sizes are assessed with mistake rates under 4% (aside from the instance of an essentially corpulent lady, where the shoulder width blunder arrived at 9%), which is adequate for the authenticity of the reproduction and deciding the suitable attire size.

D. M.Anisuzzaman et al.[4] stated that the main problem that due to recent pandemic COVID-19, online shopping was the safest way to shop these days. Nowadays, many of stores has online application or website to enable clients shop for their favorite brands and make special offers for online users such as free shipping and discounts. On the other hand, clothes sizes are still a major problem for online users. Users may find that the size doesn't fit after shipping and receiving the items so their only choice is to return it and waste a lot of time waiting to receive the correct size. In this paper, 2D image is all what is required to measure clothes size for customers. They use conventional camera to take an image, and process it using image processing with following steps: Firstly, Data Acquisition, this step which take two images, one with background image only and another background with customer body.

Secondly, Pre-processing stage which is an important step that remove noises, remove not important distortions, doing enhancement to image, remove background and detect edges.

Thirdly, Feature Detection, which is used to detect the important and main features of human body to detect body measurement and t-shirt sizes.

Finally, they use a powerful python framework called flask to create their web page They use their own dataset by taking photos of random people. The result after they taking 20 images of random people, they take two samples, one by measuring tape and other processed the images on their system, only 12 images showed the same result with manual measures. After that, they perform error analysis using root mean square error to found difference between manual value and system value.

Priyadharsun et al.[5] stated that the main problem is that fashion is a fast changing thing in history. it contains a lot of different fashion designers around the world, it is continuously changing the designs every season of the year. Fashion has a lot of brands that can confuse customers about what will suit them because it will be very hard to choose between these brands. In the modern era, both women and men know much more about fashion and have bigger knowledge about it. In this paper, They can use and start the system at any platform such as Web application, Mobile application or Windows application. They can essentially call the administrations and build up the interfaces but for this starting phase of the project, They will use it as web application. JavaScript 3D modeling library called ThreeJS is used to develop the virtual fitting room. ThreeJS library needed only software to produce 3D model and do most of processing at customer browser. After customer enter his body measurement, it will automatically generate 3D model. The results stated in this paper is when creating 3D model of user, they face a lot of problems especially technical, after a bit of time spent on this project, they found a solution which is called ThreeJS JavaScript library. ThreeJS is a JavaScript library/API which is lightweight Cross-browser used to create 3D

animated models on a web browser.

Pengpeng et al.[6] stated that the main problem was the point when customer need to wear skin-tight clothes to get filtered. therefore, expect the shape and form a body under clothes. This is very hard task because non-rigid clothes has very complex distortions coming from differences in the subject posture and shape spaces. therefor, estimation the figure under clothing is a subjective problem. Besides The data acquisition and body prediction model influences the accuracy of the prediction. **In this paper** The proposed deep learning way is called Body Point-Net. From 3d scan we can estimate the body shape of client under clothes. We use body Point-Net which avoids the use of template and another improvement is giving dressed human scans, their goals was to design neutral network that expect the undressed body and accept the scan of dressed human as input to a first stage. Given a dressed body work, a virtual scanner attempting to produce an input point cloud of n points with coordinates (x; y; z). Using OBB normalization can easily normalize the cloud of input point. There are three datasets that was used in this paper their names are INRIA, BUFF and BUG. The results in this work was proposing the main learning-based system to appraise body shape and posture under clothing from a 3D examine. Our strategy straightforwardly works on a single scan of a dressed-human and outputs a point cloud that relates to assessed body shape. We additionally present a novel dataset (BUG) of high-goal 3D dressing groupings with ground truth body shape and stance. The proposed dataset empowers preparing of profound organizations for body posture and body shape assessment just as extensive quantitative assessments. Broad outcomes show that our strategy outflanks the state-of the- craftsmanship techniques regarding precision and running time. The primary impediment of this work is that we do exclude hair in the preparation dataset. This will bring about a more extended head for the assessed body,

Sehgal et al. [7] stated in this paper how to get body measurements. The fit of the clothes depends on the efficiency of these measurements. In spite of the fact that there are numerous traditional ways of measuring the body as using measuring tapes. Due to these traditional ways, there are many problems that face us:

- Wasting a lot of time.
- Taking measurements several time, wrong positioning of equipment leads to taking wrong measurements.
- Traditional ways have very low accuracy.

In this paper, they used to extract measurement from 2D front and side images by image processing by using many steps. First, Image acquisition, this step is taking front and side image.

Secondly, Image pre-processing which takes colored image to convert it to black and white binary image.

Thirdly, Edge detection which in this paper used Canny edge detection to identify the edges from image.

fourthly, Identification of Feature Points for Measurement Extraction.

fifthly, Scaling of measurements extracted in pixels, the horizontal and vertical measurements extracted by two main equations:

Horizontal measurement = [Distance between camera and subject * sensor width of camera * extracted dimensions]/[Focal length of camera * width of Image]

Vertical measurement = [Distance between camera and subject * sensor Height of camera * extracted dimensions]/[Focal length of camera * height of Image]

Then,Girth Calculation that calculate perimeter of ellipse taking horizontal and vertical measurements that was extracted from previous step.

Finally, Final Measurement Calculation,after taking results in inches, there is a difference between manual and converted measurement so to decrease difference between them, they use converted measurements on more than one subject.

The results for each final extracted measurement for the 20 training subjects. This was tested using the Linear Regression Analysis. Correlation value shows the quality of relationship between the compared measurements. The regression value is a statistical value which shows the closeness of the data to the fitted regression line. The calculated probability checks the null hypothesis which states that there is no effect of the system. The higher the correlation and regression values, The better the results will be. The p-value should be less than or equal to 0.05 to reject the null hypothesis. [7]

2.2 Business Applications

1- The “3D virtual fitting room” is a unique e-commerce system which allows users to combine up to four articles at a time on a 3D avatar with the user’s real body measures. Furthermore, users can share their look on social networks, inviting all their friends to enter the online shop from brands utilizing (Visualook).

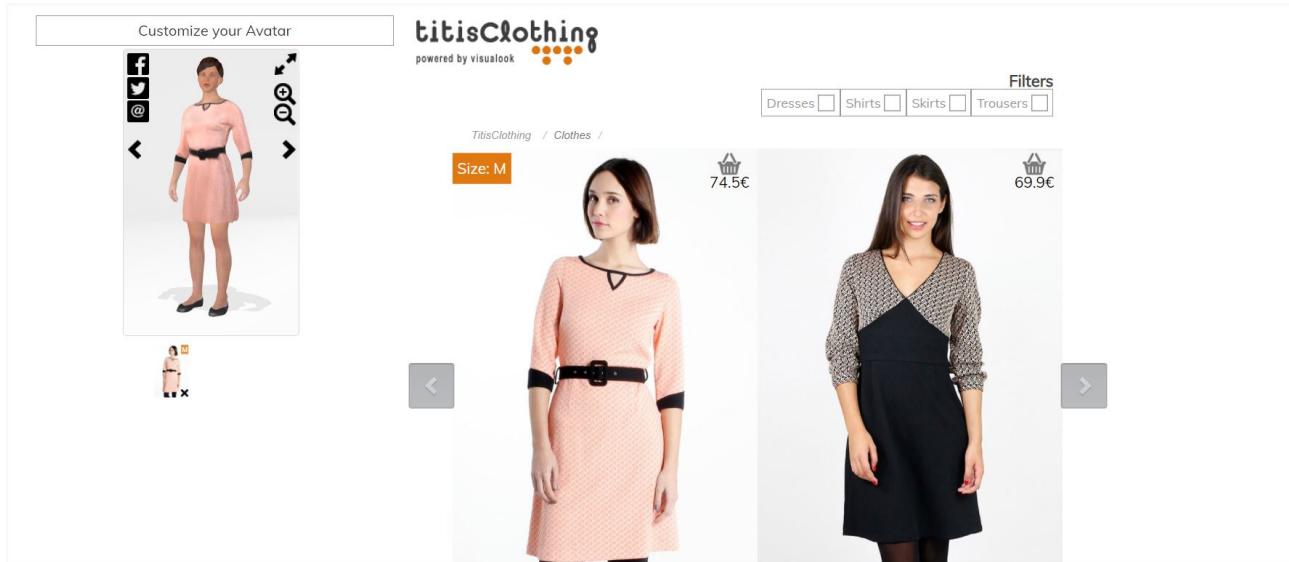


Figure 4: Visualook

2- Texel develops and manufactures solutions that enable hight-precision 3D capture, measurement and analysis of human body. The company helps retailers to provide highly personalized fit score and size recommendations to shoppers, resulting in an increases to the net revenue, conversion rate and returns reduction.

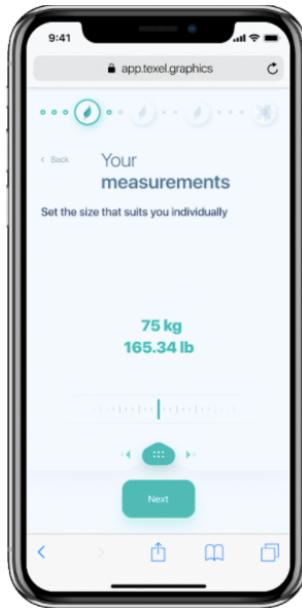


Figure 5: Enter weight measurement



Figure 6: Enter height measurement

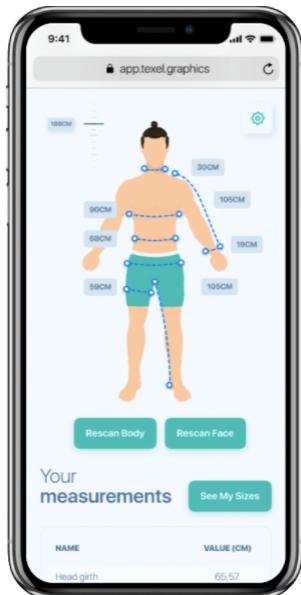


Figure 7: Generate 3D model

3 System Description

3.1 User Problem Statement

History shows that the world has been more than once influenced by pandemics over the previous many years; these pandemics have incorporated the "Spanish Flu" of 1918–1919[8] and COVID-19 of 2019-till now which has bad effects on all types of industries in the world especially clothes industry that has a large reduction due to COVID-19 pandemic.[9]

Industry name	NAICS code	Effects of pandemic ¹		
		Lower confidence interval ²	Median growth	Upper confidence interval ²
Retail and restaurants				
Automotive parts, accessories, and tire stores	4413	-16.8%	-6.6%	5.2%
Furniture and home furnishings stores	442	-48.3%	-42.5%	-36.2%
Electronics and appliance stores	443	-8.1%	-0.7%	7.7%
Building material and garden equipment and supplies	444	-6.7%	12.2%	35.1%
Food and beverage stores	445	3.2%	8.5%	14.3%
Health and personal care stores	446	-35.5%	-27.6%	-18.7%
Gasoline stations	447	-42.9%	-40.6%	-38.3%
Clothing and clothing accessories stores	448	-67.0%	-64.1%	-61.0%
Sporting goods, hobby, musical instrument, and book stores	451	-29.0%	-23.1%	-16.7%
General merchandise stores	452	-19.4%	-13.3%	-7.0%
Miscellaneous store retailers	453	-35.3%	-30.3%	-24.9%
Nonstore retailers	454	-14.5%	-8.7%	-2.5%
Food services and drinking places	722	-68.0%	-66.5%	-64.9%
Total retail and food service ³	-	-27.8%	-24.0%	-20.0%
Total retail and restaurants, excluding nonstore retailers	-	-29.7%	-25.9%	-21.9%

Figure 8: Predicted Effects of Pandemic Based on Daily Data, Clothes and Food Service

According to the rapid development of the Egyptian E-commerce and the way it's changing shopping for better and because fashion represents a large segment of the purchased goods online [10]

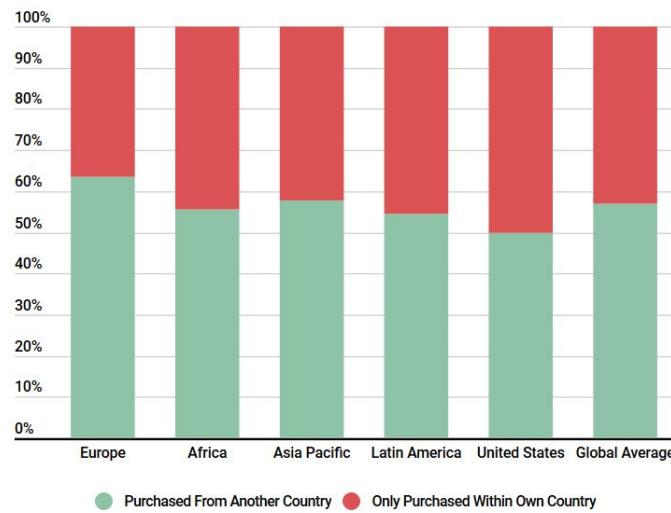


Figure 9: consumers' online spending totals

which as clarified in[11] suffers from a high percentage of returns (14-40%). This adds a huge burden to the clothing industries and keeps user away from shopping online. We introduce a mobile application that allows users to fit their clothes virtually in an attempt to decrease the rate of returns of the purchases and help users get the full experience of shopping.

3.2 User Objectives

"Online Fitting Room" is a mobile application which serves the online stores. The system allows user to take a images for his body or enter his body measurements if he knows them to help us create an accurate 3D model of his body to increase accuracy of our system. All of these features appears through a friendly easy GUI.

3.3 User Characteristics

There are 3 types of users that interact with the system: Vendor, Client, and Admin. All types of users have different use of the system so each of them has his own requirements.

- **Client:**

- Basic knowledge of using an android or ios phone

- **Vendor:**

- Basic knowledge of using an android or ios phone

- **Admin:**

- Must have domain knowledge.

- Must be able to manage and monitor the database.

- Must be able to insure the security of the data

3.4 System Context

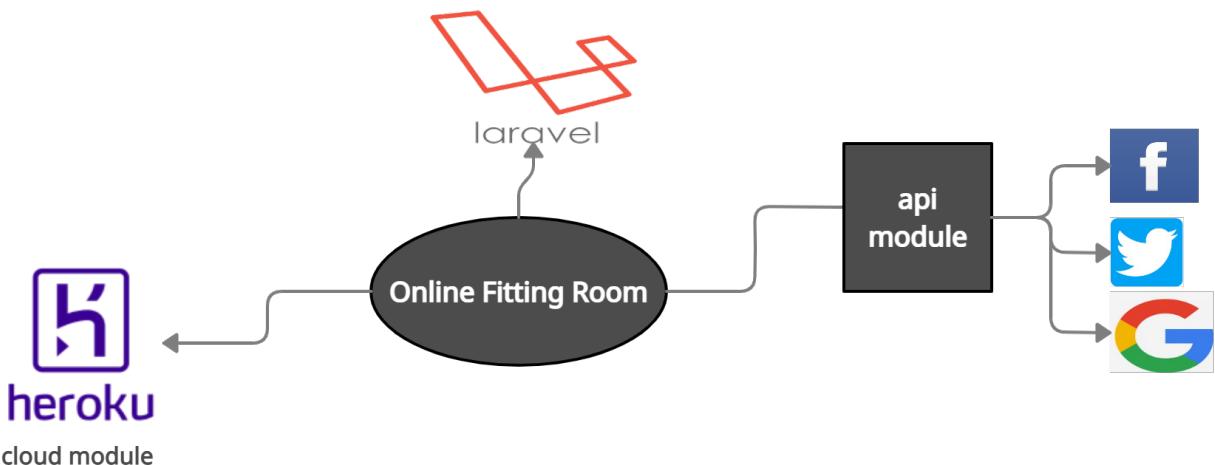


Figure 10: Block diagram

4 Functional Requirements

Admin:

1. The admin shall update security rules.
2. The admin shall add new vendor.
3. The admin shall make sign up approval.
4. The admin shall delete a vendor from the list.
5. The admin shall update list of vendors.
6. The admin shall view all users.
7. The admin shall view user information
8. The admin shall extend vendor contract

Vendor:

1. The vendor shall add new brand.
2. The vendor shall edit brand.
3. The vendor shall delete brand.
4. The vendor shall add new items of his brand.
5. The vendor shall delete items of his brand.
6. The vendor shall update items of his brand.
7. The vendor shall view all items of his brand .
8. The vendor shall view all reports of orders details happened.
9. The vendor can see all the orders that clients had ordered.
10. The vendor can see all his brands information.

System:

1. The system shall create 3d model for his items.
2. The system shall be able to create 3d model for the client.

Client:

1. The client shall be able to enter his body measurements.
2. The client shall be able to enter two images of his body
3. The client shall be able to choose item.
4. The client shall be able to view item details.
5. The client shall be able try clothes on his 3d model.
6. The client shall be able to make an order.
7. The client shall be able to cancel an order.
8. The client shall be able to see all his orders.
9. The client shall be able to edit his measurements.

4.1 Detailed Functional Specification

Table 2: Check Email Validation

Function	Check Email Validation
ID	FR00
Priority	Medium
Description	Checks if the email exist and if it email is valid in format, so it returns successful message and checked if exist in the database .
Input	Email
Output	Boolean
Pre-condition	User enter his email in specific field
Post-condition	Redirect to home page
Dependency	FR04
Risk	-

Table 3: Check UserToken

Function	Check UserToken
ID	FR01
Priority	Medium
Description	Checks if the token of user expired or not or exist or not .
Input	UserToken
Output	Boolean
Pre-condition	None
Post-condition	None
Dependency	FR04
Risk	-

Table 4: SignUp

Function	Sign UP
ID	FR02
Priority	Extreme
Description	New customers must Register to access to our mobile application
Input	Firstname, Lastname, Email, Age, Telephone, Password, Image
Output	A successful message for making account A failure message for wrong data entry
Pre-condition	User didn't make an account
Post-condition	A successful message for making a new account and Go to HomePage
Dependency	-
Risk	-

Table 5: Search Items

Function	Search Items
ID	FR03
Priority	Low
Description	Search for items with item's ID in items table
Input	Item's ID
Output	Return data of item
Pre-condition	Check if item with exist in database
Post-condition	-
Dependency	-
Risk	-

Table 6: Login

Function	Login
ID	FR04
Priority	Extreme
Description	Check email and password to make customer access to his profile
Input	Email and Password Entered by customer
Output	A successful message for logging in and system take the customer to home page
Pre-condition	None
Post-condition	User is taken to home page
Dependency	FR01
Risk	-

Table 7: Forget Password

Function	Forget Password
ID	FR05
Priority	Medium
Description	The function used when user forget his password so sent message to his email to enter his new password
Input	Email
Output	A successful message for new password added
Pre-condition	User enters his email
Post-condition	A successful message for new password added
Dependency	FR00
Risk	-

Table 8: List Users

Function	List Users
ID	FR06
Priority	Low
Description	Function that shows all users that used the mobile application .
Input	UserType's ID
Output	List all users that used the application with specific type
Pre-condition	Enter usertype's ID and check if it exists at database or not
Post-condition	-
Dependency	-
Risk	-

Table 9: Add UserType

Function	Add UserType
ID	FR07
Priority	High
Description	Creates new types of users to be added to the system .
Input	UserType name
Output	Successful message that userType created
Pre-condition	Enter usertype name and check if it exists at database or not
Post-condition	Added new usertype name to database and update database with new records
Dependency	FR04
Risk	-

Table 10: Delete UserType

Function	Delete UserType
ID	FR08
Priority	Low
Description	Deletes usertype name that selected from database
Input	UserType name
Output	Successful message that userType deleted
Pre-condition	Enter usertype name and check if it exists at database or not
Post-condition	Deleted selected usertype row to database and update database with new records
Dependency	FR04
Risk	-

Table 11: Add CustomerImage

Function	Add CustomerImage
ID	FR09
Priority	Extreme
Description	Customer upload image of him to be used after that in to convert it to 3d model
Input	Customer Image
Output	None
Pre-condition	Image not uploaded to database
Post-condition	Added Image successfully in the database
Dependency	-
Risk	-

Table 12: Add ClothImage

Function	Add ClothImage
ID	FR10
Priority	Extreme
Description	Vendor upload image of his clothe's brand to be used after that in to mobile application
Input	Cloth Image
Output	None
Pre-condition	Image not uploaded to database
Post-condition	Added Image successfully in the database
Dependency	-
Risk	-

Table 13: Add Brand

Function	Add Brand
ID	FR11
Priority	Extreme
Description	Vendor can add his brand details to mobile application
Input	name,logo,mobile,address
Output	successful message that mobile added successfully
Pre-condition	Brand not uploaded to database
Post-condition	Added brand successfully in the database
Dependency	-
Risk	-

Table 14: Edit Brand

Function	Edit Brand
ID	FR12
Priority	Medium
Description	Vendor can edit his brand details to mobile application
Input	name, logo, mobile, address
Output	successful message that brands details edited in database.
Pre-condition	New brand not uploaded to database
Post-condition	Added brand successfully in the database
Dependency	FR10
Risk	-

Table 15: Delete Brand

Function	Delete Brand
ID	FR13
Priority	Low
Description	Vendor can delete his brand details to mobile application
Input	name
Output	successful message that brands deleted.
Pre-condition	Enter name of brand that vendor want to delete
Post-condition	Deleted selected brand row successfully in the database
Dependency	FR10
Risk	-

Table 16: Add UserMeasurements

Function	Add UserMeasurements
ID	FR14
Priority	Extreme
Description	Customer enter his measurements to help in generating 3d model for human body and help in make size of clothes accurate
Input	Customer body's size
Output	None
Pre-condition	Sizes not taken from user
Post-condition	None
Dependency	-
Risk	-

Table 17: Add Items

Function	Add Items
ID	FR15
Priority	Extreme
Description	Vendor can add items to his brand. application
Input	name, description, image, price, quantity, type
Output	successful message that item added successfully
Pre-condition	Items details not uploaded to database
Post-condition	Added items successfully in the database
Dependency	-
Risk	-

Table 18: Edit Items

Function	Edit Items
ID	FR16
Priority	High
Description	Vendor can edit items details of his brand. application
Input	name, description, image, price, quantity, type
Output	successful message that item edited successfully
Pre-condition	New Item details not uploaded to database
Post-condition	Updated item with it's new details successfully in the database
Dependency	-
Risk	-

Table 19: Delete Item

Function	Delete Item
ID	FR17
Priority	Low
Description	Vendor can delete his item details
Input	name
Output	successful message that item deleted.
Pre-condition	Enter name of item that vendor want to delete
Post-condition	Deleted selected item, row successfully in the database
Dependency	FR10
Risk	-

Table 20: Edit UserMeasurements

Function	Edit UserMeasurements
ID	FR18
Priority	High
Description	Customer can edit his measurements.
Input	Customer new body's measurements
Output	None
Pre-condition	Old sizes are appeared
Post-condition	Take new sizes and updated to database and make new 3D model with new sizes
Dependency	FR11
Risk	-

Table 21: View Profile

Function	View Profile
ID	FR19
Priority	Low
Description	the customer will be able to view his information and bio through a profile card
Input	None
Output	Profile card info.
Pre-condition	check if customer's info. is in the database
Post-condition	the information card is shown in new page
Dependency	-
Risk	-

Table 22: Edit Profile

Function	Edit Profile
ID	FR20
Priority	Medium
Description	the customer will be able to change his information data
Input	firstname, lastname, email, password, phone, image
Output	A Profile card of Updated customer's data with it's firstname, lastname, email, password, phone, image
Pre-condition	check if the updated info. of the User is in the database
Post-condition	the table of updated User is shown
Dependency	-
Risk	-

Table 23: View Users

Function	View Users
ID	FR21
Priority	Medium
Description	the Administrator only will be able to view the users that accessed the system whether it's customer or brand owner
Output	A Table of loged in customers and brand owners with their firstname and lastname and email
Pre-condition	check if the users information is located in the database
Post-condition	the table of users registered in the system is shown
Dependency	-
Risk	-

Table 24: View Items

Function	View Items
ID	FR22
Priority	High
Description	Client can view all items types of brands of what he want.
Output	A Table of Items of specific brand
Pre-condition	Choose brand to view his items
Post-condition	Table of items of chosen brand
Dependency	-
Risk	-

Table 25: Delete User

Function	Delete User
ID	FR23
Priority	Low
Description	Administrator only has authority to delete any customer from the system
Input	User_ID
Output	A successful message that the user is deleted
Pre-condition	Check if user_id is in database
Post-condition	The user data is deleted from database
Dependency	-
Risk	-

Table 26: Create 3D model for human body

Function	Create 3D model for human body
ID	FR24
Priority	Extreme
Description	Customer after enter his measurements, the system take this measurements and make use it to generate 3D Model
Input	Customer measurements
Output	3D model of the customer
Pre-condition	Customer upload front and side images of his body
Post-condition	3D model of the customer
Dependency	FR14
Risk	-

Table 27: Create 3D model for human body

Function	Create 3D model for clothes
ID	FR25
Priority	Extreme
Description	Customer chooses what type of cloth he prefer then the system take cloth's image and make some operation to convert 2D images to 3D images
Input	Chosen cloth's image
Output	3D model of the cloth
Pre-condition	Customer chooses what type of clothes he want
Post-condition	3D model of the cloth
Dependency	FR18
Risk	-

Table 28: Choose ClothImage

Function	Choose ClothImage
ID	FR26
Priority	Extreme
Description	Customer chooses the image of cloth's type that he want then system take it and make operations to convert it to 3D model
Input	Chosen Cloth Image
Output	None
Pre-condition	List of clothes images
Post-condition	Chosen images of clothes that he want
Dependency	FR10
Risk	-

Table 29: Order Items

Function	Order Items
ID	FR27
Priority	Extreme
Description	Customer order what he chosen from clothes and want to buy it
Input	List of chosen items
Output	Cost of chosen items
Pre-condition	Choose what items he want
Post-condition	Ordered chosen items
Dependency	-
Risk	-

Table 30: Cancel Order

Function	Cancel Order
ID	FR28
Priority	High
Description	Customer cancel the order what he chosen from clothes.
Input	List of chosen items
Output	-
Pre-condition	Cancel items
Post-condition	successfully canceled
Dependency	FR19
Risk	-

Table 31: View Orders

Function	View Orders
ID	FR29
Priority	Medium
Description	Customer can view all his orders that he ordered before.
Input	-
Output	A table of his previous orders
Pre-condition	Check if customer has orders before or not in database
Post-condition	A table of his previous orders
Dependency	FR19
Risk	-

Table 32: Logout

Function	Logout
ID	FR30
Priority	Medium
Description	Customer clicks logout so system is no longer available and getting out of session
Input	Clicks logout button
Output	System take the student to home page
Pre-condition	Customer logged in the system
Post-condition	Customer is taken to home page
Dependency	-
Risk	-

5 Interface Requirements

5.1 User Interfaces

5.1.1 GUI

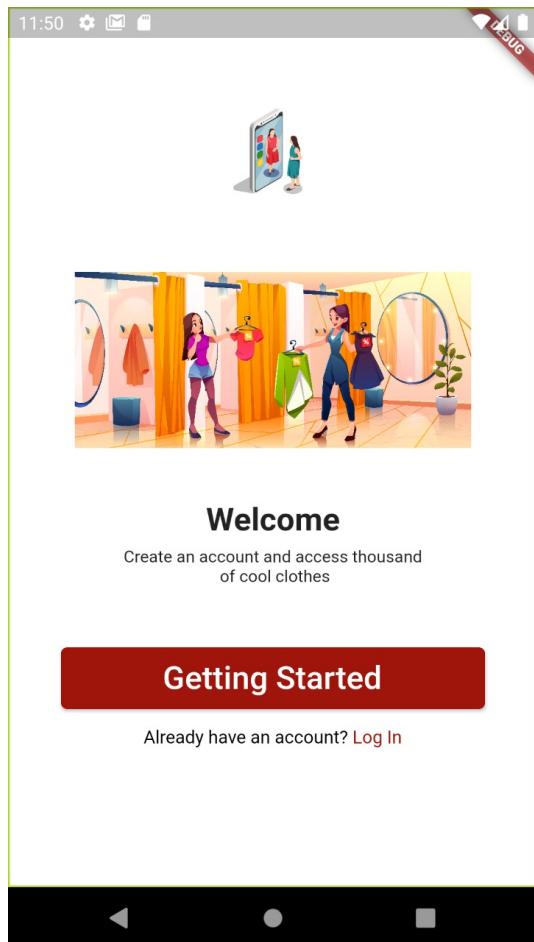


Figure 11: Welcome Page

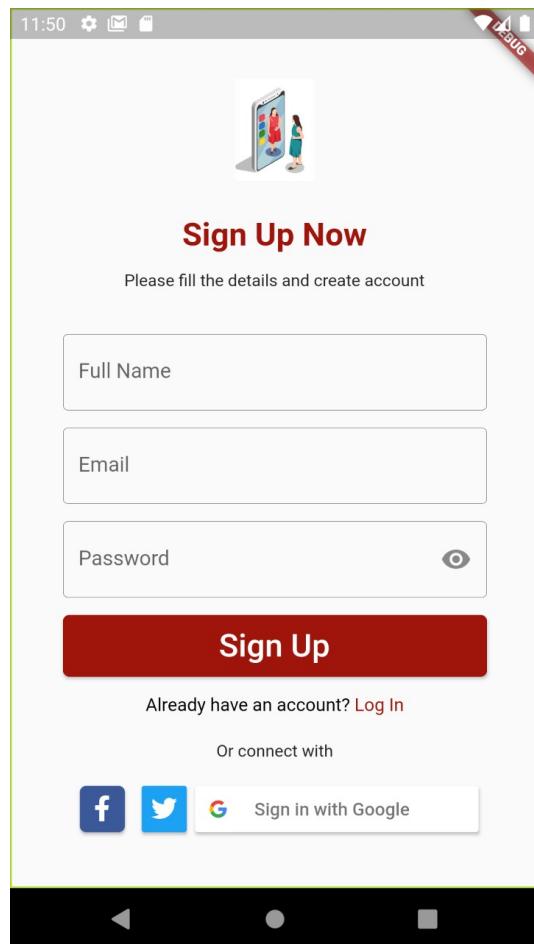


Figure 12: SignUp Page

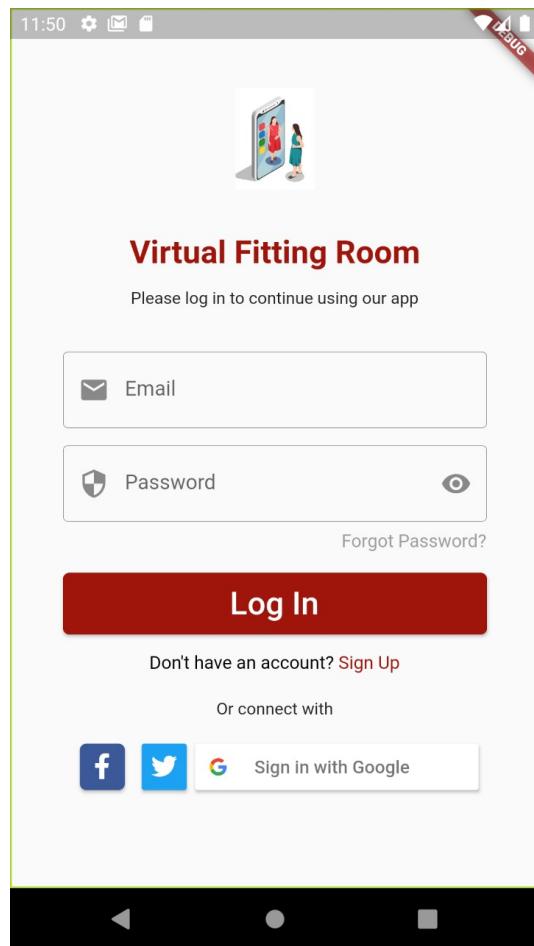


Figure 13: Login Page

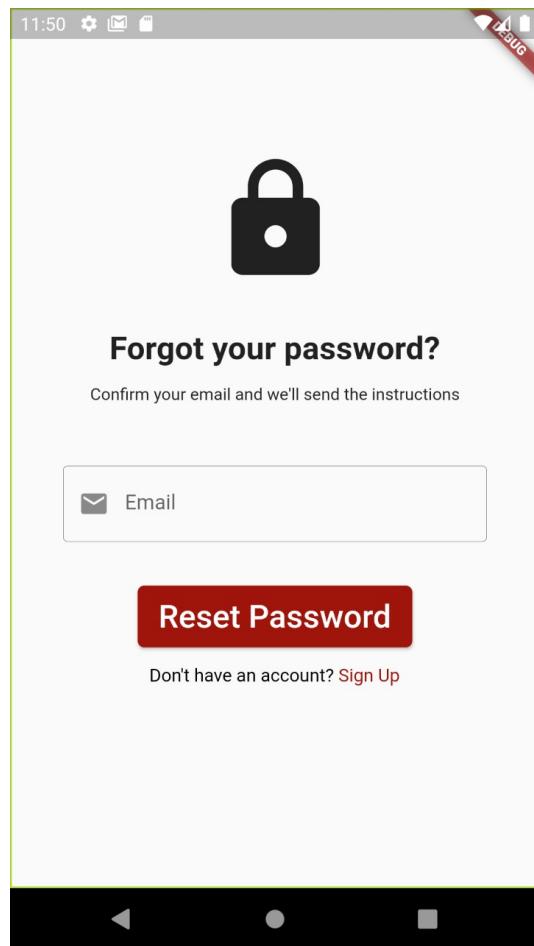


Figure 14: Forget Password Page

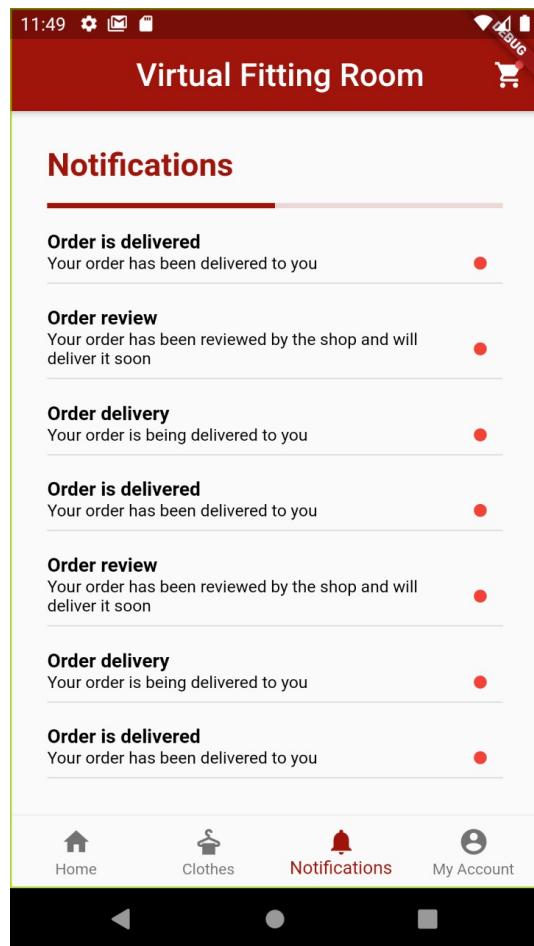


Figure 15: Notification Page

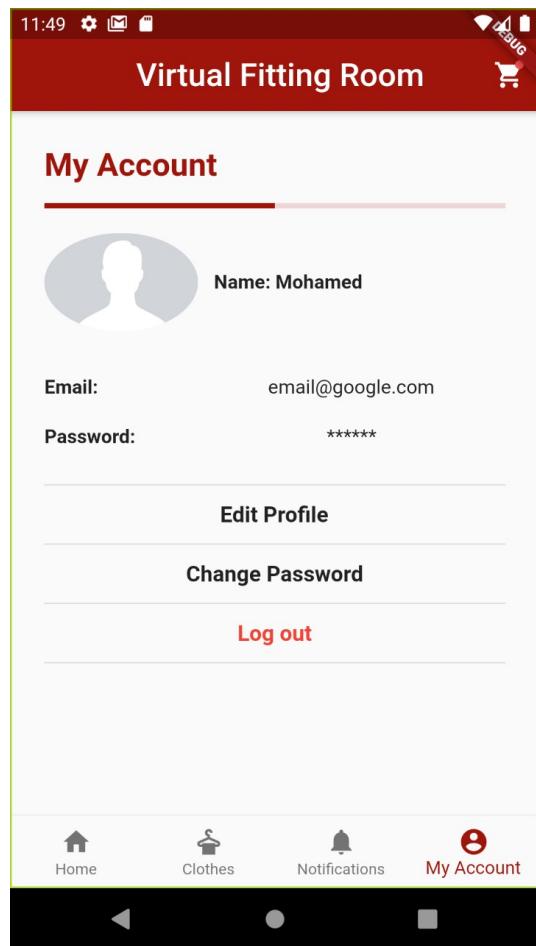


Figure 16: Profile Page



Figure 17: Upload Image Page

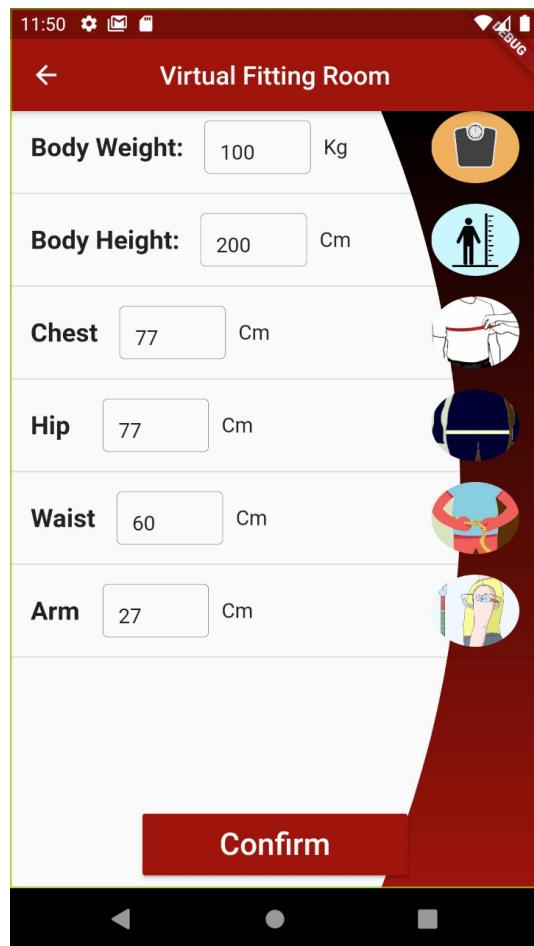


Figure 18: User Measurements Page

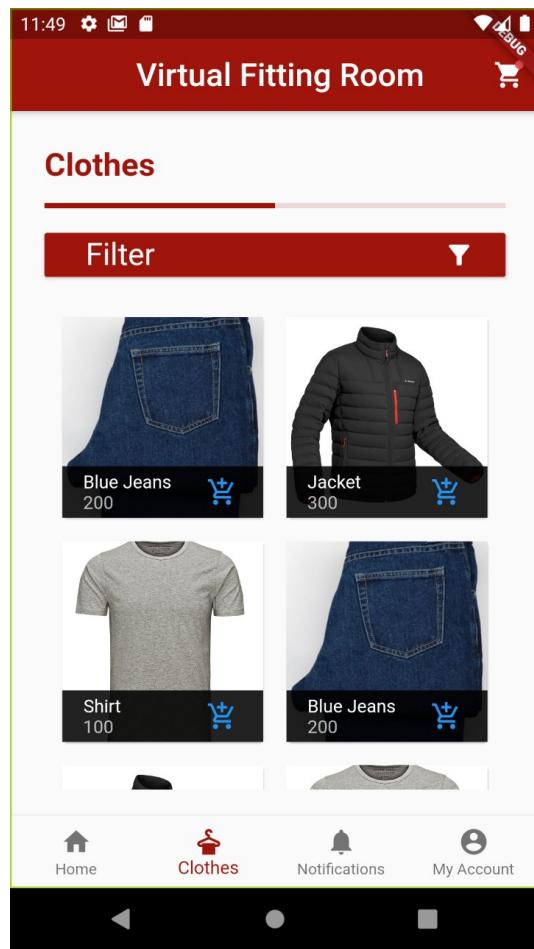


Figure 19: List of Items Page

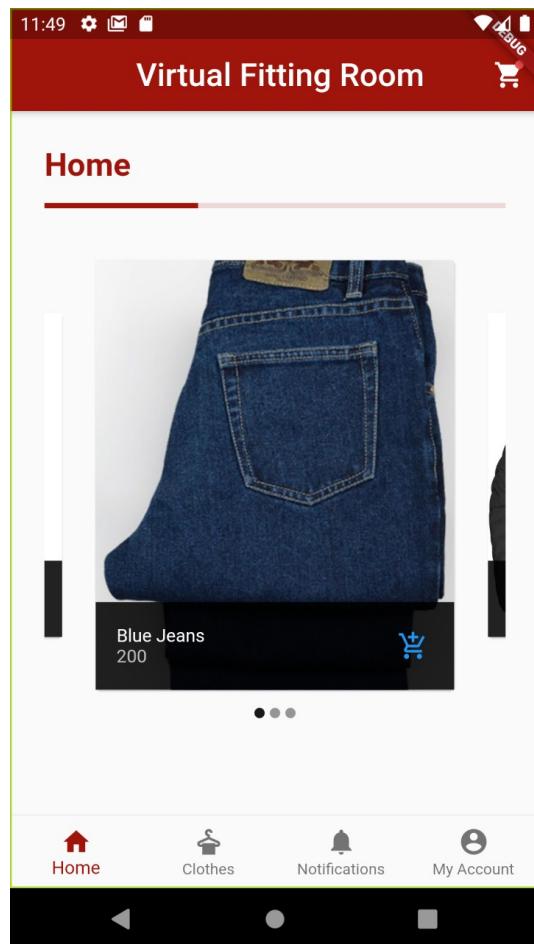


Figure 20: Item detail Page

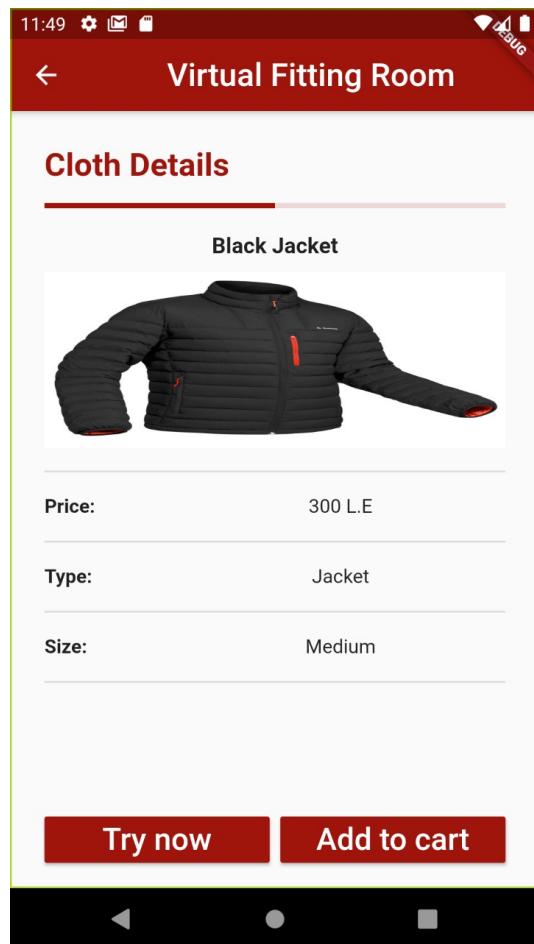


Figure 21: Item Details Page

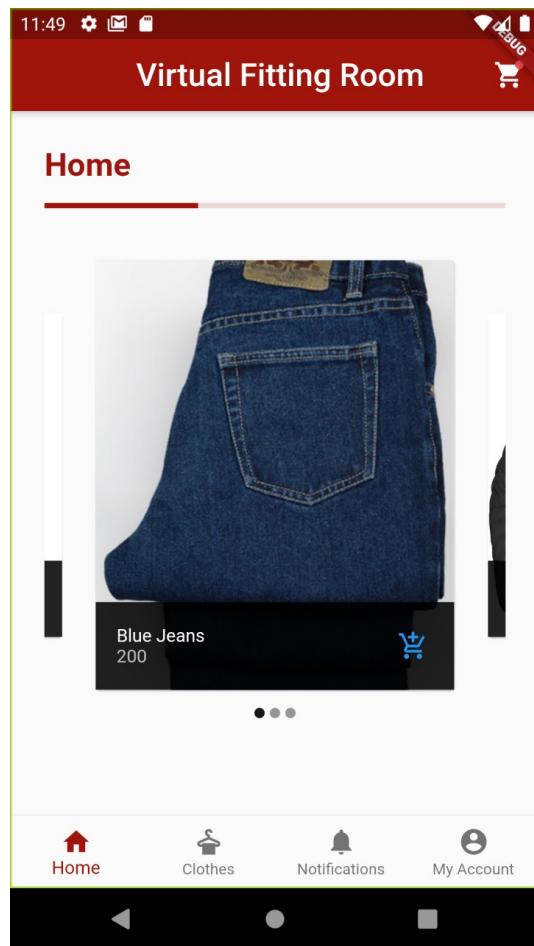


Figure 22: Item Page

5.2 Hardware Interfaces

- At least 2GB RAM to run the mobile application easily
- The camera shouldn't be less than 8MP
- Operating system of mobile must be android or IOS.

5.3 API

- Laravel
- Heroku

6 Non-functional Requirements

6.1 Security

In the user registration, the system encrypt the user password and after a successful sign in or sign up. The system request the user to Authenticate his registered account to begin using the system options. Vendors can't access to system by creating an account on the system. Any new vendor must first request an account from admin then admin will create an special account for him to access to system's data and features.

6.2 Reliability

All the customers data are stored in the data base and can be retrieved from the administrator any time by the approval of the customer so, it can't be lost and the data base is updated continuously.

6.3 Portability

Our application will be exist at any platform such as android and IOS stores because it was built using Flutter which is cross-platform native.

6.4 Maintainability

The system shall maintain any kind of data required to be entered regardless how big it is and can be easily modifying and upgraded system. The system code's is written in way that easily adaptable, this will achieved by implementing MVC design pattern which we use it as MC in Laravel as backend and V in Flutter and use as well another design pattern like Singleton.

6.5 Availability

The system should be available at any network and mobile at any time and also available in so many platforms. Our system can be accessed by mobile or PC and tablets with good internet connection.

6.6 Usability

The system is easy to be used due to the small number of tasks the customer will do.

7 Data Design

7.1 Data Description

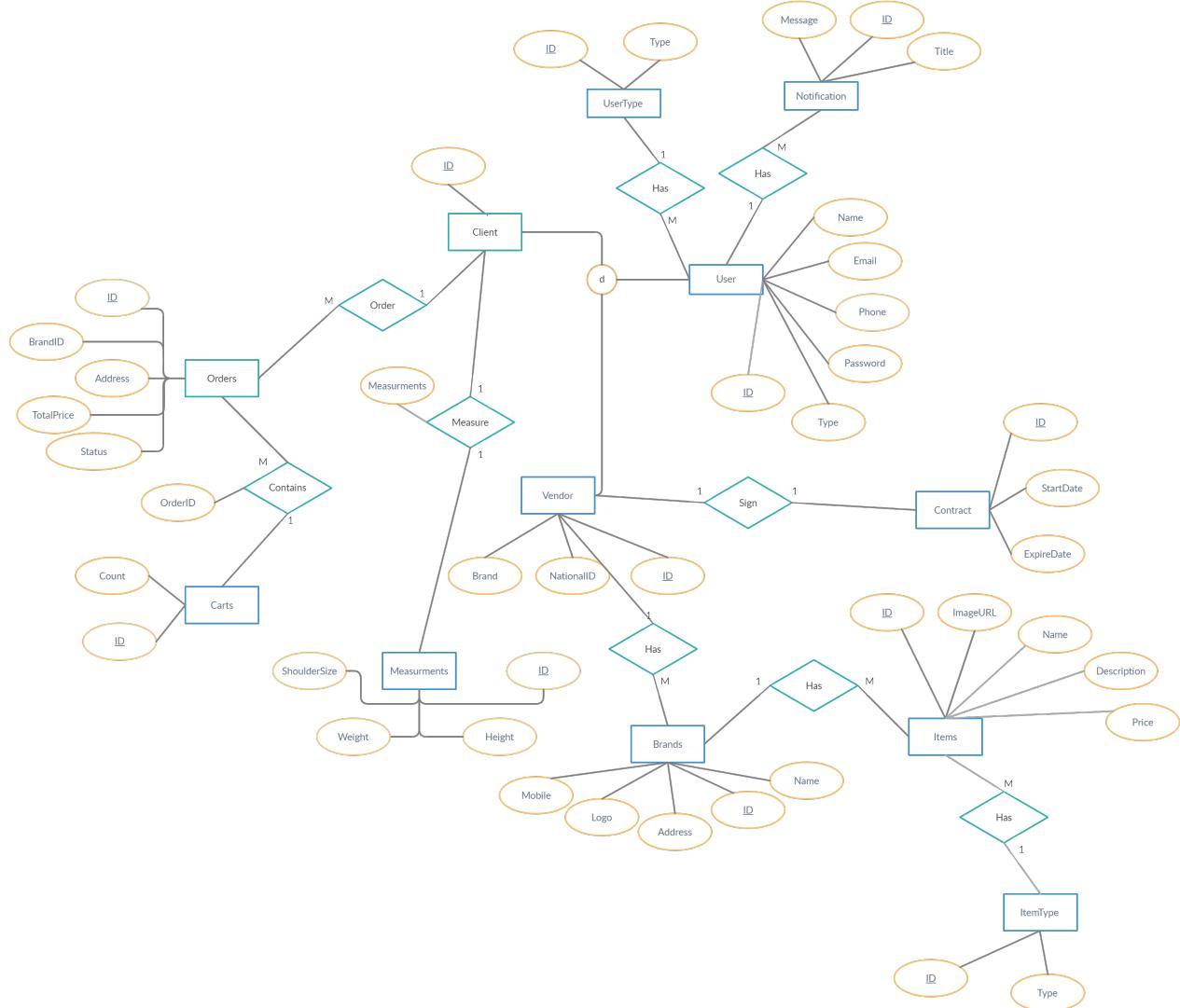


Figure 23: ER Diagram

7.2 Database design description

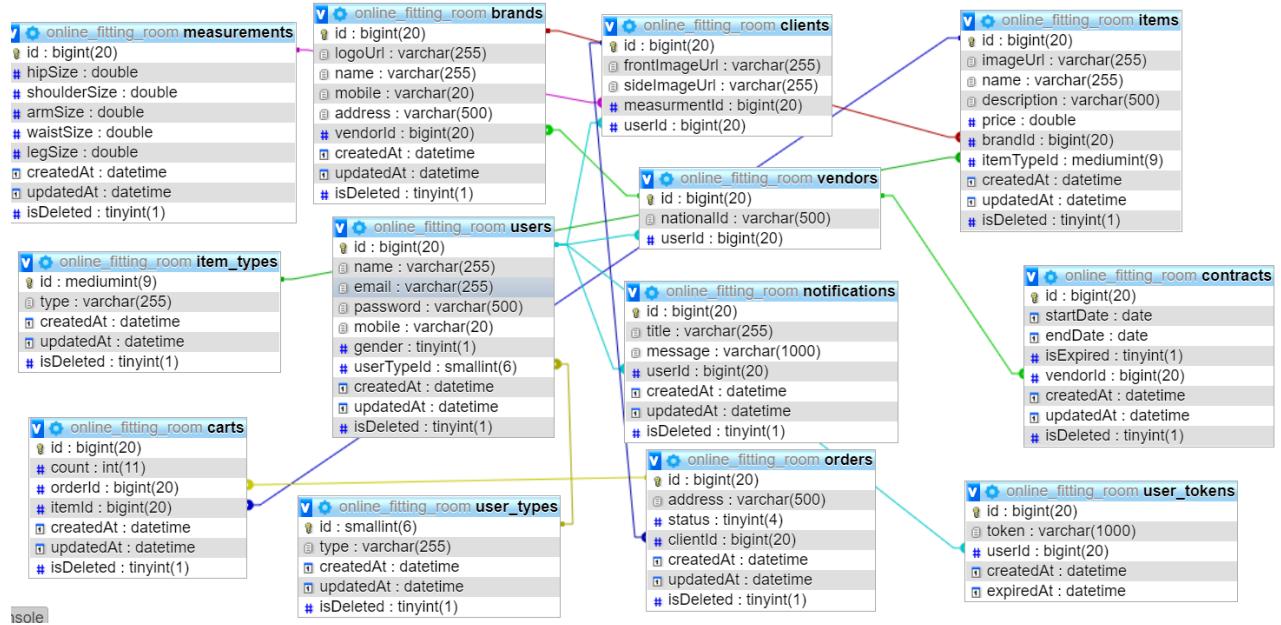


Figure 24: Database Schema

8 Preliminary Object-Oriented Domain Analysis

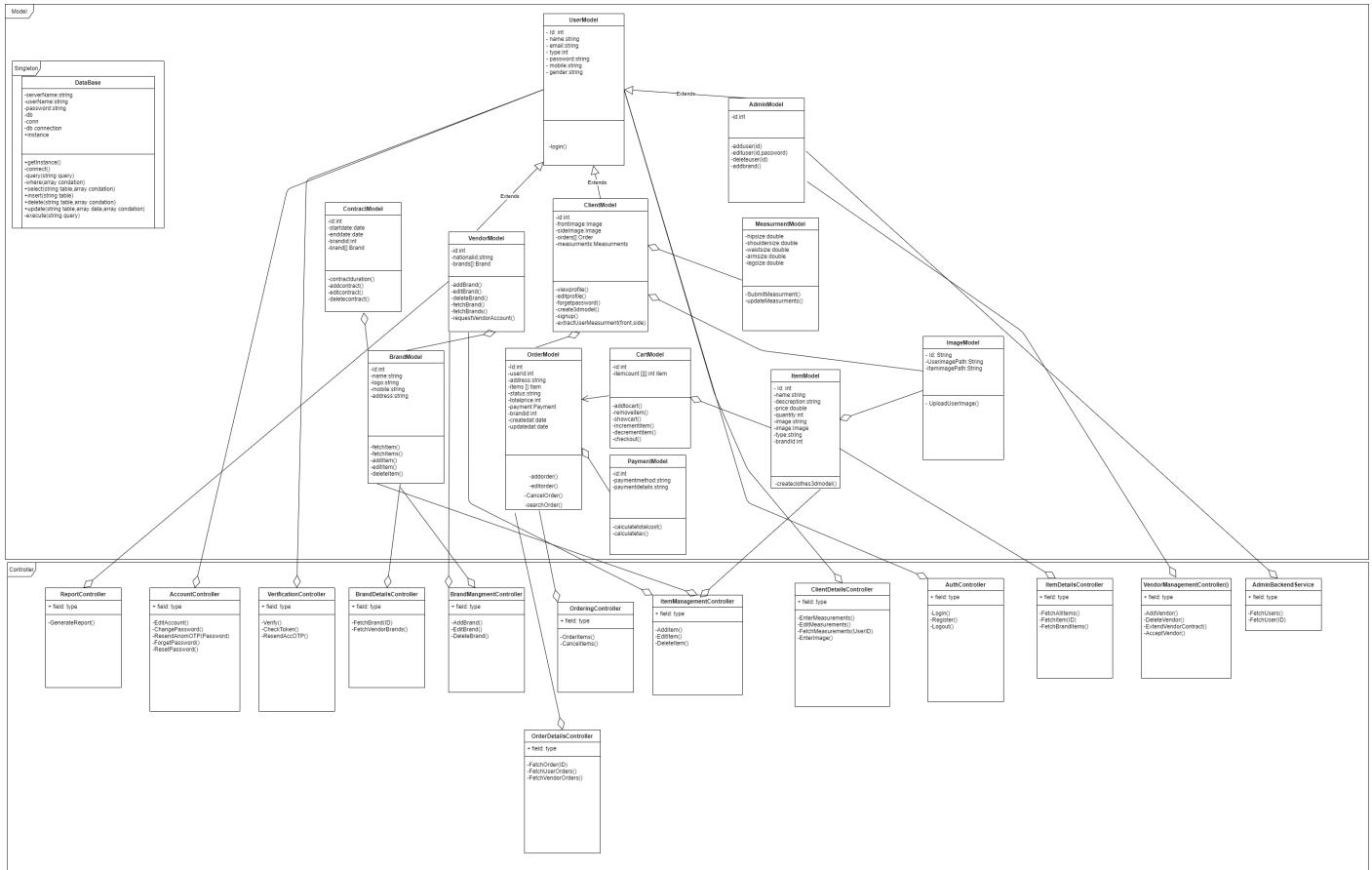


Figure 25: Class Diagram

8.1 Inheritance Relationships

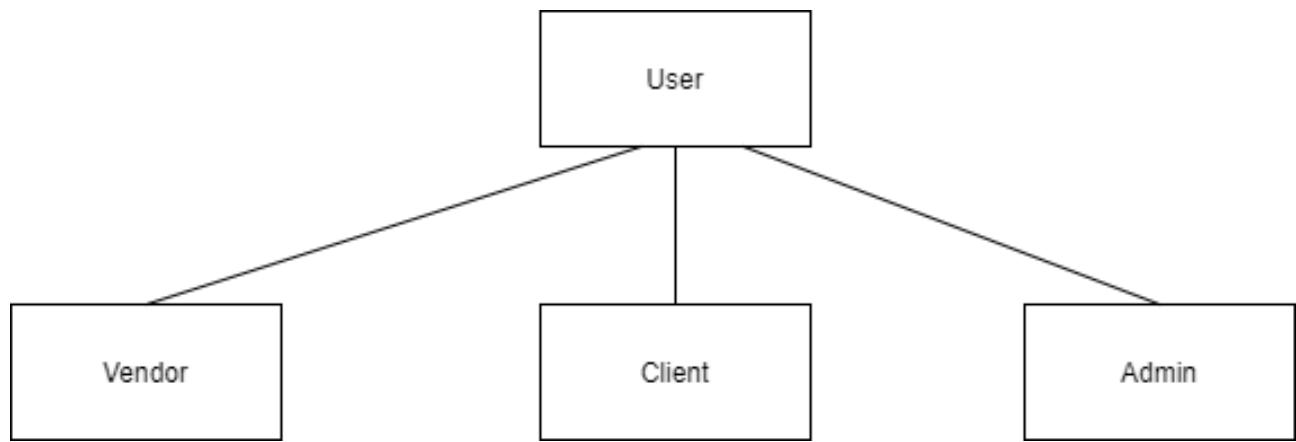


Figure 26: Inheritance Relations

8.2 Class descriptions

Table 33: Class Name - UserModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	ClientModel, VendorModel, AdminModel
Purpose	The purpose of this class is to store common information of all usertypes
Collaborations	-
Attributes	Name, email, type, password, mobile, gender
Operations	Login()
Constraints	If user doesn't have an account, he can't access to application

Table 34: Class Name - ClientModel

Abstract or Concrete:	Concrete.
List of Superclasses	UserModel
List of Subclasses	ImageModel, MeasurementsModel, OrderModel
Purpose	The purpose of this class is to store special information of all clients
Collaborations	This class is inherit from class UserModel, Aggregated with MeasurementsModel, ImageModel, OrderModel
Attributes	Name, email, type, password, mobile, gender
Operations	viewprofile(), editprofile(), forgetPassword(), changePassword(), signUp(), extractUserMeasurements(), create3Dmodel()
Constraints	None

Table 35: Class Name - VendorModel

Abstract or Concrete:	Concrete.
List of Superclasses	UserModel
List of Subclasses	BrandModel
Purpose	The purpose of this class is to store special information of all vendors
Collaborations	This class is inherit from class UserModel, Aggregated with BrandModel
Attributes	NationalID, Array of brands
Operations	addbrand(), editbrand(), deletebrand(), fetchbrand(), fetchbrands(), requestVendorAccount()
Constraints	None

Table 36: Class Name - AdminModel

Abstract or Concrete:	Concrete.
List of Superclasses	UserModel
List of Subclasses	None
Purpose	The purpose of this class is to store special information of all admin
Collaborations	This class is inherit from class UserModel
Attributes	ID
Operations	adduser(), edituser(), deleteuser(), addbrand(),
Constraints	None

Table 37: Class Name - OrderModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	PaymentModel
Purpose	The purpose of this class is to store items that client want to order
Collaborations	This class is Aggregate from class PaymentModel, Associate with class Cart
Attributes	ID, userid, address, Array of Items, status, totalprice, Object from PaymentModel, brandid
Operations	addorder(), editorder(), cancelorder(), seacrorder(),
Constraints	None

Table 38: Class Name - BrandModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	None
Purpose	The purpose of this class is to store all brands
Collaborations	None
Attributes	ID, name, logo, mobile, address
Operations	additem(), edititem(), deleteitem(), fetchitems(), fetchitem(),
Constraints	None

Table 39: Class Name - CartModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	ItemsModel
Purpose	The purpose of this class is to store all items that client want to buy
Collaborations	Associate with OrderModel, Aggregate from ItemModel
Attributes	ID, Two Dimensional Array ItemCount
Operations	addtocart(), removeItem(), showcart(), incrementItem(), decrementItem(), checkout()
Constraints	None

Table 40: Class Name - PaymentModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	None
Purpose	The purpose of this class is to show all payments that client used to buy
Collaborations	None
Attributes	ID, paymentMethod, paymentDetails
Operations	calculateTax(), calculateTotalPrice()
Constraints	None

Table 41: Class Name - ContractModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	BrandModel
Purpose	The purpose of this class is to show all contracts between vendor and admin
Collaborations	Aggregate from BrandModel
Attributes	ID,startDate,endDate,brandid,Array of Brands
Operations	contractDuration(),addcontract(),editcontract(),deletecontract()
Constraints	None

Table 42: Class Name - ImageModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	None
Purpose	The purpose of this class is to store all Images that client upload it
Collaborations	None
Attributes	ID,UserImagePath,ItemImagePath
Operations	UploadUserImage()
Constraints	None

Table 43: Class Name - MeasurementModel

Abstract or Concrete:	Concrete.
List of Superclasses	None
List of Subclasses	None
Purpose	The purpose of this class is to store all Measurements that client enter it
Collaborations	None
Attributes	ID,Hipsize,Waistsize,Armsize,Legsize
Operations	UpdateMeasurements(),SubmitMeasurements()
Constraints	None

9 Operational Scenarios

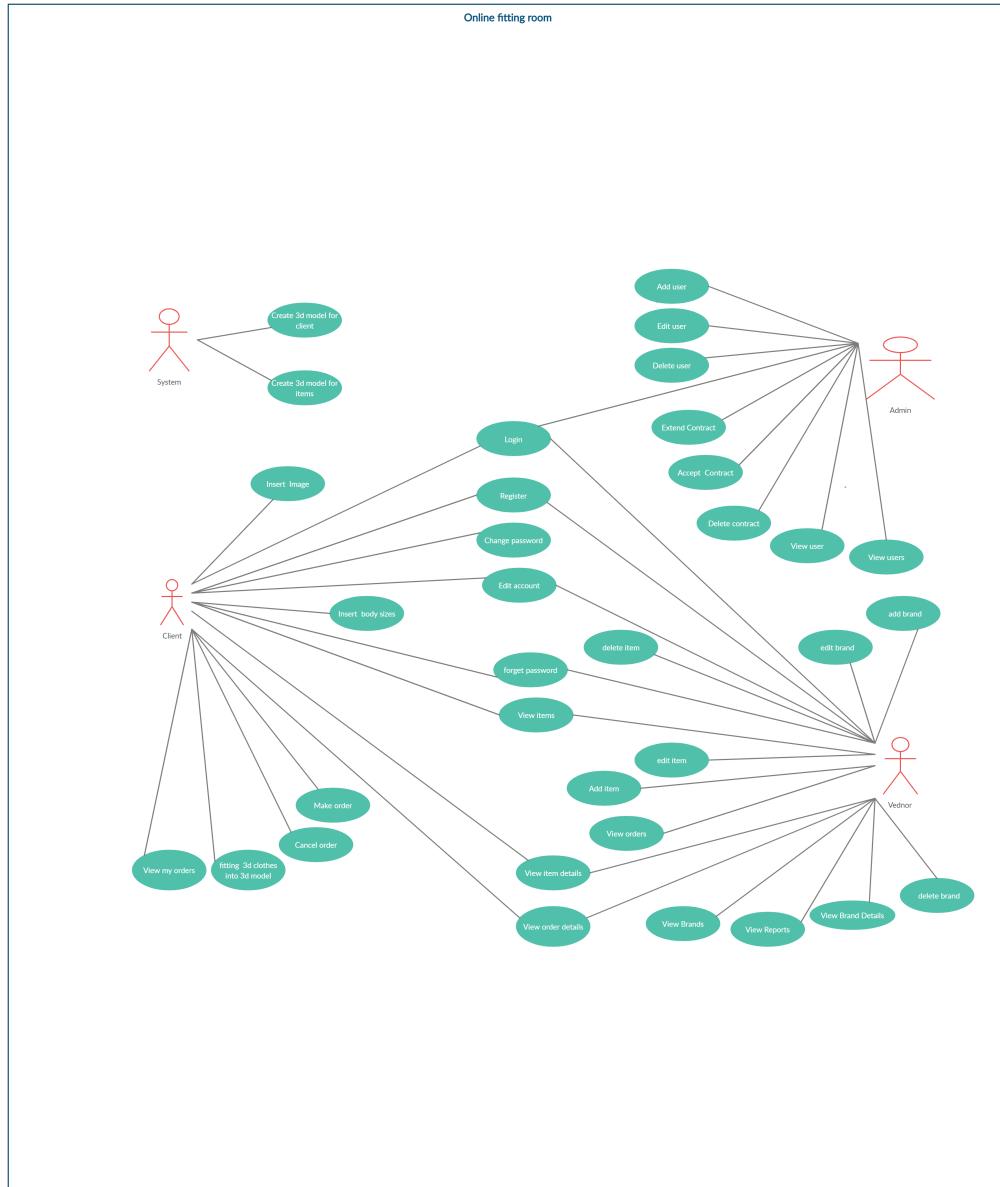


Figure 27: Use Case Diagram

9.1 Scenario 1

Vendor wants to put his brand on the mobile application so he send request to admin to add him on the application with special email and password to upload his brand with all types of items that he want according to contract terms. So Vendor has all authorities to edit and delete in his brand's details. Also, he can view all orders details or specific order details. Also edit and delete items details in his brands. At end of month or a week, vendor can see report contain all sales operation of his brand.

9.2 Scenario 2

First of all, Client should register to access to our application to take advantage of its features. Then, client will have choice to upload his front and side images or enter his body measurements if he knows them to create 3D model from his body measurements. After that, he can shop online easily through the application and will see all brands with it's items and can choose whatever he wants. The items he chose will be converted to 3D model so he can try it on his 3D model to see whether it fits him or not. Finally, he can order and buy the items that fit him confidently.

9.3 Scenario 3

Admin can see users that access our mobile application whether vendor or client. Admin also can give access to vendor after he signs the contract and can extend the vendor's contract when it expires.

10 Project Plan

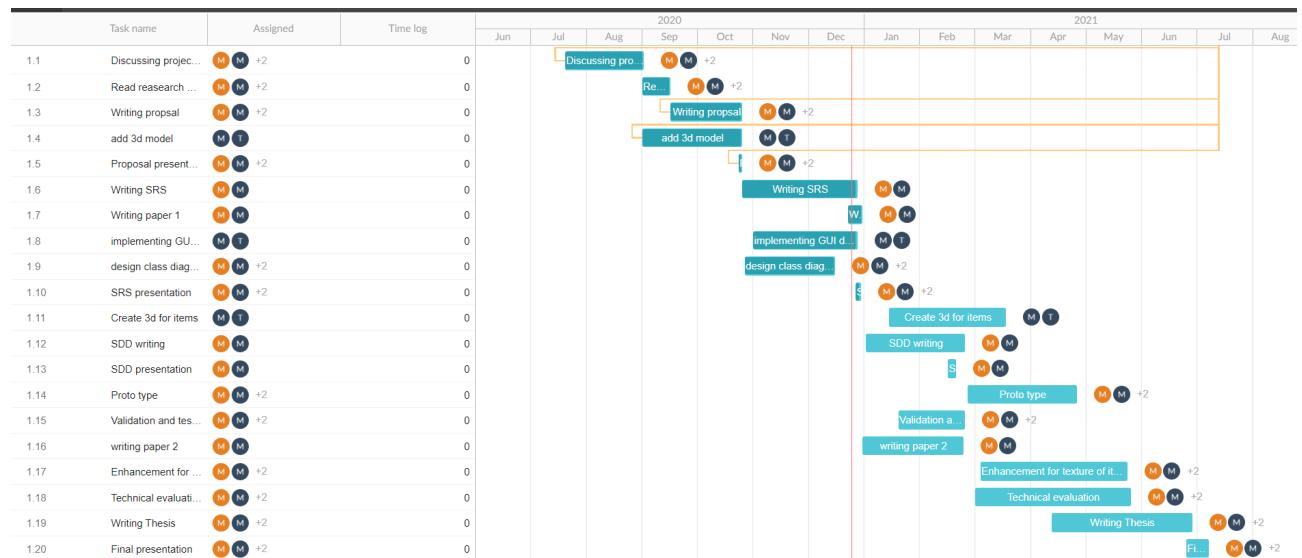


Figure 28: GANTT chart

11 Appendices

11.1 Definitions, Acronyms, Abbreviations

- COVID-19:Coronavirus disease
- MVC: Model - View - Controller
- OBB:Opaque binary blob
- RGB:Red - Green - Blue
- FR: Functional Requirement

11.2 Supportive Documents



Figure 29: Contact with client 1



Figure 30: Contact with client 2



Figure 31: Contact with client 3

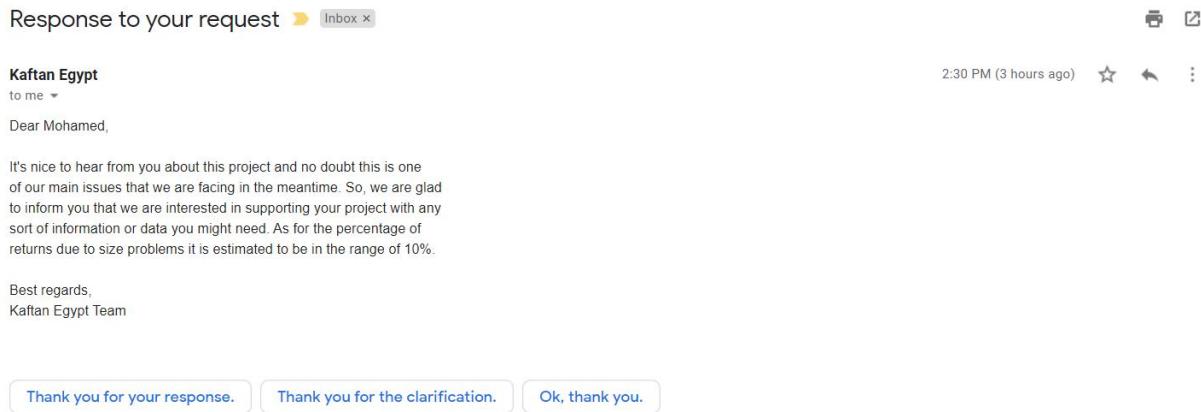


Figure 32: Client replay

References

- [1] Fatema Kawaf and Stephen Tagg. “Online shopping environments in fashion shopping: An SOR based review”. In: *The Marketing Review* 12.2 (2012), pp. 161–180.
- [2] UNCTAD. *COVID-19 has changed online shopping forever, survey shows : E-COMMERCE*. 2020. URL: <https://unctad.org/news/covid-19-has-changed-online-shopping-forever-survey-shows> (visited on 10/23/2020).
- [3] Umut Gültepe and Uğur Güdükbay. “Real-time virtual fitting with body measurement and motion smoothing”. In: *Computers & Graphics* 43 (2014), pp. 31–43.
- [4] A. F. M. SaifuddinSaif D. M. Anisuzzaman Md. Hosne Al Walid. “Online Trial Room based on Human Body Shape Detection”. In: *International Journal of Image, Graphics and Signal Processing* (2019).
- [5] S Priyadharsun, S Lakshigan, SS Baheerathan, et al. “Parade in the virtual dressing room”. In: *2018 13th International Conference on Computer Science & Education (ICCSE)*. IEEE. 2018, pp. 1–4.
- [6] Pengpeng Hu, Nastaran Nourbakhsh Kaashki, Vasile Dadarlat, et al. “Learning to Estimate the Body Shape Under Clothing from a Single 3D Scan”. In: *IEEE Transactions on Industrial Informatics* (2020).
- [7] Rhea Sehgal, Richa Gupta, and Noopur Anand. “Automatic Extraction of 3d body measurements from 2d images of a female form”. In: *IOSR Journal of Polymer and Textile Engineering* 5.3 (2018), pp. 07–17.
- [8] Julia Koch, Britta Frommeyer, and Gerhard Schewe. “Online Shopping Motives during the COVID-19 Pandemic—Lessons from the Crisis”. In: *Sustainability* 12.24 (2020), p. 10247.
- [9] Abe Dunn, Kyle Hood, and Alexander Driessen. “Measuring the effects of the COVID-19 pandemic on consumer spending using card transaction data”. In: *US Bureau of Economic Analysis Working Paper WP2020-5* (2020).

- [10] consumer decisions. *Online Shopping Statistics*. 2019. URL: <https://consumerdecisions.org/online-shopping-statistics/> (visited on 10/23/2020).
- [11] Kasper Kristensen, Nanna Borum, Line G Christensen, et al. “Towards a next generation universally accessible ‘online shopping-for-apparel’ system”. In: *International Conference on Human-Computer Interaction*. Springer. 2013, pp. 418–427.