UNIVERSITY OF ASIA PACIFIC

Department of Computer Science and Engineering

Course Title: Software Development

Course Code: CSE 410

Project Report

Project Title:

Virtual Trial Room

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1. Introduction:

A dress store is the most important part of a huge and different collection of garments. It is genuinely kinky for a client to evaluate every one of those garments without going per hour on it. Additionally, in a physical dress store, where to take a stab at some chosen garments a typical practice is to line up and turn to utilize the fitting rooms. Because of the preset number of in-store fitting rooms, customers usually need to invest the majority of their shopping energy in lining up. Drawn out holding up time will influence the client's understanding, which prompts lower consumer loyalty. Virtual Trial Room is a 3D implementation of an e-commerce shopping experience where the user can try out the clothing product in front of the camera before they make a purchase. We were using OpenCV because it is much faster and pre-trained to detect the user body on which we will superimpose the cloth and save their time while providing them with an excellent user experience. Then the user will get results in real-time output with the wearable superimposed will be provided simultaneously while taking the input by catching every frame of the video and applying the attire on the user's body in that frame and then returning the frame back which will give the user and the feeling that the results are displayed in real-time. The embodiment doesn't require any hardware cost making it a highly cost-effective solution improper some of the proposed works. This application is also platform-independent. It can run on any operating system on any device as long as the device has a camera and access to the internet and a web browser. The two major concerns of this project are the accuracy of superimposing wearables according to the user and realistic view.

1.1. Motivation:

We are learning to adapt to a lot of new changes due to the covid-19 pandemic. As for the pandemic, shopping is too difficult because social distance is essential to prevent this situation. But shopping is also an important part of our regular life. So we try to build something new for customers & sellers to continue shopping from home easily that also helps them with accurate trialing and time-consuming.

1.2. Novelty of our work:

Novelty is the state or quality of being new, exciting, unusual, or unique. In our project, we added a new feature that consumes less time & space. No longer tiresome queue, no hidden camera issues & enjoy shopping online with confidence. Don't have to use someone else's trial dress. Size fittings are exact with the online trial.

1.3.Project Related Issues: Different types of issues are related to this project. That's are,

- **Identify Societal Issue:** In this virtual platform, social distance can be maintained. Which will be really helpful in this pandemic situation.

- **Health Issue:** It is not harmful to mental or health because the virtual trial clothes worn by the user are 3D object files.

- **Safety Issue:** Customers can visit frequently and choose their product with a secret trial. Trial clips are not recorded & the trial option is usable when customers are perfectly logged in with proper information details.

- **Legal Issue:** No data from our web application will be leaked or sold to third-party applications.

- **Cultural Issue:** Customers from different cultures can choose their outfits from one place.

1.4. GitHub Link: https://github.com/asrafulislam15/VirtualTrialRoom

2. Background Study:

Firstly we started searching for the platforms related to the idea of virtual trialing. We analyzed their functionality. Then to start building an e-commerce website with our prior knowledge of python and Django frameworks. For the virtual trial function, we used Opencv for camera functionality and proper orientation and movement of products with the user.

OpenCV :

OpenCV is an abbreviated form of Open Source Computer Vision Library which supports python, C++, java interfaces. It is basically designed for achieving computational efficiency and also to give emphasis to real-time applications. This package has an added advantage that is multi-core processing when the code is written in C or C++. Using augmented reality technology reduces the time of the
customers and also the chaos created while purchasing the wearable by virtually trying them online.
Related tutorial: https://www.youtube.com/watch?v=oXlwWbU8l2o

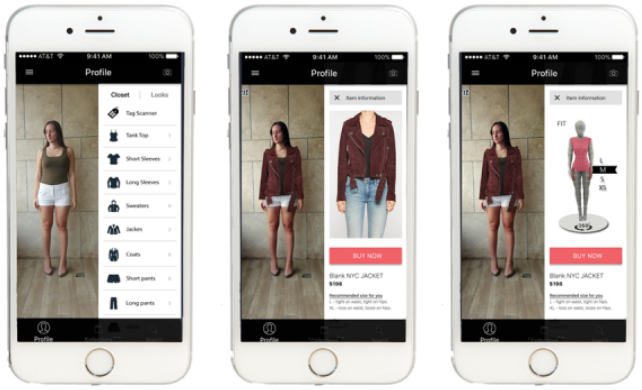
Jquery:

jQuery is a fast, small, and feature-rich JavaScript library. It makes things like HTML document traversal and manipulation, event handling, animation, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers. With a combination of versatility and extensibility.

Related tutorial: https://www.youtube.com/watch?v=i32p6HvYC1A

3. Previous Work:

- ☐ **Zeekit:** Zeekit uses its patented technology to map a person's image into thousands of segments. Clothing is processed in a similar manner and the equivalent points of the two are re-mapped into one final simulation, showing a person fully dressed while taking into account body dimensions, fit, and the fabric of the garment.



Zeekit

- ☐ **Fit'N shop:** Fit'N shop is where customers make their own 3D avatar, or take a photo of themselves to dress to shop for clothes.

- **Textronics:** Textronics, TryOn is an Augmented Reality based virtual dressing room app that digitally manages your limitless product options, choosing colors, ensuring freedom access, and allows you better in-Store commodities display with a virtual mirror, enabling a rich visual experience. It also has a 3D avatar option.

4. Limitation of the Previous Work:

In those platforms, Mannequins were used to display the dresses, which did not have proper fittings according to the user's body shape. In some cases, it has been noticed that the 3D image of the cloth is not moving properly along with the user movement.

The previous platforms started the concept of virtual fitting rooms which opened a new axis of online shopping.

5. Problem Definition :

Buying wearables online is always a risky process as there is always a doubt whether the item will look on itself. Also, buying clothes or ornaments through shops offline requires a lot of time as we have to first look for a shop and then try each and every cloth by going inside the trial room. Our proposed solution will help users save their time in trying out the wearables by digitizing the process. We decided to use OpenCV because it is much

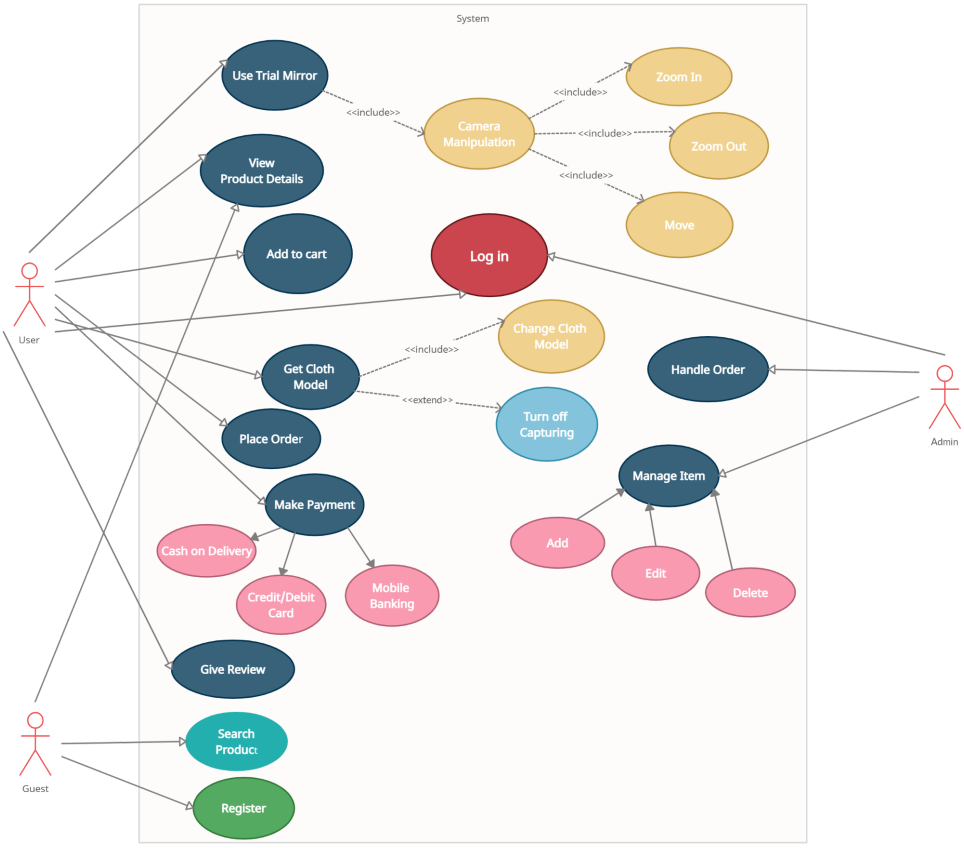
faster and pre-trained to detect the user body on which we will superimpose the cloth hence saving their time while providing them with an excellent user experience.

In this pandemic situation, people face very difficulties like they might need cloth but they can not move because of strict lockdown or they can't go anywhere easily. To fix this problem we tried to build or develop this project.

6. Methodology:

UML is a combination of several object-oriented notations: Object-Oriented Design, Object Modeling Technique, and Object-Oriented Software Engineering. It uses the strengths of these three approaches to present a more consistent methodology that's easier to use and represents best practices for building and documenting different aspects of software and business system modeling.

6.1. UML (Use-Case Diagram):



The key concept of use case modeling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behavior in the user's terms by specifying all externally visible system behavior. It only summarizes some of the relationships between use cases, actors, and systems. Here we have shown the function of our virtual trial room through three actors and some use cases. The actors are **User**, **Guest,** and **Admin**.

The first actor is the **User**. Users can log in here, search products, user can see the product's details, add to the product in the cart, be able to try using the mirror/camera in the virtual trial room, and zoom-in/zoom-out/move the camera at the user's convenience, can place orders of products of own choice, make payments through cash on delivery or by credit/debit card or through mobile banking, give product related reviews.

The second actor is that the **Guest** will be able to search the product and find out the details of the product. Will be able to register for all other facilities.

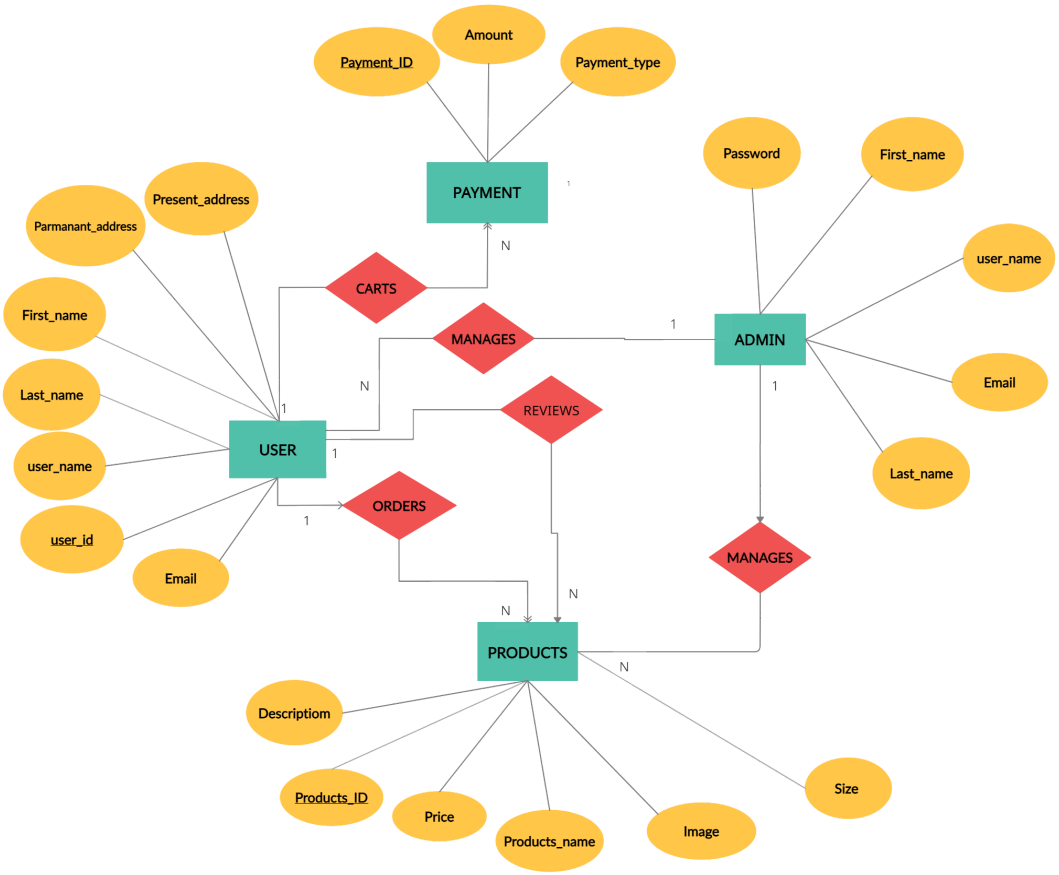
The latest actors are **Admins** and admins can log in here, handle orders and manage products by adding / editing / deleting products.

6.2. ERD:

An Entity-Relationship (ER) Diagram is a type of flowchart that illustrates how “entities” such as people, objects, or concepts relate to each other within a system. ER Diagrams are most often used to design or debug relational databases.

In the fields of software engineering, business information systems, education, and research. Databases are today’s method of storing relational information for educational purposes and later retrieval, so ER Diagrams can be valuable in planning those data structures.

We used 3 types of ERD diagram tools to design our project. Here we have used 4 entities and used relation tools to connect between entities. Each entity is defined with some attribute.



User's attributes are present_address, paramanent_address, first_name, last_name, user_name, user_id, email. Users will be able to register and log in through these attributes. A user can order one or more products through an order relationship and pay for the product through cart relationship and review products through a review relationship.

Admin's attributes are first_name, last_name, user_name, email, password and admin will be able to log in through these attributes. An admin can

manage one or more users and products through managed relationships. Another two entities are Payment and Products.

Product's attributes are product_name, product_id, description, price, size, image.

Payment's attributes are payment_id, amount ,payment_type.
This is the ER diagram of our project, a complete picture of use, admin, products, and payment entity through various relationships**.**

6.3. Cost Analysis:

Line of total code = 10965
Cost C = aL^b
=(1.4*10965)^0.93
= 6447.3963
Effort in Per Person/Month E = 1.4L^0.93
=(1.4*10965)^0.93
= 6447.3963
Documentation , DOC = 30.4L^0.90
=93453 Number of Pages
Duration , D = 4.6L^0.26
= 16.70 in months

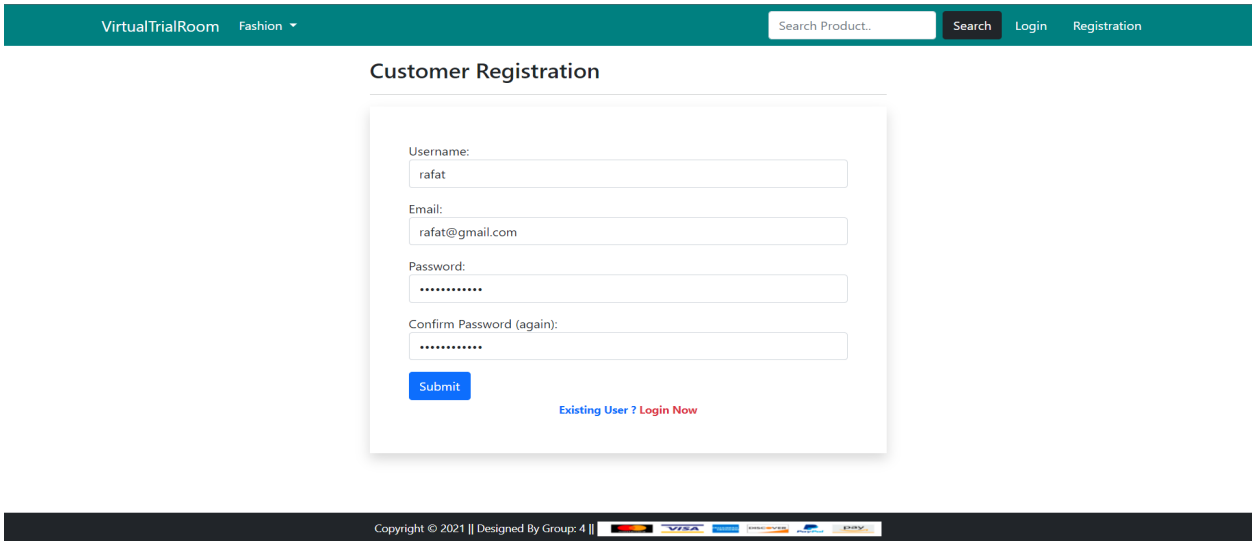
6.4. Environment Setup:

- ☐ **Language:** Python,Html5 ,CSS,Bootstrap
- ☐ **Framework:** Django
- ☐ **Library:** OpenCV
- ☐ **IDE:** Pycharm
- ☐ **Version Control:** Git & GitHub

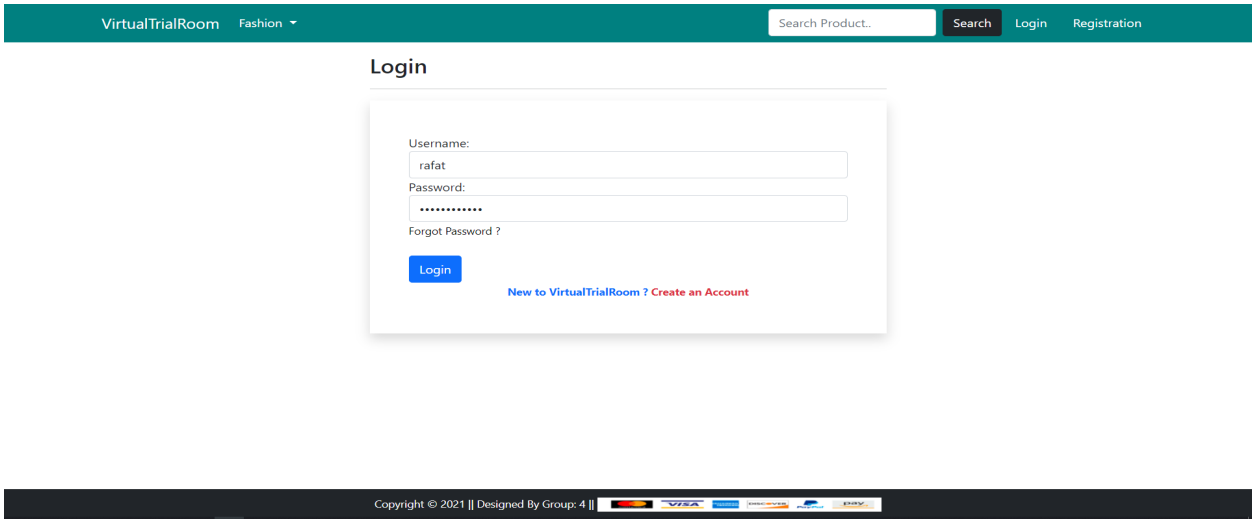
7. User Manual

The user manual contains all essential information for the user to make full use of the information like registration, login, profile, price range, product view, trial room, shopping cart, order summary, order status are the different parts of this project.

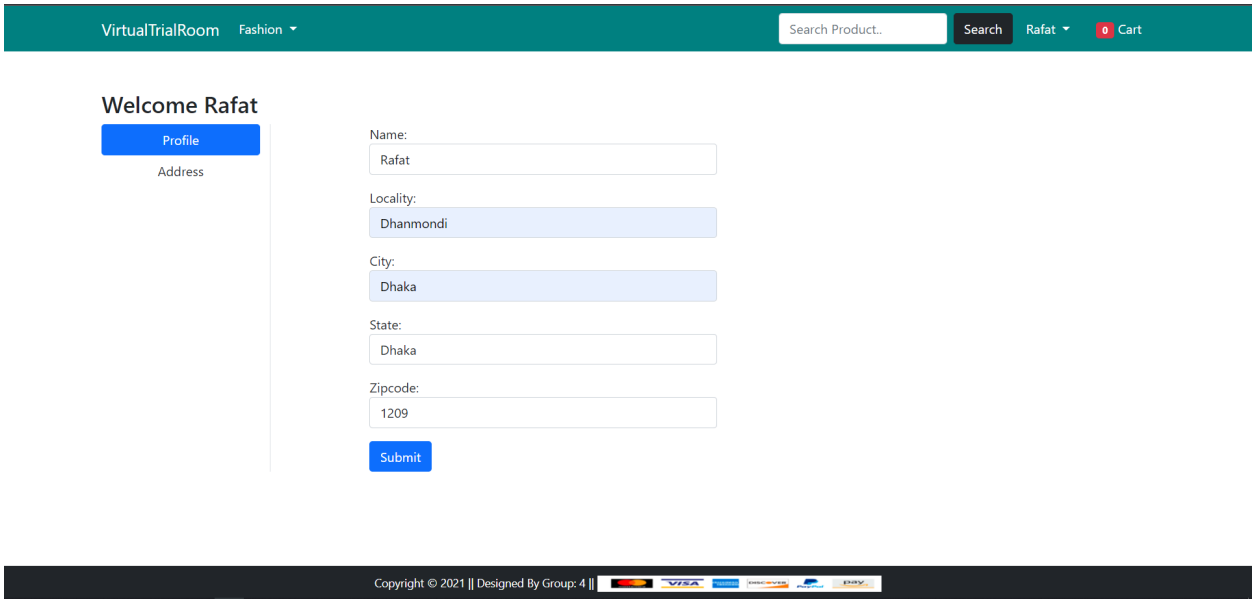
7.1. Registration: Upon visiting the website, users are welcomed by the registration page where they can create an account. In case they already have an account, they can click on “Sign in” at the bottom of the page.
There are 3 fields for registration: Username, Email, Password (also one for password confirmation). Email and Username must be unique.



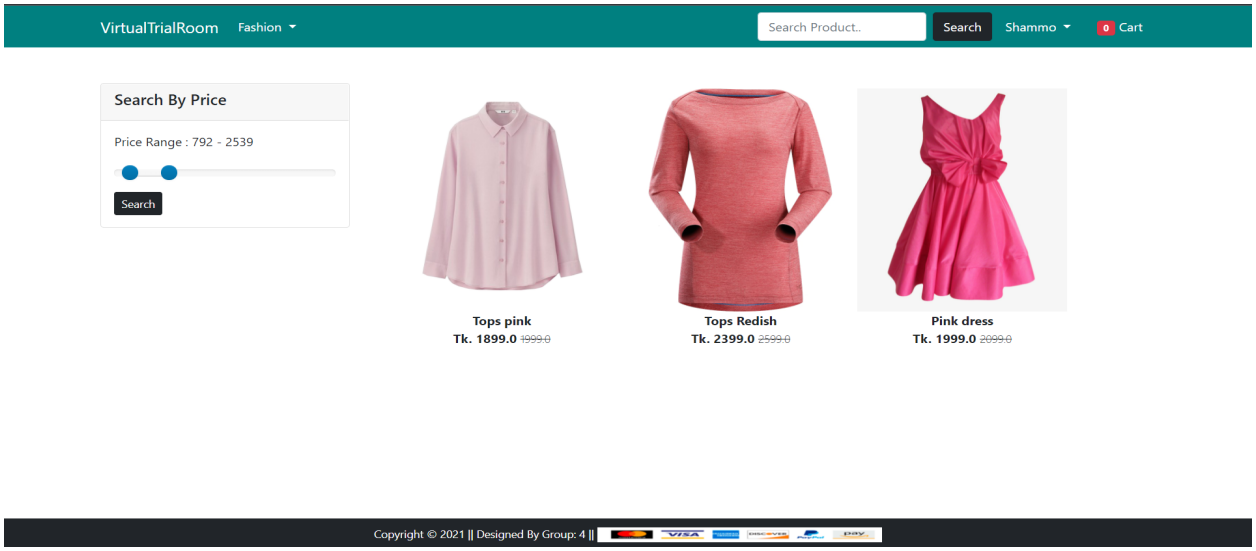
7.2. Login: After an account has been created, users can sign in using their email and password.



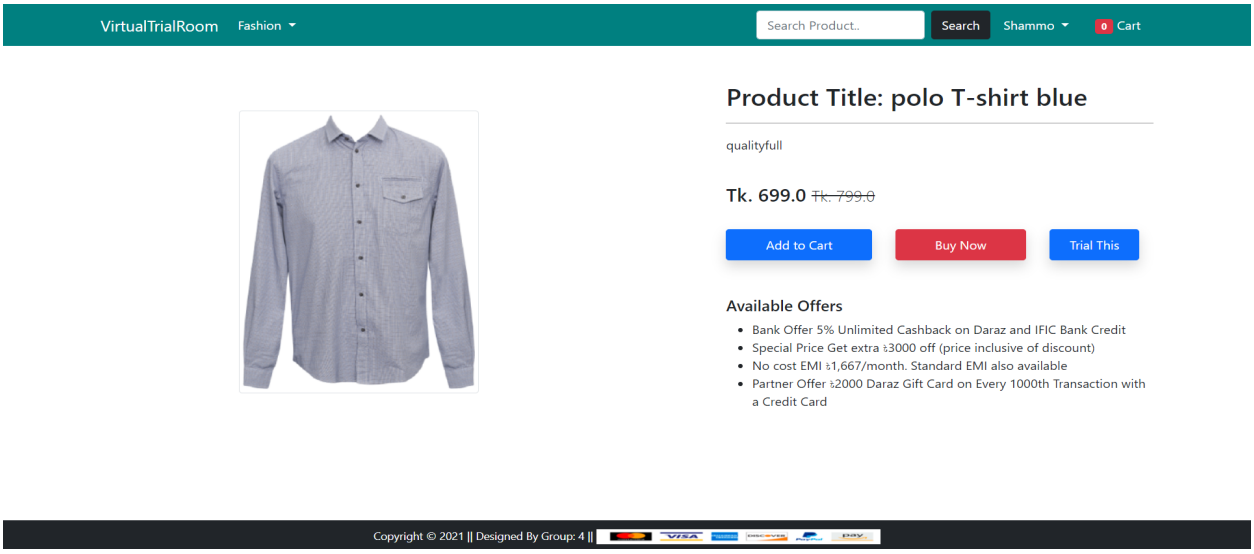
7.3. Profile: After signing in, users land on their profile page. Here they add their name, locality, city, state, zip code. It helps to confirm the user's address.



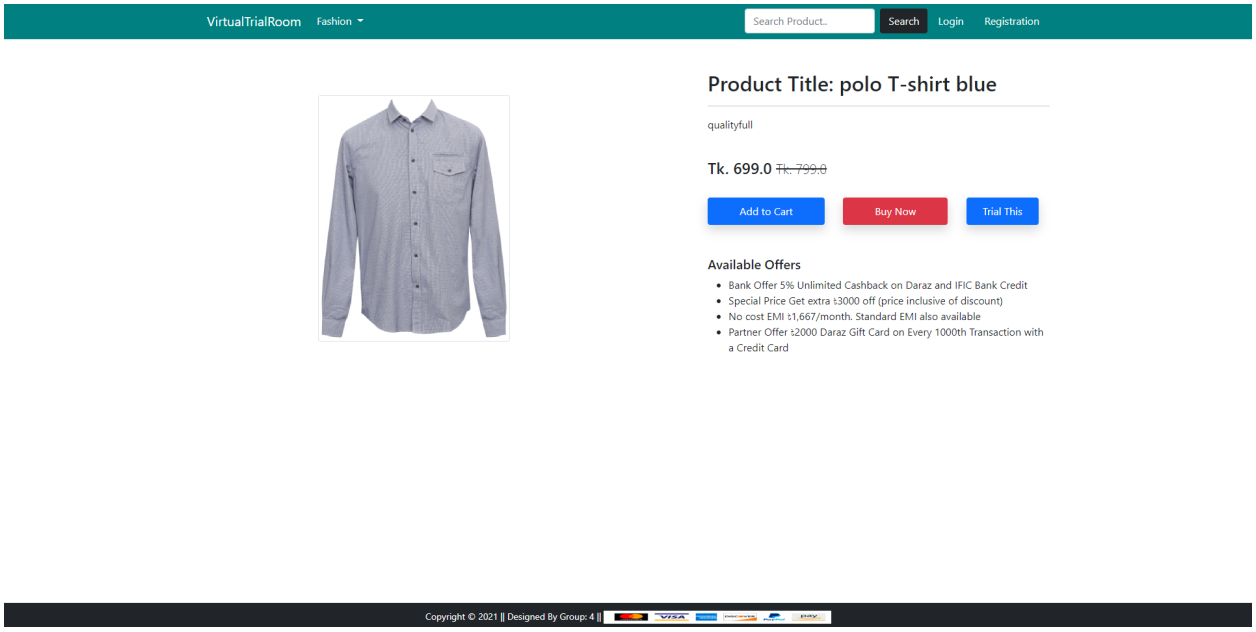
7.4. Price Range: Products are easily searched with a price range bar. Users will be able to search for products based on their price limit/range.



7.5. Product View: Product's review, details,price, discount/offer price are shown in the product view and customers can try clothes here and add their choices to the cart.

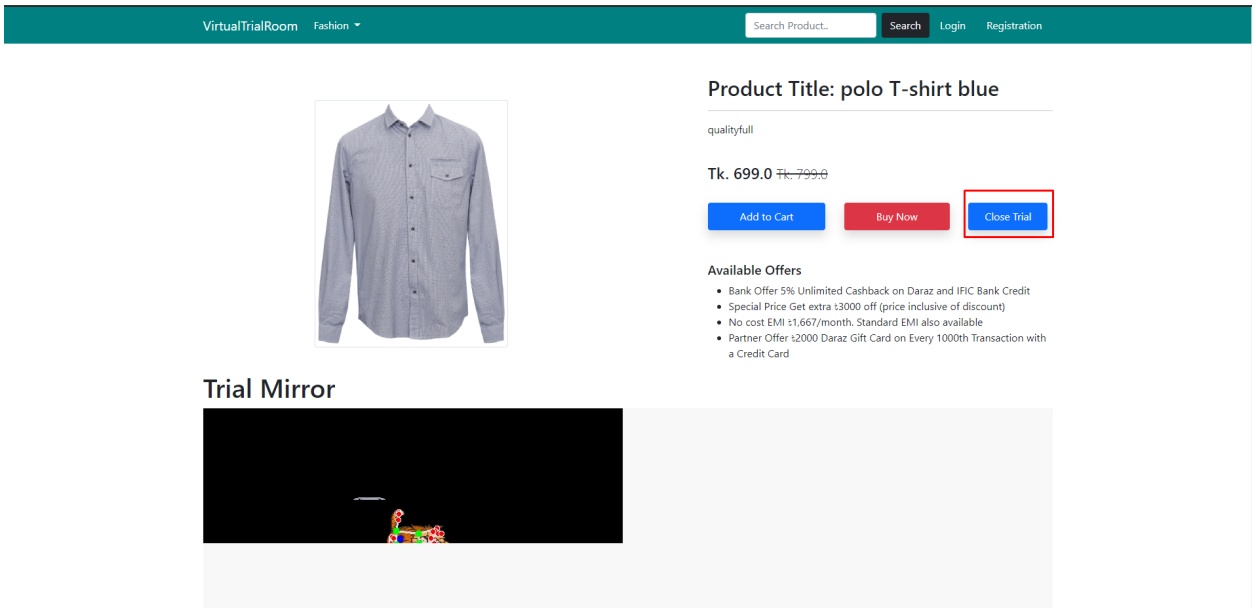


7.6 Trial-Room: Customers try to trial the product with a video camera then press the “Trial This” button.

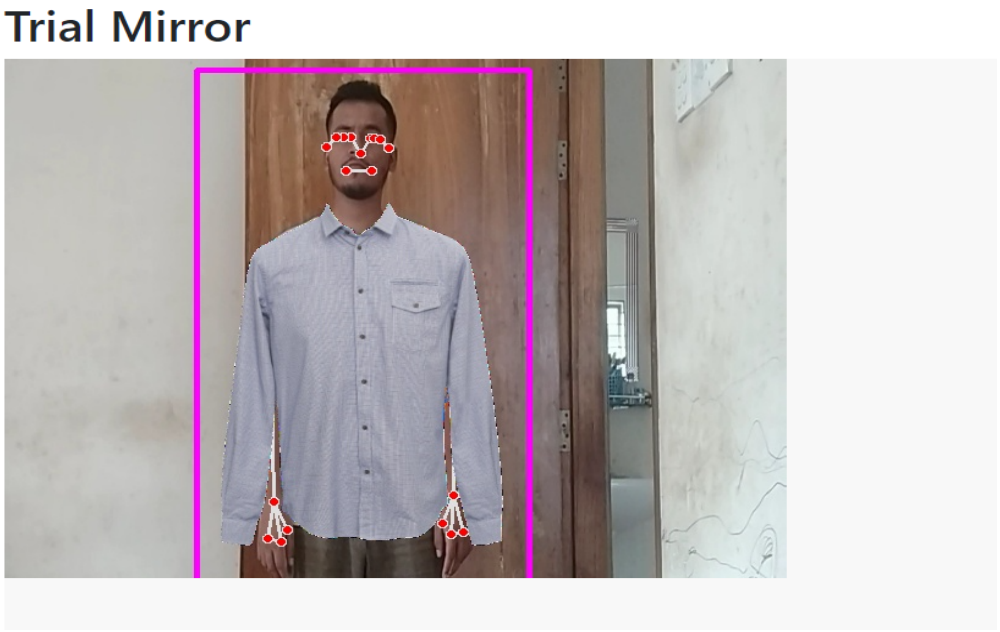


7.7 open camera: After pressing the “Trial This” button then trial mirror will be on.

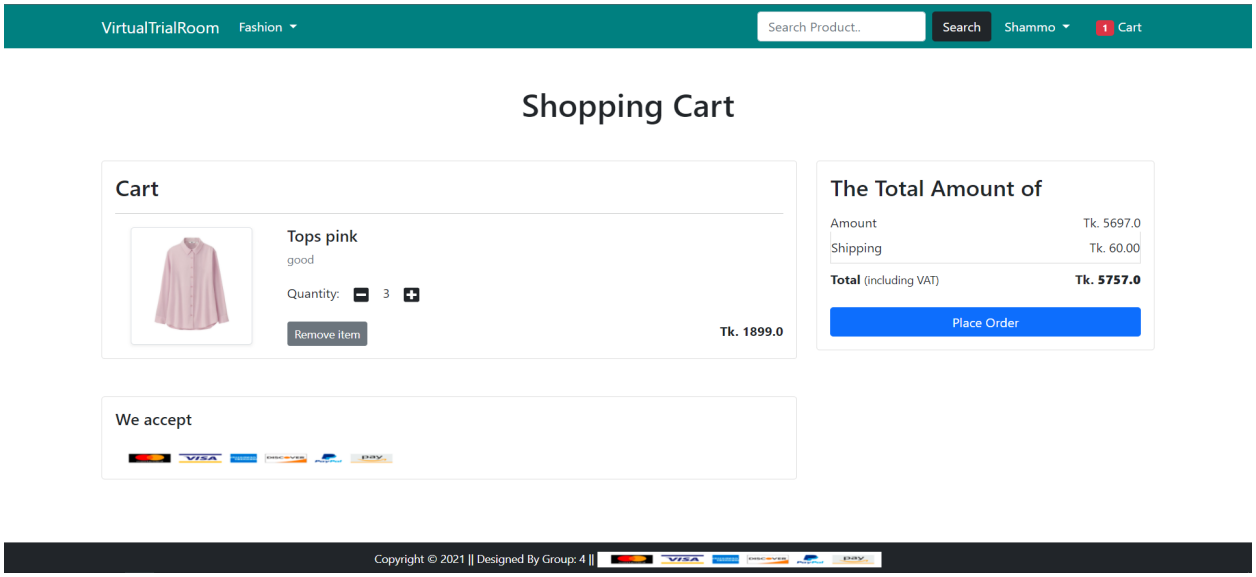
7.8 Close Trial: When trial mirror is on the we can close the trail through pressing “Close Trail”



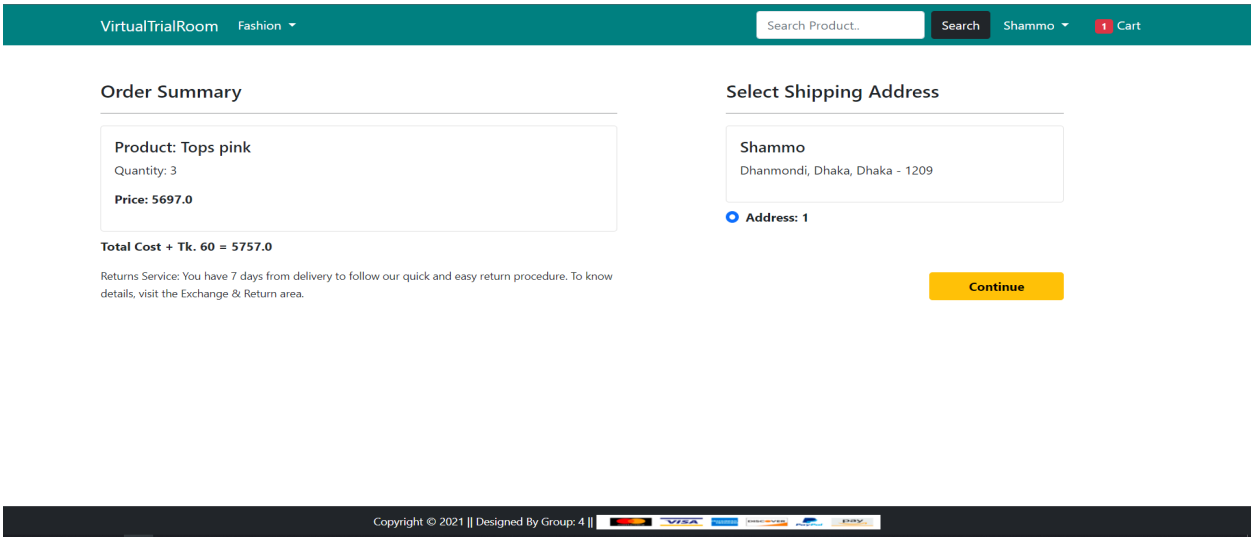
7.9 Trail Dress: After standing in the right position then the dress will fit on the body.



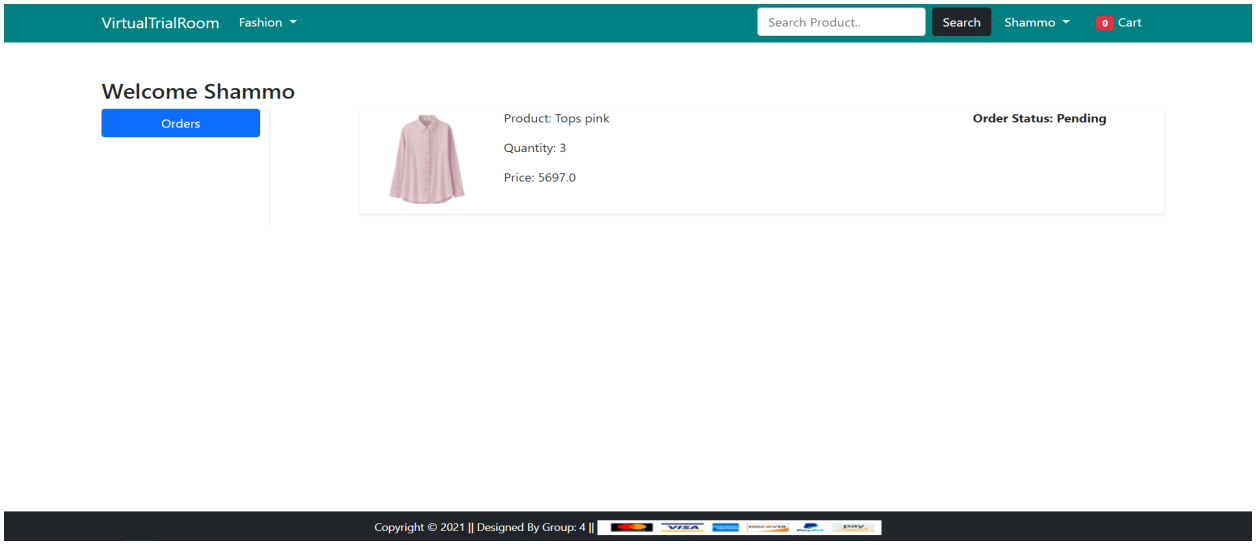
7.10 Shopping Cart: desired products are added to cart to buy ,the total quantity and amount are shown in the cart.



7.11 Order Summary: After placing the order, the orders of the desired product is shown in the summary.



7.12 Order Status: Here one can see if the order is pending or delivered.



8. Conclusions:

While working on this project, we came to learn to make a complete e-commerce website, integrate different programming languages to execute the whole system, implement virtual trial functions over products and also learn how to solve the problems throughout working on the project. We also thought about updating the project in the future and so we generated some ideas as explained below.

8.1. Things We Have Learned:

We learned and utilized the knowledge of HTML, CSS, Javascript, Bootstrap 5 and integrated them for front-end development. We programmed with Python for back-end development, and Django for the whole framework. We also used Opencv for camera capturing and functionalities to trial clothes.

8.2. Difficulties We Have Faced:

There is no clear guide or tutorial to implement the system in Django. So we faced some problems during implementation. Then it was hard making the connection process dynamic. It was difficult to implement the streaming of real-time trials. We were using different Django versions, that's why it was difficult to control the version. We faced problems in camera functioning while working with OpenCV. We further have issues building signaling servers and also debugging and fixing unprecedented issues in mesh connections. Although we faced difficulties, we have solved them with the help of online resources (tutorial videos from youtube, the internet), stack overflow and google, etc, and successfully completed our project work.

8.3. Future Directions:

This project completes the scope of our curriculum, we desire to advance with it and build it to a greater conclusion. We initially worked with topwears, further we will implement trials for bottom wear and head accessories etc. There is no such recording option for customer trialing sessions, so it is safe. We can work on it in the future. We can add some new features of the user's requirements and also add a rating system to monitor the sellers and product quality, whether they are doing their work gently or not. Also we will build a safe payment gateway module for customers to feel free while shopping using our system. In the future, we will turn it into mobile apps so that it seems easy to the users.

9. Reference:

1.https://www.youtube.com/watch?v=I6rR3Se72BU
2. https://www.youtube.com/watch?v=IJpTe-1cimE

10.Appendix A(CEP Mapping):

- **How Ks are addressed through the project**

Ks	Attribute	How Ks are addressed through the project	Cos	Pos
K3	Engineering Knowledge Fundamentals	This project requires knowledge of Opencv and good understanding of concepts of the Django framework. Knowledge- of Programming languages (Python, HTML.CSS, Javascript). Camera functioning is also required here.	CO4	POf
K4	Engineering Practice Knowledge	On this system there will be a web based frontend and integration of different components in the backend which will be great engineering practices for this system.	CO5	POh
K5	Engineering Design	Here we are using modern engineering design to identify and solve the problem with a powerful and more efficient approach.	CO8	POk
K7	Role of Engineering in the	This project allows users to shop products virtually. It has a large impact on society. People can visit	CO10	POa

	society	this website remotely, try things and get shopping done. It can also help to maintain social distance and stay safe during pandemic.		
K8	Research Literature	Our project requires study of existing systems with similar goals such as a similar virtual fitting room platform like Zovi, Zeekit, Fit'N shop etc. We have identified and analyzed all the features in those systems and tried to implement new features in our project.	CO1	POb

- **How P's are addressed through the project and mapping**

among Ps, COs and POs

Ps	Attribute	How Ps are addressed through the project	COs	POs
P1	Depth of Knowledge Requirement	The project requires rigorous study of all the existing virtual trial rooms (K8), conducts surveys on stakeholders –customers, sellers, and monitoring authority (K3, K4), web-based backend, and frontend design (K5, K6).	CO1 CO4 CO5 CO8 CO10	POb POf POh POk POa
P2	Range of Conflicting Requirement	Conflicting requirement: User data security.	CO1 CO2	POb POc
P3	Depth of Analysis Required	Depth of analysis of requirements stakeholders – sellers, customers and monitoring authority is needed to ensure user satisfaction.	CO1 CO3 CO5 CO8	POb POfs POh POk

P4	Familiarity of Issues	Choosing a dress and trial for online shopping has created a problem and our project deals with it.	CO9	POl
P7	Interdependence	Our project involves interdependent components such as requirement analysis, designing backend, and frontend, software testing, etc.	CO8	POk

- **How As are addressed through the project**

As	**Attribute**	**How As are addressed through the project**	**Cos**	**Pos**

A1	Range of Resources	The project needs to engage diverse resources including people(developers,users), development tools, information and technology.	CO2 CO3 CO6	POc POe POi
A2	Level of Interaction	A good level of interaction is needed among developers,the users and interface, also the interaction between database and models and controllers etc.	CO6	POi
A3	Innovation	The platform needs to be updated with innovative and creative ideas to meet the feedback from all stakeholders – sellers, customers, and monitoring authorities.	CO5 CO10	POh POa