Bilkent University

Department of Computer Engineering

Senior Design Project

Project name: Dressy

Analysis Report

Asuman Aydın, Doğukan Köse, Fatih Çakır, Muhammed Musab Okşaş, Şeyma Aybüke Ertekin

Supervisor: Uğur Güdükbay

Innovation Expert: Veysi İşler

Website Link: https://dress-y.github.io/

This report is submitted to the Department of Computer Engineering of Bilkent University in partial fulfillment of the requirements of the Senior Design Project course CS491/2.

Contents

Analysis Report

Project Short-Name: Dressy

1. Introduction

The preference of online shopping is a huge trend in today's digital world because of the lack of time, the convenience of online shopping, the advantage to have access to other users' experiences, the existence of cost choices and richness in the product variety. By the beginning of 2020, 69% of Americans had an online shopping experience. Also, 25% of them were regular online shoppers who bought at least one item each month. Statistics also demonstrate that 47% of online shoppers buy clothing items. The online shopping trend is not limited to America. If we look at the worldwide statistics, the rate of online shopping in 2018 is 47.3%. While 72% of women had preferred to shop items online while 40% of these items, the largest percentage, were clothing. With the effect of the coronavirus, this preference has become even clearer. People have begun to prefer to buy most of their needs online rather than visiting crowded shopping malls and trying out clothes that they do not know who had worn previously. [1] However, shopping for clothes online has a downside. Shoppers do not have the advantage of trying clothes and therefore, it is difficult to make good choices in terms of looks and size of clothing.

Figure 1. Statistics on presentation of increase on online shopping after Covid-19

The purpose of our senior design project is to assist people who choose to buy their clothes online. We want to create an application that provides a virtual fitting room for them. Thereby, they can try the clothes they have chosen and see the clothes on themselves.

With this project specifications report, we aim to explain the description of our application, current systems, requirements, diagrams about our senior project, Dressy. Also, we will provide mockups of screens of our app.

2. Current System

Zeekit

Zeekit is a virtual clothing room application which is offered in web and mobile platforms. The difference of Zeekit is that there are various models which users can try the clothes on. There is no real time reflection of the user body to try the clothes. [2]

AstraFit

This is a web-based application where you can upload a cloth and then try the clothes on virtually. [3] You need to provide the measurements of the cloth/dress. AstraFit is useful for brand-owners who will upload their collection to the application and provide people to try the clothes online. You can have an account by website. [4]

Swivel Selfie

Swivel Selfie is an augmented reality app that allows users to virtually try-on different clothes. This is a mobile application where you can simply see the mirror image of yourself on a phone screen. The app offers people with personal recommendations, sharing look blogs and purchasing those clothes after trying them. [5]

3. Proposed System

Dressy is a mobile application which provides a simulation of fitting rooms. Users register and their 3D model is created by detecting their body measurements using a camera. After creating a model, users can observe their model in different clothes from different angles and add the clothes into their virtual wardrobe by liking the clothes. The main advantage of the application is its similarity to a real fitting room. Using human pose estimation technologies, when the user moves, the model also moves like the user. In this way, people are able to see how the clothes fit on themselves just like they are in a real fitting room. There is also a size recommendation system in the application, which makes our application different from similar 3D applications. A detailed size recommendation is given according to the body measurements and the preference of the user. In addition, the application has a feature that detects pre-defined body movements and enables users to like and change the clothes from a certain distance to the camera. To be able to get the body image from the camera, there are requirements. These requirements are analyzed in the given table below.

	Has a depth sensor camera?	Has resolution to run Dressy?	Has a front or back camera?	Does Unity support?	Does Blender support?
Ios					
Android					

Table 1. Available data collection for rendering user body

The novel feature in our product is size and dress recommendations based on the preferences of the user. After a time a person uses the app, the recommendations will get better due to machine learning model training. For example, when you prefer to buy or wear large clothes, the recommendations and the settings will be arranged according to the favorites and likes on these large clothes. Also, the modeling of human body and also real time dress fitting to that model are also impactful features in our app.

The answer to the question of why Dressy is more innovative and marketing-valued application is given in the table 2. We compared the current system apps to our program.

	Zeekit	Astrafit	Swivel	Dressy
3d Modeling user body	-	-	-	+
Taking preferences	+	+	+	+
Fitting dress on model	+	-	-	+
Recommendation based on preferences	-	+	-	+
Providing category of clothes	+	+	+	+
In-app purchase of clothes	+	+	-	-
Favorites section to keep liked clothes	-	+	+	+
Recommendation based on favorites	-	+	-	+
Personalized main page	+	+	+	+

Table 2. Comparison of current systems based on features

You can simply see that Dressy is more compatible with newer technologies and more likely to be used in the marketing field for fashion and shopping.

3.1. Functional Requirements

- Users can register or login to the system.
- Users will record themselves with their camera to create the model for the app. Direction will be given in the beginning of registration.
- One optional requirement is real time virtual modeling of the user. Users will be captured by the camera and will be presented to the application real time as a 3D model.
- Second optional requirement is modeling users for the database of this application in order to use later. Users can upload their virtual 3D model by following the instructions and try clothes on this model when they want.
- Users can have multiple uploaded 3D models in their profile.
- Users will have to input their body measurements in order to have better results.
- The users will be able to see chosen clothes on themselves virtually via virtual fitting room feature.
- The users can try different combinations of already chosen clothes virtually. They can like the combinations to make them available to reach afterwards and to improve our recommendation system.
- For real time usage, users will be able to navigate through applications by pre-defined motions without using their devices manually.
- On the main page users will be able to see clothes available for our application.
- The application will provide an interface to upload 3D models of the clothes to our application by using cameras. Our application will have predefined templates of the clothes and this interface will integrate the models of the clothes with templates for better accuracy.

- Brand owners, e-commerce sources, cloth sellers will be available to add their products using this interface and the templates to our database.
- Users can select multiple clothes to try them on virtually at the studio later on.
- Users can like items and can reach to the liked items when they want.
- Users can filter available clothes considering price, color, size, sex, material, type, brand, e-commerce source. Users can save multiple filters to use later on.
- Users can see the item page for detailed information about selected items.
- Users can access their listed liked clothes, liked combinations. With this functionality users will be able to get size suggestions with categories (e.g. Asian, European, African) according to their body measurements for the outfits they have chosen in the virtual fitting room.

3.2. Non-functional Requirements

- **Scalability:** Up to 1000 users can use the virtual dressing feature of the application simultaneously. Up to 100000 users can sign up to use this application.
- **Usability:** Users should be able to add a virtual 3D model to the database to be used in this application in less than 3 minutes by following the instructions. Users should be able to use this application in less than 10 minutes after they download the app, considering they need to sign up and add a virtual 3D model to the database.
- **Reliability:** More than %85 of the items in application should be able to fit accurately to the virtual models of the user. More than %70 of the virtual models that are added by following the instructions should be acceptable to use in the application. The users who want to access the virtual dressing room will be successful in more than %90 of the tries.
- **Security:** The application will be used by an authentication system. Therefore, sensitive data of the user is not available to other users. The system will store passwords and other sensitive data in an encrypted format.

The data of the user will not be shared with any third party individual or institution.

- **Availability:** The server maintenance should be scheduled on off-peak times, mostly at 1-2 AM for different region time zones such as Europe or Asia. The system should be available at least %95 of the working time.
- **Performance:** Backend response time of the website (the time starting when an HTTP request is taken and ending when the server starts to send frontend data) should not exceed 200 milliseconds. The virtual fitting room should be available to use in less than 10 seconds when it is requested. Process of virtually fitting a cloth on a model should not take less than 30 seconds.
- **Legal and Regulatory Requirements:** The application shouldn't allow users to take virtual photographs without their permission to the terms of service and privacy policy.

3.3. Pseudo Requirements

- The application must operate on existing iOS and Android smartphones.
- The application must use Google ARCore API for modeling the user body from camera.
- The application must use Blender 3D modelling API's to fit the clothes to the model.
- The application's server side will run on REST API services of Flutter.
- The mobile application development will be on Flutter and Xcode to be worked on both iOS and Android.

3.4. System Models

3.4.1. Scenarios

Scenario 1	
Use Case Name	Register to the application
Participating Actors	Any user
Entry Conditions	• Application must be open. • Users should have a valid email address.
Exit Conditions	User submits the registration form.
Main Flow of Events	1. User opens the application. 2. User clicks on the registration button. 3. User fills out the registration form. 4. The form gets validated.

Scenario 2	
Use Case Name	Sign in to the application
Participating Actors	Any user
Entry Conditions	• Application must be open. • Users should have a valid username and password.
Exit Conditions	User submits the sign in form.
Main Flow of Events	1. User opens the application. 2. User clicks on the sign in button. 3. User fills out the sign in form. 4. The form gets validated.

Scenario 3	
Use Case Name	Upload a 3D body image
Participating Actors	Shopper Users
Entry Conditions	• User should be signed in. • User should have an available device with ARCore features.
Exit Conditions	User accepts the created 3D image.
Main Flow of Events	1. User signs in to the application. 2. User clicks on the create 3D body image button. 3. User gives permission to use the camera. 4. User poses to the camera according to the given instructions. 5. A 3D body image gets processed. 6. User gives further information about the body size. 7. User adds created 3D body model to the users database.

Scenario 4	
Use Case Name	Choose clothes to try on
Participating Actors	Shopper users
Entry Conditions	• User should be signed in.
Exit Conditions	User goes to the virtual fitting room to try chosen clothes on or saves the list to use later.
Main Flow of Events	1. User goes to the main page to see the list of available clothes. 2. User applies a filter to narrow it down the available cloth list. 3. User adds clothes to the list. 4. User can change the filter and add more clothes. 5. User either clicks on the virtual fitting room button or saves the list.

Scenario 5	
Use Case Name	Try chosen clothes in the virtual fitting room by using saved 3D body image.
Participating Actors	Shopper users
Entry Conditions	• User should be signed in. • User should have chosen some clothes to try on. • User should have created a 3D body image earlier.
Exit Conditions	User closes the virtual fitting room.
Main Flow of Events	1. User opens up the virtual fitting room after choosing some clothes to try on. 2. User choose a combination of clothes to try on. 3. User gives permission to use the camera. 4. User poses to the camera according to the given instructions. 5. A 3D body image gets processed. 6. User can see how the chosen clothes fit on the processed 3D body image from different aspects as the camera updates the current image. 7. User either closes the virtual fitting room or keeps trying different clothes for the body image taken from the camera.

Scenario 6	
Use Case Name	Try chosen clothes in the virtual fitting room by using real time 3D body image.
Participating Actors	Shopper users
Entry Conditions	● User should be signed in. ● User should have chosen some clothes to try on.
Exit Conditions	User closes the virtual fitting room.
Main Flow of Events	1. User opens up the virtual fitting room after choosing some clothes to try on. 2. User chooses the 3D body image from the database. 3. User choose a combination of clothes to try on. 4. User can see how the chosen clothes fit on the chosen 3D body image from different aspects. 5. User either closes the virtual fitting room or keeps trying different clothes for different 3D body images.

Scenario 7	
Use Case Name	Upload a 3D image of clothes
Participating Actors	Seller Users
Entry Conditions	● User should be signed in. ● User should have an available device with ARCore features.
Exit Conditions	User accepts the created 3D image.
Main Flow of Events	1. User signs in to the application. 2. User clicks on the create 3D cloth image button. 3. User gives permission to use the camera. 4. User puts the cloth in the appropriate position according to the given instructions for the camera processing. 5. A 3D cloth image gets processed. 6. User gives further information about the cloth size in order to improve the model. 7. Users adds created 3D cloth model to the users database.

3.4.2. Use-Case Model

In the following section, we will introduce the use-case models of our system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements. In our system there are two important users: shopper users which will use our system to try available clothes virtually and purchase them and the seller users which will upload their products to our system to sell.

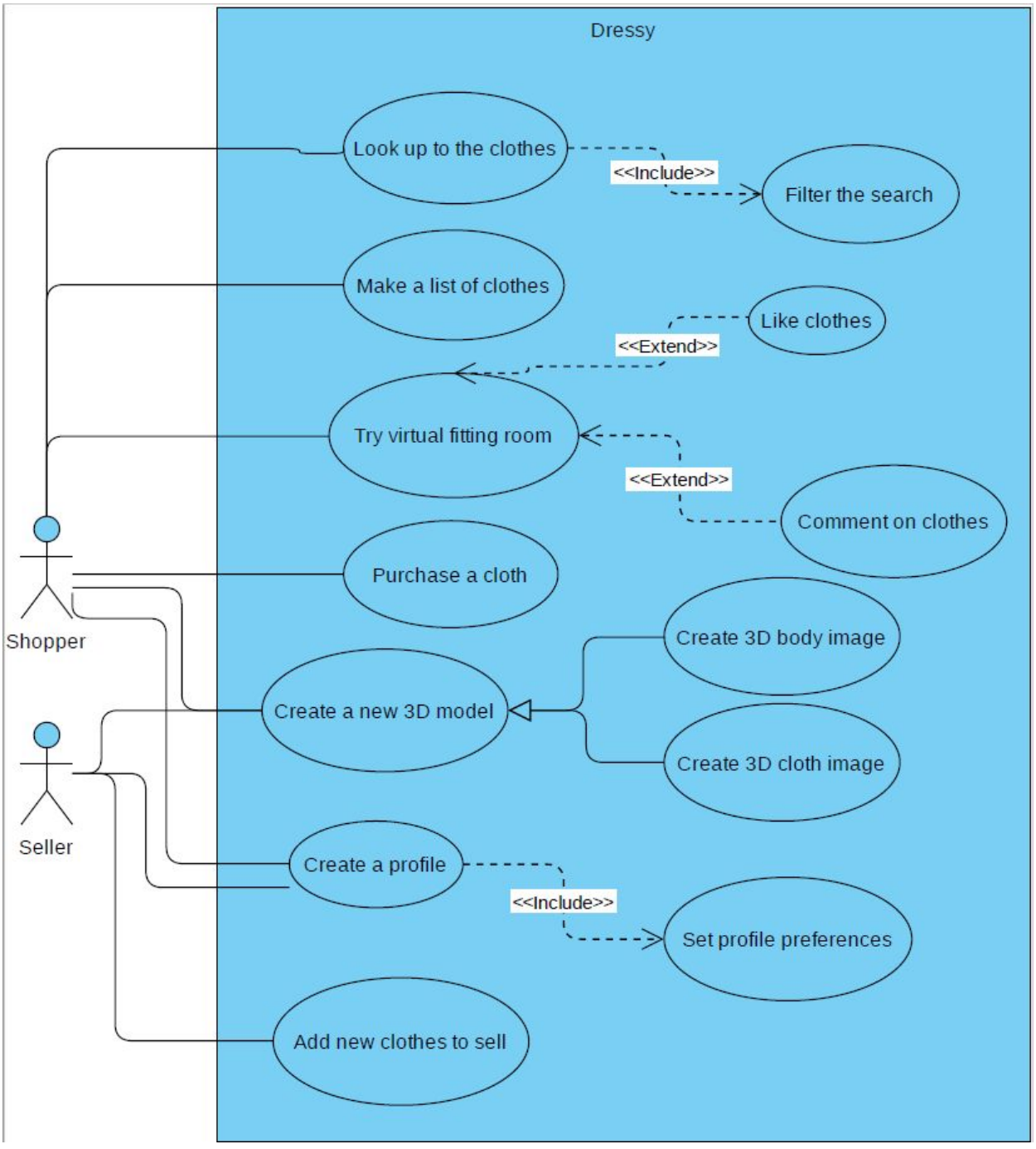

Figure 2. Use-case diagram

3.4.3. Object and Class Model

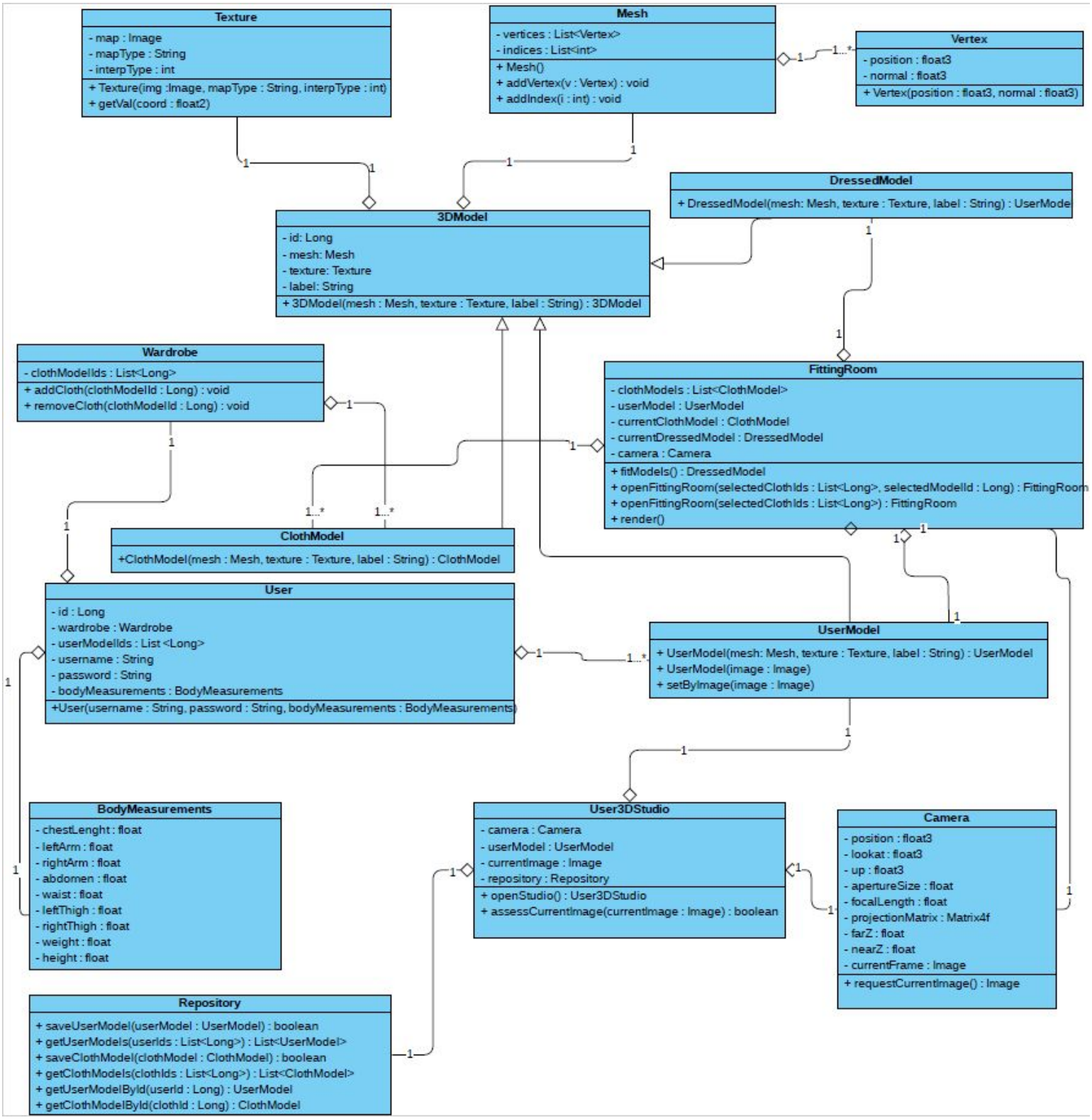

Figure 3. Class Diagram

Link to the class diagram can be found here.

3.4.4. Dynamic Models

3.4.4.1. Sequence Diagram 1. User creates its 3D model and saves the model

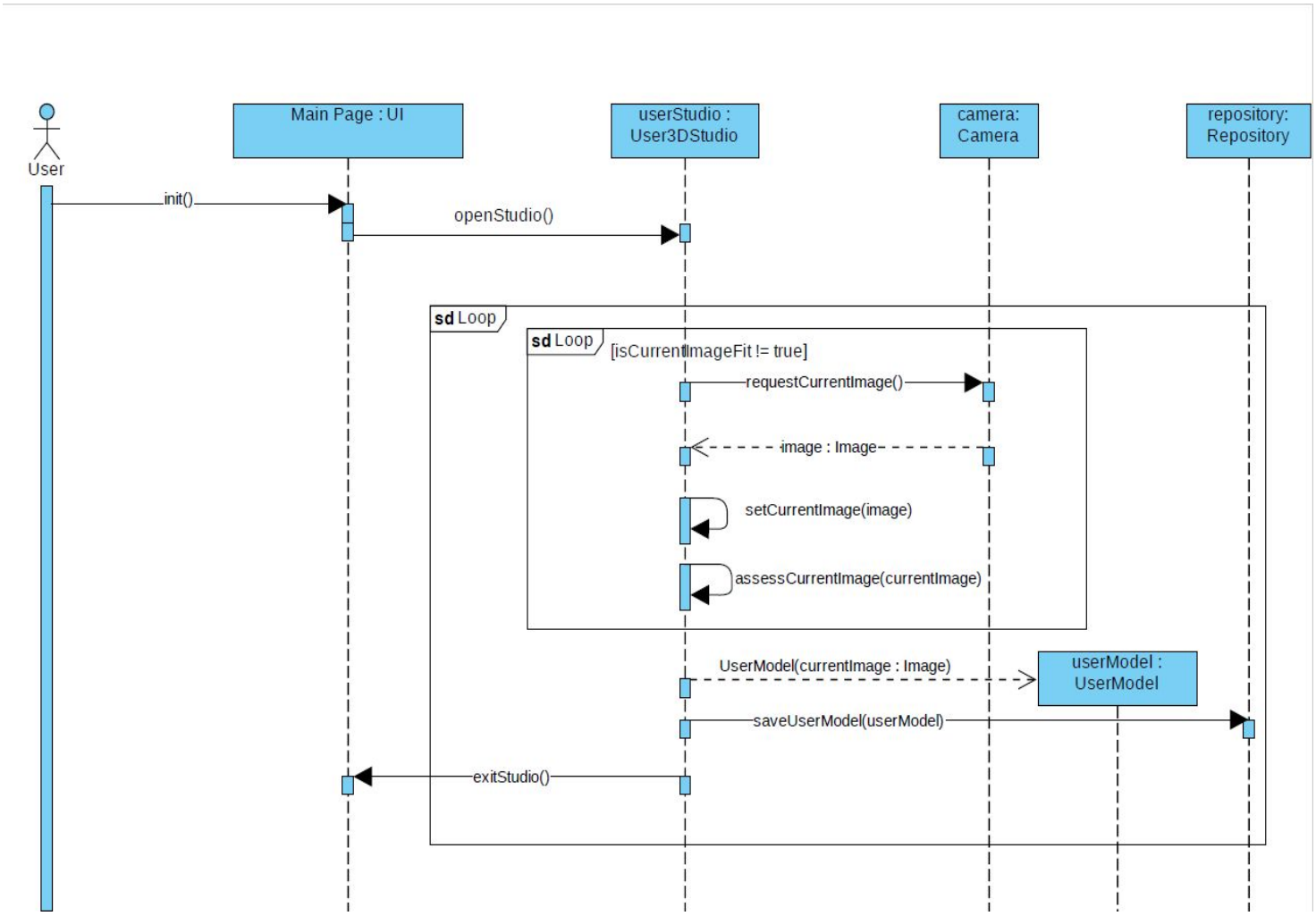

Figure 4. User creates its 3D model and saves the model

Link to the sequence diagram 1 can be found here.

3.4.4.2. Sequence Diagram 2. User tries dresses on its 3D model in the fitting room

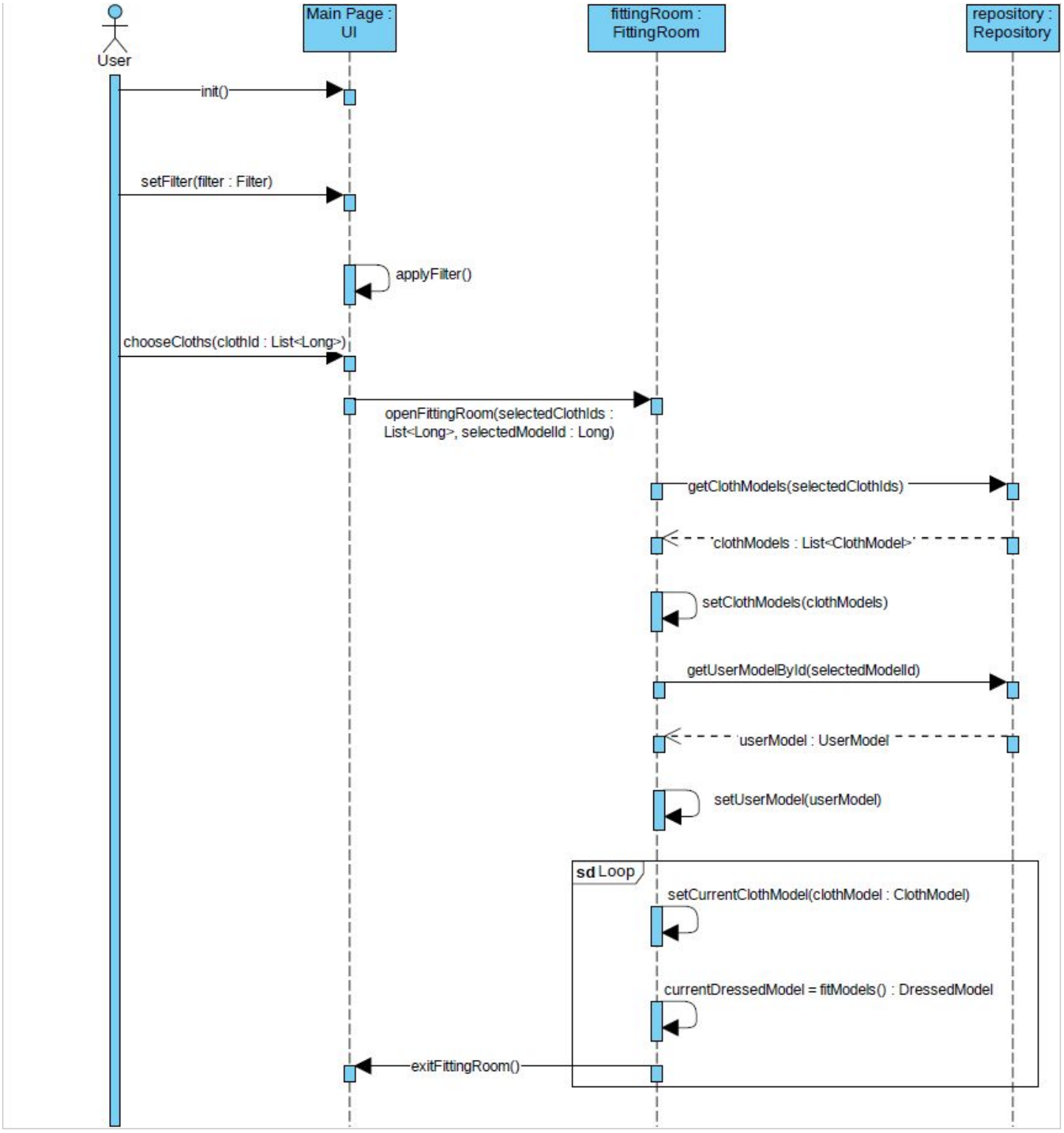

Figure 5. User tries dresses on its 3D model in the fitting room

Link to the sequence diagram 2 can be found here.

3.4.4.3. Sequence Diagram 3. User tries dresses on himself/herself with a camera

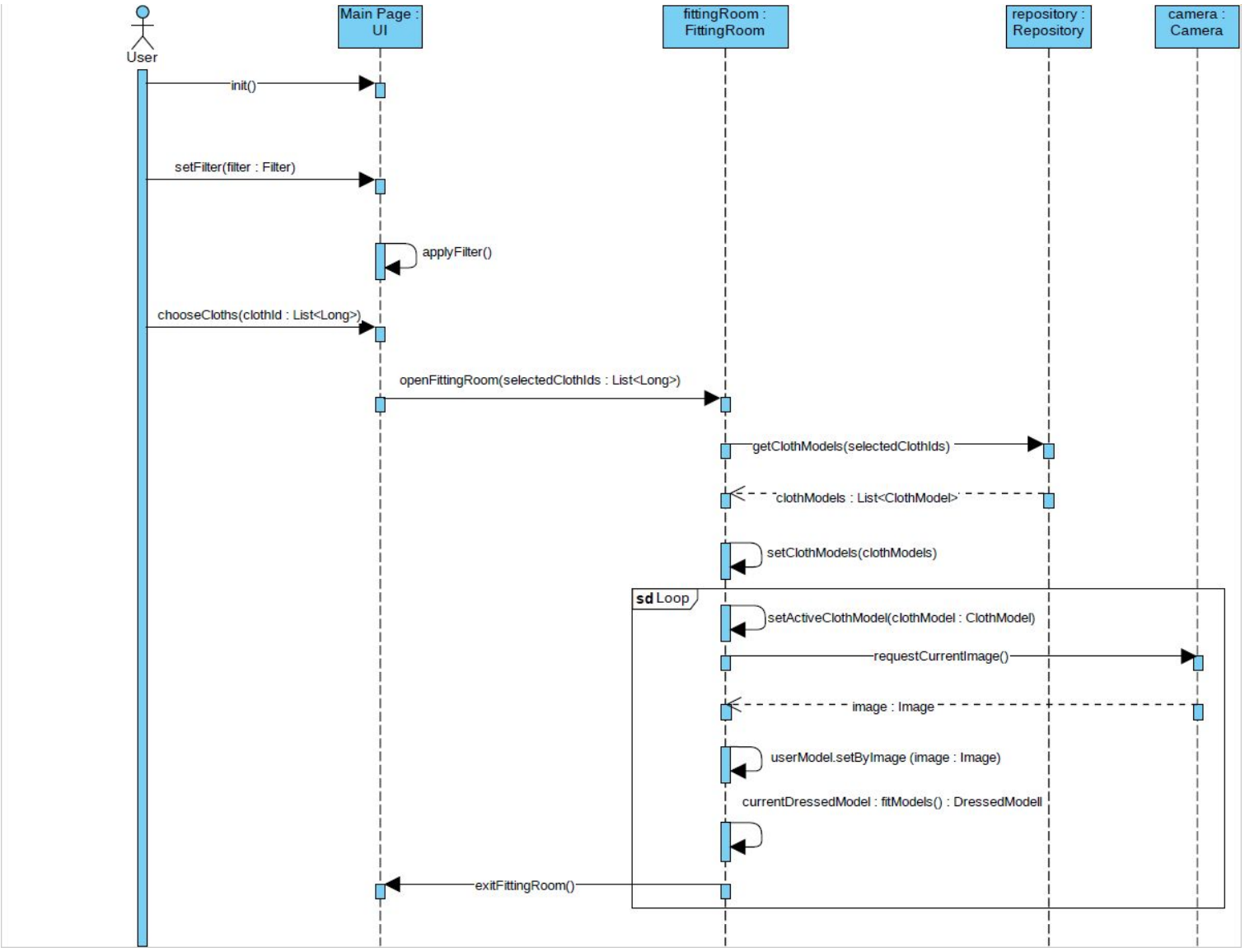

Figure 6. User tries dresses on himself/herself with a camera.

Link to the sequence diagram 3 can be found here.

3.4.4.4. Sequence Diagram 4. User creates 3D model of the cloth

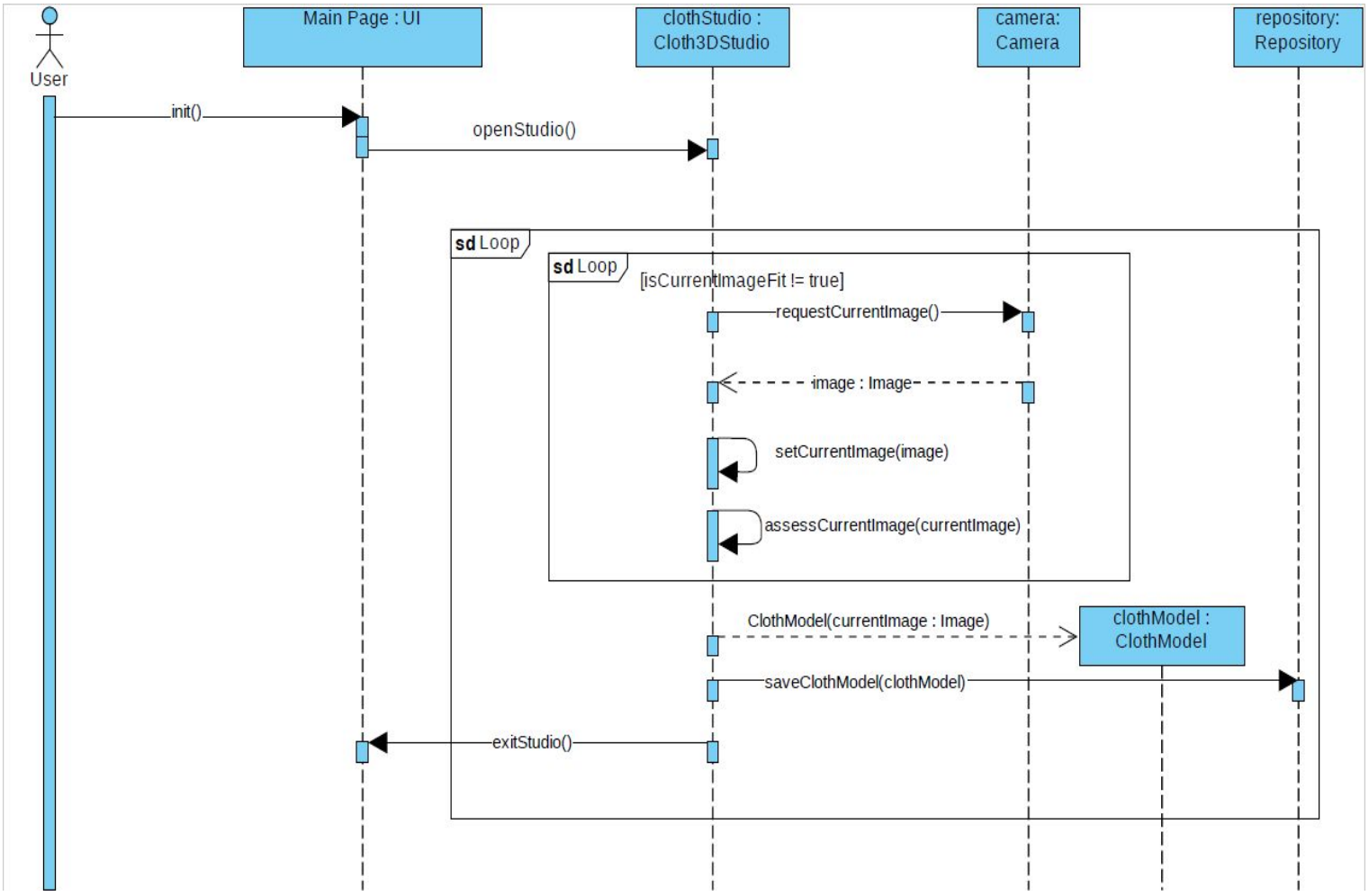

Figure 7. User creates 3D model of the cloth

Link to the sequence diagram 4 can be found here.

3.4.4.5. Activity Diagram

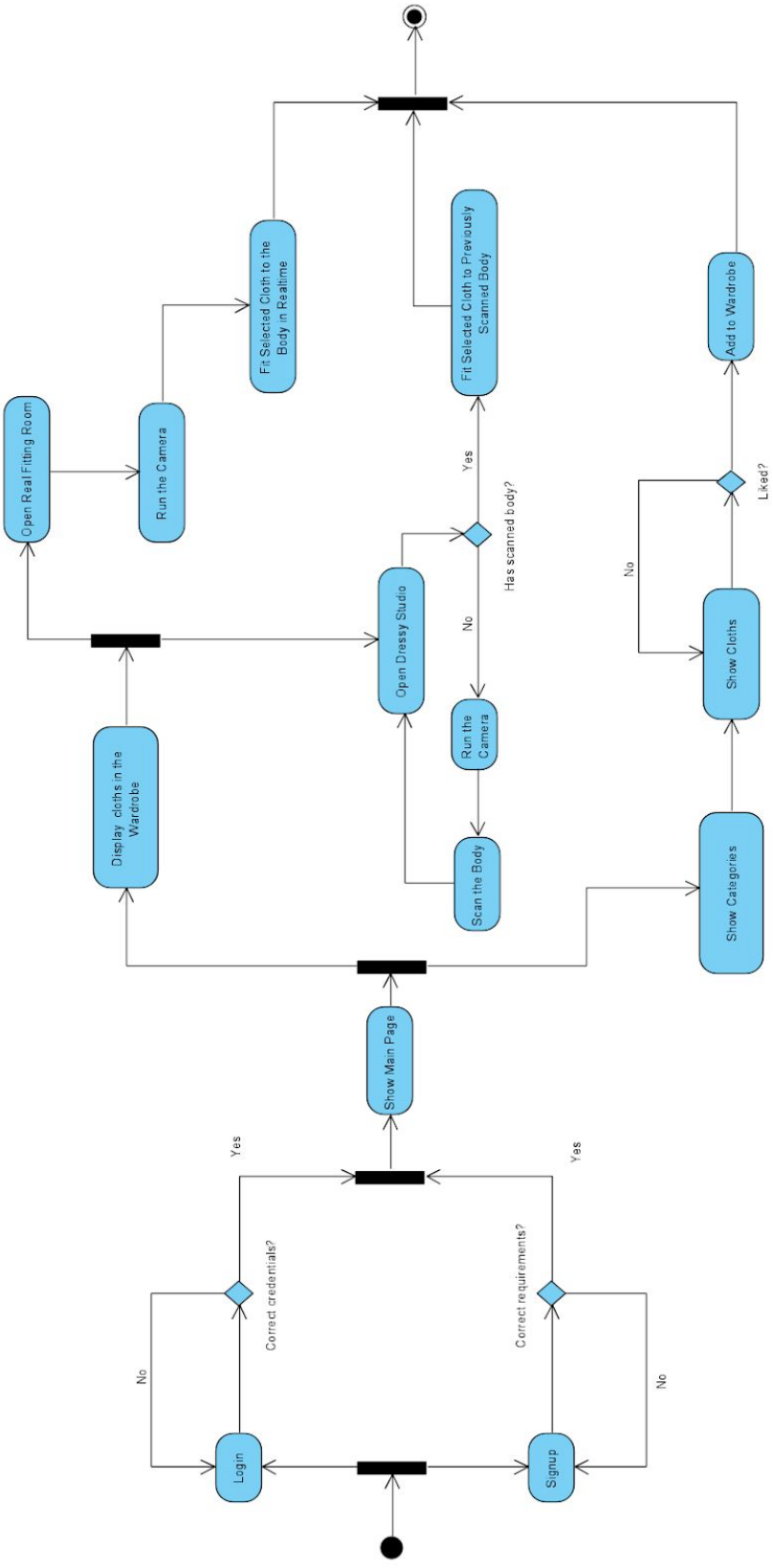

Figure 8. Activity Diagram

Link to the activity diagram can be found here.

3.4.5. User Interface

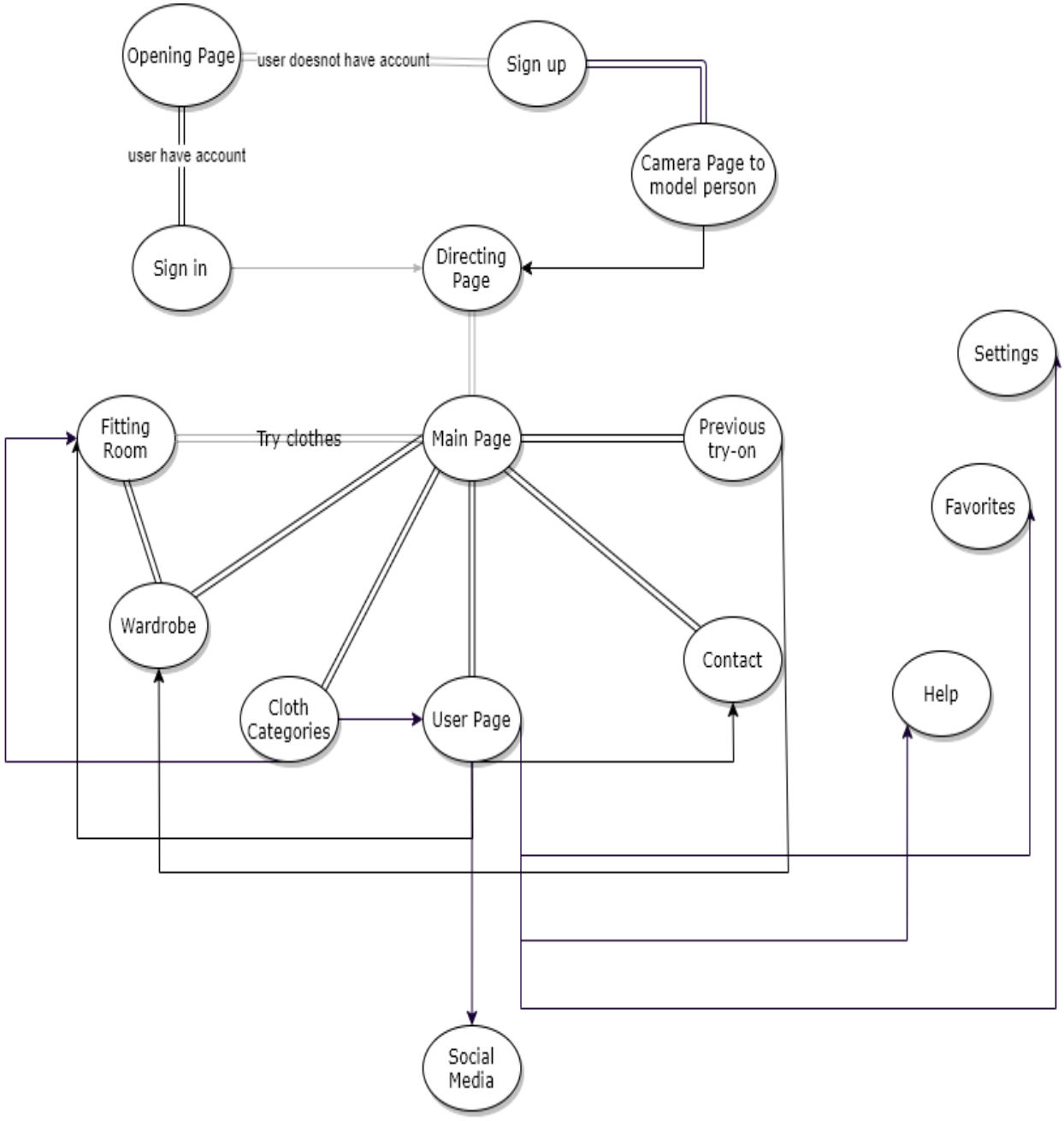

Figure 9. Navigational Path of Screens

The app has a simple overall sequence of screens. There are five main screens in total. These screens are:

- Sign in
- Sign up
- Main

- User
- Fitting room

to be shaped. The pages that progress and branch from these numbers are the pages that form the basis of the features for us. On the main page, if there are the clothes we tried before, it creates a "Previously" section and categorical clothing options that we created in the clothing database. From this page, it is possible to go to the User page, try out clothes in the fitting room, and also go to the contact page where we see our shares with others. From the user page, it is possible to go back to the page with the products that the person keeps as favorites. The settings are accessed from the User page because it aims to make the homepage very simple and for a single purpose. From the settings, it is possible to reach the preferences section for the person. At the same time, it is possible to sign out and re-enter another account or open another account.

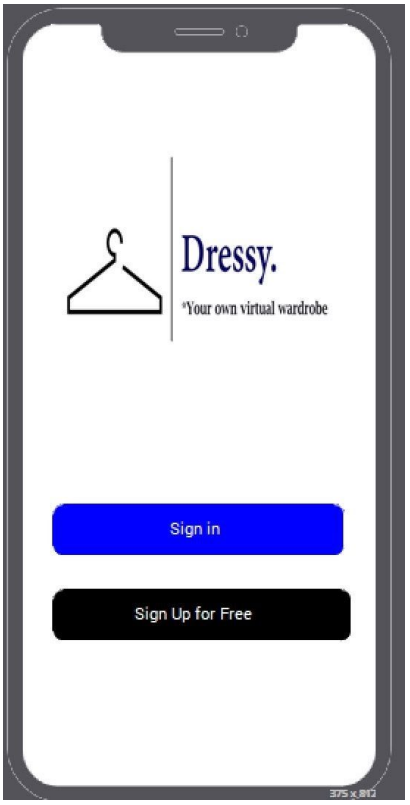

Figure 10. Opening Page

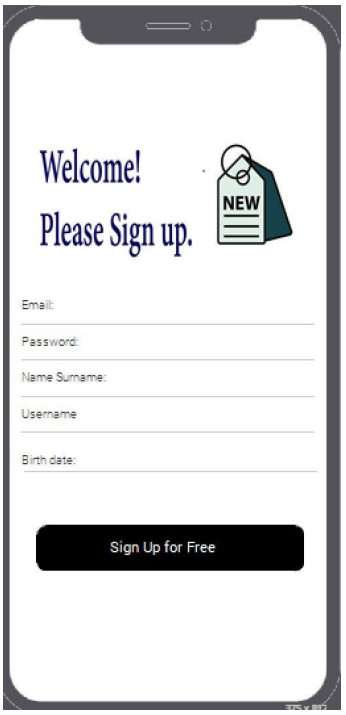

Figure 11. Signup Page

Figure 12. Sign In Page

Figure 13. Directing and Welcome Page.

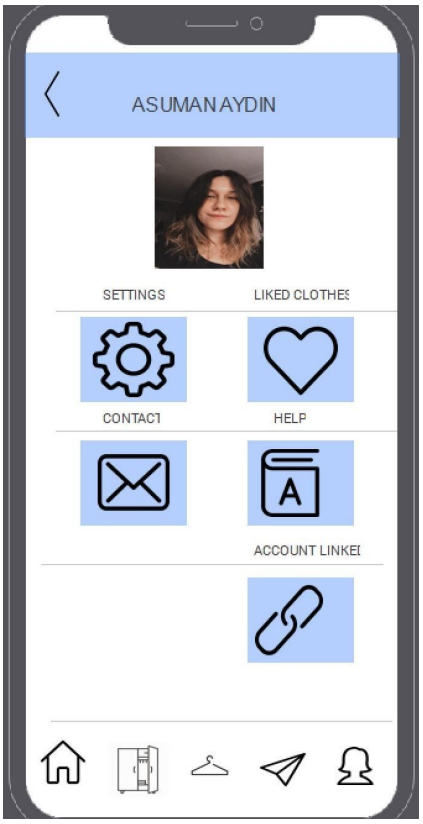

Figure 14. User page

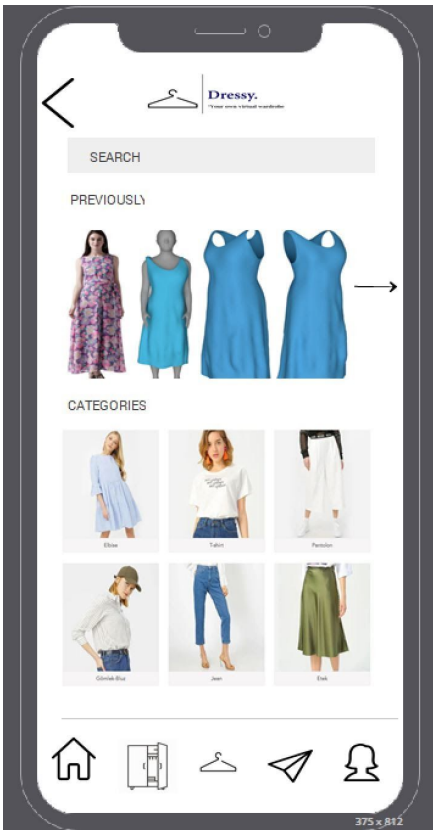

Figure 15. Main Page [6]

Figure 16. Fitting Room [6]

4. Other Analysis Elements

4.1. Consideration of Various Factors

Corona virus has taken over the world in its hands. Due to restrictions maybe even carantina situations pushed people to adapt home life even more than before. People need to stay inside the house for many days and the needs are provided by the online markets, shops and websites such as Hepsiburada, Yemeksepeti. In the consideration of these matters, the idea of online shopping has merged with online product trials in our mind. It was a lighting in our head that we need this, we need some product which will serve people as outside world experience. So in the consideration of many factors, our application might be considered as a life saver. It does not affect social interactions since we provide an interface for interaction in the application. The environmental factors are more on the positive side of the effect on the application.

Table 3 has been given to analyze the factors and effects.

	Effect level	**Effect**
Public health	10/10	Coronavirus affects people's both psychological and physical health. Due to this effect, our application will be a great provider and relief to people.
Public safety	5/10	People need to share their body image and maybe share their preferences. Even though the information will be protected by the network security, the leaks and the attack may cause some damage to people's privacy. So we may need to restrict some of the features due to these privacy issues.
Public welfare	0/10	This factor has no effect on the project.
Global factors	0/10	Globally, getting dressed is a general thing for every country. The application can be applied in any place. So global factors are not major effects.

Cultural factors	7/10	People adopted online shopping but virtual try-on might be not accepted by the elderly or conservative people.
Social factors	10/10	Current social situations are the effect which feeds the idea of the application.

Table 3. Factors that can affect analysis and design

4.2. Risks and Alternatives

- **System Inadequacy:** Dressy will run on mobile phones. The aim of our study is to run the program offline too. It means that the machine learning algorithms which we will use should run on the phone powered by its own CPU and GPU. However, The application can be heavy for CPUs and GPUs on mobile phones or some mobile phones may not meet the minimum system requirements of Dressy. If this is the case, a powerful server will take part to run the complex algorithms that need powerful process units.

- **Failure to Create 3D Virtual Garment Models:** None of our group members has enough knowledge about the research area of the project topic. The members are consequently researching new technologies to improve themselves. Therefore, Dressy may not be able to create garment models by taking photos. If this is the case, previously prepared 3D virtual garment models will be used.

- **Failure in Schedule:** Unexpected cases can occur during development of Dressy such as pandemic. We could be late for our time and accuracy goals. We may not be able to follow the schedule faultlessly. In this case, we could postpone or cancel some additional features from Dressy.

Risks	Likelihood	Effect on the project	B Plan Summary
System Inadequacy for Mobile Phones	2/5	Mobile phone's GPUs and CPUs are not able to run complex algorithms. The program runs slowly.	A powerful server will take part to run the complex algorithms that need powerful process units.
Failure to Create 3D Virtual Garment Models	2/5	Cloths cannot be added by taking photos. Therefore, comparison becomes more challenging.	Previously prepared 3D virtual garment models will be used.
Failure in Schedule	3/5	Time and accuracy goals do not match. That can cause incompleteness in main features.	To eliminate some additional features

Table 4: Risks and Alternatives

4.3. Project Plan

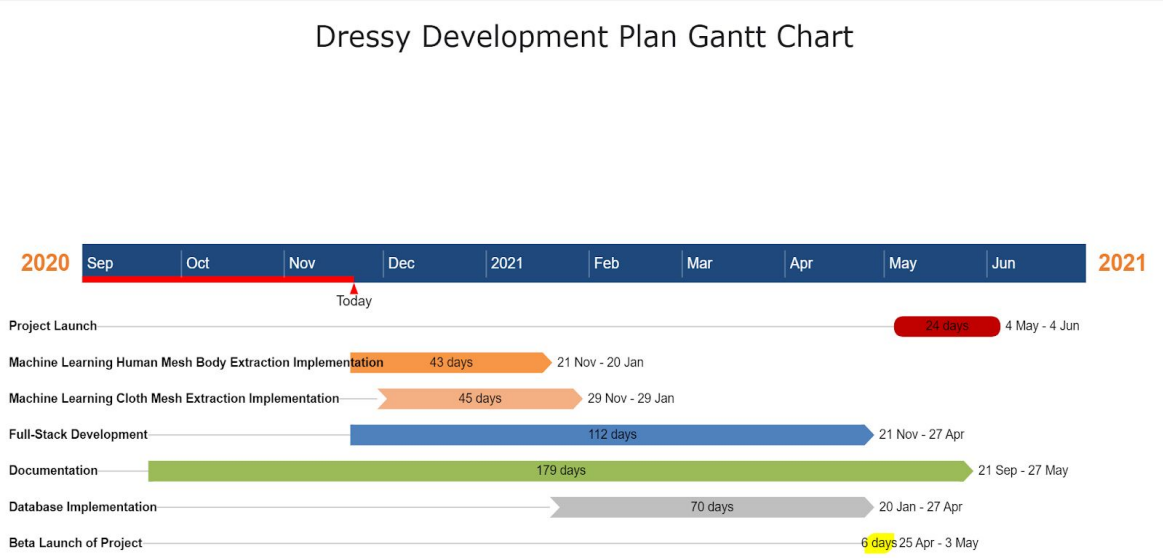

Table 5: List of work packages

WP#	Work package title	Leader	Members involved
WP1	Documentation	Musab	All Members
WP2	Full Stack Development	Asuman	All Members
WP3	Machine Learning Human Mesh Body Extraction Implementation	Doğukan	Musab, Doğukan
WP4	Machine Learning Cloth Mesh Extraction Implementation	Aybüke	Aybüke, Fatih
WP5	Database Implementation	Asuman	All Members
WP6	Beta Launch of Project	Doğukan	All Members
WP7	Project Launch	Musab	All Members

WP 1: Documentation			
Start date: *21.09.2020* **End date:** *27.05.2021*			
Leader:	*Musab*	**Members involved:**	*Doğukan Köse, Aybüke Ertekin, Asuman Aydın, Fatih Çakır, Musab Okşaş*
Objectives: *Documentation helps to get all facets of an application under control and improves the product's efficiency. We concentrate on easy and organized development, maintenance and knowledge transfer to other developers with the help of high-level, low-level and final reports.*			
Tasks: ***Task 1.1 Writing High Level Design Report:*** *This involves the decomposition of a system into components and modules and the interface invocation relationships.* ***Task 1.2 Writing Low Level Design Report :*** *The aim is to specifically design each and every module so that the developer can write the code based on it directly.* ***Task 1.3 Writing Final Report :*** *Summarize how implementation went. Overall, we were able to satisfy non-functional requirements: which functions were effectively implemented, which functions we failed to implement, what kind of improvements were made. Comprehensive installation guides will also be included in the final report.* *…*			
Deliverables ***D1.1:*** *High Level Design Report* ***D1.2:*** *Low Level Design Report* ***D1.3:*** *Final Report*			

WP 2: *Full Stack Development*			
Start date: *21.11.2020* **End date:** *27.04.2021*			
Leader:	*Asuman Aydın*	**Members involved:**	*Doğukan Köse, Aybüke Ertekin, Asuman Aydın, Fatih Çakır, Musab Okşaş*
Objectives: *Implementation of user interface and backend structure of the application.*			
Tasks: ***Task 2.1 Search different design of interface*:** *Searching similar products' interfaces in order to design the interface of the application.* ***Task 2.2 Starting implementation of user interface* :** *After finishing and having an idea about similar user interface designs, start implementation.* ***Task 2.3 Implementation of class diagram*:** Start converting class diagram to source code of the project.			

Task 2.4 Implementation of database connection of application: *Start to implement database connection of the backend.*
Deliverables ***D2.1:*** Interface mockups ***D2.2:*** *Front user interface* ***D2.3:*** *Source code of all classes* ***D2.4:*** *Database communication of the app.*

WP 3: Machine Learning Human Mesh Body Extraction Implementation			
Start date: *21.11.2020* **End date:** *20.01.2021*			
Leader:	*Doğukan Köse*	**Members involved:**	*Doğukan Köse, Musab Okşaş*
Objectives: *Extraction of human's body mesh data using machine learning techniques in order to fit dresses on it.*			
Tasks: ***Task 3.1 Search used techniques*** **:** *Starting to search different techniques to extract human's body mesh and gathering information.* ***Task 3.2 Implementation of one of the techniques*** **:** *Starting to implement the best and efficient technique.* ***Task 3.3 Adapting the implementation into the app*** **:** *Starting to adapt the implementation into the application..*			
Deliverables ***D3.1:*** *Information about different techniques* ***D3.2:*** *Implemented body mesh extraction algorithm* ***D3.3:*** *Machine learning adapted application*			

WP 4: Machine Learning Cloth Mesh Extraction Implementation			
Start date: *29.11.2020* **End date:** *29.01.2021.*			
Leader:	*Aybüke Ertekin*	**Members involved:**	*Aybüke Ertekin, Fatih Çakır*
Objectives: *Extraction of cloth mesh data using machine learning techniques in order to fit dresses on the human body, and to add new cloths to the application.*			
Tasks: ***Task 4.1 Search used techniques*** **:** *Starting to search different techniques to extract human's body mesh and gathering information.* ***Task 4.2 Implementation of one of the techniques*** **:** *Starting to implement the best and efficient technique.* ***Task 4.3 Adapting the implementation into the app*** **:** *Starting to adapt the implementation into the application..*			
Deliverables ***D4.1:*** *Information about different techniques* ***D4.2:*** *Implemented cloth mesh extraction algorithm* ***D4.3:*** *Machine learning adapted application*			

WP 5: Database Implementation			
Start date: *20.1.2021* **End date:** *27.04.2021*			
Leader:	*Asuman Aydın*	**Members involved:**	*Doğukan Köse, Aybüke Ertekin, Asuman Aydın, Fatih Çakır, Musab Okşaş*
Objectives: *Build a consistent database to store and access data of users, diseases and treatments.*			
Tasks: ***Task 5.1 Conceptual Design:*** *Create a high- level conceptual database design.*			

Task 5.2 Create relation schemas: *Build the database schemas on MySQL server.* ***Task 5.3 Normalization:*** *To reduce duplication and to ensure atomicity, normalize the database.*
Deliverables ***D5.1:*** *ER Diagram.* ***D5.2:*** *Relational schemas.* ***D5.3:*** *SQL script for creating the database.*

WP 6: Beta Launch of Project			
Start date: *25.04.2021* **End date:** *03.05.2021*			
Leader:	*Doğukan*	**Members involved:**	*Doğukan Köse, Aybüke Ertekin, Asuman Aydın, Fatih Çakır, Musab Okşaş*
Objectives: *The purpose of beta launch is to monitor for bugs and incosencies and fix them in a short time before the final launch.*			
Tasks: ***Task 6.1 Compatibility check*:** *Fix any inconsistencies between the different parts.* ***Task 6.2 Experimental Launch:*** *The project will be launched to detect initial bugs after the complete integration of all components.* ***Task 6.3 Fixing bugs:*** *Fix detected bugs and do any appropriate changes*			
Deliverables ***D6.1:*** *Ready product for final launch*			

WP 7: Project Launch			
Start date: *04.05.2021* **End date:** *04.06.2021*			
Leader:	*Musab*	**Members involved:**	*Doğukan Köse, Aybüke Ertekin, Asuman Aydın, Fatih Çakır, Musab Okşaş*
Objectives: *Release a successful product in the marketplace*			
Tasks: ***Task 7.1 Testing*:** *Once again, test the application after beta launch; make sure the software works well.* ***Task 7.2 Organizing*:** *Clean up Github repository, merge all branches into master, organize files.* ***Task 7.2 Create Executable*:** *Build a single executable file.*			
Deliverables ***D7.1:*** *Well- documented source code* ***D7.2:*** *Final product* ***D7.3:*** *Online website*			

4.4. Ensuring Proper Team-Work

The senior design project is very different compared to other projects in our university life. It is a much more important project for us, both in length and seriousness. Therefore, division of labor and time control are two key factors for the senior design project. Under the conditions created by the coronavirus, we are trying to run the project online. This becomes a limiting factor for us. In order to overcome this kind of obstacle, we decided to have two full-stack developers, a team leader, a communication manager and tester, and a UI designer and developer in our

five-person project group. These 6 divisions of labor became a system that made everyone's duty clear for us and that the time and effort to be given to everyone was determined. In addition, after the weekly meeting with the supervisor, we continue to follow the business over the phone and Discord by making our weekly plan and distributing the part suitable for everyone's business.

4.5. Ethics and Professional Responsibilities

In order to design an application with a high usability rate, we need to save body measurements data related to the user. Even if this data may not seem very risky, any unauthorized sharing of this data may lead to violation of privacy rights. Therefore, we will be careful about not sharing this data with any third-parties.

We also need to access the camera of the users' phone in order to run our application. This access permission to the camera will not be used for any other purpose than acquiring the data needed to run the application.

We should provide Terms and Conditions Agreement in order to inform the user about access permissions. We should let users decide whether they want to use the application or not with the knowledge of the data we obtain.

In addition, we should be careful about using libraries, frameworks, APIs, or any material from the Internet because of the copyright issues. We need to choose open source alternatives of these tools. Besides, we need to give credit to the owners of the code while using code of different developers.

4.6. New Knowledge and Learning Strategies

Learning how to fit the clothes on a user is not an easy task. We need to quickly learn new technologies, try them, and decide whether to use them for our project or not. We need to get some computer vision knowledge and be aware of the market. For this purpose, we need to read articles, examine the projects done previously, and watch online tutorials related to these technologies. We will also benefit from online platforms such as StackOverflow in order to get answers to our questions related to the bugs we encounter or technologies we use. We also need to benefit from the manuals of the technologies we use and try to get connected to the community utilizing these tools and technologies.

5. References

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