

Image-Based Virtual Clothing

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ABSTRACT

Online shopping has found speedy growth for the fast-paced world in the present situation. Precisely garments shopping are one of the most exciting parts especially for ladies. The continuous changing fashion and newly designed outfits motivates customers for shopping. New online shopping stores have added an ease for shopping your desired products by removing the constraints of places and time limits. As far as garments are concerned, predicting the appropriate size and imaging the real life look of that garment just by viewing its image is a challenging task.

The project introduces an easy and feasible solution for the online shopping try-on scenario by introducing an app with a digital try-on feature. It can enhance online shopping experience. In this project, we propose an idea for fitting a given 3D garment model on a person. We will use 3D models of the clothes that will fit on the image of the user and enable a user to see himself/herself wearing virtual clothes. The 3D models of the clothes are stored in the system. On opening the application, user can view the clothes available and by using the mobile's camera the user can get an idea of how the garment will fit on him/her. This way the user can have a fair idea about the look of the garment.

Keywords— Virtual, Clothing, Image, 3D, Online Shopping

I. INTRODUCTION

There can be multiple problems a user can face while he/she goes out to shop. The trial of the same cloth by multiple users may lead to various skin diseases to the customer and also degrade the quality of cloth. The chances of having a camera in the trial room and violating the privacy of customers are a major issue in India. On the other hand, the seller's job also becomes tedious. If such problems are addressed by an effective solution, then the pleasure of shopping can surely be increased leading to a huge profit to sellers as well.

Online shopping has found speedy growth for the fast paced world in the present situation. Instead of people walking in and out of the several shops to find their clothes, they only buy them at home using a single click. Shopping online gradually becomes a kind of fashion with

the prevalence of Internet and e-commerce. At the same time, as the development and the increasing integration of network and information technology, many traditional media contents go for digital methods.

But as many people now-a-days tend to go for online shopping, it is not the case that the customer is totally satisfied. Trying on of the clothes takes place only after the product is delivered to the customer. It is better for the customer to get an idea about how the clothes will look on him/her before actually buying it. Analysing the look of the garment on oneself is a problem in online shopping and can lead to customer dissatisfaction. There is a need to find a solution for this problem and thus reducing the tedious process that follows for returning the product. This solution has to be user friendly, efficient and embedded with advance technology. Virtual Try-On can prove to be a solution for eliminating the problems. It provides an option to try on the clothes virtually without actually visiting a shop and physically try on the clothes.

II. LITERATURE SURVEY

1. Literature Review

- **Unity 3D**

Unity3D is a powerful cross-platform 3D engine and a user friendly development environment. Unity3D is efficient for rendering 2d and 3d scenarios. The engine can be used to create both three- dimensional and two-dimensional games as well as simulations for its many platforms. The quality offered by unity3D is far better compared to any other applications for 3D development. Unity is a cross-platform game engine primarily used to develop video games and simulations for PC, consoles, mobile devices and websites. Unity is used for scripting, scene creation, animation, app architecture development, level design, motion design, and physics implementation. Flutter

Flutter is an open source UI software development kit created by Google. It is used to develop applications for Android and IOS from a single codebase. Flutter is not a language, rather an SDK just like Android SDK. For android development Java/Kotlin are the

programming languages, for cross-platform development using flutter, DART is the official programming language. The SDK is free and launched as a source developer to explore and create powerful tracking applications around. It is the reason for apps and interface made with flutter.

- **DART**

Dart is an open-source general-purpose client-optimized programming language for developing apps on multiple platforms. It is developed by Google and is used to build mobile, desktop, server, and web applications. Dart is an object-oriented, class-based, garbage-collected language with C style syntax language. Dart can compile to either native code or JavaScript. The Dart SDK comes with its compiler – the Dart VM. The SDK also includes a utility -dart2js, a transpiler that generates JavaScript equivalent of a Dart Script.

- **Vuforia**

Vuforia is an augmented reality software development kit (SDK) for mobile devices that enables the creation of augmented reality applications. It uses computer vision technology to recognize and track planar images and 3D objects in real time. This image registration capability enables developers to position and orient virtual objects, such as 3D models and other media, in relation to real world objects when they are viewed through the camera of a mobile device. The virtual object then tracks the position and orientation of the image in real-time so that the viewer's perspective on the object corresponds with the perspective on the target. It thus appears that the virtual object is a part of the real-world scene.

- **Firebase**

Firebase is a backend platform for building Web, Android and IOS applications. It offers real time database, different APIs, multiple authentication types and hosting platform.

2. Related Work

A Mixed Reality Virtual Clothes Try-on System Article in IEEE Transactions on Multimedia · December 2013

This paper has a brief description over mixed reality system for 3D virtual clothes try-on. It automatically customizes an invisible (or partially visible) avatar based on the user's body size and the skin color and use it for proper clothes fitting, alignment and clothes simulation. The contributions in this paper are summarized as follows:

- 1) They have proposed a system that allows the user for trying-on various virtual clothes with one consumable RGB-D sensor. As concluded from their user study, this system can help users to make their purchase decision without physically trying- on clothes.
- 2) They automatically customize an invisible (or partially visible) avatar and use it for proper clothes fitting, alignment and clothes simulation. This includes:

- i) A body customization algorithm to modify the avatar based on the user's body sizes,

- ii) A method for adaptively matching the avatar's skin color to the user's face skin, and

- iii) A method for robustly aligning the customized avatar with the user's image.

Towards Photo-Realistic Virtual Try-On by Adaptively Generating(Preserving Image Content)

This paper propose a novel visual try-on network, namely Adaptive Content Generating and Preserving Network (ACGPN). In particular, ACGPN first predicts semantic layout of the reference image that will be changed after try-on (e.g. long sleeve shirt arm, arm jacket), and then determines whether its image content needs to be generated or preserved according to the predicted semantic layout, leading to photo-realistic try-on and rich clothing details. ACGPN generally involves three major modules. First, a semantic layout generation module utilizes semantic segmentation of the reference image to progressively predict the desired semantic layout after try-on. Second, clothes warping module warps clothing images according to the generated semantic layout, where a second-order difference constraint is introduced to stabilize the warping process during training. Third, an inpainting module for content fusion integrates all information (e.g. reference image, semantic layout, wrapped clothes) to adaptively produce each semantic part of human body. In comparison to the state-of-the-art methods, ACGPN can generate photo-realistic images with much better perceptual quality and richer fine-details.

III. PROPOSED SYSTEM

This project aims to provide a convenient mobile application for the customers to get a digital try-on the of clothes that have been developed using an open-source UI software development tool (flutter) and Unity3D. The user interface is designed purely using flutter with the use of Dart language and firebase is used as the database for storing the user information and the products. For storing the 3d models of the clothes the Vuforia kit is used.

The 3D models of the garments are stored in the database for the available clothes. If a new model is to be added then the 3d model is added in vuforia kit. The admin then adds the clothes and description of the clothes in the app database through the app interface that are then visible to the user in the app. The available items are displayed in a list

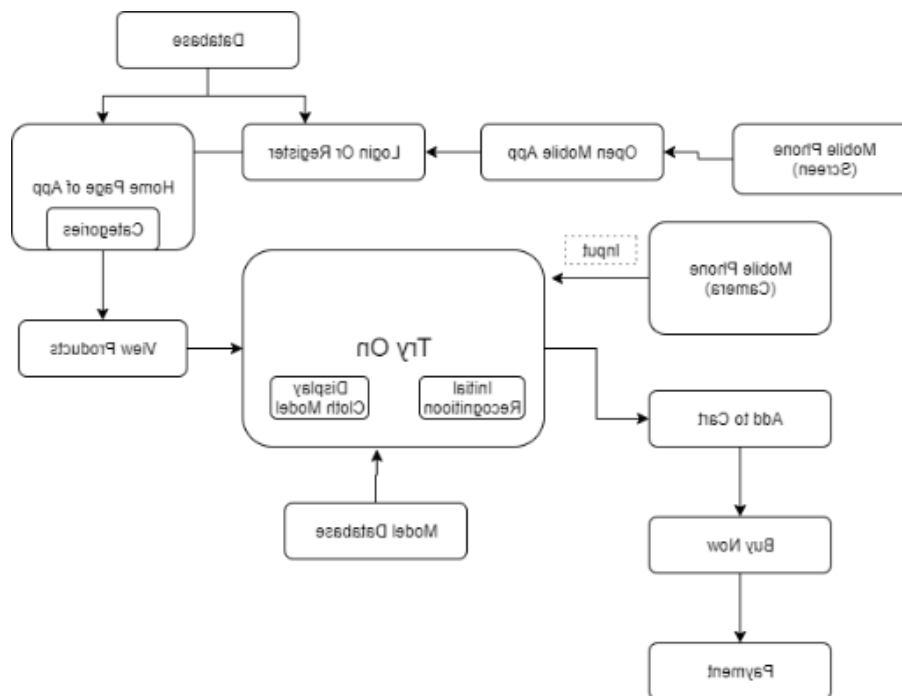
The user needs to create an account and log in the system to be able to view the list of clothes available through the UI. Once the user is logged in, he will interact with the mobile application and go through the various categories available. A list of cloth styles will be

displayed. The customer then selects the desired cloth to try.

The user can see all the details of the items available and the user can add the items to cart. There is a button for try-on of the clothes. When the user clicks on try-on, he will be redirected to Unity interface where the camera of the mobile is on. The user needs to stand in front

of the camera to get a view of the garment on one's body. The 3D cloth models are fetched from the database and using an algorithm overlaid on the customers and displayed on the mobile screen.

The customer can then decide which product to buy and can proceed to payment process.



IV. IMPLEMENTATION DETAILS

The implementation of the proposed system is highlighted with help of an architecture diagram (fig. 1). The core system design is divided into modules. Modules and their implementation details are as follows: The first phase includes the mobile app while the second phase includes the use of augmented reality technology.

1. A mobile application using Flutter
 2. Augmented Reality try-on room
- Virtual Try-On has following modules:

1. App Module

Flutter is an open-source framework created by Google for developing mobile applications. It can be used to develop both Android and iOS applications. The apps built using flutter are written in dart language. The Flutter applications can be developed directly from Android studio by configuring flutter SDK in it.

• Login and Register

The first step is to Register and then Login to use the app. This module will register a new user and store the user details in the database. When the user wish to use the app again, he/she can use the information and continue

using the app. If the user is not registered, he/she will not be able to login directly. The user data is verified from the database and then the user can proceed further.

• Database

We will be using firebase database for storing the products, user details and 3d models of the products. When the user will register, the information will be saved in firebase database and when user logs in, the data is fetched and user is authenticated. You can query the Firebase Auth backend through a REST API. This can be used for various operations such as creating new users, signing in existing ones and editing or deleting these users.

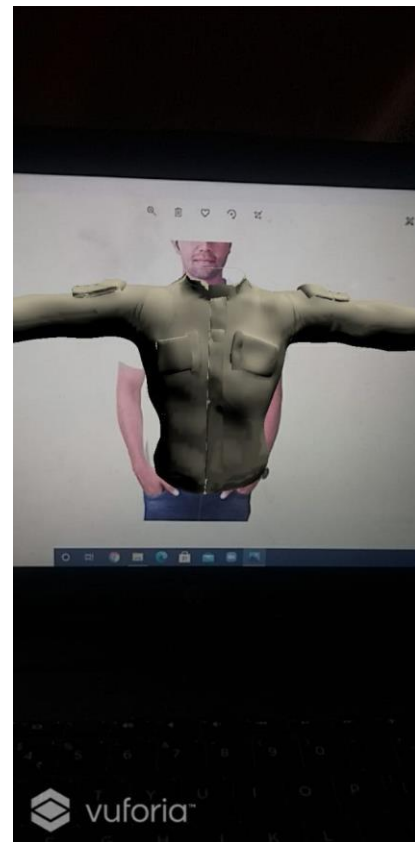
2. Augmented Reality Display

For Augmented Reality, we will be using Unity software to show the 3d images on the app screen. Unity will be integrated with flutter app and 3d images of clothes will be displayed.

• Object Detection

Real-time object detection in Flutter using camera and tflite plugin. tflite is a Flutter plugin for accessing TensorFlow Lite API. Supports image classification, object detection on both iOS and Android.

V. RESULTS



VI. CONCLUSION

There are a lot of shopping apps where customers can buy the clothes but it involves guessing work of how the cloth will look on the customer. The advantages and disadvantages of various existing dressing methods are analyzed, and a new way of virtual dressing is proposed. Virtual Try-On presented an efficient and affordable method for real time virtual dress up system. This method consist of two steps: explore the shopping app and select the cloth and second is to try it on using the mobile camera. There existed many benefits from this real time virtual dress up systems for customers, shop owners and companies, such as space saving and reduce wasting cloth tried on. Moreover, it did not require physical space and it was much easier to use. The system has a resize option so that the cloth will fit on the person perfectly. The customer can take a picture of his/her virtual dress-up and can get opinions of other people. It also made people easier to choose dress perfectly within a short time with the social media sharing. Finally, experimental results were demonstrated this proposed method is accurate and reliable to solve the promising and challenging real-time automatic dress up system.

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