

DESIGN AND IMPLEMENTATION OF VIRTUAL FITTING ROOM BASED ON IMAGE BLENDING

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Abstract — In the 21st century, Fashion is not only the thing we put on, it is a way of life. The fashion trends change almost every day. Trying different jewels in a physical shop and finally selecting the right one is a time consuming and a bit tedious task. Whether technology can improve upon this situation and thereby provide better satisfaction and experience to buyers. This paper presents human-friendly interface of Virtual Fitting Room Application on Android based devices. The proposed system helps to choose jeweler, which can be worn virtually, on a virtual display screen. It results in saving of users' as well as sales person's time. To achieve this, the methodology includes automatic detection of human face and neck on which the chosen jeweler is superimposed. An Image Blending approach may be used to achieve superimposition. Finally, the jeweler-worn image is displayed on screen. Proposed Virtual Fitting Room is software based and a designed to universally compatible with Android based device does not require any proprietary hardware components or peripherals.

Keywords-Virtual Fitting Room(VFR), Virtual Mirror, Augmented Reality, Face Detection, Google Play Service Library

I. INTRODUCTION

Fashion is a well known style or practice, especially in clothing, accessories, makeup, footwear or furniture. Fashion is a unique and frequently habitual trend in the style in which a person dresses. Shopping is a time-consuming activity for a few social people, while for others a much enjoyed one [1]. Virtual Fitting Room attracted a complete lot of interest of men and women in last few years. It is similar to Trial Room but there is placed Virtual Mirror instead of real Mirror. Virtual Mirror is a computerized mirror that works like a real mirror in which a user is allowed to see him/her for different applications [2].



Figure 1. Virtual Mirror

1.1 Motivation

Users commonly try on many items and spend lots of time for them to don and doff to purchase jewels. In Stores, many mirrors are located to help users for making their decision to buy jewels looking well. Sometimes, it is very inconvenient for them to try jewels carefully each time and put on whenever they find attracting of them and also for sales person who has responsibility to take care of jewels. Due to security reasons, there is also a restriction on the number of jewels that can be taken at time for trial. It builds the general shopping time because of multiple trips from the shelves to the trial rooms. Virtual Fitting Room yield out the solution to this problem.

1.2 Problem Definition

Virtual Fitting Room is a digital interactive platform that helps the real stores try out jewels quickly and seamlessly. The Virtual Fitting Room System captures the image of the user and selects the desired accessory in front of screen which allows the user to see how they look in it.

1.3 Objectives

The proposed system gives different objectives as follows: It helps to choose jewels in virtual display screen and can be tried virtually rather than physically and Sales person does not need to show every jewel by hand. So lots of time is saved by user as well as vendor while shopping in the real-store. It stops stolen jewels and any damage for jewels. It can be easily operated and Low Cost and It gives better satisfaction and experience to buyers and sales person.

1.4 Scope of Paper Work

The Proposed System works on universally compatible Android based device does not require any proprietary hardware components or peripherals. Thus, it is reduced the cost for constructing system and maintenance cost for it.

1.5 Organization of paper

Chapter I gives a general awareness of Virtual Fitting Room, Problem Definition, its Motivation, Objectives and Scope of paper work. Chapter II describes the survey of existing Virtual Fitting Rooms, its goal and limitation of its.

Chapter III presents overview of proposed work i.e. proposed algorithm, flowcharts and experimental parameter, expected outcome of proposed work and design constrain. Chapter IV shows implementation results of proposed method and Finally, Chapter V presents conclusion of overall proposed system

II. LITERATURE SURVEY

Several commercial products exist for VFR usage. Styku [3] presents a body scanner that scans the complete user and creates a 3D model of the user. This 3D model is then used in web pages to try the clothing on body. The model can match any size and can be rotated. It uses a color map to analyze the fit. The body scanner is implemented using sensor devices Microsoft's Kinect and Asus' Xtion. Thus, this System requires powerful scanning technology and 3D camera to give good solution.

A VFR implementation by JCPteen [4] gets an image of the user and use adobe flash player to display the clothing items on user. At First, it shows a shadow on the screen where user has to fit them and after that the cloth is appeared. In this system if the user is moving, the item will not track him, only shows how it looks as a fixed template.

Zugara [5] offers VFR is like to the JCPteens since the items don't track once they are shown. It is based on the augmented reality principle. The VFR doesn't consider the extent of the user, only shows how it appears to be as a fixed template. Similarly, Swivel [6] is labeled as a trial system that user can see how clothes and accessories look on them in real-time.

The Ray-Ban [7] is a web page; there is a Virtual Mirror where a user can see how the glasses fit on him/her. If the user turns his/her head, the model fits the glasses on user's face. User only require to download a plug in and install and integrate with own system. The program works based on augmented reality principle: At First, the user has to match the face area within a position the eyes in a line and a shape that it is shown on screen so it can take a reference of the head. After that it displays the glasses that have been chosen.

Divalicious [8], proposed app for Android mobile device, called itself as a virtual dressing room with more than 300 brands, stored on Google Play. It works by changing the clothes of a default model.

Martin et al [9] proposed human friendly design for virtual fitting room applications targeting both android based mobile device and personal computer. The interface consists of a three-task: First, detect and sizing of the user's body. Second, calculate reference points through on face detection and augmented reality markers. Third, superimpose of the cloth over the user's image.

The traditional shopping and online shopping has been walking hand in hand from past decade. The online shopping raised the need of the virtual trial rooms for the customers. At the same time, the traditional shopping also needed the same for saving the valuable time. Luible et al [10] has proposed an internet based technique for virtual fitting rooms. But this system was not real time. This system also required the motion capturing system based on the marker, for creating the animated avatars.

Later, Zhang et al [11] proposed another innovation utilizing multi-camera systems. The core necessity is to capture the motions of the user for developing virtual trial room, as these motions will be shown in the animations. For finding the correct size clothes, the approximate measurements of the user are also required.

Krahnstoeber et al [12] proposed a framework for extraction and initialization of the articulated models from the visual data sets. The framework uses the Bayesian Motion Segment for above mentioned process. The captured image sequences are disintegrated into the firm components that are later to be used for parametric motion. The joint information is obtained from the relative motion of these components. The resulting components then form the visualizations. The limitation of this approach is completing the thorough handmade models. More research is needed in the field of capture, analysis and synthesis for more detailed and accurate system.

Miki et al [13] proposed a new method for capturing the motions based on the twist-based model. This method aims to find widespread applications categorized in the three tasks: First, applications involving the interaction with virtual world avatars either in video game or computer graphics animation. Second, classification and identification of the users, their gestures, motions and conducting an advanced user interface using it. Similarly, third, the personalized sports training, clinical orthopedic patient's studies, and choreography.

Guan et al [14] proposed a technique called, "DRAPE". DRAPE is a learned model of apparels that trained with different body shapes and sizes then simplifies dressing of 3D avatars of different body shapes and sizes but the learned model is only as good as the input from it is trained. The model is an approximation and gives the solution animated.

Zahangir Alom [15] et al proposed system that consists of multiple tasks: First, Extract different body parts, Second, Torso detection which detect the body parts consists joins and arms, Third of Resizing input dress images based on user body size and finally superimposed dress up using blending techniques over subjects. The presented torso detection gives accurate results, but it has limitation. The use of torso detection will fail in images if the user's clothing color is too nearer to their skin color. The torso detection also gives less optimal results in cases where the user's cloth contains multiple dominant colors.

Pughazendi [16] et al proposed the augmented trial room using raspberry pi, web camera and a normal personal computer. The system gets the frame continuously from the camera and sent to the server side. It is converted into grayscale images which make it easier to eliminate the background pixels and other unwanted frames. Using HAAR algorithm, if face is detected then it will show the jewel on the neck and user is able to adjust the position of the jewel. The limitation of the system is that speed, the speed of capturing frame is very low. Analyze a 320 by 240 image using a 1.2 GHz ARM 11 processor; a frame rate of 3 frames per second was achieved.

The key difference in our approach is the absence of any exclusive hardware components or peripherals. Thus, reduce the initial cost for constructing the system and maintain cost of it. Proposed VFR also works with dynamic template rather than default fixed image. Proposed VFR is also software based and designed to be universally compatible based on android using a camera. For the proposed system, the minimum API version 14 is supported. Additionally, proposed algorithm detects face in different orientation and can resize the items according to user image.

III. PROPOSED WORK

The Proposed System will be developed using Eclipse and Android SDK [17] used in combination with ADT plug in Eclipse present a flexible environment to build and tests any Android applications. This app is available for any android device with camera. Once the proposed system is started, the user can choose between different choices. First user has to selects the jewels that she wants to try. The system detects the face of the user and it displays the jewels using as reference a rectangle that is drawn around the user's face.

The area of this rectangle depends on the user's face: if the user is close to the camera the rectangular shape will be bigger, on the other hand if she is farther it will probably be smaller. By using this rectangle and references, the jewel that are going to appear in the screen are scaled by the system. The proposed system works on different types of jewels likes necklace, earring and tikka. In order to calculate the position where the image has to be displayed, the measurements from the face rectangle and the image width and height have been used. If the image is necklace then it is displayed setting the origin, reference point, at the bottom-left corner of face rectangle. The width of image, to display on face neck, is calculated from the reference rectangle and the image height is calculated by scaling of its width i.e. display on screen. The equations applied are:

$$\text{Origin point of Image} = (\text{Rectangle. left}, \text{Rectangle. bottom})$$

$$\text{Scale of Image} = \frac{\text{Viewwidth}}{\text{Imagewidth}}$$

$$\text{Viewheight} = \text{Imageheight} * \text{Scale}$$

Similarly, calculate the position of earring and tikka to display on face. Viewheight and Viewwidth may be different for different items.

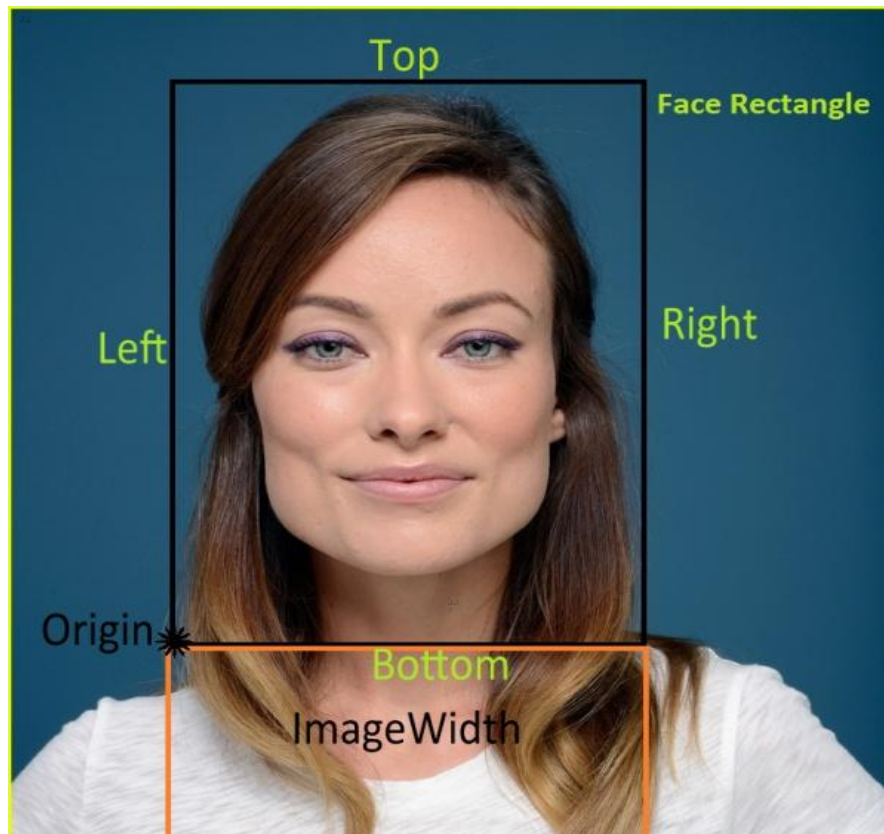


Figure 2. Calculation for the Position

As expected, the camera tracks the user in real time. To implement the face detection, the Android's new Mobile vision API[18] is used, release of Google Play Service 7.8, addition of new APIs, which can detect the face from the previous frame and indicate facial features as the position of the eyes or the mouth. The API detects human faces in images and video different orientations and with different facial features facial expressions. So, if user's head is turned sideways, it can detect it. And also Specific landmarks can be detected on faces, such as the eyes, the nose, the mouth and the edges of the lips[19]. A Face Detection Listener has been implemented to use this and it returns an array that containing all the faces characteristics that have been detected.

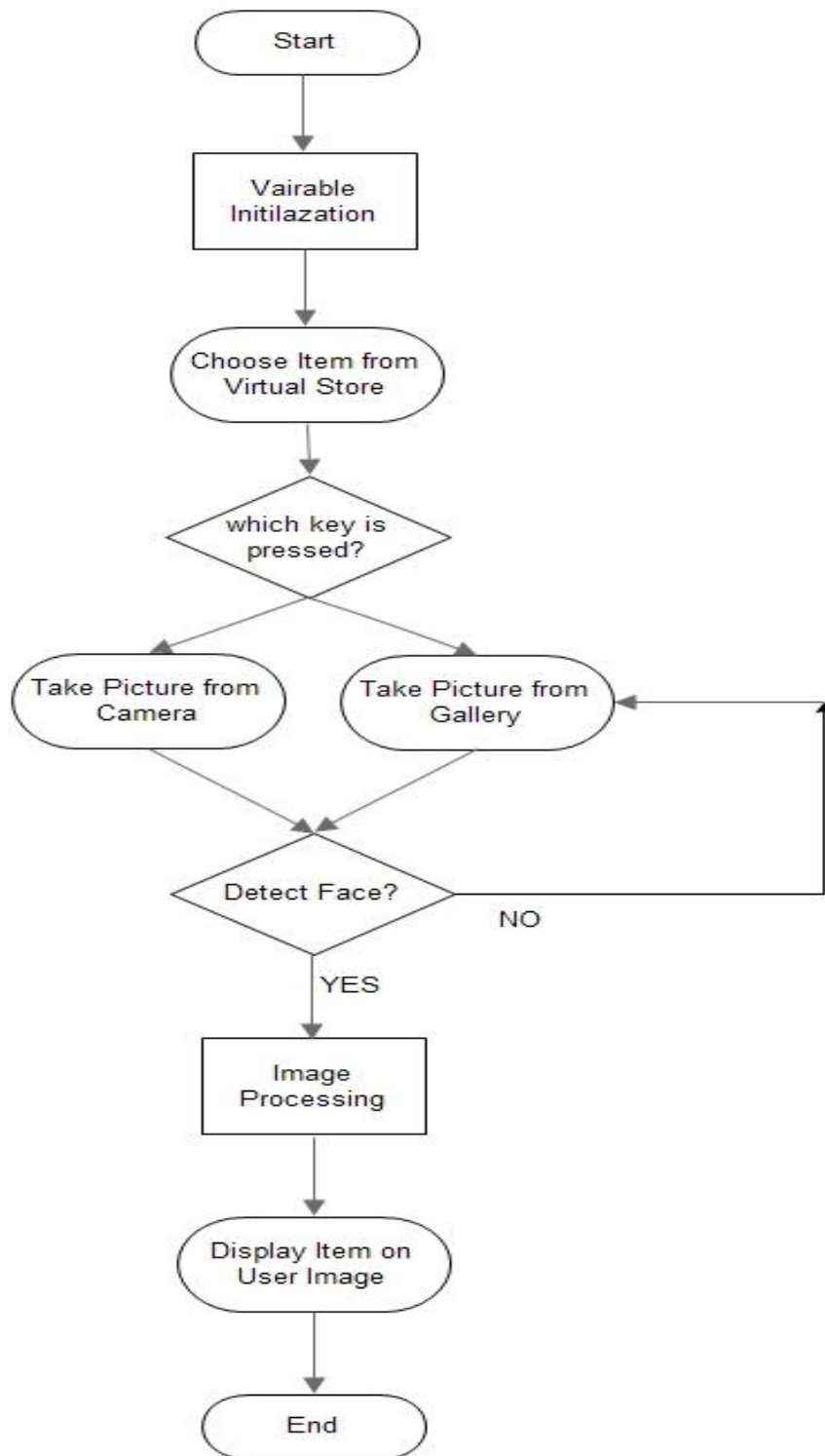


Figure 3. Flowchart of Proposed Work

Figure 3 shows the flowchart of the Proposed System. User enters into virtual store where able to choose different item init. The algorithm includes two options to change parameters with user input. User can upload image using camera or from gallery. Mobile visions API detects the face from uploaded image and return the face position and different landmark position like eyes, nose, mouth. Based on this position the item is scaled and display on face. The size of item depends on user's face: if the user is close to the camera the item will be bigger or if user is farther it will be smaller. For best result user has to upload clear view image that includes face and neck to try jewel.

IV. RESULT AND DISCUSSION

The proposed system is universal compatibility across different android mobile devices which present an ideal solution to enable every user to be able to run the system. Mobile Vision API release by Google Play Service provides face detection to display items on face and adjust the position of items.

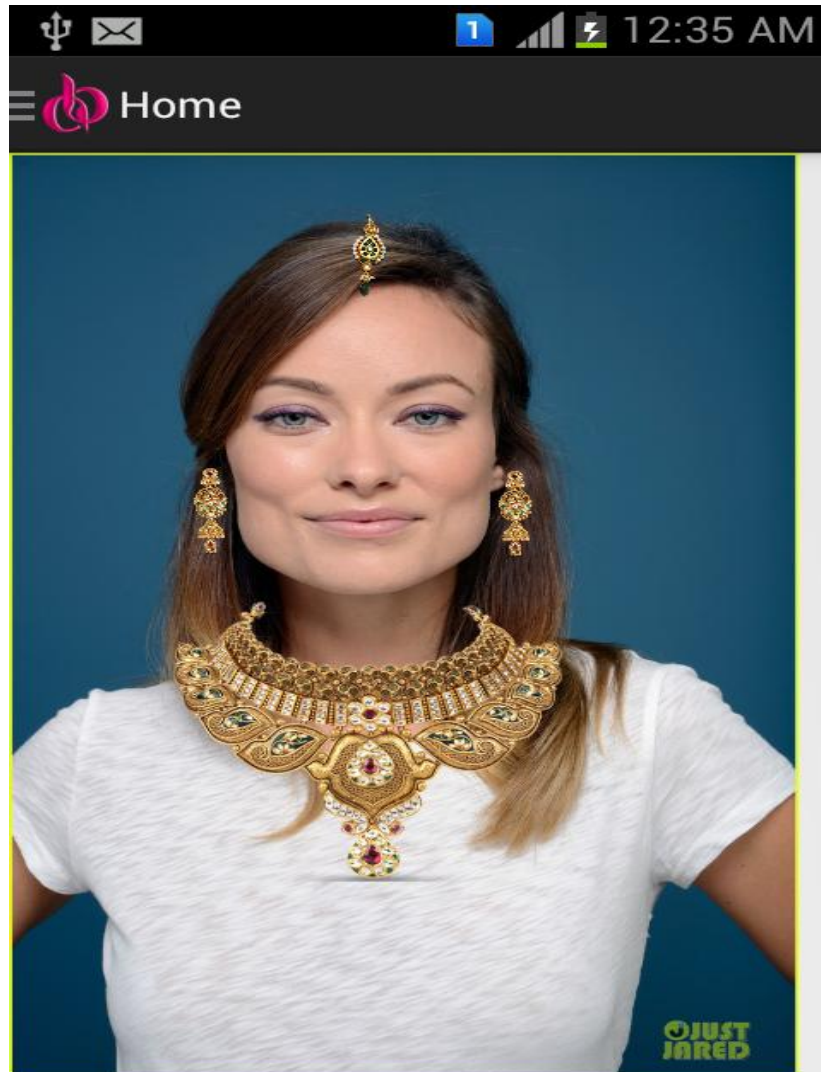


Figure 4. Final View of Proposed System

Figure 4 shows final view of proposed VFR system. The performance of proposed system has been analyzed using Dalvik Debug Monitor Server (DDMS) and has been tested by different face image from gallery as well as real time captured image. The system detects the number of faces from the uploaded image and set jewels on each face. Compare to Camera API, using Mobile Vision API released by Google Service, gives more accurate result. Vision API detect face in different orientation and gives results for specific position of face and its expression

V. CONCLUSION AND FUTURE PLAN

In Proposed System, lots of time saved by user as well as vendors while shopping in real stores. It gives better satisfaction and experience to buyers and sales person. In this system compared to other technologies like time motion capturing techniques and augmented reality markers no need any expensive configurations and time consuming build up are required and compatible to any android based devices. So, any real store can be used easily. Now, my future work to capture motion of user instead of sensor and set the item image according to user position. In future more accessories like caps, clothes and more things are to be added to make this system more useful in future. Future works can be done on creating 3D models to further enhance the usability of the system. After all, the Virtual Fitting Room system brings a new way of real-time virtual trying on experience to the customers.

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