

3D Virtual Trial Room

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Abstract-- Augmented Reality is direct and indirect view of real world elements that are augmented on computer software. It mainly adds the software information and refines the users view to actual environment. The aim of this work is to develop Virtual trial Room application using AR which allows a user to try on different colors of clothes. Most of the early applications attempted to do this by overlying a static image of clothing over an image of the user captured by a camera or any digital camera. But, like any other idea, the virtual trial room involved from very basic solutions to more advanced solutions which were more synchronizing with actual reality. This is the motivation behind any AR application. This application is implemented using Open CV and web camera to capture video. Once the video is captured, it identifies the background and object of human and changes the color of the T-shirt and adds the selected logo according to the users' choice. This application use OpenCV for identifying the user and to change the color and logo according to user's choice. It is an excellent platform basically designed to for achieving computational efficiency and also to give emphasis for real time applications. OpenCV contains various functions which together help in detecting the contours of different objects in the frame. After the color boundary analysis, the image is converted into grayscale and thresholding is applied on the image which basically brightens the pixels whose brightness intensity values are greater than a specific threshold value and rest of the pixels are darkened. Multiple iterations of thresholding can be applied on the image if it is required. Thresholding helps in distinguishing objects by highlighting them with respect to the background complementary functions of dilate and erode are applied to dissolve and sharpen the pixels on the contour accordingly. Once the hierarchy is extracted then it's just the work of detecting the contour which best relates go the desired object the application is focusing on. After this one can calculate specific areas to augment logos on the real time user video feed or can change colors of cloths according to the user's desire. Compared to other existing Virtual Trial Room systems, key difference is the lack of any proprietary hardware components of peripherals.

I. INTRODUCTION

Augmented Reality is direct and indirect view of real world elements that are augmented on computer software. Augmented Reality considers real and virtual elements. It mainly adds the software information and refines the users view to actual environment. This work is an implementation to develop Virtual trial Room application using AR which allows a user to try on different colors of clothes. Most of the early applications attempted to do this by overlying a static image of clothing over an image of the user captured by a camera or any digital camera. But, like any other idea, the virtual trial room involved from very basic solutions to more advanced solutions which were more in sync with actual reality. This is the motivation behind any AR application. This work presents an image processing design flow for Virtual Trial Room applications, targeting personal computers.

This application uses OpenCV for identifying the user and to change the color and logo according to user's choice. Compared to other existing Virtual Trial Room systems, key difference is the lack of any proprietary hardware components of peripherals. In the last few decades there have been a number of efforts in creating logos and changing color of T-shirts digitally. By the importance of Virtual Reality and Augmented Reality in Technical Society, new technologies can be adopted in this concern such as Webcam, smart phones to try on different colors and different logos on T-shirt.



Fig 1: Virtual trial room using Augmented Reality

Augmented Reality is direct and indirect view of real world elements that are augmented on computer software. Augmented Reality considers real and virtual elements. It mainly adds the software information and refines the users view to the actual environment. In most augmented reality pleas, a user will see both synthetic and natural light. This is done by overlaying projected images that allow the images and interactive virtual objects to a layer on top of the user's view of the real environment. Augmented Reality devices are often self-contained, they are completely untethered and do not need a cable or desktop computer to function.

OpenCV is an abbreviated form of Open Source Computer Vision Library which supports python, C++, java interfaces. It is basically designed to for achieving computational efficiency and also to give emphasis for 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 cloths by virtually trying the cloths.

II.RELATED WORK

Many of the existing systems have variable perceptions in the area of Augmented Reality which made possible the implementation of Trial Room concept virtual. Few such E-Commerce sites like Lenskart, Abof, Snapchats etc, have developed applications based on virtual reality. One of those ideas is the Virtual Trial Room which displays the user in desired attire. But, none of the current applications provide the three dimensional dynamic imaging. In order to improve on this area we are proposing a new system called the "3D Virtual Trial Room".

In the proposed system, we will describe a simple and efficient Trial Room with virtual usage. This application helps the user to visualize his/her own attire without actually wearing it. Initially the user needs to face the camera which focuses the user image and fit various costumes to it and displays. This basically helps the user to know his/her choice easily and provide greater level of satisfaction. According to the papers [1], [2] and [6] which are proposed by Shreya Kamani, F. Isikdogan and Vipin Paul respectively, the implementation of virtual trial room application is proposed with the usage of a sensor known as Kinect sensor which mainly takes the bone measurement of a person which is a

way to determine the size of user's body on which the virtual cloth has to be augmented. In paper [3] which is proposed by Cecilia Garcia Martin, an android application is integrated with the concept of augmented reality. There the proposed technology is augmenting the virtual cloths on a users' static image and the whole application is dumped in an android phone. The application Virtual Trial Room can be visualized in varied perspectives and can be implemented using various hardware – software integrations. One such is the usage of OpenCV for this application development. This idea has been proposed in [4] and [5] by authors Nikki Singh and Sourabh Botre respectively.

This work uses RGB Normalization algorithm which consists of four steps:

- (i) Moving pixels or regions in the current frame of a video are determined.
- (ii) Determination of lighter and brighter portions of the image depending on the direction of so light.
- (iii) Mathematical computation for converting pixel to normalized pixel with scaling factor.
- (iv) Iterate step (iii) until all pixels in the considered image are normalized.

According to [7] proposed by Jamal Dargham and Ali Chekima, the RGB Normalization technique is used basically for face detection. The Normalization algorithm discussed in this paper is applied in our application for achieving normalized image which is then processed for augmentation.

III.IMPLEMENTATION

A. OpenCV

Our basic idea is to detect the contour of a person's image standing in front of the camera. OpenCV is a cross platform open-source software package that contains a huge number of programming functions that give the user a gateway to interact with computer vision. The functions are built to give a common platform as well as infrastructure for applications and problems related to computer vision. The functions are coded in such a way that they are capable to integrate machine learning ideas and functionalities. OpenCV functions comprises of over 2500 algorithms that together provide functionalities like face detection, identifying objects, detect human actions in a video and much more.

B. Capturing the video

OpenCV contains functions that are specifically built to capture images and video from a machine equipped with multiple cameras, be it ht e internal or an externally attached camera. It can read live video feed from a camera and break it down into frames for convenient processing in further stages. In this work we capture a video input of the user from the camera and apply the application code logic directly on the input stream of frames without saving the actual video file anywhere in the system. This makes the application memory efficient as video files are very large in size and need gpu resources to render the video. Also by this practice we can

simulate a virtual environment in which we do appropriate augmentations on the real time video image of the user.

C. RGB Normalization

OpenCV uses color contrast based differentiation of objects by detecting the pixels which reside on the boundaries where colors change values significantly, but this process can't be fully accurate as in real world scenarios images can be difficult to analyze based on color differentiation. As an example consider the below image(include image with fig no.) in which a person's video feed is being analyzed for detecting the T-Shirt he is wearing.

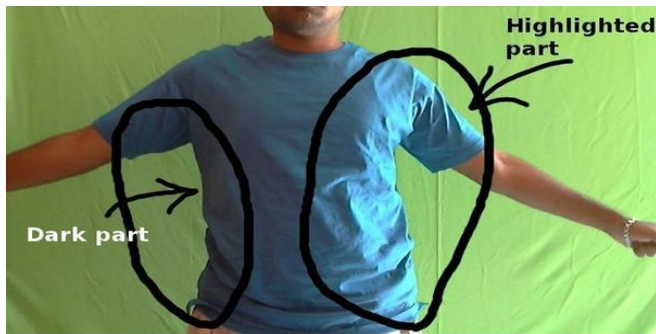


Fig 2: Uneven distribution of light on a sample image

As shown, due to variable light source conditions left part of the T-shirt is darker as compared to the right part which is lighter in shade. This can cause problems for OpenCV functions in detecting color boundaries and as a result they may produce unexpected outputs. To resolve this issue we do normalization at pixel level for all the frames captured.



Fig 3: Normalized image

As a result which is seen in the figure 3, the colors become uniform and hence the software easily detects the color boundaries on the object.

D. Contour detection

OpenCV contains various function which together help in detecting the contours of different objects in a frame. After the color boundary analysis, the image is converted in grayscale and thresholding is applied on the image which basically brightens the pixels whose brightness intensity values are greater than a specific threshold value and rest of the pixels are darkened. Multiple iterations of thresholding can be

applied on the image if it is required. Thresholding helps in distinguishing objects by highlighting them with respect to the background complementary functions of dilate and erode are applied to dissolve and sharpen the pixels on the contour accordingly.

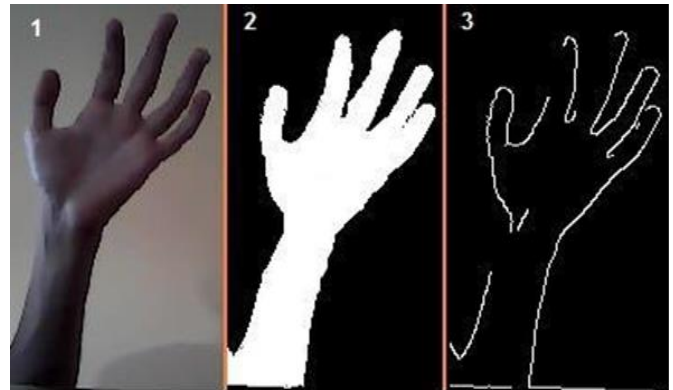


Fig 4: Original Image and Contour detection

The threshold function each time returns a contour and hierarchy of contours which is basically a Has-a container relationship between the contours of various objects.

E. Augmentation of colors and logos

Once the hierarchy is extracted then it's just the work of detecting the contour which best relates go the desired object the application is focusing on. Here in our case we want the outer most containing contour which will relate to the T-shirt which the user or test object is wearing.



Fig 5: Augmentation of Colors and logos

After this one can calculate specific areas to augment logos on the real time user video feed or can change colors of cloths according to the user's desire.

IV. CONCLUSIONS AND FUTURE WORK

We studied and found out the observations in textile shopping experiences and figured out the potential problems. The virtual trial room system is introduced and implemented which aims at increasing customers' satisfaction while shopping the cloths. This Project presents the system design, the preparation process and the iterative implementation of the Virtual Trial Room system. By using this application one can

have the look, at how a cloth suits for the respective user. One dress has various colors and users can choose the color of their choice. Also, it saves the retailer from damaged or soiled garments due to heavy try on customers. The experimental results show that this system works better for some objects and for some objects it does not work. The different types of cloths augmenting on different user's body irrespective of gender and the number of people standing and saving the data of the user's body measurements for the later use can be done as the future work.

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