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A Novel Approach of Virtual Visualization of Cloth Fitting

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Abstract*— The concept of a virtual fitting room in real time has been proposed. The interest in online shopping has grown exponentially. When it comes to buying products like shirts that always require knowledge of how the clothes will fit when worn. This is the main reason why so few clothes are being bought online. As a result, a virtual dressing room that tells consumers how clothes fit personally will be a huge asset to online sellers that can give consumers a wide choice. For online marketers, this would be a great way to grow your market. The proposed system consists of a number of tasks, including locating the user's shirt and specifying the color of the user's shirt. In our proposed system we have used Alpha Channel Masking to mask the user's shirt, and libraries such as Numpy, OpenCV. Finally, we conclude that the concept of virtual fitting rooms that we have implemented helps humans in many ways, such as making their purchases easier, saving them time.

***Keywords*— Alpha Channel Masking, Numpy, Open cv**

I. INTRODUCTION

Recently, merchants have encountered difficulties trying to sell clothing items online. Although consumers like to save time and money by shopping online, customers are not able to determine what it looks like to wear and how it fits. In addition, people use a mirror every day to see what they look like when they wear a shirt, and many mirrors are available in stores to help consumers choose the clothes that are right for them. - First of all, the benefits for consumers are that they save on dawn and off-time and can easily estimate their body measurements for clothing designed for measurement. Customers usually try many items and spend a lot of time donating and donating to buy clothes. It is very painful for them to take the clothes they want to try, go to the dressing room, take them off, and wear them whenever they find an attractive dress. Second, shop owners can save costs, as they no longer need a dressing room. In addition, there will be a reduction in the loss of clothes tested by customers. So our goal is to provide a concept for a real-time system called a "virtual fitting room" that allows users to try out countless shirts without leaving the comfort of their own space.

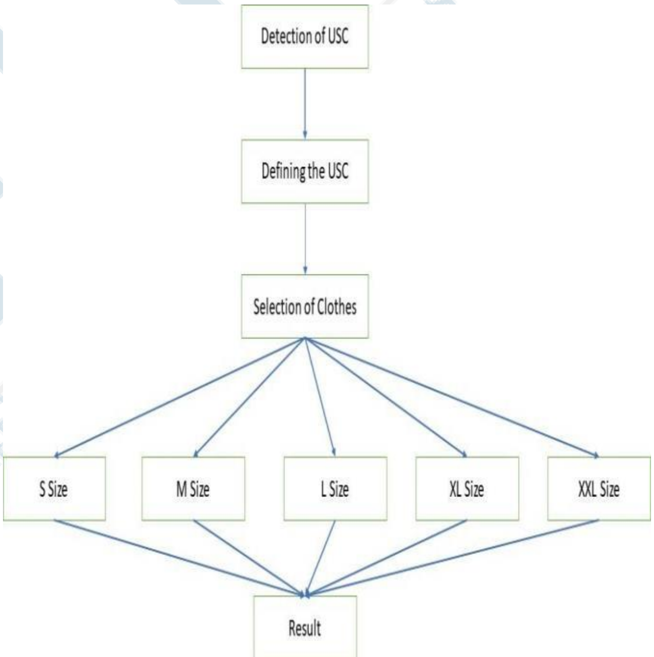

Fig 1 : Stage-wise representation of our model

System architecture is a conceptual model that describes the structure, behavior, and ideas of a system. An architectural description is a formal description and representation of a system, organized in a way that supports reasoning about the structure and behavior of the system. In the proposed system, this represents how the process works. Initially, after detecting the color of the user's shirt, the range of the user's shirt is defined and masked on the user's shirt using a technique called Alpha Channel Masking. Now the user chooses his size and based on the masking the specific size shirt is integrated on the user.

II. LITERATURE SURVEY

1. Implementation of a virtual fitting room using image processing

The popularity of online purchasing has greatly increased. When buying things like clothing, it's important to understand how the clothing will look on the buyer. This is the main cause of the decline in online clothing sales. Therefore, a virtual dressing room that allows users to see how clothing fits them personally would be a tremendous luxury for online retailers that could offer a variety of options for customers. This would be a fantastic tool for web marketers to expand their market.

The Virtual Dressing Room technique for virtually dressing a person requires separating the person from the background while taking into account changes in lighting and with the least amount of disruption to surrounding items. Then, using an alpha channel masking filter and edge detection, the top and lower body's contours are to be discovered. Following that, feature points are extracted based on the fundamental human anatomy. The sample shirt is bent to precisely suit the person using these locations as a guide.

2. Virtual dressing room application

It normally takes a lot of time to try on things in a store. Additionally, in situations like internet purchasing, it might not even be able to try on clothing. By establishing a virtual changing room setting, we hope to improve accessibility and time efficiency for trying on clothing. In this work, they present a Microsoft Kinect-based virtual changing room application. Our suggested method is primarily based on skin colour recognition, model alignment, and user extraction from the video stream. The 2D cloth models are aligned with the user by using modules that control the joints' placement, scaling, and rotation.The undesired occlusions of the user and the model are then handled using skin colour detection on video. Finally, a real-time overlay of the model on the user is performed. The alignment of the user and the cloth models with precise location, scale, rotation, and ordering is the only issue. One of the first steps in solving the issue is identifying the user and the affected bodily parts. Several methods for body component detection, skeletal tracking, posture assessment, and user interface superimposition onto a virtual environment are suggested in the literature. The application for real-time, Kinect hacking is implemented in the C# development environment. When paired with Microsoft kinect, middleware from the driver is utilised for a number of fundamental activities as well as for tracking.

3. Effects of 3D Virtual "Trial Ons" on Online Sales and Consumer Shopping Experiences

Although the image-based virtual try-on system has garnered recent research interest, it still requires users to provide images of themselves in the desired pose. In order to smoothly integrate in-store apparel into a person image and simultaneously change the pose of the person image to a different one, they introduce a novel learning model called Fit-Me network. Users can save time by changing their clothes less frequently using the planned Fit-Me network, which also offers detailed information about how well-suited the clothing is. They can build a series of postures by enabling arbitrary pose morphing, giving users more information to consider before making a purchase decision.

With a market volume of $598,631 million in 2019 and an anticipated market volume of $835,781 million by 2023, fashion is the market's largest segment and has seen a gain in revenue recently. 1 The average conversion rate of online shopping platforms worldwide in 2018 is only 2.42 percent, despite the fact that people are becoming accustomed to shopping for fashion items online. 2 One of the main causes is that when purchasing online, consumers are unable to try on clothing to see whether they are comfortable or not. As a result, it would be ideal for the fashion industry to create a virtual try-on system to increase conversion rates and sales.

4. Show me your face and I'll tell you your height, weight and body mass index.

Height, weight, and the associated and composite body mass index (BMI) are human characteristics that are relevant because they are used in surveillance, re-identification, image retrieval systems, and healthcare, among other uses. The majority of previous research on the automated estimation of height, weight, and BMI has been done using 2D and 3D full-body photos and movies. The use of faces to estimate these qualities has received little consideration. Motivated by the aforementioned, they investigate the potential for estimating

By recommending a regression technique based on the 50-layer ResNet-architecture, we can estimate height, weight, and BMI from single-shot facial photos. Additionally, they provide a brand-new dataset made up of 1026 people and display results that seem to support the idea that facial photos, like body photographs and videos, carry discriminatory information about height, weight, and BMI. The examination of the prediction of height, weight, and BMI is then performed based on gender..

5. Fit-Me: Image-based virtual try-on with arbitrary poses

Technology and the Internet have advanced to the point where it is now possible to utilise and acquire a variety of goods and services online rather than in person. In particular, new features have been attempted and implemented to make up for the restriction of not being able to physically wear clothes in an online mall since the size of online shopping malls is continuously expanding. Among them, 3D virtual try-on is a cutting-edge service whose technology is always being developed with interest. Numerous relevant studies

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have been conducted as a result of technological development and interest in 3D virtual try-on. The majority of earlier studies on virtual try-on focused on either the consequences and consumer behaviour from the viewpoint of the customer or the virtual fitting technology from the standpoint of clothing manufacturers.

However, there hasn't been any research that uses actual customer data to demonstrate how virtual try-on impacts sales. As a result, this study comprehends the essential significance of a virtual "try-on" as a consumer experience and investigates how a 3D virtual try-on affects online sales. They develop a 3D body model that is enhanced by the addition of more varied body types and dimensions, and they use real data to examine how virtual try-ons affect online sales. To supplement and understand the findings, qualitative data, including interviews, are also utilised. The statistics demonstrate how virtual try-on impacts sales: an increase in average customer purchases of 14,000 won (13USD). The most significant discovery was that by eliminating items with wrong sizes and fits, the return rate dropped by 27%. Virtual fitting rooms may eventually take the place of actual ones. In a case study of the women's casual L brand, this study showcases cutting-edge 3D virtual try-on technology and demonstrates how virtual try-on can increase sales and lower customer returns.

6. DP-VTON: Detail saving towards an image-based virtual try-on network

Recently, there has been a lot of interest in image-based virtual try-on systems that aim to transfer a target piece of clothing onto the relevant area of a person. The current approaches still face difficulties in producing try-on images that are photorealistic while retaining non-target features.

Fig 2 : Semantic segmentation prediction

They present the DP-VTON virtual try-on network as a solution to this problem. The target apparel is first altered by a warping module that combines pixel and feature modification. The semantic segmentation map of the person wearing the target clothes is predicted by a semantic segmentation prediction module, which comes second. Third, an arm generating module creates the reference image's arms, which will be modified after trying them on. Finally, try-on picture synthesis is performed by fusing the distorted clothing, semantic segmentation map, arms image, and other non-target elements (such as the face, hair, and bottom clothing). Numerous tests show that our solution delivers cutting-edge virtual try-on performance in both the qualitative and quantitative senses.

7. Analysis of facial landmark features to determine the best subset for face recognition detection

Applications that analyse human faces are increasing daily, and one important and forthcoming study in this field is face orientation or pose identification. In order to compute the Euler angles of the face, this research employs a mathematical technique that compares the coordinates of facial feature points in the real world with those of 2D points derived from an image or live video using a projection. Additionally, the optimal set of face landmarks with the broadest detection range are found using this method. Face detection and facial landmark detection are the first steps in the face orientation approach. The Haar Cascade and Deep Neural Network algorithms are tested for face detection. The analysis leads to the conclusion that DNN is more reliable, accurate, and ideal. By putting an image or video frame through a series of previously trained regression trees, facial landmarks can be retrieved. A set of six facial points—nose tip, chin, corner points of the eyes, and corner points of the mouth—is found to be sufficient for the algorithm to be able to detect the orientation of the face in a wide range of views with fewer computations after analysing various sets of facial features for their use in face orientation detection techniques and testing the results of each.

8. Multi-pose virtual try-on based on 3D clothing reconstruction

Deep generative model-based image-based virtual try-on (VTON) systems have recently attracted a lot of research interest. However, the preceding works' 2D clothing shape transform approaches demonstrate significant limits in the 3D clothing deformation necessary in multiple-pose VTON settings. The outcomes of a 3D clothing model reconstruction approach for the multi-pose VTON scenario are demonstrated in this research using a 2 pipeline 3D-MPVTON system. First, CloTH-VTON+ is the foundation of the pipeline for reconstructing 3D clothing models. The target clothing regions in the simply-shaped reference human model are matched to the try-on clothing, and the related 3D human body model is used to reconstruct the try-on clothing's 3D model. Proper texture mapping is essential for rendering natural apparel from any angle.

They have created a technique for texture matching that is extremely precise. The target segmentation for the conditional information for the network models in the subsequent step is first produced by the try-on pipeline from

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the target pose. In earlier VTON research, accurate target segmentation was one of the major performance bottlenecks. The segmentation label imbalance is significantly decreased by our suggested equalised entropy loss for the target segmentation generation network, which also produces high-quality segmentation and requires less training time. The rigged 3D reconstruction of the clothing model allows for simple deformation into the desired position and human body type while preserving the apparel's details. A deep generative human pose transfer model is used to produce the remaining components, or the non-target clothing regions, of the human in the target position. In order to in-paint the occluded portions and mix the created apparel and the remaining components, conditional generative networks are used.

9. Is the face in stereo images 3D or 2D?

In order to discriminate between actual faces and flat photographs in stereo camera images, this research proposes two algorithms. the original method, which was based on geometric relationships between specific facial characteristics. While the points on a face image will all be on the same plane, this is not the case for a genuine face. The second makes use of the face relief pattern developed. Depending on how closely the resulting normalisation pattern resembles the pretrained template, the face can be 2D or 3D. The suggested methods make it possible to update the current 2D face recognition systems while gaining a number of the benefits of 3D face recognition systems at a reasonable cost. The use of the methodologies under consideration is subject to some suggestions and restrictions.

10. Composition of images of humans in invisible poses

They deal with the computational issue of synthesis of novel human poses. They create a representation of a person in the appropriate position from a person's photograph while maintaining the appearance of both the person and background. They demonstrate a modular generative neural network that can create previously unknown postures by training it on pairs of images and positions extracted from recordings of people in movement. Our network divides a scene into body part and backdrop layers, repositions body parts, cleans up their appearances, and composites the new foreground with a background that is filled with holes. These independent modules-implemented subtasks are trained together utilising just one target image as a supervised label. They force our network to generate accurate features conditioned on position by using an adversarial discriminator. They present picture synthesis findings for three different activity classes—golf, yoga/workouts, and tennis—and demonstrate that our method yields correct results both within and between action classes. They can also create action videos that are cohesive when given a set of desired stances.

III. REQUIREMENTS

A. Functional Requirements :

A functional requirement defines the function of a system or its components, where a function is defined as the behavior between inputs and outputs.

Steps involved in our proposed system is :

Step 1: Detection of User Shirt Color (USC).

Step 2: Define range of color of user shirt.

Step 3: Threshold USC to get only user shirt.

Step 4: Mask black on user shirt.

Step 5: Import try on shirt image.

Step 6: Merge the Try on cloth on user.

B. on-Functional Requirements –

Non-Functional requirements (NFRs) define system attributes such as integrity, performance, reliability, reusability, Strengths, scalability, and Ease of use. They act as barriers or restrictions on system design in various backlogs.

Integrity : Integrity requirements define the security features of the system, limit access to certain users or data, and protect the privacy of data entered into the software.

Performance : The performance range describes the timing features of the software. Some tasks or features are more sensitive for a longer period of time than others. Passive requirements should recognize the functions of software that have performance impediments.

Reliability : Reliability describes the ability of software to maintain performance over time. The system must have computational intelligence to understand how the image is processed and how to recognize it and how to present the desired output. Unreliable software often fails, and some tasks are more susceptible to failure (for example, because they cannot be restarted, or because they must be run at the same time.)

Reusability : Many systems have been developed with the ability to take advantage of some common ingredients in multiple products. Reusable Indicates the extent to which software components should be designed to be used in applications other than those for which they were originally designed. -

Strengths : Algorithms should be developed to create a framework for identifying robust and effective counterfeiting.

Scalability : Expandable software systems can handle a wide variety of configuration sizes. Passive requirements should indicate how the system can be expected to grow (by increasing the capacity of the hardware or by adding machines).

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Ease of use : Ease of use requirements focus on the factors that open up the ability of users to understand, learn, and use software.

IV. IMPLEMENTATION

A. **NUMPY** : NumPy is a library used to work with arrays in python. It also has functions to work in the domain of linear algebra, foyer transform, and matrix. NumPy was made Travis Oliphant. It is open source and you can use it freely.

B. **Python-OpenCV** : A large open source library for computer vision, machine learning, and image processing. OpenCV programming supports a wide variety of languages, such as Python, C ++, Java, and more. It can process images and videos to identify objects, faces, or human handwriting.

C. **File dialog** : Python Tkinter (and TK) presents a set of dialogs that you can use when working with files. Using them, you don't have to design your own standard dialog. Example dialogs include an open file dialog, a file saving dialog, and many more. There are standard dialogs other than the file dialog, but in this article, we will focus on the file dialog. File dialogs help you open and save files or directories. This is the type of dialog that opens when you click on a file. This dialog exits the module, not all code needs to be written manually. Tickter does not have a locally visible file dialog, instead it has customer tk style. The file dialog will work on all desktop platforms.

D. **Alpha Channel Masking** : Each image has different features for cutting tasks such as background removal. Therefore different methods need to be implemented. Different images require different methods. Alpha channel masking is a slightly more complex method of masking. If there is considerable contradiction between the object and the background, the alpha channel masking technique will be easier to apply.

Fig 3 Alpha Channel Masking Example

V. RESULTS

Fig : User Pic

Fig : Try On Shirt of size XL

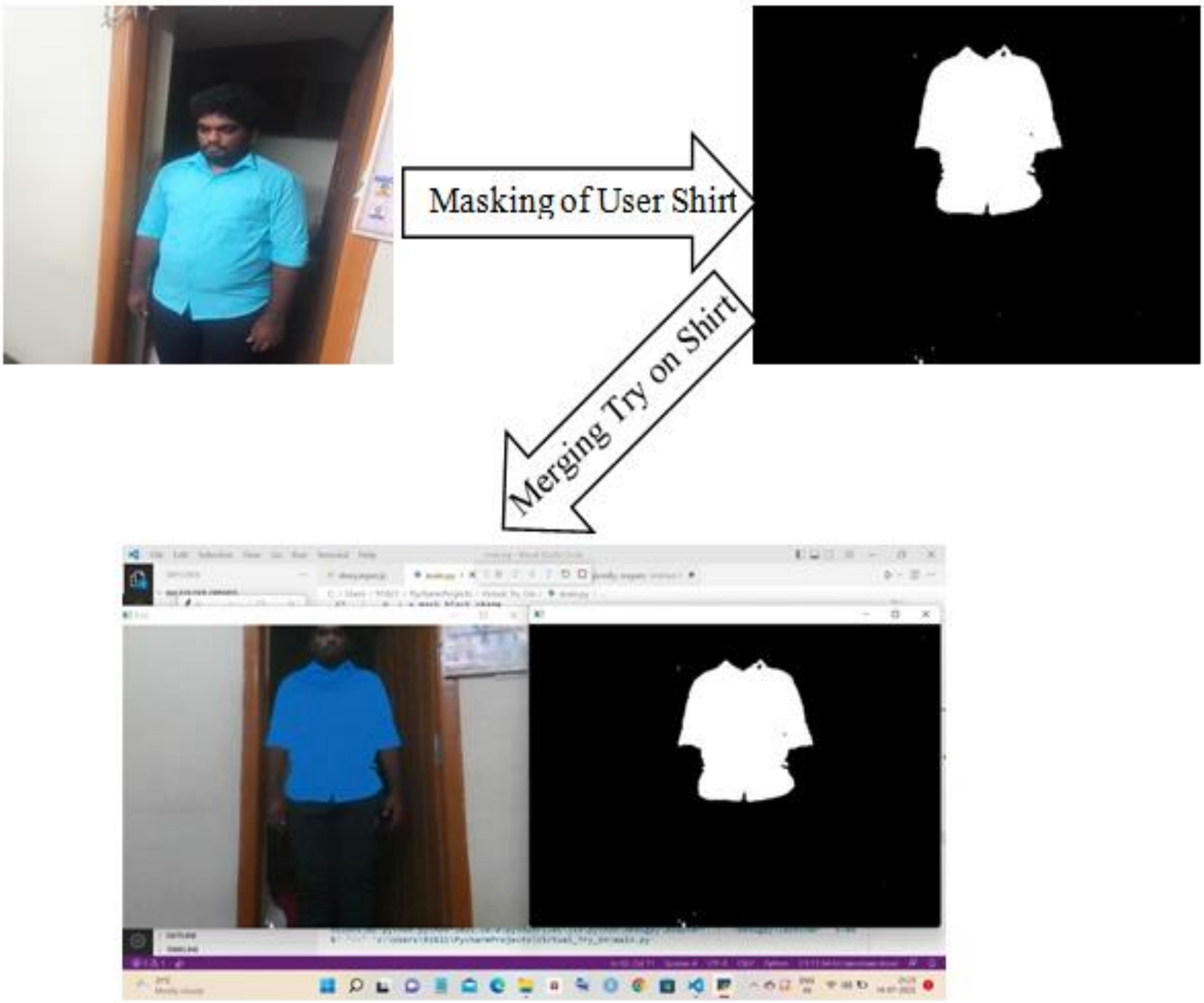
The following steps show how the process works.

Step 1 : User Stand infront of camera.

Step 2 : Try On shirt image is choosen based on their size.

Step 3 : Using Alpha Channel masking technique masking of user shirt is performed by capturing only concentrated region.

Step 4 : Based on the obtained masking image the try On shirt image is merged on user.



VI. CONCLUSTION

We have created a concept called "Virtual Fitting Room" where the user can choose shirts of different sizes like S, M, L, XL, XXL and then apply the clothes of their choice based on their size. Can fit which reduces their time in choosing different types. Clothes In this proposed system we have used "Alpha Channel Masking" to mask the user's shirt to gain an area of interest. So far we have worked on 3 to 4 colors because if we are going to mask each color, it will also mask the background items. So we have chosen only 3 to 4 colors.

VII. FUTURE WORK

In the future, there are plans to modify the algorithm to find human sleeves with both dark and light colored shirts, design shirts, to blur the background image. Whenever the user is standing in front of the camera, the background becomes blurred, so the person becomes focused. Still working hard.

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