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MULTIPLE POSE VIRTUAL TRY ON BASED ON 3D CLOTHING RECONSTRUCTION

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Abstract

Augmented reality (AR) is one of the technologies gaining increasing interest. By mixing virtual with the real world in different proportions, augmented reality allows a level of immersion that no virtual equipment can provide. AR systems have been already used in many applications as surgery, inspection of hazardous environments, engineering. Most of those systems, however, only operate indoors and cover relatively small areas. The advances of the computers, vision and wireless technology make possible development of outdoor wireless systems to support complex analysis, decision-making and governing processes. The benefits of utilizing such systems in these processes are twofold: 1) data supply on "the spot" (location-basedservices) and 2) provision of 2D, 3D model projections.

Key Words: **Augmented Reality, Virtual Reality, Clothing Reconstruction, Visualization**

1. Introduction

Online shopping and e-commerce are rapidly increasing worldwide due to their efficiency and convenience. However, in the case of fashion items, especially clothing, a fair percentage of purchased products are returned due to a mismatch in style and size. Multiple pose VTON (MPVTON) systems can generate virtual fitted images in multiple poses with different try-on clothes from a single customer image as input.

Virtual Try On (VTON) technology was invented to narrow the gap between these online viewing and purchasing experiences by creating virtual images that help users have a more thorough and realistic shopping experience. Early approaches with 3D computer graphics could not handle mass-market demands due to the high costs and difficulty of building 3D clothing and human models. Recently, with advances in deep learning technology, several methods such as CP-VTON, CP-VTON+, ACGPN, Cloth-VTON, Cloth-VTON+, VITON have been proposed. They create virtual fitted images based on the store clothes but in a fixed input body pose, which we will call here 'Fixed Pose VTON (FPVTON)' not real 3D postures. It is crucial to realize that the Clothing fitted on the human body experiences 3D deformations from joint motion of Human limbs whichcannot be approximated by any 2D non-rigid transformation like 2D ARAP (as-rigid-as possible) and TPS.

However, customers often have a desire to see themselves in the clothing from different perspectives or in different poses. According to a user study in Fashion On, 78 percent of users are more willing to use try-on services with multiple views and different poses than those with only one fixed posture. Multiple pose VTON (MPVTON) systems can generate virtual fitted images in multiple poses with different try-on clothes from a single customer image as input. These MP-VTON methods can be built by combining clothing warping techniques developed in FPVTON and human pose transfer techniques. Due to their practical importance, techniques for human pose transfer have been widely studied.

1.1 Statement of Problem

We extend Cloth-VTDN+ to a multiple-pose scenario and show that 3D clothing reconstruction can provide higher quality VTON results than the previous multi-pose guided VTON systems. The quality improvement over these systems is substantial because our approach is able to handle the significant deformations of the in-shop clothing needed to handlea large range of target poses.

We propose a new fast high-quality loss and training method for the target human semantic segmentation generation network compared to that in MG-VTON. Notably, the technique takes the label imbalance in the dataset into account. Efficient generation of high-quality target human semantic segmentation plays a crucial role in guiding the following stages. We propose a new clothing texture mapping method to reduce the artifacts generated at the revealed boundaries of clothing, which is critical for high-quality results, especially for side view poses.

1.2 Objectives

- To improve understanding of abstract, spatial geometric concepts through manipulationand multi-angle observation of virtual 3D objects.
- To create content for social media filters
- To promote brands and their logos on social media via lenses/filters.
- To promote organizations using Digital Marketing.
- To be used in educational domain for better visualizations in multi dimensions.
- To be unlike virtual reality, which creates its own cyber environment, augmentedreality adds to the existing world as it is.
- To create unique digital experiences that blends the best of digital and physical worlds.Also, it does not need any special hardware or software to savor the experience.

1.3 Scope

Virtual try-on refers to trying on digitally created garments in a virtual environment. That means that you can see how those items look on you or an avatar, allowing you to know if something is a good fit without physically trying it on. Hence, virtual try-on technology couldlet you try on clothing without having it shipped or even leaving your house. With evolving technology and customer needs, the future shop will seem quite different from what we are used to. It can even reduce clothes return rates.

1.4 Limitation

- **It is not cent percent accurate:** Sometimes we may not get the expected or desiredoutput as it is not hundred percent accurate.
- **Requires fast internet connectivity:** The internet connectivity in your device shouldbe fast enough, so the application may carry out its process effectively.
- **Requires good lighting:** In case of live video virtual try on the lighting effect shouldbe good in order to allow application to detect the face and carry out its process.

1.5 Methodology

For building an end-to-end projection using Augmented reality application it isnecessary to go through the following phases listed below:

1. Model construction
2. Selecting AR Powered Engine
3. Model Licensing
4. Application Interface

MODEL CONSTRUCTION: A model represents the object which we are trying to project using the application, in this step we generally try to capture the image from all dimension so as to make the projection more realistic and making sure no part of the object is left out.

SELECTING AR POWERED ENGINE: An Augmented Reality powered engine is neededfor the project. In this case we are going to use 3D Unity Gaming Engine for our model generation. Unity is particularly popular for mobile game development and much of their focusis on mobile platforms. Unity 3D's 2D pipeline is a more recent addition to the engine, and is less mature than the 3D pipeline.

MODEL LICENSING: Vuforia is an augmented reality software development kit (SDK) formobile 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.

INTERFACE BUILDING: For particular model creation on any operating such as MAC, WINDOWS or Android, IOS we would be requiring an UNITY SOFTWARE where we generate our target location and the model size and features.

2. SYSTEM ANALYSIS AND DESIGN

2.1 Existing System

The existing system of model projection using augmented reality has a very tidy process of hardware resources to be of very good efficiency as We need cameras of better resolution and currently used Augmented Reality applications are very heavy in terms of size and space, A general smart phone with minimal specification can hang and lag with theapplication leading to improper projection or no projection at all.

Disadvantages

1. Needs a flat Surface to project the model
2. Better hardware resources are required
3. Need proper stable camera setup.
4. Cannot implement our own model or build by our own.
5. Need a higher resolution camera.
6. Not applicable for all smart phones.

2.2 Proposed System

The proposed system is a Real Time Model Projection using Augmented Reality where we are trying to build an mobile application which is resource friendly to make projections of some pre install models and project them on real surfaces such as Floors, walls,rough surfaces, roads Etc. Aim of this project is to make a light weight application suitable for all types of smart phones and ability to make their own model projection of their choice infuture scope.

2.2.1 Proposed Model Framework

Our 3D clothing model reconstruction is composed of geometry reconstruction and texture image mapping. For the geometry reconstruction from 2D in-shop clothes, we adopt the method described in Cloth-VTON+. We briefly summarize the method here. A standard human body model Vs is defined as an A-posed SMPL with a fixed pose and shape parameter set. We first generate the target human segmentation Sms using thetrained THSS generator.

Sms = Gthss (Msh, Msf, Msbs, Msl, Mss, Isbot, C, Pt)

where C is in-shop clothing, Msh, Msf, Msbs, Msl, Mss, Isbot, Pt are the hair mask, face mask,body shape mask, leg masks, mask shoe masks, lower-body clothing mask and the pose of thetemplate SMPL A-Pose model. The 2D matched clothing Imc is generated by applying SCM-TPS to the try-on clothing according to the matching silhouette mask Mmc which is simply the upper clothing labels from Sms. According to the study in Cloth-VTON+, SCM-TPS achieves satisfactory deformation results due to the minor 3D pose difference between the A-pose of thestandard SMPL body model and the in-shop clothing.

Once the matching in 2D image space is done, the depth of the clothing model is constructed. Assuming similarity in the depth between clothes and a human body, the depth of the 3D body model is utilized. First, the standard 3D body vertices Vs are projected into 2D image space.Then, a second 2D matching is applied to the 2D projected vertices of the standard model to align with the clothing boundary. Transformed 2D mesh points are considered as the vertices projected from the 3D mesh of clothing Vc. Mapping from 2D points to 3D points is done withinverse projection using depth obtained from the body with a small constant gap to produce thereconstructed 3D clothing model.

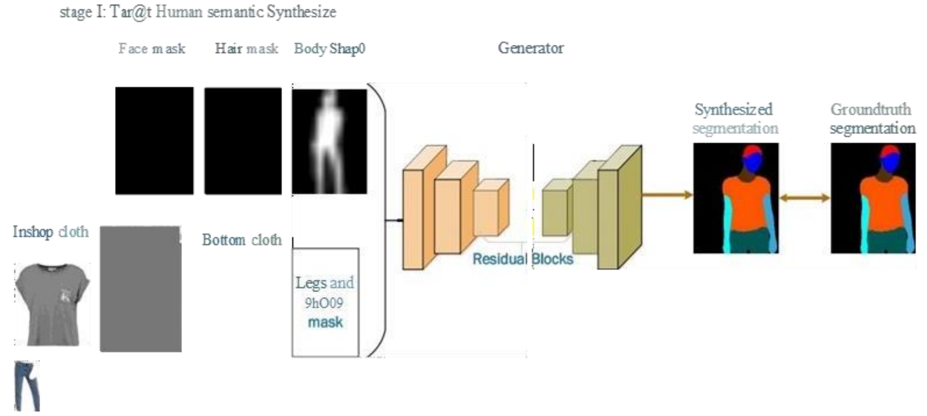


Figure 2.2.1 : Target Human Semantic Segmentation generator(THSS).

We were used flask micro framework as a interface between backend(python) and frontend(html). And for gui we used tkinter library which was written in python for design user interface. app.route ("/") it means whenever the home page is found invoke the function below it under that function in the end of that function you are returning a function render template("html file") and whatever html file is given in the argument that html page will be shown in the browser for that this html file should be available in template folder

app.route success",methods="POST" it means whenever the route is success then invoke the function below it post shows that we are sending data to server.

Advantages

- Can execute the application with low hardware smart phones.
- Available for across all android phones
- Increase order value.
- Ability to introduce custom models for projection.
- Reduce return rates.

2.3 Design Procedure

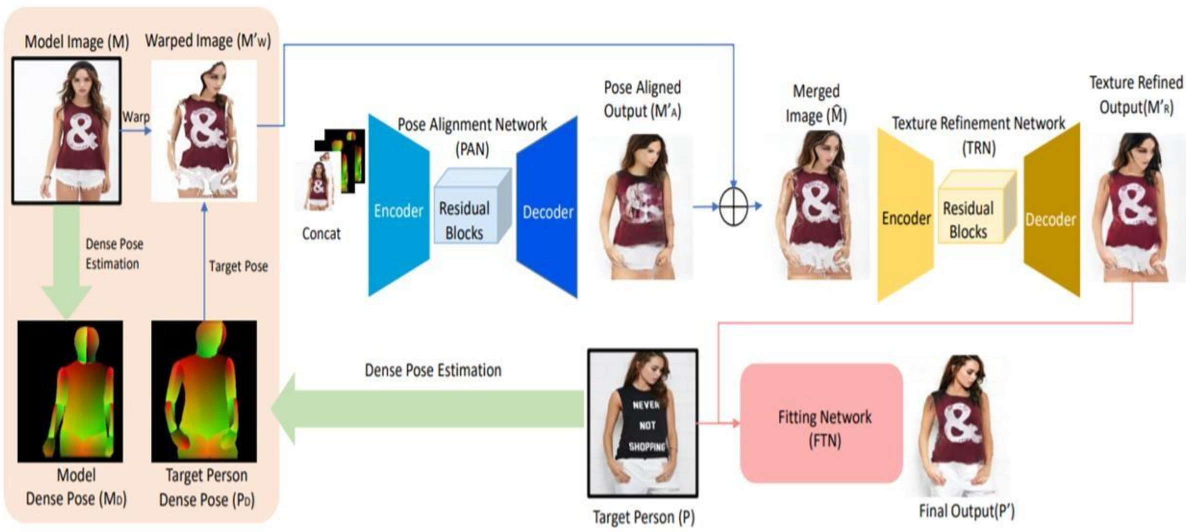


Figure 2.3.1: System design

The design procedure for a virtual try-on system involves several steps. Here's a high-level overview of the process:

Data Collection: Gather the necessary data for the virtual try-on system. This includes collecting 3D models or high-resolution images of the products or clothing items that will be used in the virtual try-on experience.

Body Scanning: Develop a method to capture accurate measurements and 3D scans of the user's body. This can be done using technologies like depth sensors, photogrammetry, or body scanning booths. The goal is to create a digital representation of the user's body that can be usedfor accurate virtual garment fitting.

Garment Digitization: Convert physical garments into digital representations. This involves creating 3D models of the clothing items by either manually designing and modeling them or using advanced techniques like 3D garment simulation software. The digital garments should accurately reflect the physical properties and characteristics of the real garments.

Body-Garment Alignment: Align the digital representation of the user's body with the digital garments. This step involves mapping the user's body measurements onto the 3D garment models to ensure a proper fit and realistic appearance.

Virtual Try-On Interface: Develop an intuitive and user-friendly interface for the virtual try-on system. This interface should allow users to browse and select different clothing items, adjust sizes and colors, and visualize how the garments would look on their own bodies.

Real-Time Rendering: Implement real-time rendering techniques to display the virtual garments on the user's body. This involves rendering the 3D models with realistic lighting, shading, and textures to create an immersive and visually appealing try-on experience.

Fit Assessment: Incorporate algorithms or techniques to assess the fit of the virtual garments on the user's body. This can include analyzing the garment's dimensions and the user's body measurements to determine if the fit is appropriate or requires adjustments.

Optimization and Refinement: Continuously optimize and refine the virtual try-on system based on user feedback and testing. This includes improving the accuracy of the body-garment alignment, enhancing the realism of the virtual garments, and addressing any usability or performance issues.

Integration: Integrate the virtual try-on system into the desired platform or application. This could be a mobile app, e-commerce website, or in-store kiosk, depending on the target audienceand use case.

User Testing and Feedback: Conduct user testing sessions to gather feedback and evaluate theeffectiveness of the virtual try-on system. Incorporate user feedback to make further improvements and enhancements.

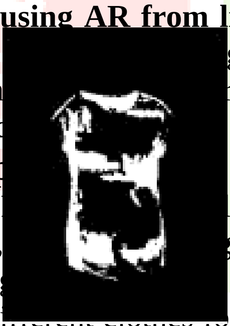
3. IMPLEMENTATION

User Extraction/Detection from the Input image: By separating user area user allows creating environment and background from the image and layered it onto a virtual manner in the user interface.

Human Body Detection: The main function of this step is to determine whether human body appears in a given image, and where these are located at.

Kinect Skeletal tracking: Large number of dimensions is described in the skeletal tracking. Skeletal tracking dimensions describe unique individuals, shapes, size, hair and clothing etc.

Face detection using AR from live camera: It uses Haar-Like features algorithm, this algorithm created by Voila and Jones g the location of human faces in a frame,the human faces has some universal properties like th righter than other regionslike the eye region and the eyes region is darker than the pixels arounc



Data Set Prep

We used the M l of our experiments, which consists of 35,687 single-person images in a variety of poses, es of in-shopclothes. Each image has a fixed resolution of 256 x 192. We split them into trainin 52,236 and 10,544 three-tuples, respectively. We generate a further 10,544 three-tuples of d r testing.

Since our clothing reconstruction method uses in-shop clothes and their masks, after checking the MPV dataset, we decided to filter out the seemingly undesirable in-shop clothing images. First, we filtered out images with two or more clothes, called a 'clothing stack'. In total, 356 of the original 13,524 images were removed in this filtering. Also, we filtered out the incorrect clothing masks.

Figure.3.1: Samples of bad clothing masks and clothing stack

Three neural networks in our approach, THSS, CHT and RTO, all share the U-Net architecture for the generators, and the discriminators are from Pix2PixHD (except RTO, which does not have a discriminator). GAN losses include the generator losses, discriminator losses for real and fake outputs, and the feature-matching loss but only for CHT. All networks are implemented in PyTorch. THSS, CHT, and RTO are trained for 50, 20, 5 epochs, respectively, with a mini-batch size of 8. For testing, we use two sets of testing tuples. One contains the tuples that have the same in-shop clothes and different poses. The other set includes tuples with different clothes and different poses, similar to the real-world scenario used for visual comparison. A learning rate of 0.0002 is used for training all the networks.

For optimization, ADAM optimizer with beta1=0.5, beta2=0.999 is used. Shapecontext matching is used to find the control points between the in-shop clothing mask and template body mask, then a thin plate spline is used to transform in-shop clothes to fix the body silhouette template mask. Since the TPS does not perfectly match in-shop clothing to template body shape, we further perform some geometric adjustments on the 2D clothing matching to cover all the template body mask areas. From input in-shop clothes, we build a 3D clothing model from the 2D matching texture. Then the texture is transferred based on target pose and shape, which is estimated by SMPLify-X optimization. We then project the 3D reconstructed clothes to 2D to get the deformed clothes image.

We built and trained the coarse human try-on and refinement networks following the MG- VTON. To understand the effects of the target segmentation performance, in addition to the try-on results using our THSS, we also show the results with MG-VTON's original synthesizedsegmentation in quantitative and qualification.

4. RESULTS

Figure 4.1: Image Based Output

The above image is the final output of the processed model and cloth in image based system.As you can see the selected cloth is virtually fitted to selected person.

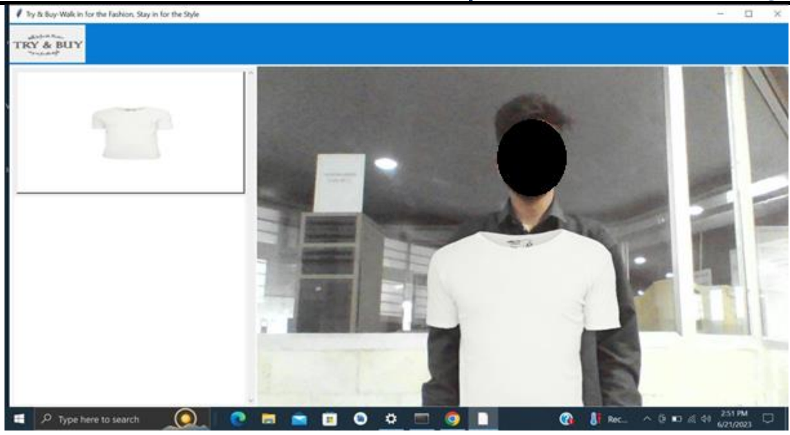


Figure 4.2: Video Based Output

The above image is the final output of video based virtual try on, as you can see the selectedcloth is virtually fitted to targeted person.

5. CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

Recent advancements in Augmented Reality are helping ease the fashion industry's transition from customary stores into modern online shops equipped with high-tech features such as virtual try-on and fashion synthesis systems.

We demonstrate a completed process for garment computational representation, computational styling and user preference training and modeling. Our model and implementation show great performance on different datasets and proved capable of modeling users' preferences.

5.2 FUTURE SCOPE

After detecting the physique of the targeted person further it can be improved by applicationof three tools which will help to set the clothes on target.

5.2.1 PAN (pose alignment network)

5.2.2 TRN (texture refinement network)

5.2.3 FTN (fitting network)

6. BIBLIOGRAPHY

1. H. Liu, "Computer 5G virtual reality environment 3D clothing design," *Mobile Information Systems*, vol. 20, no. 13, pp. 5–11, 2021.
2. Y. Hong and Y. Ge, "Design and analysis of clothing into account unity's immersive virtual reality in an artificial intelligence environment," *Computational Intelligence and Neuroscience*, vol. 52, no. 11, pp. 52–61, 2019.
3. Y. L. Jia, "The research of dance costume design based on virtual reality technology," *Advanced Materials Research*, vol. 18, no. 21, pp. 15–34, 2018.
4. International Journal of Innovative Technology and Exploring Engineering (IJITEE)ISSN: 2278-3075, Volume-8 Issue-11, September 2019
5. Seunghwan Choi, Sunghyun Park, Minsoo Lee, and Jaegul Choo. Viton-hd: High- resolution virtual try-on via misalignment-aware normalization. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pages 14131– 14140, 2021. 1, 2, 3, 6
6. Chieh-Yun Chen, Ling Lo, Pin-Jui Huang, Hong-Han Shuai, and Wen-Huang Cheng. ashionmirror: Co-attention feature-remapping virtual try-on with sequential template poses. In Proceedings of the IEEE/CVF International Conference on Computer Vision,pages 13809–13818, 2021.
7. https://viejournal.springeropen.com/articles/10.1186/2213-7459-1-9
8. https://www.google.com/ml
9. https://en.wikipedia.org/wiki/Augmented_reality
10. https://store.unity.com/download?ref=personal
11. https://free3d.com/3d-model/ironman-rigged-original-model--

    98611.html? cf_chl_tk=pfdFvJUKOhV.nWDBGqOfIwSBhCMk_uqUhLBgqHpG46U-1672473197-0-gaNycGzNCJE