Virtual Wardrobe

Shinde Vaishnavi[1], Shelke Supriya[2], Gawade Pratiksha[3,] Karpe Prachi[4]

Guide- Prof.A.H.Pawar
Savitribai Phule Pune University, Pune. Department of Information Technology Engineering.
Shivnagar Vidya Prasarak mandal's
College of Engineering, Malegaon (BK) Tal:-Baramati, Dist :- Pune

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Abstract - The rise of e-commerce, especially in fashion, has transformed the shopping experience, but it has also brought challenges such as the inability to physically try on clothing before purchase. This paper presents an Android-based 2D virtual try-on application designed to enhance online clothing shopping by providing users with an interactive and personalized fitting experience. The system utilizes advanced image processing techniques, including background removal, resizing, and alignment, along with machine learning models for pose detection and segmentation, to accurately overlay clothing on the user's image.

***Key Words*:** Android, processing, 2D, try-on, shopping

1. INTRODUCTION

The rapid growth of e-commerce has revolutionized the way people shop, particularly in the fashion industry. Online clothing shopping offers consumers convenience and a vast array of choices, but it also presents significant challenges. One of the major limitations of online shopping is the inability to physically try on clothes, which often leads to uncertainty about fit, style, and overall appearance. This problem frequently results in higher return rates, customer dissatisfaction, and a reluctance to purchase clothing online without first experiencing how it looks on their body. To address these issues, virtual try-on systems have emerged as a tecHnological solution that allows customers to visualize how garments will look on them without needing to visit a store. These systems enhance the online shopping experience by combining image processing, computer vision, and machine learning to overlay clothing on the user's image, providing a near-realistic representation of the user wearing the selected attire.

2. RELATED WORKDONE

The aim of this study is to seamlessly replace the clothing worn by a person in an image with selected garments from a retail store.. Accurate detection of the clothing area is the premise of the clothing replacement and attribute transformation in our method. We apply clothes parsing to determine the clothing area. Moreover, we use an excellent method for the semantic analysis of clothes, which analyzed clothing images at the pixel level and added accurate pixelated labels on clothing. The pixel-level clothes parsing can help us to accurately determine the clothing area in our framework, which is the premise to ensure the best try-on effect. B. 3D Virtual Try-on In early studies, 3D human body models were built to achieve 3D virtual tryon. Sekine et al. synthesized the user's body shape through depth images captured by multiple cameras and adjusted the 2D clothing image according to the body shape to complete the 3D virtual try-on. PonsMoll et al. used the 3D technology of multi-area scanning to capture the clothes. Subsequently, the clothes were adjusted according to the body shape and posture of the person. Miretal. provided a realtime 3D try-on method, which transferred image-based clothes onto 3D models. The method was more accurate than TPS warping and performed 3D try-on tasks. The proposed model, TailorNet, accurately predicts 3D warping of garments and retains intricate clothing features. Gundogdu et al. he proposed method utilizes two streams to effectively fit a 3D clothing template to a 3D body structure. It rendered a static clothing simulation onto the body to achieve try-on results in

real-time. However, 3D virtual try-on requires 3D measurements to accurately simulate clothes, and this involves both strict implementation conditions and a heavy workload. Hence, 3D virtual try-on based-methods always are less acceptable, it still requires more researches to tackle related difficulties. In current works, 2D virtual try-on basedmethods are more popular. C. 2D Virtual Try-on Recently, 2D image processing has become a popular topic in the virtual try-on field. As a popular way for image synthesis, GANs has been applied to various tasks such as clothing image generation, clothing image editing, clothing fashion sense enhancement, and virtual try-on. Yoo et al. combined GANs and deep convolutional 4 neural networks (CNNs) to generate images. The top image was generated using the person's image without considering the target person's pose. Lassner et al. proposed an imagelevel person-generation model, wearing full-body clothing, which could be adjusted according to the person's pose and figure. However, the clothes were randomly generated without considering how to control the clothing item. Fashion++ was a model that aimed to improve fashion sense; it could automatically measure fashion standards and make small changes to full-body clothing to adjust input images to more fashionable clothing.

3. METHODOLOGY

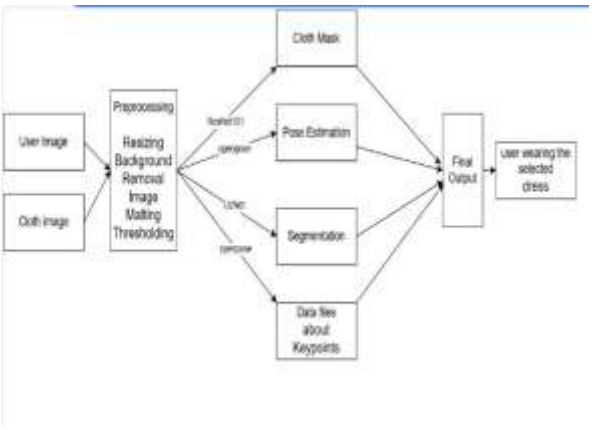

Fig -1: System Architecture

A. System Architecture Design:Modular Approach: The system is designed in a modular fashion, where each module (e.g., preprocessing, pose estimation, segmentation, masking) operates independently but communicates effectively with others. This ensures ease of maintenance and scalability.

B. Data Collection and Annotation:Dataset Acquisition: Collect diverse datasets containing various clothing types and user images under different lighting and pose conditions.

Annotation: Annotate the datasets with keypoints and segmentation masks for supervised training of the pose estimation and segmentation algorithms.

C. Training the Models

- Supervised Learning: Train the models (OpenPose, U2-Net, ResNet101) using annotated datasets. The training process involves minimizing loss functions to improve accuracy in predictions.

- Transfer Learning: Utilize pre-trained models where applicable to leverage existing knowledge and reduce the training time.

D. User Interaction Flow

- User-Centric Design: Focus on creating an intuitive user interface that guides users through the process of uploading images, selecting clothing, and viewing results.

4. PROPOSED SOLUTION

Overview of System Architecture

The image depicts a system architecture for a virtual try-on system, which overlays a piece of clothing on a user's image. Here's an overview of the architecture:

- **Input:**
- **User's Image:** A photo of the user.
- **Cloth Image:** The clothing item (e.g., a dress) that will be tried on by the user.
- **Preprocessing:**The system uses multiple preprocessing techniques to transform both the user's image and the clothing item into the necessary components for try-on.
- **Components after preprocessing:**
- **Cloth Mask:** Generated using a deep learning model (e.g., ResNet101).

  The cloth mask defines the outline and shape of the apparel item.
- **Pose Estimation:** Performed using OpenPose, which estimates the user's body pose by identifying keypoints.
- **Segmentation:** U2Net is used to segment the user's body and clothing to ensure proper placement of the clothing item.
- **Data Files about Keypoints:** Keypoint data generated during the pose estimation process helps in aligning the clothing item to the user's body accurately.
- **Final Output:**The processed images and data are combined to generate an image of the user wearing the selected clothing item, ensuring that it aligns with the user's body pose and contours correctly.This pipeline integrates computer vision techniques, such as pose estimation, image segmentation, and cloth manipulation, to create the virtual try-on experience.
- **ResNet101:**ResNet101 (Cloth Mask Generation) Function: ResNet101 is a deep learning model used to process images and generate precise masks outlining the clothing regions. In this system, it is responsible for generating the cloth mask, which isolates the shape of the clothing item. This mask helps in separating the garment from its background and defining its contours, making it easier to overlay the clothing onto the user's body. Why ResNet101?: ResNet101 is known for its ability to extract features from images effectively, which is crucial for complex tasks like cloth masking.
- **OPenPose**:OpenPose (Pose Estimation) Function: OpenPose is a real-time multi-person system used to detect keypoints of the human body (like joints, limbs, etc.). In this system, it is responsible for estimating the pose of the user from the image, which includes the user's body posture, arm positions, and more. Why OpenPose?: It provides accurate pose detection, allowing the clothing to be properly aligned and adjusted according to the user's body pose.
- **U2Net**:U2Net (User Image Segmentation) Function: U2Net is a deep learning model used for image segmentation. It segments the user's image into different regions, such as the body, background, and other objects. In this system, it is used to segment the user's body to differentiate between the person and the surrounding environment, ensuring that the clothing item is applied only to the correct areas. Why U2Net?: U2Net is highly efficient for extracting fine details in segmentation, ensuring accurate fitting of the clothing.
- **Segmentation:**OpenPose (Segmentation Keypoints Data) Function: The OpenPose-generated keypoints data helps track the positions of various joints and body parts. These keypoints are used to inform the alignment and scaling of the clothing to the user's pose. Why Important?: Keypoints ensure that the clothing can adapt to the user's posture dynamically, making the virtual try-on realistic.
- **Preprocessing**:Preprocessing Function: This step involves preparing both the user image and the cloth image for further processing. This might include standardizing the image resolution, orientation, and lighting conditions before passing them to other components. Why Important?: Consistent preprocessing is critical to ensure that

the inputs are uniform and suitable for the models to work effectively.

5. RESULTS

6. CONCLUSIONS

The virtual TRY-ON app promises to enhance the online shopping experience by providing a realistic and interactive way for users to visualize clothes before purchasing. By using advanced image processing techniques and machine learning, the system aims to reduce return rates, improve customer satisfaction, and revolutionize the e-commerce sector.

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