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User Friendly Virtual Clothes System Based on Simulation and Visualization using RGBD Camera

Vishruti Patel[1] | Varsha Satpute[2] | Shivani Kuhikar [3] | Arun Hattarge[4]

[1,2,3] Student, Computer Dept., Jaywantrao Sawant College of Engineering, Pune, Maharashtra, India
[4] Professor, Computer Dept., Jaywantrao Sawant College of Engineering, Pune, Maharashtra, India

ABSTRACT

Now a days due to the commercial strength, virtual try-on of different things such as shirts, pants, skirts etc has received much attention. The paper represents a system for 3d virtual clothes try-on that enables a user to see himself/herself wearing virtual clothes on the screen. it is possible by just looking at a screen, without taking off his/her actual clothes. It is helpful for online shopping or fashion recommendation to nail down the selections to few designs and sizes. The user can select various virtual clothes for trying on the screen. The major contribution of this project is that we automatically sets an invisible (or partially visible) avatar based on the user's body size and the skin color and use it for proper clothes fitting, alignment and clothes simulation in our virtual try-on system. The system physically characterize the selected virtual clothes on the user's body which help the user to see virtual clothes fitting from multiple angles as he/she moves.

KEYWORDS: *3D-2D alignment, body customization, mixed reality, skin color matching and real-time cloth simulation, virtual try-on.*

I. Introduction

Virtual try-on applications have become popular in re- cent years because they allow users to see themselves wearing different clothes without the effort of changing them physically. **This helps users to quickly judge whether they like a garment or not, and also garment is fit or not which in turn allows retail shops to sell more in less time.**In some previous solution display garment pictures as retexture images from a single camera. These approaches are not directly capable of producing arbitrary viewing angles. Moreover, garments do not adapt their size and shape to the user due to their static nature. Other solutions address these issues by reconstructing 3D clothes models.

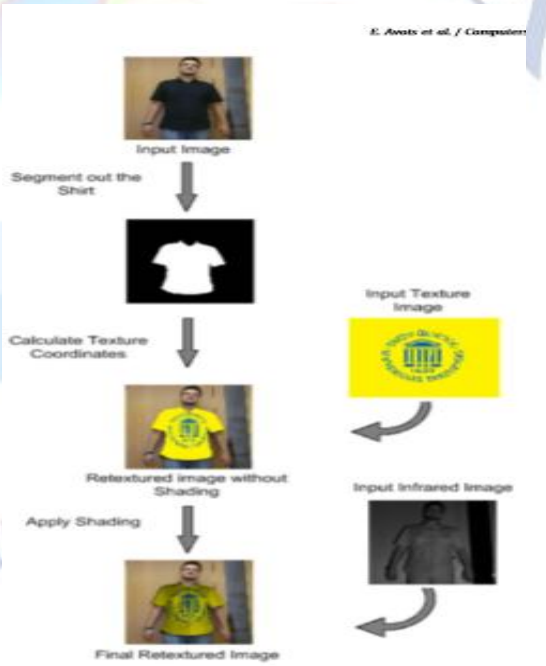


Fig.1. The Virtual Mirror system replaces color and texture of a t-shirts.

These approaches can produce the desired output, but require motion capture to track the user's position over time. One method is proposed where a user can be displayed wearing previously recorded garments. To achieve this by creating a garment database that stores the appearance of a worn garment over time. These recordings are not required to be from the same user and are performed using the same multi-camera device that is used for augmentation.**In virtual clothes system, users stand infront of camera can see themselves on a screen which shows them wearing different clothes.** User can see themselves from arbitrary viewpoints. The system therefore needs to capture and render the user at interactive rates while augmenting his or her body with garments.

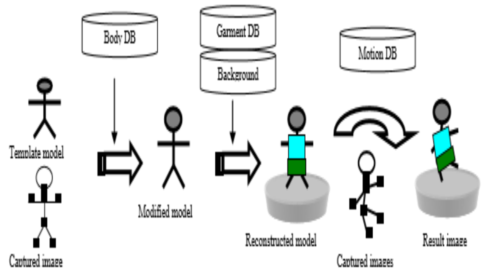


Fig2.Structure Of Virtual Dressing

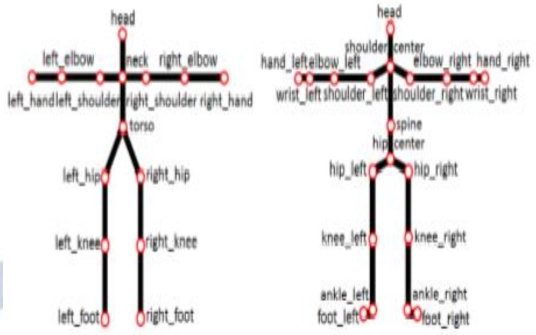
II. Related Work

A. Body Customization

Avatar customization can potentially be a strong tool in modeling and simulation applications. Rather than having to create models with different body shapes and sizes for a specific application, it is much economical in terms of time and effort, if a generic model can be modified realistically based on some parameters. measurements such as height, shoulder width, waist height and arm lengths can be obtained di- rectly from a RGB-D camera, and can be used to customize an avatar which is suitable for virtual try-on[1].

B. Height Estimation

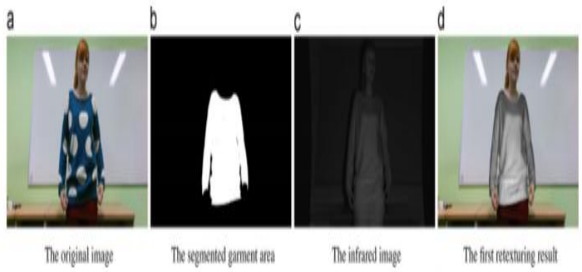
Virtual clothes need to be rescaled according to users' body size, for good fitting and try-on experiences.In virtual try on sytem pepar used two methods to estimate a user's shoulder height[2]. The first one simply uses the neck to feet height difference, when both the neck and the feet joints are detected by Kinect skeletal tracking SDKs. sometimes the feet are not located within the field of view of Kinect. In such scenarios, estimate the neck height from the tilting angle of the Kinect sensor,the depth of the neck joint in the Kinect depth image,and the offset of the neck joint with respect to the center point of the depth image. After the shoulder/neck height is estimated, then uniformly resize the digital clothes in three dimensions for a better fit to the user's body.



C. Cloths Segmentation and Image Preprocessing

Hilsmann et al. created a databases of different body positions of different levels of details to allow interactive visualization and retexturing of cothes. Here two modes are used for the clothes segmentations.One is the Detection Mode and another is Tracking Mode .During the Detection Mode the algorithm searches for the clothes in the image using the apriori knowledge of the color of the clothes and the assumption that it contains a rectangular highly textured region. Additionally, in this mode the mesh that is used as motion model to estimate the deformation of the texture in image plane. During the Tracking Mode here segments are used the clothes region in order to give it a new color. Assume that if the clothes is in the image, it is the largest area of that color and all parts of the shirt are connected. With these assumptions can use a very simple but efficient approach to detect and segment the clothes in the image that is robust against illumination changes and changing background.

First,author Hilsmann et.al. transform all pixels in the image into the normalized RGB-colorspace which is more invariant to changes of surface orientation relatively to the light source. then find the largest blob by evaluating the normalized pixel values and fill all holes in that region. Using this very general method for segmentation ensures that all parts of the shirt are segmented, including dark shadows or highlighted regions. During the Tracking Mode user can use this segmentation mask to recolor the untextured part of the shirt.



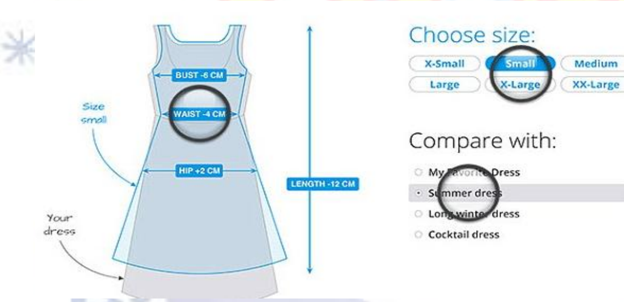
In the Detection Mode proceed further by searching for a highly textured region in the detected green region to initialize the mesh used for tracking. Then find and sample the contours of the texture defining the positions of the border mesh vertices and interpolate all inner vertex position points. By this method we assure that if the texture is already deformed in the model frame.

D. Size Estimation

Size Estimation[5][7] method was indroduced by Shreya Kamani et al. when the user calibrates himself/herself to the Kinect sensor[6], his/her size and girth is estimated. This information is used to achieve a better fit of the virtual clothing. The length of each limb is taken by computing the distance between each joint from the skeleton. The size of the body is taken by estimating[the girth of the chest on a number of points.**The girth of the user can be measured by two methods:**

1. Computing the distance between each point on the line .

2. Taking 3 points (outer left, center and outer right) and compute the distance .



Although the first solution seems more appropriate and easy to calculate, it is susceptible to a noisy sensor and cloth folding. Even the slightest fold will drastically hamper the users estimated girth. The second option, although not ideal, proved more accurate than the first method. To calculate the estimated size of the user, an average over 20 frames is taken for better approximation.

E. Deformable Surface Tracking

Once the clothes has been detected and the mesh has been initialized track the tex- tured region of the shirt in an optical-flow based approach. In exploit the optical flow constraint quation and regularize the optical flow field[3] with a predefined mesh- based motion model[4]. The best transformation can then be determined by minimizing a quadratic.

$$E = \sum_{i=1}^{n}(\nabla I(xi,yi).d(xi,yi)+\frac{di}{dt}(xi,yi)^2$$

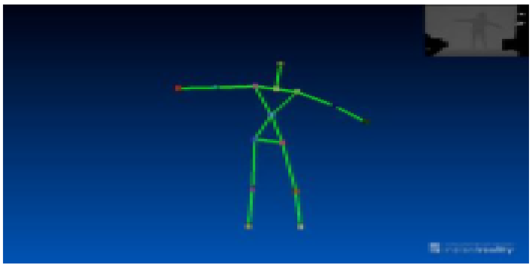
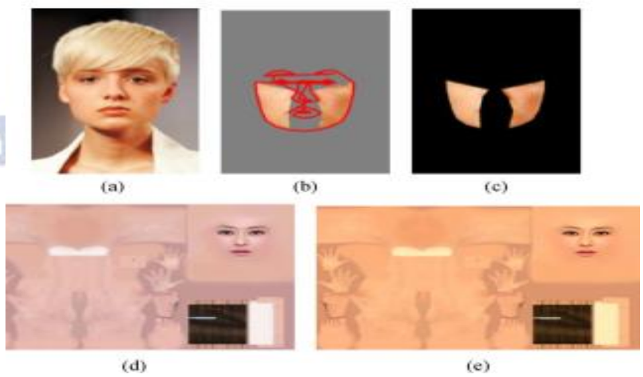


Fig. Skeleton Tracking

(xi, yi) denotes the spatial derivatives of the image I at pixel position [xi, yi]T and ?I ?t (xi, yi) denotes the temporal gradient between two images. d (xi, yi) denotes the displacement vector at position [xi, yi]T and is defined by the motion model. n is the number of pixels selected for contribution to the errorfunction, i.e. pixels where the gradient is non-zero.

F. Skin-Tone Matching

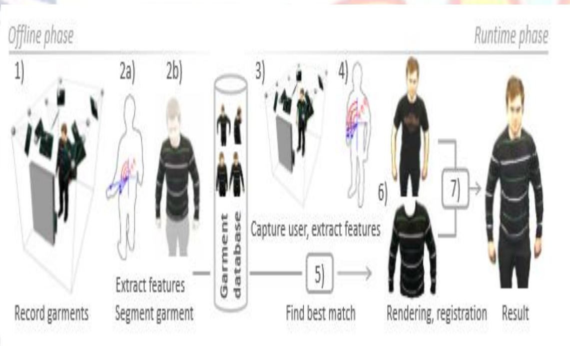
In paper Virtual Try-ON System[2][1] author presented SKIN-TONE MATCHING[4] Besides editing the mesh geometry according to the user's sizes,skin color matching is the another requirement for creating a tool alike avatar. In this method they are using the user's face skin color to adaptively change the avatar's body skin color.This transformation consist of three steps .In first step facial features are located using the active shape model(ASM)technique. In the second step,they are using piecewise linear curves represent the cheek areas and the extract cheep patches.finally they are applying global color transfering method to shift the color of the avatar body face patches. In given fig they are showing original face image and face jointed lines and this image is presented by[1].



.6. (a) Original face image; (b) face cheek with landmarks and jointed lines; "cut out" face cheek patches; (d) original avatar UV map and (e) new avatar map using cheek patches.

To capture face skin patches[1], one common technique is applied for transfer the RGB images to YCbCr color space and threshold the chrominance components. The pixels with their chromatic value falling in a certain range are classified as skin-color pixels. However, in most uncontrolled environments, some background clothes or hair may have similar colors as face. Moreover, the lips and the areas between eyebrows and upper eyelids (or even the eyebrows in some cases) are easily misclassified as skin areas which are not perfect skin patches to be used for skin-tone transfer. Another problem in skin tone extraction is that the appearance of skin is usually quite different under different viewing and lighting conditions. Additionally, due to different scattering properties of skin[1], cellular and 3D topographic structure of the face[7], there are usually highlights in the forehead, nose and chin areas.

G. Virtual Clothes



Virtual cothes[4][10] step is to dress the tracked user. 3-D meshes[5][7] of clothing are designed in Blender and imported to Unity. As per our research, Unity provides two different cloth components that can be added to a mesh: interactive cloth and skinned cloth . Both components have features such as stretch, damping and thickness to give a real clothing experience.

III. Conclusion

In this study, a virtual mirror system is designed for the purpose of cloth changing room. Our motivation here is to increase the time efficiency and improve the accessibility of clothes try-on by creating a virtual dressing room environment. The system exchanges the colour and the texture of a shirt while the person wearing the shirt can move freely in front of the mirror and even perform elastic deformations of the cloth like stretching and bending or move toward or away from the camera. Besides these results, one important characteristic of our system is that it uses very simple application. These algorithm achieves realism by using image-based rendering, which makes it a good alternative to manually model garments.

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