Depth Image based Cloth Deformation for Virtual Try-on

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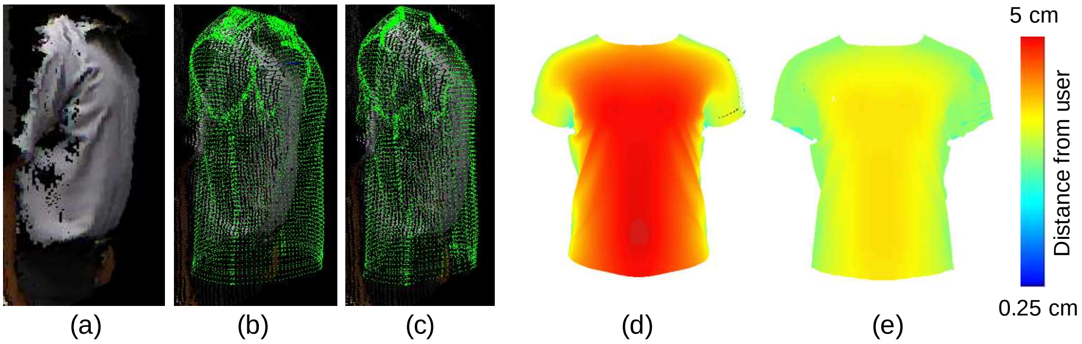

Figure 1: *Output results of virtual tryon showing the user side view (a), point rendering of the original undeformed mesh (b), point rendering of depth based deformed mesh (c), underformed mesh depth values color mapped (d), and deformed mesh depth values color mapped (e).*

1 Introduction

The affordability of RGBD cameras has pushed the retail shopping to the next level with the Virtual Try-on (VTO) application. Existing approaches [Giovanni et al. 2012], [Kevelham and Magnenat-Thalmann 2012] use skinning whereas systems like FitNect augment skinning with cloth simulation. Alternatively, image-based approach [Zhou et al. 2012] utilizes video clips for virtual try-on. In all of the existing approaches, the user's depth profile is not taken into consideration. Therefore, the user does not feel a good fit. Using customized avatars [Yuan et al. 2012] solves the fitting issue but it requires an offline user-look-alike avatar creation stage which is improper for walk-through scenarios. Furthermore, accurate physics based simulation of a 3D garment on a detailed avatar model is very time consuming.

To circumvent these problems, instead of cloth simulation, we propose to deform the clothes model using the nearest depth point. This way, the user experiences a better fit with a more pleasing virtual try-on as shown in Figure 1.

2 Methodology

The steps involved in our approach are:

1. Segment and filter the user's depth map obtained from RGBD camera
2. Calculate the normal map from the depth map of the user
3. For each vertex in the garment mesh, find the closest point in the depth map
4. Displace the garment vertex in the normal direction of the found point in the depth map

The normal map is obtained by extracting the eigenvalues (λ_k) and eigenvectors (V_k) from a covariance matrix (C) in the neighborhood of a given point (x_i) as

$$C = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})(x_i - \bar{x})^T, C.\vec{V_k} = \lambda_k.\vec{V_k}, k \in 0, 1, 2 \quad (1)$$

The normal is used for displacement of garment vertices and will be utilized for collision resolution in our future cloth simulation pipeline. To accelerate search for the closest point to a given depth, we employ a kd-tree acceleration structure which is generated at initialization. The entire pipeline is illustrated in Figure 2. After initial deformation, some vertices are left out at the extremities. These are stitched to the closest point in the depth map. The stitched mesh vertex displacements can also be used for user size recommendation i.e. small, medium, large etc.

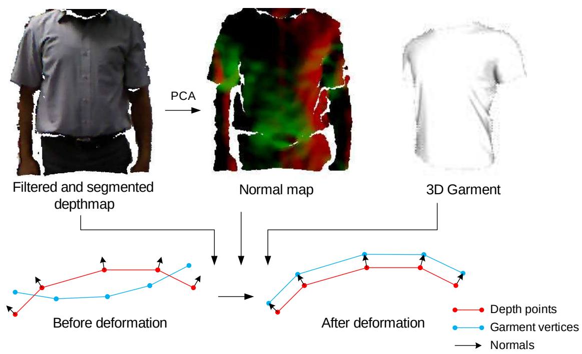

Figure 2: *Our proposed pipeline.*

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SIGGRAPH 2013, July 21 – 25, 2013, Anaheim, California.

ACM 978-1-4503-2261-4/13/07

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