K S INSTITUTE OF TECHNOLOGY

Department of Computer Science & Engineering
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Project Title: Virtual 3D Trail Room	

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INTRODUCTION

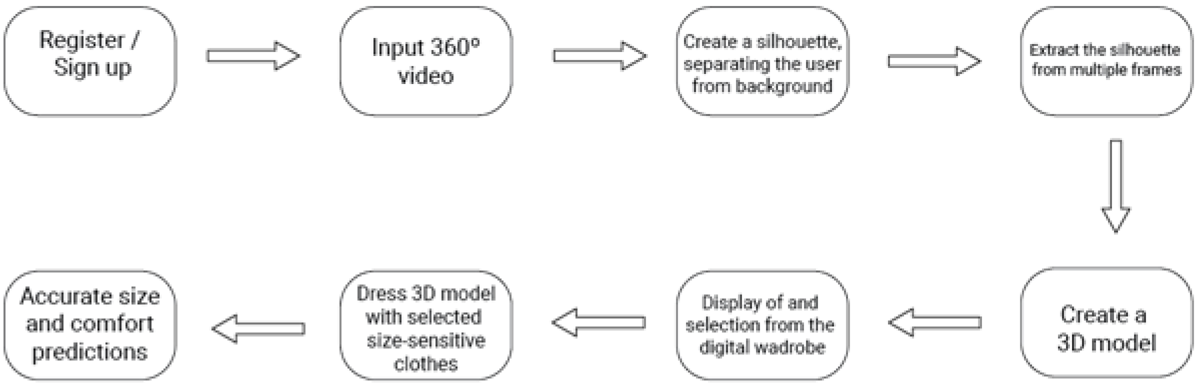
- Following the SARS-CoV-2 disease (COVID-19) pandemic and nationwide lockdown, clothing which is essential for functional and social reasons became a discretionary need.
- The fashion industry has taken a hard hit. Online shopping for clothing is doable but is unreliable for various reasons long before the pandemic hit our streets.
- Clothes and shoes are one of the top three online product categories that are returned the most (56%). 52% of customers return their purchased items because the size/fit wasn't right or they can't try them on.
- Presenting "Virtual 3D trial room", an application which uses CNN to produce a 3D model of a person and allows them to try on clothes virtually.
- Based on the parameters taken from a single monocular video provided by the user as input, the 3D model is constructed which comprises the person-specific static geometry of the body, hair and clothing, alongside a coherent surface texture which is replaced by size-sensitive clothes subjected to trial.

PROBLEM STATEMENT

"Due to the pandemic, everyone has taken to shopping online for their essentials. These essentials include clothing, and going outside to buy clothes hinders the social distancing health measure. Shopping online for clothes is difficult as there is no way to check the fitting and comfort of the clothes. Hence, a virtual 3D trial room allowing the user to upload a video of themselves along with few other inputs such as height and weight resulting in a robust, texture-rich 3D human model with clothes tried on would be helpful."

INITIAL PLAN

FLOWCHART



Work Flow Diagram of the proposed system

METHODOLOGY

The system has 2 main functionalities.

1. To reconstruct a 3D model of the user from the input video.
2. Dress any body shape in arbitrary poses using the available 3D digital wardrobe.

The 3D model creation has three stages:

First, it analyses the video for a few seconds long of someone moving with T-pose, preferably turning 360°- to show all sides and for each frame creates a silhouette separating the person from the background. Based on machine learning techniques in which computers learn a task from many examples it roughly estimates the 3D body shape and location of joints using SMPL with clothes.

In the second stage, it combines information about the T-posed people into one, more accurate model from the obtained visual hulls.

Finally, in the third stage, it applies color and texture to the model based on recorded hair, clothing, and skin .

In the next step, the 3D model is analyzed to separate and extract the underlying body geometry, motion component and the clothing as separate geometric layers.

The study of the MGN model is used to replace the clothing geometry over the body geometry to “dress” any body shape in arbitrary poses. A publicly available digital wardrobe, the MGN model [6], and code is used to dress SMPL obtained 3D models with the garments.

WORK DONE

Presented a paper named Virtual 3D Trial room in the virtual CSI convention 2021.[3]

LITERATURE SURVEY

Thiemo Alldieck et al. 2019. [1] describes a learning-based model, referred to as Octopus model, to infer the personalized 3D shape of people from a few frames (1-8) of a monocular video in which the person is moving with a reconstruction accuracy of 4 to 5mm, while being orders of magnitude faster than previous methods. From semantic segmentation images, Octopus model reconstructs a 3D shape, including the parameters of SMPL plus clothing and hair in 10 seconds or less. The model achieves fast and accurate predictions based on two key design choices. First, by predicting shape in a canonical T-pose space, the network learns to encode the images of the person into pose invariant latent codes, where the information is fused. Second, based on the observation that feed-forward predictions are fast but do not always align with the input images, it predicts using both, bottom-up and top-down streams (hybrid method) allowing information to flow in both directions. Learning relies only on synthetic 3D data. Once learned, Octopus can take a variable number of frames as input, and is able to reconstruct shapes even from a single image with an accuracy of 5mm.

B. Bhatnagar et al. 2019. [2] describes a method to predict body shape and clothing, layered on top of the SMPL model from a few frames of a video. This model allows to predict garment geometry, relate it to the body shape, and transfer it to new body shapes and poses. The following steps are involved in this process:
SMPL registration to the scans: For every scan, the underlying body shape, and the garments of the person registered to one of the 5 garment template categories: shirt, t-shirt, coat, short-pants, long-pants.
Body aware scan segmentation: The garment templates are defined as regions on the SMPL surface; the original shape follows a human body, but it deforms to fit each of the scan instances after registration. Since garment registrations are naturally associated to the body represented with SMPL, they can be easily reposed to arbitrary poses.
Template registration: Obtained data is used to train Multi-Garment Network to estimate the body shape and garments from one or more images of a person.

[1] Thiemo Alldieck, Marcus Magnor, Bharat Lal Bhatnagar, Christian Theobalt, Gerard PonsMoll "Learning to Reconstruct People in Clothing from a Single RGB Camera", 2019 IEEE Conference on Computer Vision and Pattern Recognition, Germany.

[2] B. Bhatnagar, G. Tiwari, C. Theobalt and G. Pons-Moll, "Multi-Garment Net: Learning to Dress 3D People From Images," 2019 IEEE/CVF International Conference on Computer Vision (ICCV), Seoul, Korea (South), 2019, pp. 5419-5429, doi: 10.1109/ICCV.2019.00552.

[3] CSI convention paper

Name of the Faculty	**Suggestions Given**	**Signature**
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