Evaluation of Open-source software for use with a clothing virtual try-on system

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Clothing virtual try-on (VTO) technology facilitates the effective use of newer garment purchasing and design technologies. The high return rate for online purchased clothing and the treatment of VTO as adjunct to the apparel design process however shows that this technology has not yet been fully adopted. This is attributed to the dominance of expensive commercial VTO systems as opposed to open-source 3D animation software coupled to more affordable 3D scanners such as Microsoft Kinect. These will make the VTO systems available to a wider audience and contribute to the greater adoption of the technology. This project evaluated the MakeHuman and Blender open-source software packages for application to VTO systems.

The MakeHuman software uses a parametric approach to generate 3D avatars for use in animation software. These parameters may be mapped to anthropometric measurements from databases, physical measurements or 3D scanner output. The generation of avatars from a subset of the anthropometric measurements from the female subjects in the SizeUSA database was evaluated. These measurements were correlated to the MakeHuman macro modeling parameters through either direct mapping (e.g. SizeUSA height to the MakeHuman height parameter) or nonlinear optimization that adjusted the MakeHuman weight, muscle and weight proportion parameters until the avatar's body surface area corresponded to the body surface area calculated from the SizeUSA weight and height measurements.

These avatars were imported into Blender which is a 3D graphics and animation software that contains models for garment modeling. This software's three different virtual 3D garment generation options were evaluated. The virtual sewing option (see Figure 1) assembles the garment from 2D patterns that are imported as jpeg images from external software. A sewing simulation was performed until the required pattern draping is achieved.

The direct modeling option edits the meshes of basic geometry objects such as planes, polygons, and cylinders until the required garment model is achieved. A cylindrical mesh was used as the starting point for this project and an overview of the process followed is illustrated in Figure 2.

For the B-surfaces garment design approach (Figure 3) lines are directly drawn on the avatar which results in a mesh that closely match the avatar surface.

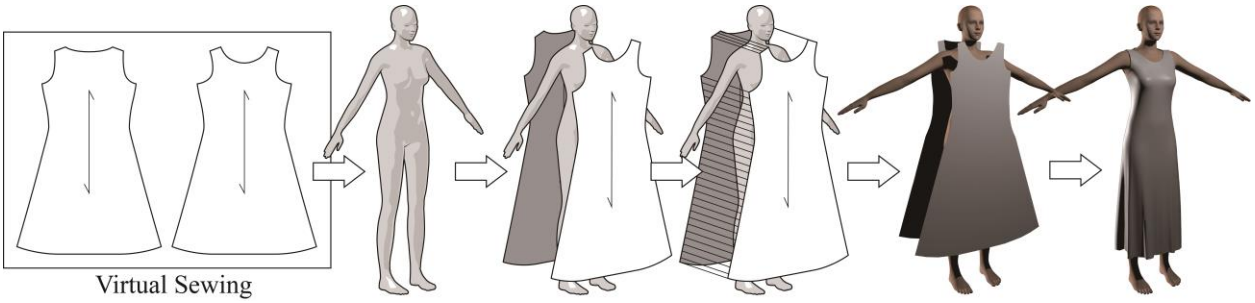

Figure 1: Overview of the virtual sewing option for garment modeling in Blender

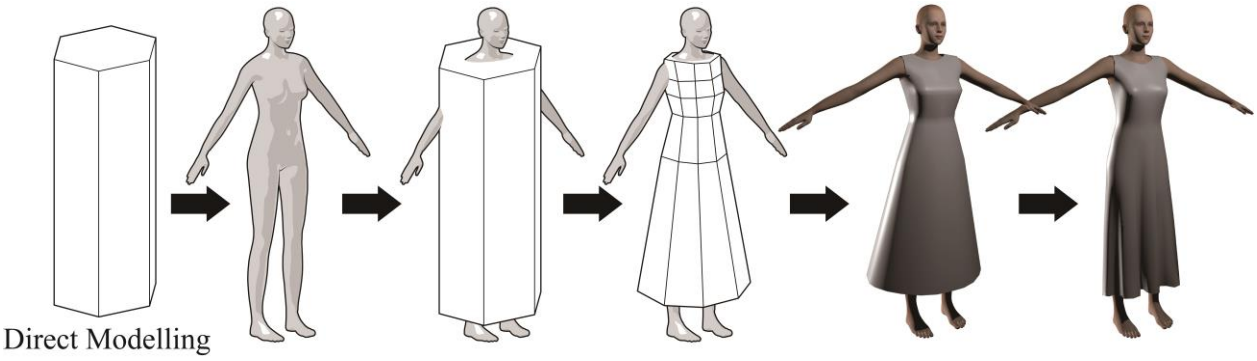

Figure 2: Overview of the direct modeling option for garment modeling in Blender

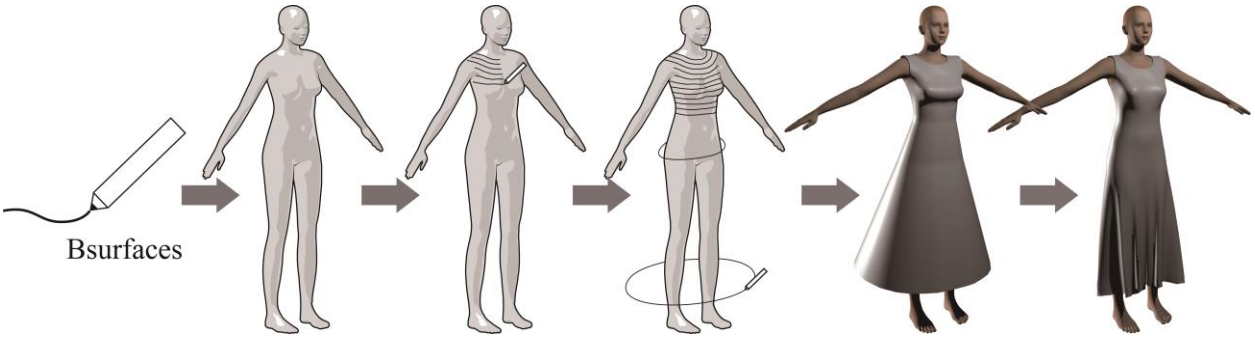

Figure 3: Overview of the B-surfaces modeling option for garment modeling in Blender

This study demonstrates that MakeHuman and Blender are feasible candidates for a VTO system based on open-source software. Avatar development from SizeUSA data is possible in MakeHuman but requires validation against 3D scan output. A greater subset of SizeUSA anthropometric parameters should however be incorporated to obtain more accurate avatars and avatar input options should be expanded to utilize input from 3D scanners

The Blender Direct modeling and B-surfaces options place greater emphasis on graphic design expertise than clothing design expertise. The Blender Virtual sewing option is consequently recommended since it resembles the traditional clothing design workflow.