**Objective**

- To develop methods for accurate virtual 3D draping of apparel on a digitized 3D body considering variations in fabric mechanical properties.
- Understand how variations in fabric mechanical properties can be incorporated into virtual simulations: via examination of simple forms progressing to representations of apparel items on the body.
- Develop and refine methods and metrics for measuring effectiveness of the virtual techniques and accuracy of simulated garments.

**Method**

- Fabrics with defined range of characteristics were selected for the studies. The fabric weight parameters of the selected fabric samples are listed in Graph 1.
- Tensile, bending, stretching and surface property measurements from FAST & KES-effect shape of fabrics and are used in the simulation studies.
- Square fabric samples in parallel to warp and 45 degree bias directions were used to verify the developed method from analysis of pass/fail input to the simulation calculations.
- Fabric images from the digitization software (Figure 2). The Cusick Drapemeter & Three-dimensional body scanning (Figure 3) were used to evaluate the simulations by measuring and comparing the accuracy based on developed metrics.
- The simulated images were characterized using Geomagic software to allow comparison with the experiment's drape shape (Figure 4).
- Modulate and 3D scanning results were used to optimize the fabric property input to produce the best simulation.
- Representation of fabric mechanics in 3D virtual draped forms fit to be digitized forms is evaluated on sample form (Figure 5). The research was performed to generate the next stage.

**Abstract**

Methods and technologies that provide true representation of fabric shape and bending both physical and communication barriers in the textile supply chain. Therefore, use of such technologies would result in improved products, higher product success rates, increased consumer satisfaction and improved organizational efficiency. Key systems include the Cusick Drapemeter & Three-dimensional body scanning software. The research measured tensile, bending, stretching and surface property measurements from FAST & KES-effect shape of fabrics and are used in the simulation studies. The square fabric samples in parallel to warp and 45 degree bias directions were used to verify the developed method from analysis of pass/fail input to the simulation calculations. The Cusick Drapemeter & Three-dimensional body scanning were used to evaluate the simulations by measuring and comparing the accuracy based on developed metrics. The simulated images were characterized using Geomagic software to allow comparison with the experiment’s drape shape. Further research is in progress to extend the work to complex forms that would be necessary to virtually represent apparel products for design, development and e-commerce applications.

**Results & Discussion**

Curves relating bending stiffness of cloth to particle model bending stiffness

Plots relating bending stiffness of the cloth derived from Kawabata Tests and bending stiffness input to the Modulate software were developed by comparison of shapes of circular fabrics with the simulations based on a criterion derived from repeatability tests (Figure 5).

The criterion for comparative evaluation is:
- Translated drape coefficient within 10% of the mean experimental drape value
- Translated number of nodes input to the number of nodes obtained in any one of the 4 repeatability trials done on the real cloth
- Translated nodal dimensions in d1 and d2 within 10% of the mean experimental drape values

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