

# Virtual Suit Fit Assessment Using Anthropometric Body Shape Model

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## ICA PROJECT OVERVIEW

Suboptimal suit fit is a known risk factor for crewmember shoulder injury. Suit fit assessment is however prohibitively time consuming and cannot be generalized across wide variations of body shapes and postures.

In this work, we have developed a new design tool based on the statistical analysis of body shape scans. This tool is aimed at predicting the skin deformation and shape variations for any targeted body sizes and shoulder poses.

## INNOVATION

With the web-based graphical user interface, users can parametrically adjust body dimensions and shoulder poses.

The tool uses the latest 3-D rendering techniques to illustrate a predicted 3D avatar of a virtual crewmember.

This new process, when incorporated with CAD software, will enable virtual suit fit assessments

## OUTCOME / RESULTS

- Scanned and statistically analyzed 3-D scan data from 12 subjects each in 9 different poses
- Developed a model capable of predicting body shapes across  $\pm 45^\circ$  range of shoulder articulations
- Model estimated skin deformation patterns with prediction error  $\leq 1.0$  cm
- Implemented a web-based visualization tool using HTML5 and WebGL

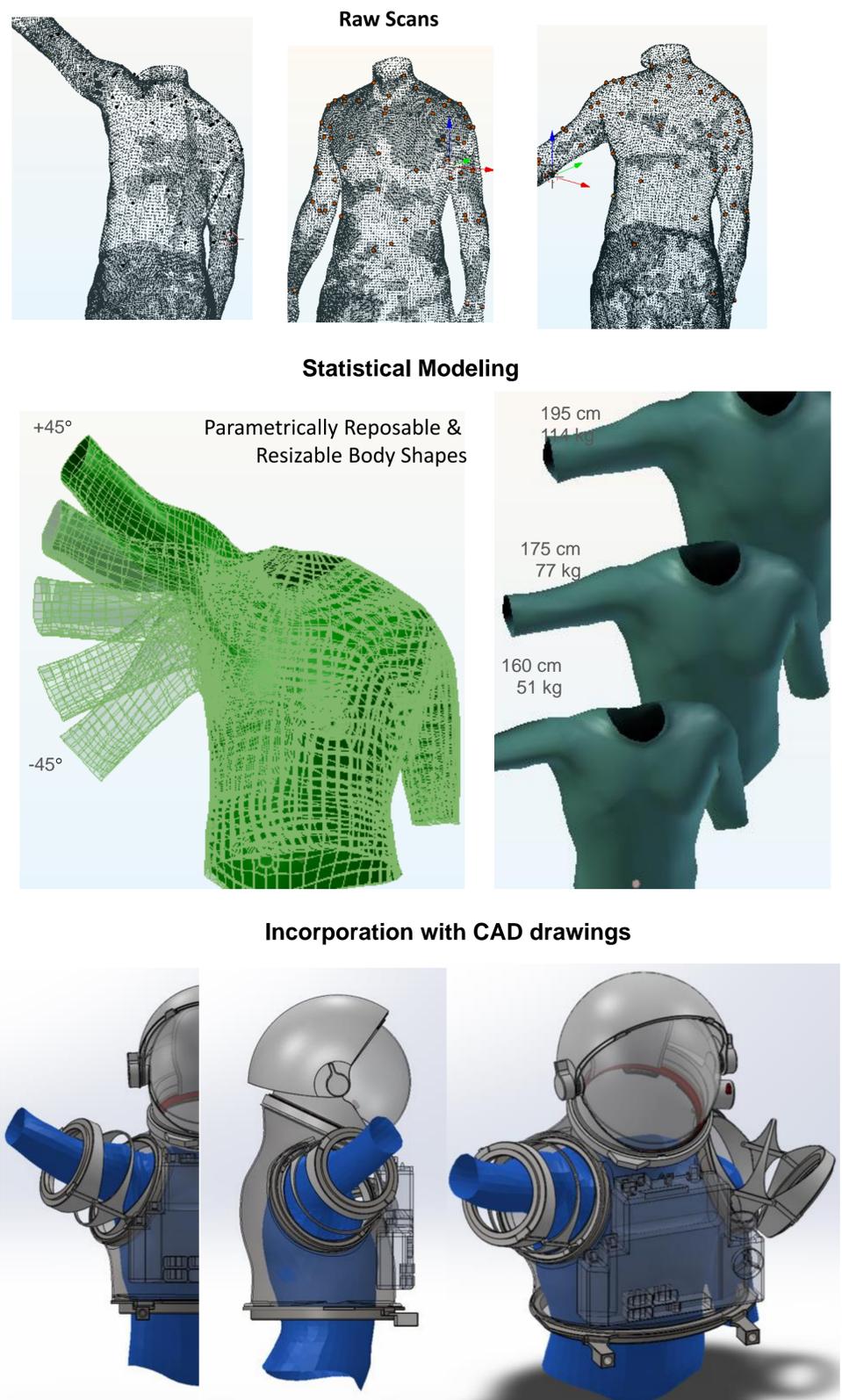
## INFUSION FOR SPACE / EARTH

Optimal spacesuit design is crucial to minimize the potential injury and health risks for crewmembers in extravehicular and exploration activities. The developed tool can provide quantitative guidelines for accommodating diverse crewmember populations in a wide variety of body sizes.

## PAPERS / PRESENTATIONS

Kim et al., Proceeding of the International Conference on 3D Body Scanning Technologies, Lugano, Switzerland, 2016.

## ICA DEVELOPED PROTOTYPE



## FUTURE WORK

We can enhance the models to include articulations at other critically important body joints for suit fit assessments, including the knees, wrists, and lower back.

