3D Body Scanning, Past and Future

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Abstract

New technology is valued for one of two reasons: 1) it enables us to do something better or cheaper or 2) it enables us to do something we couldn't do before. Many people still value 3-D scanning for the first reason, because they think it enables us to gather 1-D measurements better, faster or cheaper. In 1996 when recruiting partners for the first whole body 3-D scanning survey we thought the 3-D scanners would <u>automatically</u> produce more accurate, consistent and repeatable 1-D measurements than manual measurers do. While we found that 3-D scanners can produce highly accurate, consistent and repeatable 1-D measurements for point-to-point distances, it has become clear they can't do that without an expert pre-marking measurement locations, (Robinette and Daanen 2006). In addition, for circumferences, such as waist circumference, hip circumference, and vertical trunk circumference, the tape measure is still superior to the 3-D scanner. However, 3-D scanners are much more valuable than just alternative 1-D measuring tools. 3-D enables us to do things we can't do with 1-D data, (the second reason why new technology is valued.) 3-D provides shape, contour, volume, location, comparative locations over time or under different conditions, (such as fitting versus not fitting) or between two people, etc. 3-D provides capability essential to: true-to-life dynamic human modeling for design, injury prediction, fit quantification, situational visualization and more. Some people might even argue that if you have 3-D you don't need 1-D, but 1-D data are easy to store, search and use for simple categorization using tools readily available to most people. Therefore the two tools each provide different capabilities and are even more useful together. For example, in figure 1 Eye-Height-Sitting and Buttock-Knee-Length measurements were used to sort and select two women, then their 3-D scans were used to visualize the whole volume they occupy and the relationship between them, their postures, contours, etc. McConville et al (1980) used 3-D to calculate segmental mass, moments and axes of inertia etc. and, by collecting manual 1-D at the same time, developed equations to predict these things from 1-D measurements. In other words, 1-D can be used to make 3-D more accessible and useful to the common person. This presentation reviews the evolution of anthropometry technology, the lessons learned, the goals and aims of the research and proposes a vision of the future for the science of anthropometry that could change the way human-worn or inhabited products are designed and produced.
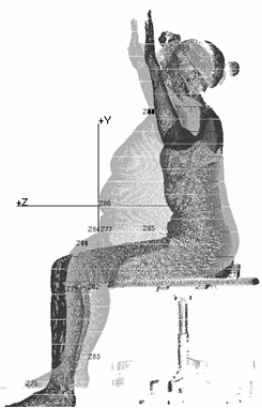
Figure 1. Two women same eye height & buttock-knee length. (from Robinette and Hudson, 2012).

References

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