

the results in studies of this nature. Creating visual models with embedded information for analysis, as we have done with the creation of the color mapped models, can contribute to our understanding of the complex issues related to fit of clothing.

Similar analyses of other garment shapes and materials can also be undertaken to add to our understanding of apparel fit. Ultimately it should be possible to model fit in sophisticated ways that take fabric properties into account if enough information is collected from studies of this nature. It is also necessary to introduce body variation as an additional variable in order to understand the complexities of fit. Studies similar to this are difficult when clothing is scanned on people instead of dress forms, due to the difficulty of repeating a posture precisely for the clothed and unclothed scans. Variations such as bilateral asymmetries that exist in all people also add to the difficulty of interpreting results of these studies. However, the data from such studies can provide the most valid measure of clothing fit. Studies need to be undertaken to develop methods to resolve these difficulties.

References.

- [1] Loker, S., Ashdown, S. P., and Schoenfelder, K., "Size-specific analysis of body scan data to improve apparel fit," *Journal of Textile and Apparel, Technology and Management* 4(3), (2005). http://www.tx.ncsu.edu/jtatm/volume4issue3/articles/Loker/Loker_full_136_05.pdf.
- [2] Ashdown, S. P. and Dunne, L. , "A study of automated custom fit: readiness of the technology for the apparel industry," *Clothing and Textiles Research Journal* 24(2), 121-136 (2006).
- [3] Nam, J. and Ashdown, S. P. , "Fit analysis of liquid cooled vest prototypes using 3D body scanning technology," *Journal of Textile and Apparel, Technology and Management* 4(3) (2005).
- [4] Zheng, R., Yu, W. and Fan, J. , "Development of a new Chinese bra sizing system based on breast anthropometric measurements," *International Journal of Industrial Ergonomics* 37(8), 697-705 (2007).
- [5] McConville, J. T. , "Anthropometric fit testing and evaluation," In R. L. Barker, & Coletta, G.C. (Ed.), *Performance of Protective Clothing: ASTM STP 900*. Philadelphia, PA: American Society for Testing and Materials, 556-568 (1986).
- [6] Erwin, M., Kinchen, L. and Peters, K., [Clothing for Moderns], Prentice Hall, Englewood Cliffs, NJ (1979).
- [7] Fan, J., Yu, W. and Hunter, L., "Subjective assessment of clothing fit," In *Clothing Appearance and Fit: Science and Technology*, Fan, J., Yu, W., and Hunter, L., Eds, Woodhead Publishing, Ltd, Cambridge, England. 31-41 (2004).
- [8] Ashdown, S. P. and O'Connell, E. K., "Comparison of test protocols for judging the fit of mature women's apparel," *Clothing and Textiles Research Journal* 24(2), 137-148 (2006).
- [9] Ashdown, S. P. Ed., "Sizing in Clothing: Developing Effective Sizing Systems for Ready-To-Wear Clothing," Woodhead Publishing, Ltd, Cambridge, England (2007).
- [10] Petrova, A. and Ashdown. S.P., " Three-dimensional body scan data analysis: Body size and shape dependence of ease values for pants fit," *Clothing and Textiles Research Journal* 26(3), 227-252 (2008).
- [11] Robinette, K. M., "Fit testing as a helmet development tool," *Proceedings of the 37th Annual Meeting of the Human Factors and Ergonomics Society*, Vol. 1, pp. 69-73, The Human Factors and Ergonomics Society, Santa Monica CA. (1993).
- [12] Ng, R., Chan, C. K., Pong, T. Y. and Au, R., "Objective measurement of the 'fit' of an apparel," *Proceedings of the 77th Textile Institute World Conference* (1996).
- [13] Kim, H., Suh, C., Suk, E., Park, S. and Lim, J., "A study of the comparative evaluation of wearing fitness of women's ready-made jackets using 3D scanner," *Journal of the Korean Society of Clothing and Textiles* 25(10), 1707-1718 (2001).
- [14] Taya, Y., Shibuya, A. and Nakajima, T., "Evaluation method of clothing fitness with body, part 1: evaluation index of clothing fitness," *Journal of the Textile Machinery Society of Japan* 48(2), 48-59 (1995).
- [15] Li, P., Corner, B. D., Paquette, S., Lee, C. and Kim, I. Y., "Analysis of air gap size and distribution in single and multilayer clothing systems using 3-D whole body digitizing," *XIVth Triennial Congress of the International Ergonomics Association and the 44th Annual Meeting of the Human Factors and Ergonomics Society*, 758-761 (2000).
- [16] Song, G., "Clothing air gaps layers and thermal protective performance in single layer garment," *Journal of Industrial Textiles* 36(3), 193-205 (2007).
- [17] Nam, J. H., Branson, D. H., Ashdown, S. P., Cao, H. and Carnrite, E. , "Analysis of ease values and fit of liquid cooled vests from 3D body scan data taken in working positions," under review for the *International Journal of Clothing Science and Technology*.