Studying the female form: Math could lead to sexier lingerie, safer labcoats

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Researchers in Japan have turned to mathematics to build a computerized 3D model of the female trunk that could help lingerie and other clothes designers make more sensuous, comfortable, and better fitting product ranges.

According to Kensuke Nakamura of Kyoto Institute of Technology and Takao Kurokawa of Osaka University, identifying body shape components is critical for designing close-fitting products, whether underwear, everyday clothes, or safety garments.

However, conventional body measurements, photographic images, and silhouette do not provide complete three-dimensional data with which modern designers could work to improve their products and tailor specific ranges to particular body shapes. The study might also have implications for research into body image disorders and ergonomics.

Now, Nakamura and Kurokawa have developed a technique that allows them to extract a woman's body shape components from 3D data and then ties this to a classification of trunk shapes.

The team took a close look at the bodies of 560 Japanese women aged from 19 to 63 years using laser metrology to map "control points" at specific sites on the women's trunks. They could then fit this data to a generic 3D trunk model in the computer and fit the control points to it to build up a database of body shapes.

They then applied statistical analysis to the data employing principal component analysis and cluster analysis to classify trunk characteristics into five different types. Each depends on slimness or otherwise, breast size and angle, neck type, and shoulder slope. They obtained five classes of body shape which they say represent the majority of trunk shape among Japanese women.

The researchers say their analysis will be helpful in producing clothes that fit better for size and shape, and in improving practical functional clothes used for body adjustment and posture improvement.

They point out that it would be possible to classify body shape into more classes, but having too many variations on the same clothing theme would raise costs to the consumer. One size fits all is inadequate, but a bespoke lab coat is probably an inappropriate extreme.

"We expect that the method will be applied to various customer groups and the results will be reflected in clothes design instead of the seat-of-the-pants approach of designers," the researchers conclude.

More information: "Analysis and classification of three-dimensional trunk shape of women by using the human body shape model" in *Int. J. Computer Applications in Technology*, 2009, 34, 278-284

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