

Revolutionising the Garment Industry in Thailand

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Abstract

Resulting from the Thai national sizing survey (SizeThailand) using 3D body scanning technology, Thailand now has standard body size charts. These charts were further analysed and average body shapes representing each size were calculated. As a result, 3D avatars and polyfoam fit mannequins were developed. This paper outlines the initial works, carried out jointly with a large clothing manufacturer and a fashion design and pattern making school, where polo shirts were designed and produced according to SizeThailand shape data. Prior to the garments going into production, final drafting patterns were evaluated in terms of fit and appearance using the pattern making software, OptiTex, with incorporated SizeThailand 3D avatars. Finally, the actual polo shirts were evaluated with 700 men and women where the majority had found the garments with new standard sizes to be better fitting.

Keywords: SizeThailand, polo shirts, pattern making, 3D avatar

1. Introduction

The textile and garment industry plays an important role in Thailand's economy. The industry consists of around 2,500 garment companies, 1,500 spinning and weaving and knitting companies and 400 dyeing, printing and finishing companies. With over 1 million workers, the textile and garment industry is the biggest employer in Thailand's manufacturing sector [1,2].

In a globalising world with diminishing trade barriers, garment manufacturers need to find ways to keep hold of or increase their market shares both domestically and internationally. The common ways to compete would be on price and product design but it is recently found that a more important factor would be the company's ability to offer their potential customers better fitting clothes [3,4]. However, in order to improve apparel fit, sizing information of the target customers must be available. Because of this, many countries have completed (or are conducting) their own anthropometric study to survey the body size and shape of the population. Thailand is also one of those countries having completed such survey [5].

The release of standard Thai body size charts in 2009 had attracted a high level of media interest in Thailand, and this in turn stimulated interest from various industries including fashion and garment. Prior to SizeThailand being conducted, Thailand had no proper standard sizing scheme. Clothing sizes offered by each retailer were different and unreliable which meant that consumers ended up having to try on garments before buying. Although, e-commerce businesses started to take off in Thailand recently, buying clothes online was still considered risky and challenging for most people. To help tackle this problem, the SizeThailand research team, has been working with local textile organisations and clothing retailers on developing standardised sizing system for the garment industry. This paper therefore outlines the works that have been carried out on applications of SizeThailand data in the garment industry in Thailand.

2. Applications of SizeThailand data in Thai Garment Industry

The Thai National Sizing Survey (SizeThailand) was conducted during 2007-2008 with 13,442 subjects taking part. A TC² 3D body scanner was used to capture the body shapes and measurements of the subjects. The project was jointly funded by the government, an automotive company and three clothing retailers. To select participants, quota sampling was used and the recruitment criteria were *gender* (male and female), *age* (5 age groups: 16-25, 26-35, 36-45, 46-59, 60+) and *region* (5 geographical regions). Data collection took place in 14 places around the country and subjects were asked to undergo a 3D body scan and selected manual measurements and fill in questionnaire on health and lifestyle [5].

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2.1. Developing Standard Sizing System

The SizeThailand standard body size charts were initially constructed using a novel Artificial Intelligence technique whereby a number of criteria had to be met. The criteria were:

- maximise the number of persons with good fit
- the number of sizes in the sizing system needs to be feasible for manufacturing purposes
- size intervals must not be greater than 3 inches

For the classification stage, measurements that were used to define female body sizes were bust, waist and hip. Similarly, the measurements defining male body sizes were chest and waist. Once the initial charts were created, they were evaluated and manually adjusted by a panel of experts from various industries. The charts, according to the survey data, covered 98 percent of the population and comprised 10 female and 9 male body sizes and were publicly announced in 2009 as mentioned earlier. This initial data was aimed to inform the general public of the new sizing information. However, to develop a proper standard sizing system for the garment industry, additional sizing information would be required.

According to a panel of Thai pattern makers, the average dimensions of 30 key body landmarks and average body shape were needed to define each size, for designing and making basic types of clothing. Figures 1 and 2 show, respectively, the additional key body landmarks required by the garment industry and average female body shapes.

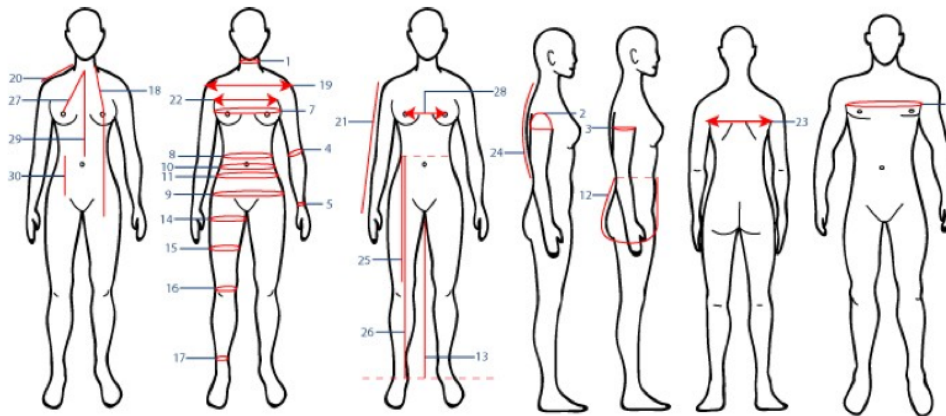


Fig. 1. Measurements for the garment industry.

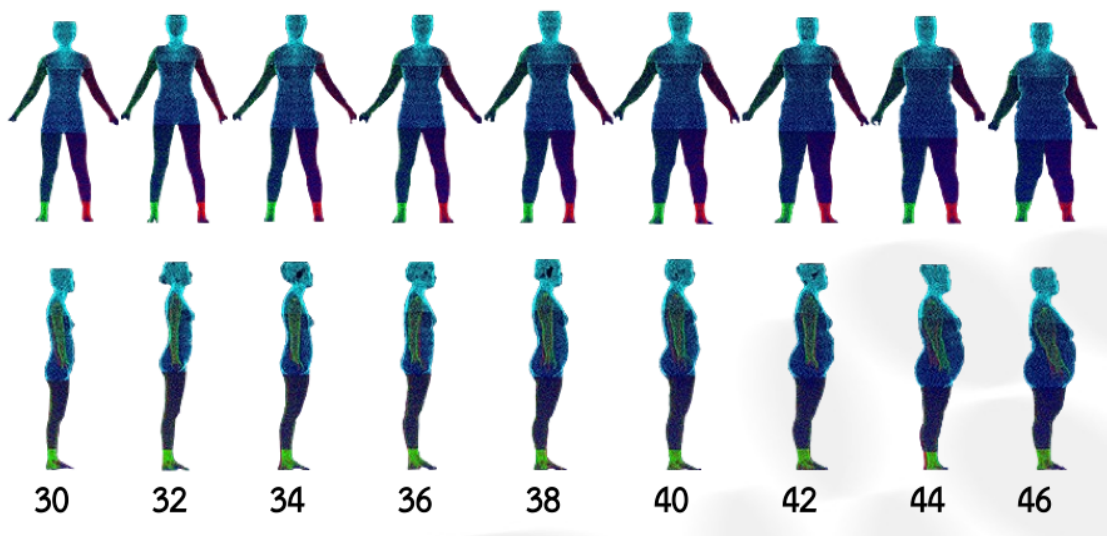


Fig. 2. Average body shapes of women aged 25-59, Sizes 30-46.

2.2. Garment Pattern Development and Evaluation

To evaluate the accuracy and efficiency of the developed sizing system with additional sizing information, a trial of polo shirt pattern development was jointly conducted by the national electronics and computer technology center (NECTEC) and pattern makers from a clothing manufacturer, People's Garment Public Company Limited, and pattern making school, PatternIT. Both teams of pattern makers had to design and create basic polo shirt patterns, graded according to the SizeThailand sizing system. Fig.3 shows 2D patterns created by PatternIT.



Fig. 3. 2D Polo Shirt Pattern.

To evaluate the level of fit and appearance for each of the sizes in the sizing system, OptiTex's pattern design software was used for visualisation. Originally, the software comes with its own 3D avatar which is adjusted according to the inputted body measurements. Since the trial aims to evaluate patterns in terms of fit and appearance, the software's own avatar is not suitable as it does not capture the variations of body shapes. Therefore, to make the virtual garment fitting more realistic, a set of SizeThailand 3D avatars representing every size in the sizing system, was used instead of the software's original avatar, see Fig. 4. Note that this trial started in 2010, therefore the old version of the software was used. To the author's knowledge, a newer version of OptiTex came out in 2011 which allows users to load their own 3D avatars.



Fig. 4. Evaluation of pattern for Size 36 Male.

2.3. Evaluation of Prototype Garment

After the final drafting patterns were evaluated, prototype polo shirts designed by each pattern making team were produced in all sizes in the sizing system. The prototypes were initially fit tested on SizeThailand fit mannequins as shown in Figure 5. The final fit test was conducted with 700 volunteers where each was given a appropriately sized polo shirt. It was later revealed that the majority had found the given garment to be better fitting.



Fig. 5. Fit Test on SizeThailand Mannequins.

2.4. Determining Body Shape Variations

The classifying process for determining body shape variations is complex. An extensive analysis of SizeThailand scan data showed that thai body shapes cannot be directly identified by available body shape definitions published by various researchers. Earlier results from classifying female body shapes according to Rasband's Fabulous Fit [6] revealed that there were no ideal and hourglass types and a quarter of the population could not be assigned a body type. Having manually evaluated the 3D scan data, these results were not applicable. Common basic types, published by August [7], were also studied as his classification of body types involved both front and side views to which 3D body scans could be applied, see Fig. 6 below.

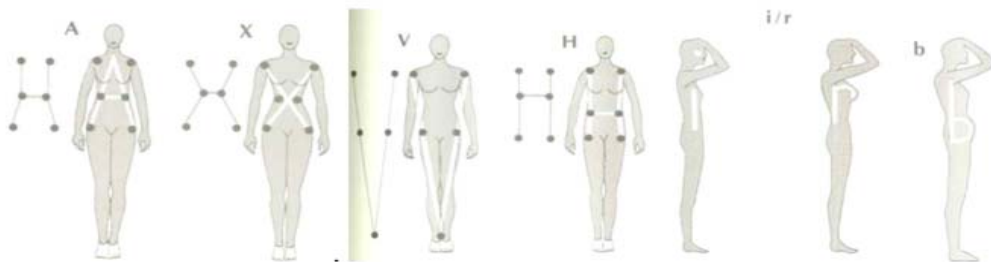


Fig. 6. Body types by August [7] (picture taken from [8]).

After having spent a considerable amount of time fine-tuning the body shape classification rules, the research team has finally come up with a Thai body shape classification engine. However, a drawback was found with the earlier version where people who were found to be overweight or obese could not be classified into one of the 7 body types shown in Fig. 6. It seemed that another body type 'O' needed to be considered for the people who are overweight and obese (with Body Mass Index Score ≥ 25.0). Therefore, the updated version of engine now takes into account 8 body shapes and uses 6 body measurements; width and girth values of shoulder, waist and hip, for the classification.

Currently, the research team is in the process of testing the body shape classification engine by visual evaluation of 3D body scans. An example of earlier results being classified by the engine is shown in Fig. 7.

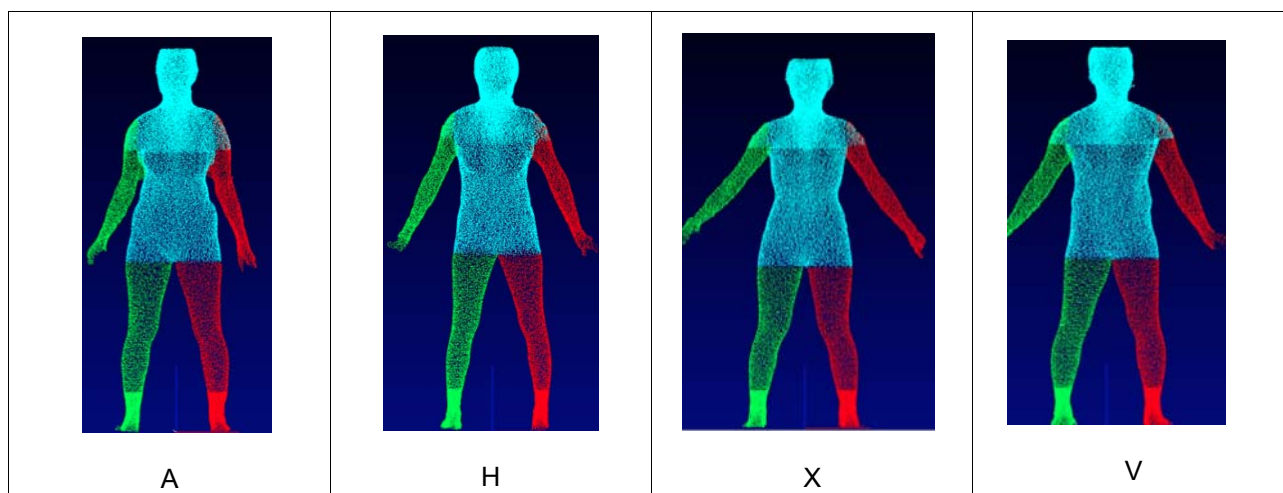


Fig. 7. Resulting classifications by SizeThailand body shape classification engine.

2.5. Adoption of SizeThailand Sizing System

The developed sizing system has been released earlier in March 2012 to requested parties and companies. Over 90 companies have since shown interest in using this new sizing information. Currently, to the author's knowledge, 1 large clothing retailer, 2 uniform manufacturers and 2 textile organisations have now adopted our sizing system.

2.6. Future Work

Although, the feedback from volunteers on the prototype polo shirts was satisfactory, it was still not enough to conclude the effectiveness of the sizing system. More product development and fit evaluation trials had been requested by the industry. Fit evaluation trials for working trousers and shirts will start later this year after the body shape information becomes available. It is planned that once the body shape analysis is done, the sizing system will be updated to take into account various body shapes for each size.

3. Conclusion

The work described in this paper was built upon our previous publication on SizeThailand [1] and the release of Thai body size charts. It outlined the current applications of SizeThailand data in the garment industry in Thailand. In order to help local manufacturers improve the quality of garment fit, a sizing system designed specifically for the garment industry was developed. The effectiveness of the system was evaluated by carrying out a trial of polo shirt production with a large clothing manufacturer and a pattern making school. The trial itself consisted of a number of stages of development. Firstly, the pattern making teams designed and created patterns according to the sizing system. Secondly, the 2D patterns were evaluated on fit and appearance using OptiTex's pattern making software. The contribution made by the research team was the replacement of the software's avatar with SizeThailand 3D avatars. Thirdly, prototype polo shirts were manufactured and initially fit tested on SizeThailand mannequins. Finally, the final fit test was conducted with 700 volunteers where each was given a appropriately sized polo shirt. It was revealed that the majority had found the given garment to be better fitting. The sizing system was released earlier in March 2012 for requested parties and so far, has been adopted by 1 large clothing retailer, 2 uniform manufacturers and 2 textile organisations.

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