

Development of Basic Patternmaking Using Parametric Modelling and AutoLISP

Haziyah Hussin, Syazwan Abdul Samad, Rosnani Jusoh

Abstract—This study is aimed towards the automisation of basic patternmaking for traditional clothes for the purpose of mass production using AutoCAD to apply AutoLISP feature under software Hazi Attire. A standard dress form (industrial form) with the size of small (S), medium (M) and large (L) size is measured using full body scanning machine. Later, the pattern for the clothes is designed parametrically based on the measured dress form. Hazi Attire program is used within the framework of AutoCAD to generate the basic pattern of front bodice, back bodice, front skirt, back skirt and sleeve block (sloper). The generation of pattern is based on the parameters inputted by user, whereby in this study, the parameters were determined based on the measured size of dress form. The finalized pattern parameter shows that the pattern fit perfectly on the dress form. Since the pattern is generated almost instantly, these proved that using the AutoLISP programming, the manufacturing lead time for the mass production of the traditional clothes can be decreased.

Keywords—Apparel, AutoLISP, Malay Traditional Clothes, Pattern Generation.

I. INTRODUCTION

MALAY traditional clothes such as 'Bajukurung' (loose), 'Kebayang' (semi-fitted) and 'Kebaya' (fitted) are the traditional attire that has been worn by Malay since ages ago. However, years by years, the design of the attire was influenced by many people around the world such as traders from India and Arab. Even though it has undergone a lot of changes, it is still maintained the basic characteristic which defines them. In Malaysia, as we speak, there are still a number of people whom still wearing the traditional clothes, even in urban area or rural area. It can be worn at any time regardless of occasion. Therefore, it can be considered formal attire for Malaysian women especially for the Malay. The silhouette of 'bajukurung' and 'bajukebaya' is depicted in Figs. 1 and 2, respectively. These traditional clothes are normally custom made type. The patterns for the attire may vary from a tailor to another tailor because of there are no specific pattern that should be followed by the tailor. Because of the variation, one may feel that the dress made by a tailor is

better compared to another dress that made by another tailor, but the opinion of another wearer might differ. The main reason for the variation of the pattern is due to non-existing of specific pattern been published or claimed before. Therefore it is necessary that an experienced clothes designer to make a pattern that can standardized the process of making the traditional clothes for the purpose of mass production.

There are a number of research has been conducted in order to simplify the process of making apparel. For example, Maki et al. [6] has developed a method to recognize the freehand illustration using fuzzy knowledge based system. Another research by Xu & Sreenivasan [1] aims to develop an automated and accurate 3D body imaging measurement system. Xu & Zhong [2] also studies on the method to visualize 2D garments to 3D garments. Ding & Xu [10] uses immune algorithm and Analytical Hierarchy Process (AHP) in order to assist people to find the optimal garment size for them.

Fang & Tien (2012) and Tao, Thomassey & Bruniaux (2013) recommended that basic pattern or torso based on human body structure is vital for the development of CAD tailoring and 3D fashion design. Similar study also mentioned that scan of reference body and garment is necessary for calculation and evaluation of the overall 3D ease of the garment [4], [8], [9].

Currently, in economical aspect of Malaysia, the clothing industries served to be the third most prominent industries, which only fall behind from electrical and petroleum industries [5]. The export of garment in Malaysia in 1990 is USD1315 million and steadily inclined to USD2842 million in 2006 [7]. Despite of that, most of the factories that produce clothes are still using the traditional methods to produce the traditional attire as a result of no Asian standard sizes measurements are made. Furthermore, there is no specific information regarding the pattern (which is served as a base for making clothes). Using the traditional methods, different factories might have its own pattern thus will lead to variations. Moreover, the traditional pattern was constructed based on body proportion; not all of the body parts need to be measure. However, these might become issues when a person has varied body proportion (in comparison with population).

Thus the needs to create a pattern that can make use of most of the body measurement, to ensure that good attire is created which fit to the user with different body proportion compared to major population. The attire made by industries also based on the standard sizes of dress form. However, the dress form that being used is not meant for Asian; therefore the attire not might fit to most Malaysian population. A most recent work

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Hsu & Lin (2010) focused on the anthropometric of adult female in Taiwan to develop a female chart for using cluster based mining method with 956 samples [3]. It would be beneficial for industries as it is easier to generate standard size for Taiwan population. However such research has not been conducted in Malaysia. The gap of the study is clearly seen, therefore the objective of this study is to create a standardize torso basic pattern generated by AutoLISP programming using the body measurement as parameter. It is envisaged that the outcome of this automation process can be beneficial in the aspect of clothing industries. These basic torso is vital for development for pattern adaptations from fitted, semi-fitted to loose.



Fig. 1 'BajuKebaya', the fitted Malay traditional clothes



Fig. 2 'BajuKurang', the loose Malay traditional clothes

II. METHODS

In the process of developing the automated generation of the pattern of traditional clothes, commercial CAD software, AutoCAD is chosen to be one of the tools used in this study. The reason for AutoCAD was used is because of the ability to used LISP programming or Visual Basic to generate a pattern. Using AutoLISP features to develop Hazi Attire software, the basic pattern can be developed using variables such as the bust, waist and hip circumference. For the purpose of this pilot studies, dress form with the size of S, M and L is measured. A 3D body measurement machine ([TC]² NX-16) is used for measurement in order to eliminate human error. The sample image from the measured human is shown in Fig. 3, while Fig. 4 shows the measured dress form. At present, there is limited research of basic patterns creation for clothes using 3D body scanner and the AutoLISP have been published. Thus it is necessary to create a pattern for the traditional clothes beforehand. The pattern (with variables) is designed by professional designer to ensure that the design will fit

perfectly onto the dress form. The pattern is generated in form of CAD data. Afterwards, the pattern is plotted using 1:1 scale. The plotted paper is cut and sewn together to fit onto the dress form. The pattern is then revised in case of any modification is necessary. The standard dress form is depicted in Fig. 5. The flow chart of the methodology employ for this pilot study is shown in Fig. 6.

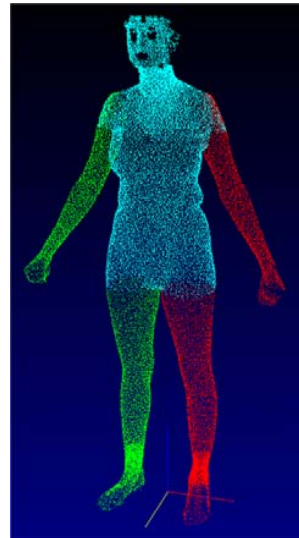


Fig. 3 The 3D measurement of human figure

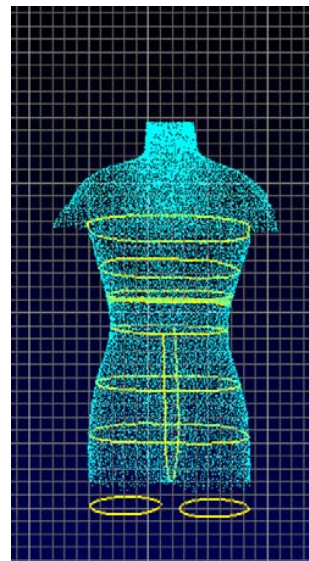


Fig. 4 The measured dress form



Fig. 5 The Standard small (S) size dress form

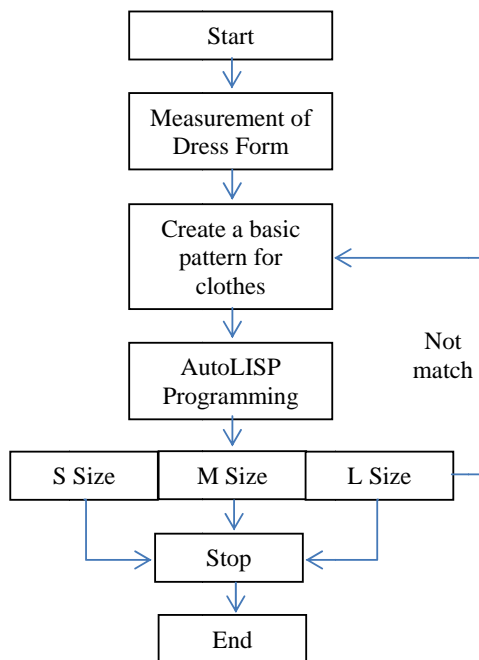


Fig. 6 The Methodology for the development of basic pattern of clothes

III. RESULTS AND DISCUSSION

The aim of this study is to design a basic block for future adaptation of Malay traditional attires using Computer Aided Design (CAD). The basic block was made to guide fashion designer to create pattern adoption based on various Malay traditional design. During the process of the development of patternmaking, most of the parameters utilized the length measured from the dress form. The basic block of the clothes is shown in Fig. 7. After the pattern has been designed, it was programmed to the CAD software using AutoLISP features in AutoCAD. First, the initial coordinate were defined in LISP as a first point. Using the first coordinate as reference, the

location of other coordinate will be calculated from the bodice parameter entered by user. The parameters, such as length, angle and curve profiles were created using mathematical functions. Therefore user will be able to generate custom size of basic pattern. Table I represents the measured part of the body, while Fig. 7 shows the generated pattern (by user input) using AutoLISP. In this study, the program is tested by keying in the parameters. Afterwards, the pattern was plotted using 1:1 scale and a toile (version of garment to test the pattern) were constructed and tested. The toile is made to ensure that pattern fit the dress form. The same procedures also apply for other sizes of dress form to ensure that the program can be used for other sizes. The result shows that the basic block such as front bodice, back bodice and etcetera fit perfectly on all the dress form. The figure of toile, fitted to the dress form is shown in Fig. 8. This shows that it is practical to use the AutoLISP programming in order to automate the process of patternmaking. It would serve to be beneficial for industries to reduce their manufacturing lead time and cycle time.

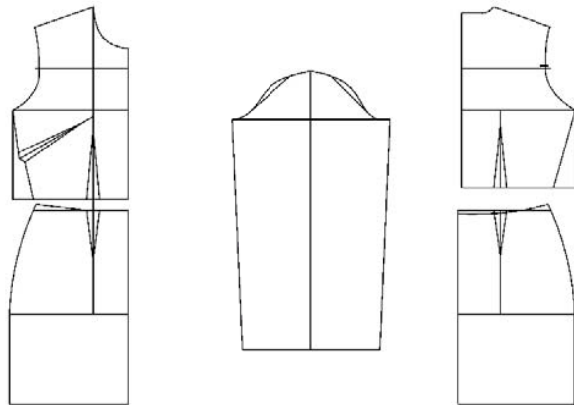


Fig. 7 The basic block generated by AutoLISP



Fig. 8 The toile from the basic block

TABLE I
THE MEASURED PARAMETER OF SMALL SIZE DRESS FORM

Bodice Parameter	Gauge Length (cm)		
	S	M	L
Back Width	33.6	36.1	37.2
Bust Circumference	87.6	91.1	96.4
Cervical to Breast Point	18.3	20.0	19.7
Hip Circumference	88.7	92.2	97.6
Hips Height	74.0	75.6	80.6
Neck Base Girth	35.0	35.5	16.7
Neck Shoulder to Breast Point	22.9	24.2	24.6
Shoulder Length	11.3	13.1	13.2
Shoulder to Shoulder Length	37.2	38.9	39.3
Waist Circumference	71.4	74.6	78.4
Waist to Hip	16.5	17.5	18.5
Waist Height	90.0	91.6	96.6

IV. CONCLUSION

The pattern that can fit on all the dress form is successfully designed. Through AutoLISP feature in AutoCAD, the pattern can be generated by user input, which means that it can create custom sizes of basic pattern. The developed pattern is in accordance with the standard European dress form. In industries perspective, the automated pattern generation is a useful tool as it can increase their productivity for the purpose of mass production. Custom sizes of pattern can be generated in case of a customer does not fit to the standard sizes. In the future, with the help of an automated generation of the basic block, clothes can be produced efficiently. However, in this pilot study, the pattern generated has not yet been tested with major Asian population sizes; instead of tested on the standard dress form. In the near future, the standard size designed is needed for industries in order to make them able to plan the number of production for each size to maximize their profit. Therefore, the study on the Asian body sizes will deemed necessary in the future.

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REFERENCES

- [1] B. Xu, and S.V. Sreenivasan, "A 3-D body imaging and measurement system for apparel customization," *Journal of the Textile Institute*, vol. 90, no. 2, pp. 104-120, 1999.
- [2] B. Xu, and Y. Zhong, "Three-dimensional technology for apparel mass customization: part III: visualization of three-dimensional garments," *Journal of the Textile Institute*, vol. 94, no. 1, pp. 92-110, Oct 2003.
- [3] C.-H. Hsu, H.-F. Lin, et al., "Developing female size charts for facilitating garment production by using data mining," *Journal of the Chinese Institute of Industrial Engineers*, vol. 24, no. 3, pp. 245-251, Feb 2010.
- [4] J.-J. Fang and C.-H. Tien, "Trimmed NURBS surface applications in computerized 3D fashion design for garment industry," *International Journal of Clothing Science and Technology*, vol. 25, no. 1, pp. 123-135, July 2012.
- [5] Ministry of Finance, "Economic Reports 2007/2008," *Government of Malaysia*.
<http://www.treasury.gov.my/index.php?option=com_content&view=article&id=150%3Alaporan-ekonomi-20072008&catid=73%3AAsenarai-laporan-ekonomi&Itemid=174&lang=en> (retrieved on 12 November 2010).
- [6] N. Maki, T. Tabe, et al., "Design and utilization of a fuzzy knowledge-based system for design feature recognition of freehand illustration," *International Journal of Production Research*, vol. 35, no. 3, pp. 17-27, Jan 1997.
- [7] R. Rasiah and R. Ofreneo, "The dynamics of textile and garment manufacturing in Asia," *Journal of Contemporary Asia*, vol. 39, no. 4, pp. 501-511, Aug 2009.
- [8] S. Thomassey, P. Bruniaux, "A template of ease allowance for garments based on a 3d reverse methodology," *International Journal of Industrial Ergonomics*, vol. 43, no. 5, pp. 406-416, Sept 2013.
- [9] X. Tao, and P. Bruniaux, "Towards advance three-dimensional modeling of garment prototype from draping technique," *International Journal of Clothing Science and Technology*, vol. 25, no. 4, pp. 266-283, Jan 2013.
- [10] Y.S. Ding, and Y.C. Xu, "Intelligent optimal selection of garment sizes by using immune algorithm and AHP method," *Journal of the Textile Institute*, vol. 99, no. 3, pp. 15-64, June 2008.

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