

The interactive production system for apparel

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Abstract

This paper argues for the immediate use of *Kansei* engineering to help deal with the chaotic situation of poorly implemented and disconnected technologies. A theoretical criticism of the current industrial capitalism, together with the promotion of a new post-industrial form of capitalism lays the foundation for an explanation of how this transition can be achieved through a proper understanding of *Kansei*. A detailed explanation of the Interactive Production System Apparel demonstrates the benefits to both manufacturers and consumers. The paper concludes that the application to apparel is just one of many potential applications to improving the lifestyle and enjoyment of individuals throughout society.

Key words: *Kansei engineering, Interactive production system, Apparel technology*

1. Individualized Clothes' Pattern making

Apparel manufacturers have been struggling to meet the needs and wants of their customers without sacrificing the efficiencies and profits gained through mass production. While conventional order-made clothes are ideal, they are also expensive because the processes involved are complicated and far from automatic. In order to establish interactive apparel pattern making using CAD at a reasonable cost for customizing clothes, it is essential to employ three-dimensional pattern. We focus on the development of a clothes measurement system using a three-dimensional digitization of the shape when clothes are worn. Moreover we attempted to develop a pattern-making system that is three-dimensionally interactive, using measurement data from a given model to provide accurate information for individual pattern design. The three-dimensional measurement data was converted by coordinate column to build a cross section line model. We created a human body model with ten control points, which were capable of being modified by scaling magnification. A clothes model can be modified interactively and suitably with a body model. Pattern fitted size information from the

three dimension shape was created, thus allowing us to simulate clothes pattern fitting for individual body shapes (Figure 1).

2. Evaluation of comfort and health

2.1. *KANSEI* measurement

The purpose of our study is to construct an evaluation method for clothing comfort by measuring the multiple relationships between human and clothes. In order to design comfortable clothes, we should measure the physiological and psychological effects of clothes on the wearer. Clothes and human have multiple relationships. For conscious consideration, clothing comfort can be evaluated by sensory tests. For subconscious considerations, the measurement of physiological response is the only method of evaluating clothing comfort. Actual evaluation of clothing comfort is achieved by both a physiological evaluation and a psychological evaluation. We call the evaluation of the comfort by measuring a multiple relation a *Kansei* measurement (Figure 2).

2.2. Effect of Clothing Pressure by Waist Belt on Brain Activity

The condition of brain in brain activity resulting from the pressure exerted on the abdomen by waist belts was evaluated using an Electroencephalogram (EEG) measurement. We investigated the possibility of estimating psychological and physiological stress arising from waist belts in clothing based on EEG measurements. Waist belts are often daily attire for both men and women. In this study, electrodes were fixed to the scalp and EEG was measured for states of abdomen pressure and non-pressure as exerted by the waist belts. Additionally, sensory tests for sensations of tightness, arousal, and feelings of comfort were carried out. Frequency analysis of the measured EEG data was carried out and brain activity as reflected in the intensity of alpha waves under the conditions of pressure exerted by waist belts was evaluated. The intensity of alpha waves decreased significantly under waist-belt pressure in comparison with the intensity of waves in non-pressure conditions. The slow wave intensity increased as a result of

pressure, and it decreased after the pressure was released. Therefore, it seemed to be generating the slight blood circulation disorder in the pressure. This means that the subjects could not evaluate the lowering degree of the arousal of the brain by sensory tests. The pressure on the body exerted by clothes has been seen to be a problem not only from the standpoint of sensuous comfort but also in terms of its effects on physiological functioning and health caused by oppressiveness (Figure 3).

3. Development of products

3.1. Kenaf blended shirt

We developed the Kenaf blended shirt in cooperation with Flex Japan Co. Ltd. Kenaf is an annual plant, and we evaluated its comfort on the user. We demonstrated that Kenaf shirts feel cooler, prevent sweatiness and possess a comfortable feel. We also proved that the warmth stress of Kenaf shirt is smaller than that of conventional shirts (Figure 4).

3.2. Comfortable socks

We developed "RL" type socks. Comfort of that new type and normal type socks was evaluated by physiological reaction and subjective evaluation. The following were measured: Muscular activities of the lower leg in the walking, sole pressure, electrocardiogram in the wear, clothes pressure by the socks. From this analysis, the clothes pressure of the socks affected muscular activities and heart rate variability under walking, and it became clear that the comfort was influenced as a result. In the future, plane shape of the foot and solid shape plane must be considered the clothes pressure in the index in order to design the socks which suit Japanese people (Figure 5).

3.3. Conservation cover

A conservation cover was developed. For example, for people whose breast were damaged by cancer operations. They could wear it when they took a bath in public spa without feeling too self-conscious because of any scarring (Figure 6).

4. Conclusion

In this paper we started by identifying concerns we have in society at large from the poorly implemented use of technology. We argued for a new paradigm of tackling these problems using *Kansei*. We demonstrated how this would affect a post industrial capitalism to replace the current

system. And then we showed several concrete examples of how this can be achieved at a practical level through the Interactive Production System Apparel (IPSA). This impacts every stage from individual fibers, fabric and textiles through to apparel design and production. In terms of the broad application of *Kansei*, the IPSA is only one practical outcome. We believe there are many other areas of daily life where these concepts can be introduced in such broad areas as physical products (design, manufacture and retail), computer software (user interface, education, database) and urban planning and control. These are just some of the projects being conducted through our department. We feel that this is a field rich in possibility and worthy of further investigation.

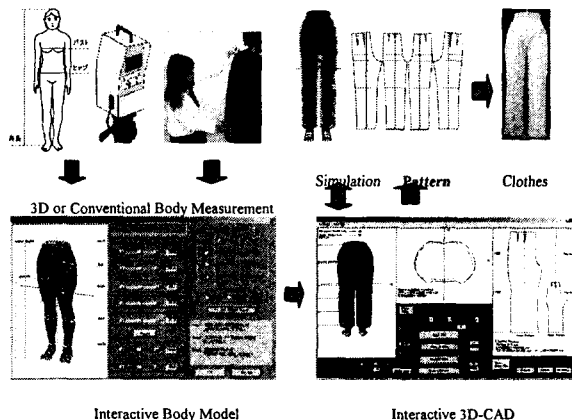


Figure1. Individualized Clothes' Pattern making

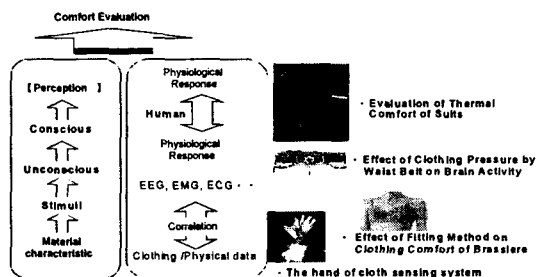


Fig 9 KANSEI measurement

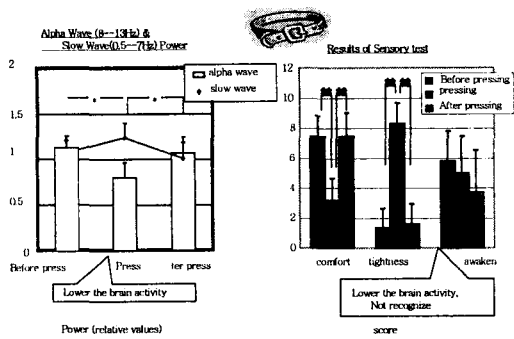


Figure 3. Effect of Clothing Pressure by Waist Belt on Brain Activity

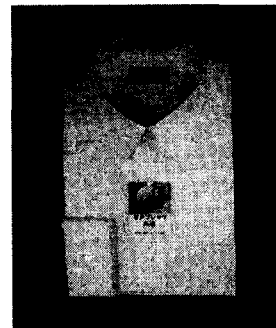


Figure 4. Kenaf blended shirt

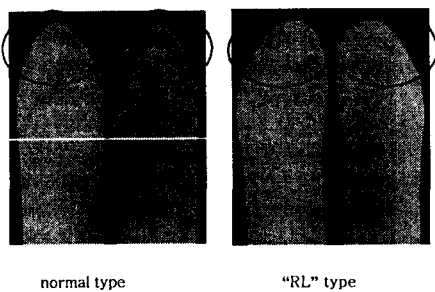


Figure 5. Design of comfortable socks



Figure 6. A conservation cover after breast cancer operations