

O-15

Contact-Free Skin Temperature Evaluation Using Thermogram Image

Hae Young Choi, Jung Soon Lee[†]
Chungnam National University

I. INTRODUCTION

Thermogram has been used in grasping real time temperature distribution of surface. It gives a help to solve the problem of measuring skin temperature, because it measures a temperature as a non-contact type. Also, we can save a time and effort for measuring skin temperature. However, thermogram has not been fully utilized yet, because it has a difficulty to analyze quantitatively. It was just used to compare and evaluate visually for qualitative analysis. S. J. Park, J. M. Koo, H. J. Lee Evaluation of Massage Chair Effect on Human Body using Infrared Imaging/Radiometric Camera, Proceedings of KSNT, p279-283 (2004). Y. C. Park, C. J. Seok, J. Y. Um, S. S. Sohn, I. S. Choi, Thermographic Study on the Effects of Deep Acupuncture at Hapkok(L14) in Cerebrovascular Hemiplegia, The Journal of Korea Acupuncture & Moxibustion Society, 20(4), p134-144 (2003).

As developing an image analysis technology, its application is increasing, such as evaluation of fabric properties, yarn equality and fabric crystallization. K. W. Oh, H. S. Kim, S. H. Kim, Image Analysis Method for Evaluating Fabric Damage by Household Washing Machines, Journal of the Korean Fiber Society, 39(1), p108-115 (2002). K. I. Shin, J. J. Kim, Image Analysis of the Reflection of Silk, Polyester, and Pile Fabrics According to the Directions, 39(6), p714-722 (2002). In preceding study, image analysis was tried to analyze the image of thermogram quantitatively. B. I. Lee, Y. J. Lee, K. H. Hong; Proceedings of The Society of Living Environment System, p115-118 (2002). Nevertheless, Lots of data was lost in the process of changing a RGB color image to gray scale image. To solve this problem, we analyzed the image of thermogram under the condition of color image.

II. METHOD

Experimental clothes were made with materials which were treated with UV irradiation for treatment time, of 0min, 30min and 90min. Subjects wore the test suit and training short pant with 100% cotton under the conditions of 29°C, 70% ±5% R.H. and walked at the speed of 6.7km/hr. The microclimate inside the clothing was measured to examine the climate between clothing and skin. According to the schedule shown in Fig. 1, thermogram image was taken with infrared imaging camera (TVS-2000MK2 Series, Nippon Avionics Co., Ltd.).

After the image was converted to BMP file in IR Image Analyzing Software, it was analyzed with Inspector 4.0(Matrox Electronic System, Ltd.). Representative surface temperature was calculated based on the percentage surface area of the certain temperature range, which was frequency of RGB data with an interval of 1°C.

Stabilization (30min)	Exercising (15min)	Rest (30min)
--------------------------	-----------------------	-----------------

■ Measurement of microclimate under clothing.

↑ : Measurement of subjective wear comfort.

↻ : Measurement of thermogram

Fig. 1. Time schedule of experiment.

III. RESULT & DISCUSSION

In our previous study, H. Y. Choi, J. S. Lee, Proceedings of 8th Asian textile conference, p113 (2005).

, the physiological response of human bodies and the comfort sensation were investigated. In result, we can't find significant difference in the micro climate temperature, but the clothing treated by UV for 90min had the lowest thermal sensation and the highest comfort sensation in the subjective sensation.

In the thermogram image analyzed, we calculated the frequency rate of temperature. The distribution of temperature was varied with a measure time, different kinds of clothing. In the low temperature area under 35°C,

the rate was following the order; 90min>30min>0min. On the other hand, the order was reversed in the high temperature area. Clothing treated for 90min have much area in the low temperature.

The result of analysis was more corresponded to subjective thermal sensation than microclimate temperature, which measure a point under clothing. Therefore, it can be more accurate method to evaluate subjective sensation and comfort also.

IV. CONCLUSION

In this study, thermogram was used to evaluate thermal property of PET treated by UV for 0min, 30min and 90min. The results of thermogram were coincident with the subjective thermal sensation. Therefore, we can get more data and better accurate data from a surface temperature using scanning a body than from a temperature measured in a point.