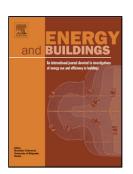
Accepted Manuscript

Title: Thermal Comfort Prediction using Normalized Skin Temperature in a Uniform Built Environment

Author: Tanaya Chaudhuri Deqing Zhai Yeng Chai Soh Hua Li Lihua Xie



PII:	S0378-7788(17)32735-4
DOI:	https://doi.org/doi:10.1016/j.enbuild.2017.10.098
Reference:	ENB 8118
To appear in:	ENB
Received date:	9-8-2017
Revised date:	29-10-2017
Accepted date:	31-10-2017

Please cite this article as: Tanaya Chaudhuri, Deqing Zhai, Yeng Chai Soh, Hua Li, Lihua Xie, Thermal Comfort Prediction using Normalized Skin Temperature in a Uniform Built Environment, *<![CDATA[Energy & Buildings]]>* (2017), https://doi.org/10.1016/j.enbuild.2017.10.098

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Thermal Comfort Prediction using Normalized Skin Temperature in a Uniform Built Environment

Tanaya Chaudhuri^{a,b}, Deqing Zhai^b, Yeng Chai Soh^{a,b,*}, Hua Li^c, Lihua Xie^b

^aEnergy Research Institute @ NTU (ERIAN), Interdisciplinary Graduate School ^bSchool of Electrical and Electronic Engineering ^cSchool of Mechanical and Aerospace Engineering Nanyang Technological University, 50 Nanyang Ave, 639798, Singapore

Abstract

Thermal comfort prediction can be instrumental in bridging the gap between energy efficiency and occupants' comfort by utilizing the predicted thermal state (Discomfort/Comfort) of occupant as a control criterion for the cooling systems in buildings. Skin temperature, through its heat-transfer properties, plays a significant role in the thermoregulation principle that governs thermal comfort. This paper presents a method termed as Predicted Thermal State (PTS) model, which uses the peripheral skin temperature and its gradient features from a single body location to evaluate the thermal state. The model introduces a novel normalization process to resolve both inter and intra individual differences by incorporating body surface area and clothing insulation, respectively. Human subject experiments were conducted, during which each subject's skin temperatures and respective thermal sensation surveys were recorded while environmental conditions varied from cold/cool-to-neutral levels (18°C-27°C). This study revealed that the combined information of skin temperature and its gradient carry significant potential to establish the thermal state. Four model input cases were compared using Support Vector Machine (SVM) and Extreme Learning Machine (ELM) based classifiers. While non-normalized skin temperature alone could accurately estimate only about 65% of thermal states, the PTS

Preprint submitted to Energy and Buildings

October 29, 2017

^{*}Corresponding author. Tel.: +65 6790 5423

Email address: eycsoh@ntu.edu.sg (Yeng Chai Soh)

Download English Version:

https://daneshyari.com/en/article/6729263

Download Persian Version:

https://daneshyari.com/article/6729263

Daneshyari.com