EEG Pattern Recognition and Classification for Thermal Comfort

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I. EXTENDED ABSTRACT

In this paper, electroencephalogram (EEG) techniques were adopted to evaluate thermal comfort of human subjects. According to ASHRAE (2004), thermal comfort is defined as "condition of mind which expresses satisfaction with the thermal environment", which suggests that thermal comfort is closely related to emotion. EEG pattern recognition and classification methods are widely used in human-computer interface, especially in emotion research (Frantzidis et al. 2010; Chanel et al. 2005), which allow identification of emotion regardless of the human facial expression, behaviour, or verbal communication. In this research, a 14-channel EEG headset was used to detect electrical activity in the brain and power density in different EEG frequency band was collected as features. Different numbers of features were used to build LDA/SVM algorithm classifiers. This enabled classification of human subject's mental state under different thermal conditions in built environment and the classification rates were above 90%. This new approach helps to better understand the impact of architectural spaces on building occupants. Further exploration provides possibility to improve the human-building interaction which facilitates the development of future intelligent buildings where occupants are able to control the indoor environment through this human-building interaction process.

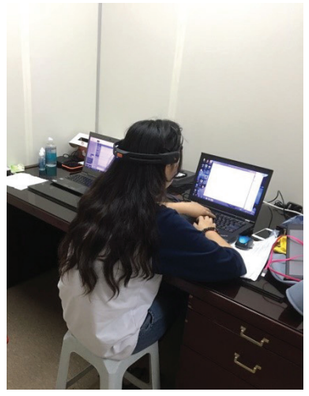

Figure 1 - *Experimental setting in a normal office room*

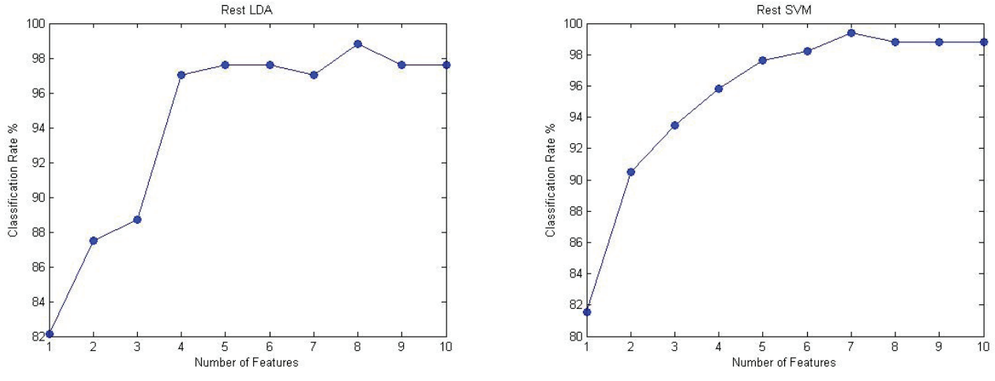

Figure 2 - Classification rate with increasing number of features

2. REFERENCES

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Biographical narrative for the speaker: Xin Shan is currently a PhD student with research interest in indoor environment and building-human interaction. He got his Bachelor degree in Civil Engineering (First Class Honours) from the University of Hong Kong in 2013.