Intra-individual Differences in Predicting Personal Thermal Comfort Using Model-based Recursive Partitioning (MOB)

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ABSTRACT

With the advent of personal comfort models in predicting thermal state, investigating individual differences including gender, age, and race has been widely conducted to predict personal thermal comfort. The personal comfort model is a good complement to the conventional Predicted Mean Vote (PMV) model; however, the efforts to understand individual differences to date have been quite fragmented in terms of intra-individual differences. The underlying assumption of the current personal comfort models is that the generalized one personal model is universally applicable to any sub-personal variants. However, this assumption does not hold if intra-individual variant subgroups exist, and these subgroups differ in their thermal comfort state. Given that a person can have different thermal preference from day-to-day and time-to-time under the same environment, interpreting one's thermal comfort with one single model is not enough to understand intra-individual variances. To address such research gap and better understand human thermal comfort, this study aims to investigate underlying sub-personal thermal states with differential thermal comfort responses building upon the MOdel-Based (MOB) recursive partitioning model. To validate the proposed approach, building occupants' thermal responses and their corresponding physiological data were collected through field experiments, and the performance was compared with current personal comfort modeling approach. It is worthwhile to revisit the overlooked intra-individual differences and explore appropriate modeling methods for better understanding of building occupants' thermal comfort.