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Development of artificial neural network models for thermal comfort evaluation in outdoor urban spaces

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This study has formulated artificial neural network models to predict thermal comfort evaluation in outdoor urban areas in Seoul for summer. The artificial neural network models were considerably improved by including preceptions of microclimate, perception of environmental features(e.g urban spatial characteristics and visual stimuli, etc) and personal traits as additional predictor variables. Thermal comfort in outdoor environments has been repeatedly shown to be influenced also by human perceptions and preferences. Despite numerous attempts at refining these thermal comfort, there still have been large discrepancies between the results predicted by the theoretical models and the actual thermal comfort evaluation votes. indeed Thermal comfort model using microclimatic factors including air temperature, air velocity, solar radiation and relative humidity as predictor variables could explain only 7–42% of thermal comfort evaluation votes.

Accordingly, this study aims to formulate models to predict thermal comfort evaluation in outdoor urban areas for summer in Korea, which is located in temperate climate zone. ANN models were formulated to portray intricate interrelationships among a multitude of personal traits, urban residents' environmental perception, microclimatic and spatial perception and physiological factors. The prediction performances of the formulated ANN models were compared with those of the commonly used thermal comfort models(PMV, PET). Also, this study aims to identify important factors that influence thermal comfort evaluation in outdoor urban areas. In addition, it is intended to compare whether the important factors and the magnitude of their contributions are different in urban spatial environment. The findings should provide valuable insights for informing urban planning designers on formulating effective strategies to improve the thermal environments in outdoor urban areas in the temperate climate zone.