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Project CoolBit Updates: Personal Thermal Comfort Assessments using Wearable Devices

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The consideration of thermal comfort and human health is among top environmental priorities for city livability around the globe. The information gathered using the conventional methods of data measurements (such as surveys and measurements of microclimate data) contributes significantly to our knowledge of thermal comfort, but several limitations persist: 1) measurements are scattered in time and space, and 2) data gathered on outdoor thermal stress and comfort do not include physiological and behavioural parameters that correspond to the thermal stress of individuals. Project CoolBit aims to address these shortcomings and propose a human-centric approach to thermal comfort assessment. Accordingly, we employ wearables for the monitoring of personal physiological and subjective responses of comfort and stress that span a wide range of spatial and temporal distributions. Working together with the Fitbit research team, we modified a number of wearable devices such that they record 1) microclimate parameters (such as air temperature and humidity), 2) physiological parameters (heart rate, skin temperature and humidity), and 3) subjective feedbacks, such that a more comprehensive and personalized representation of human thermal comfort, heat stress, and individuals' performance is obtained.
The main objective of this presentation is to present and discuss the objectives, updates, and perspectives of the Project CoolBit. In the initial phase of this study, we aimed to address the feasibility of the methodology and evaluate the link between microclimate parameters and physiological responses. To evaluate the validity of measurements using wearable devices, we conducted two sets of experiments: 1) assessment of the physiological data collection (conducted in a controlled environment), and 2) assessment of outdoor environmental data collection (conducted in semi-controlled environments). The results of these experiments and further deployment of the wearables during realistic daily activities in the (non-controlled) built environment will be discussed. We believe that wearables devices combined with interactive apps developed to thermal comfort assessment provide a novel approach for microclimate analysis in the built environment.