

Human-Centric Sensor Networks for Comfort and Productivity in Offices: Integrating Environmental, Body Area Network, and Participatory Sensing

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Abstract : Indoor environment in office buildings directly affects comfort, productivity, health, and well-being of building occupants. Wireless environmental sensor networks have been deployed in many modern offices to monitor and control the indoor environments. However, indoor environmental variables are not strong enough predictors of comfort and productivity levels of every occupant due to personal differences, both physiologically and psychologically. This study proposes human-centric sensor networks that integrate wireless environmental sensors, body area network sensors and participatory sensing technologies to collect data from both environment and human and support building operations. The sensor networks have been tested in one small-size and one medium-size office rooms with 22 participants for five months. Indoor environmental data (e.g., air temperature and relative humidity), physiological data (e.g., skin temperature and Galvani skin response), and physiological responses (e.g., comfort and self-reported productivity levels) were obtained from each participant and his/her workplace. The data results show that: (1) participants have different physiological and psychological responses in the same environmental conditions; (2) physiological variables are more effective predictors of comfort and productivity levels than environmental variables. These results indicate that the human-centric sensor networks can support human-centric building control and improve comfort and productivity in offices.

Keywords : body area network, comfort and productivity, human-centric sensors, internet of things, participatory sensing

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