A review of advances for thermal and visual comfort controls in personal environmental control (PEC) systems

by

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ABSTRACT

The buildings are conventionally operated to maintain homogeneous indoor ambient conditions to maintain comfortable thermal and visual environments. However, maintaining these homogeneous conditions throughout the building leads to unnecessary energy consumption, and does not address the varying thermal and visual comfort needs of the individual occupants. This has led the building science community to pursue personal environmental control (PEC) systems that work in tandem with adaptive centralized ambient comfort systems. These PEC systems create favorable environmental conditions around each occupant, employing specialized equipment, such as a personal thermal conditioning system, task lighting, plug load monitoring and control, window shade control system, and similar systems. Coordinating among personal control systems and with centralized building management systems allows the optimal provision of services such as cooling, lighting, and other such services where they are needed, potentially leading to significant energy efficiency and improved occupant satisfaction.

This paper provides an overview of the state of research associated with personalized thermal conditioning and lighting systems. In addition, presents a survey of controls and communication systems that operate these devices. Finally, the paper considers the energy savings potential from a personal thermal comfort and lighting comfort.

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