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Effective computational support for knowledge-based design and operation of bio-climatically sensitive buildings

Abstract

The present contribution sheds light on an ongoing research effort toward provision of effective computational support for knowledge-based design and operation of bio-climatically sensitive buildings. Thereby, two sources of knowledge are brought together: i) historical traditions of climatically adapted vernacular architecture, and ii) methods and tools for predictive modeling of the hygro-thermal behavior of built structures. Although computational building performance tools have been available for a long time, their application in the building delivery process cannot be considered to be pervasive. This circumstance is rather unfortunate, as such tools have the potential to effectively support the navigation of the design-performance space. To support climatically sensitive building design and operation, we describe in this paper a knowledge-based, performance-guided design assessment strategy and a corresponding tool, tailored toward applications in the context of Indonesia, a country that faces challenges such as natural hazards and rapid urban growth but also possesses vast resources and rich cultural diversity. This research effort will be embedded in the proposed Tra2in research collaboration. Thereby, the proposed interdisciplinary character of the participants is expected to provide valuable synergies, thus enriching both the knowledge base and usability consideration concerning the proposed methodology and associated tools.

Keywords: Design support environments, building performance simulation, vernacular architecture, bio-climatic architecture, Indonesia