

Interoperability between BIM and BEM using IFC

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ABSTRACT

The lack of seamless interoperability between building information modeling (BIM) and building energy modeling (BEM) has been a long-lived problem, which causes two main obstacles: (1) significant time and effort required in building design and energy modeling iterations, and (2) limited opportunities for architects to optimize their design informed by BEM. A smooth model information transfer from BIM to BEM can significantly accelerate the BEM process since BEM-related information can be imported from BIM, rather than start from scratch. In the reverse direction, mapping BEM to BIM will provide better opportunities for BEM-informed design optimization and integration with generative design tools, allowing architects more opportunities to improve building designs towards energy efficiency, such as by geometry modifications. In this paper, the authors proposed a new methodology of developing computing technologies to automatically map BEM to BIM following the industry foundation classes (IFC) standard. The authors concluded that the reverse mapping automation from BEM to IFC can be achieved through the state-of-the-art Data-driven Reverse Engineering Algorithm Development (D-READ) method, based on the invariant signatures of building objects. The developed algorithm was tested on a high-rise residential building model and it achieved seamless and error-free model transformation. This builds a solid step towards enabling smooth bi-directional modeling workflows between BIM and BEM, and helps move the whole architecture, engineering, and construction (AEC) industry beyond the fairly isolated design and BEM practices towards enabling more opportunities to benefit the building's life cycle from BEM.