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Title: Optimizing BIPV design

Abstract:

Building-integrated photovoltaics (BIPV) has gained significant attention as a sustainable solution for generating renewable energy within the built environment. As BIPV technology advances, optimizing the design of BIPV envelopes becomes crucial to maximize energy production while considering aesthetic, economic, environmental, and functional requirements. This study introduces a novel framework that enables BIPV envelope design optimization through the integration of surrogate models. The proposed framework will be implemented as a plug-in that leverages the capabilities of Grasshopper Rhino, a popular parametric modelling software, to streamline the BIPV design process and optimize BIPV performance at the detailed building design stage. By incorporating surrogate models, which are simplified mathematical representations of complex models, the framework enhances computational efficiency and facilitates rapid iteration of BIPV envelope designs. The plug-in integrates with the Grasshopper interface, allowing designers to specify design parameters, such as material properties, geometric configurations, and environmental conditions. These inputs are then used to train surrogate models that accurately approximate the performance of BIPV envelopes. Using advanced optimization algorithms, the plug-in guides the designer towards optimal BIPV envelope configurations.

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