Building energy optimization in the early design stages: A simplified method

This paper presents the application of multi-objective genetic algorithms for holistic building design that considers multiple criteria; building energy use, capital cost, daylight distribution and thermal indoor environment. The optimization focus is related to building envelope parameters. To obtain relevant feedback from multi-objective optimizations in early design stages, evaluation speed is a key concern. The paper presents a fast evaluation method fit for the early design stages. It uses a combination of two different quasi-steady-state methods for energy and indoor environment evaluations, a Radiance implementation for daylight simulations and a scripted algorithm for capital cost evaluations. The application of the method is developed around an integrated dynamic model which allows visual design feedback from all evaluations to be an integrated part of the design tool experience. It is concluded, that quasi-steady-state methods implemented as part of integrated dynamic models are fast and flexible enough to support building energy-, indoor environment- and cost-optimization the early design stages.

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