A Daylight simulation method for inverse opening design in buildings

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The daylight management has a crucial impact on opening design in buildings. Lighting visualization tools are currently used for simulation prediction for a given geometric model as an aid for this task. An alternative and more efficient approach is the use of an inverse model where the opening shape can be obtained from some given light intention input. In this paper we present a daylight simulation method for an inverse opening design model in buildings. Our approach considers openings composed as a set of small elements and computes, using hardware graphics, directional incoming light from the sky accurately. At each opening element a spatial directional representation is stored. These representation is converted into anisotropic light sources that are used to evaluate their importance for a given indoors light intention. Finally, geometric shapes of the openings are derived.

The main contribution of our method is the treatment of generic models containing outdoors and indoors specifications with occlusion, an imposed restriction in previous approaches. Moreover, the outdoor simulation method is based on hardware-accelerated parallel projection procedures that computes fast and accurately the visibility of each opening element, improving in this way time processing and precision. Results shows the use of our method as a helpful tool in the early stages of architectural design.

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