PHOTON MAPPING
FOR ARCHITECTURAL DAYLIGHTING SIMULATION OF INTERIOR SPACES

By

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ABSTRACT

Tools currently available to architects for the purpose of lighting simulation emphasize photorealistic accuracy in their renderings. The sacrifice is in the time required to generate these picture-perfect results. This wait can be very limiting, especially in an iterative design process. A more efficient tool can be seamlessly incorporated into an architect's workflow.

This thesis explores and evaluates various types of modern rendering algorithms. We consider the strengths and weaknesses of these algorithms and how they fit the use case of an efficient daylighting simulator. To further push the efficiency of such tools, we investigate the use case of daylighting simulation and examine optimizations that can be made to the algorithm based on our use case.

We present a system developed with the preceeding in mind. Leveraging the stream processing model of modern graphics cards, the system provides a user with accurate high-level global illumination information. The system is also capable of producing this information in the frame of seconds, as opposed to minutes or hours, and displays advantages over more traditional tools for practical architectural design.