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Computing Urban Radiation: A Sparse Matrix Approach

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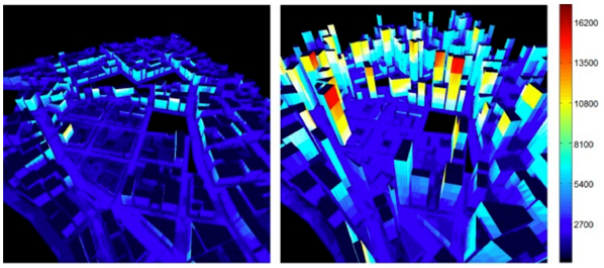

(a) City 1. (b) City 3.

Cities numerical simulation including physical phenomena generates highly complex computational chal- lenges. In this paper, we focus on the radiation exchange simulation on an urban scale, considering differ- ent types of cities. Observing that the matrix representing the view factors between buildings is sparse, we propose a new numerical model for radiation computation. This solution is based on the radiosity method. We show that the radiosity matrix associated with models composed of up to 140k patches can be stored in main memory, providing a promising avenue for further research. Moreover, a new technique is proposed for estimating the inverse of the radiosity matrix, accelerating the computation of radiation exchange. These techniques could help to consider the characteristics of the environment in building de- sign, as well as assessing in the definition of city regulations related to urban construction.

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