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TOWARD ACCESSING SPATIAL STRUCTURE FROM BUILDING INFORMATION MODELS

C. Schultz and M. Bhatt
SFB/TR8 Spatial Cognition, University of Bremen P.O. Box 330 440, 28334 Bremen, Germany

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Abstract. Data about building designs and layouts is becoming increasingly more readily available. In the near future, service personal (such as maintenance staff or emergency rescue workers) arriving at a building site will have immediate real-time access to enormous amounts of data relating to structural properties, utilities, materials, temperature, and so on. The critical problem for users is the taxing and error prone task of interpreting such a large body of facts in order to extract salient information. This is necessary for comprehending a situation and deciding on a plan of action, and is a particularly serious issue in time-critical and safety-critical activities such as firefighting. Current unifying building models such as the Industry Foundation Classes (IFC), while being comprehensive, do not directly provide data structures that focus on spatial reasoning and spatial modalities that are required for high-level analytical tasks. The aim of the research presented in this paper is to provide computational tools for higher level querying and reasoning that shift the cognitive burden of dealing with enormous amounts of data away from the user. The user can then spend more energy and time in planning and decision making in order to accomplish the tasks at hand. We present an overview of our framework that provides users with an enhanced model of "built-up space". In order to test our approach using realistic design data (in terms of both scale and the nature of the building models) we describe how our system interfaces with IFC, and we conduct timing experiments to determine the practicality of our approach. We discuss general computational approaches for deriving higher-level spatial modalities by focusing on the example of route graphs. Finally, we present a firefighting scenario with alternative route graphs to motivate the application of our framework.

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