

Seamless 3D-Indoor and Outdoor Navigation supporting User Context including Location Based Services

Navigation in indoor environments is already a hot topic and part of several research projects world-wide. Due to the absence of a full GPS signal coverage in indoor environments, in recent years indoor navigation and localization techniques getting a higher attention and many promising approaches were made to locate and guide individuals indoors and to create navigation algorithms for such spaces. However, there are still issues concerning the full coverage of the localization in indoor space, the guidance and routing as well as the need of LBS to get further information about the space around you. Moreover a promising approach for seamless indoor and outdoor navigation is missing.

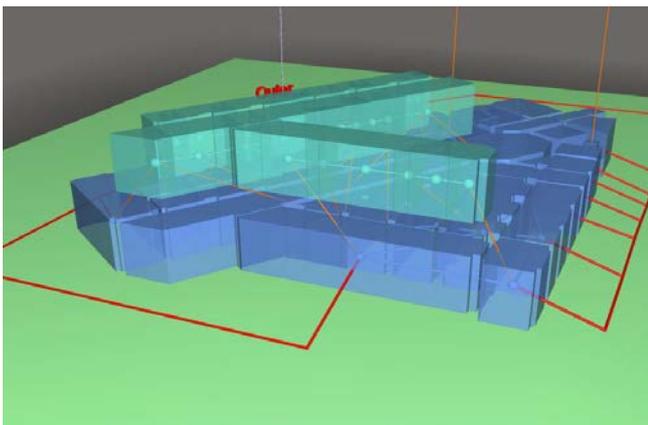


Figure 1. Example for coexistence of primal and dual space.

The IGG developed, established (OGC IndoorGML) and published a framework for modeling indoor environments to be able to form the base for an indoor navigation system. The model proposes a general concept on space modeling and graph derivation by separating different notions of space onto different space layers where the primal and dual spaces co-exist (c.f. fig 1). This so called Multilayer Space Event Model framework allows for the integration of conceptually separated indoor space models within a multilayered representation. The layers are independent in such that they represent separate decompositions of indoor space according to

different semantic criteria such as building topography or sensor characteristics. Additional layers may be added to denote the subdivision of indoor space according to different modes of locomotion or with respect to logical contexts and are then linked by joint-states which mutually constrain possible locations of moving subjects or objects in either space model. The challenge is to enable the dynamic selection and change of layers and thus to automatically determine the resulting user-centric navigation graph to support indoors and later on a seamless indoor & outdoor navigation.

Understanding the cognitive structure of environments is a basic concept in current navigation systems. A salience model indicates how objects can become a landmark by means of visual, structural and cognitive characteristics (Raubal & Winter, 2002; Klippel & Winter, 2005). However, most suggestions in the literature are dedicated to outdoor environments so that the difficulty is related to the assignability from outdoors to indoors. Hence, a catalogue defining a minimum set of concrete objects for a landmark-based guidance in indoor environments would be desirable.

Exemplary topics for master thesis:

- For more details about exemplary topics, please refer to the display case of the chair "Methods of Geoinformation Science" at room H5121 (main building of Technische Universität Berlin).

Recommended skills:

- 3D modelling, programming; GML and CityGML; FME; GIS software.