

Point clouds for indoor modelling and obstacle detection: towards real indoor navigation.

Lucía Díaz-Vilariño

-Dept. of Natural Resources and Environmental Engineering, University of Vigo

-Faculty of Architecture, Technical University of Delft

Abstract:

Indoor navigation consists on finding the most suitable path connecting two points within an indoor environment while avoiding collision with obstacles. Navigational assistance for blind or wheelchair people, building crisis management and quick emergency response, augmented reality for gaming, tourism or training assistance units are just some of the direct applications of indoor navigation. Successful indoor path planning depends on the accurate and updated models, especially for people with reduced mobility. However, navigational information is traditionally extracted from 2D drawings or layouts in which the real state of indoors, including opening position and geometry and the presence of obstacles is commonly ignored.

The main idea of this work is to consider point clouds not only for reconstructing semantically-rich 3D indoor models but also for detecting potential obstacles in the route planning and using them for readapting the routes according to the real state of the indoor depicted by the laser scanner.

The general workflow of the methodology is summarized in Figure 1. Datasets consisting on point clouds are firstly used to reconstruct a building indoor 3d model. Point cloud regions not belonging to building envelope are considered for obstacle detection.

GbXML is the standard selected to represent the building model since it stores valuable information such as adjacency between spaces, position and type of openings, building materials useful for crisis management, etc. Nodes representing doors and concave corners projected on the floor surface are tessellated into a set of adjacent cells, based on the *Voronoi Diagram*, to create the navigable network. Afterwards, indoor paths are initially generated from the navigable network and original point cloud is used to check if obstacles interrupt the trajectory defined by the path. The presence of obstacles in the indoor planning is analysed from the creation of a buffer representing a person. If obstacles exist, indoor path is readapted until no obstacles are detected.

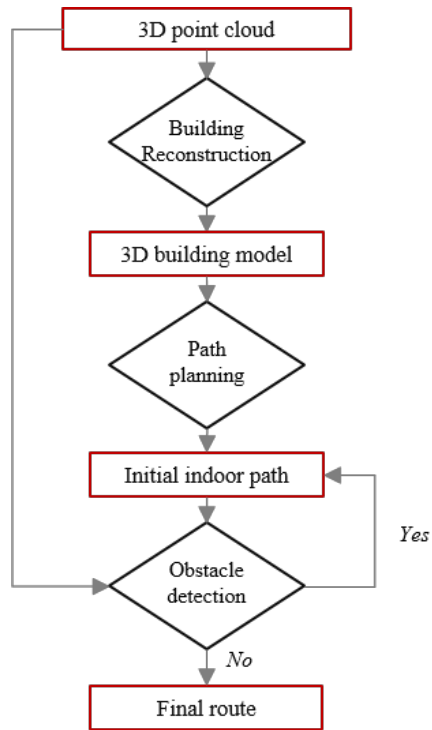


Figure 1: General workflow of the proposed methodology