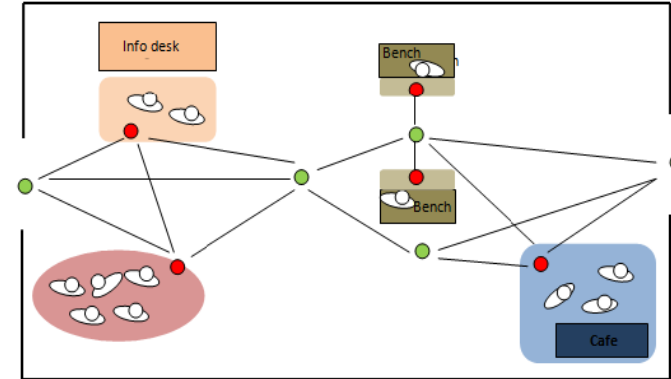


Master topics

To be presented on Friday 23rd of September

Shape grammar to subdivide spaces

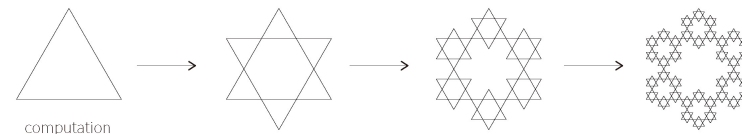
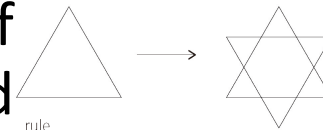
Indoor environment in public buildings consist of very large spaces and usually **it is difficult to give instructions how to get to a specific part of the such space**. Therefore for indoor localisation and navigation, spaces are **subdivided into functional areas**. There several approaches to subdivide spaces.



This research will concentrate on space subdivision using shape grammar. A shape grammar consists of number of shape rules and a generation process that selects and processes rules.

This research is part of www.sims3d.net project.

design idea: snow crystal



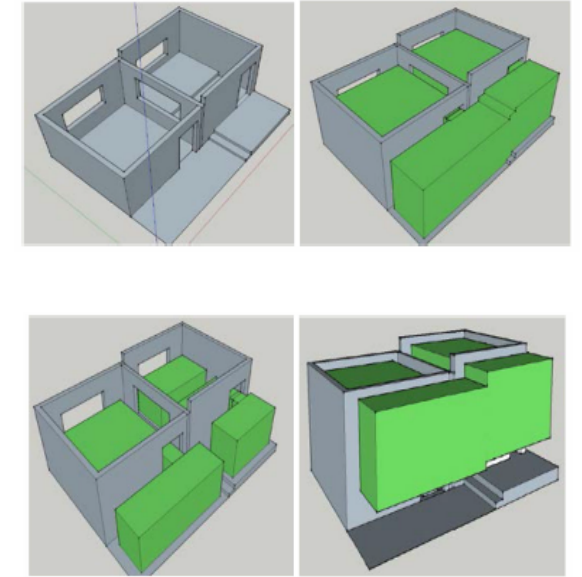
Shape Grammar

Navigation for user profiles

Current commercial navigation **applications distinguish only between few navigations modes** and does not take into account the profile of the user. To be able to provide personalised navigation, **two types of information is needed: about the user and about the environment** in which a user will be navigated.

This research is going therefore to investigate the following issues:

- Which **characteristics (age, gender, availability, ...)** can be taken into a user profile?
- What **kind of Indoor spaces** are of interest per profile?
- What **kind of paths** can be computed considering the profile?



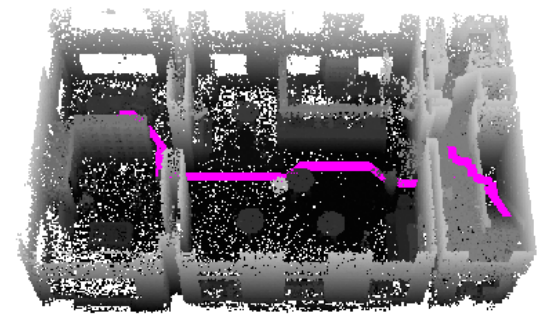
Khan, A. A., & Kolbe, T. H. (2012, November). Constraints and their role in subspace for the locomotion types in indoor navigation. In *Indoor Positioning and Indoor Navigation (IPIN), 2012 International Conference on* (pp. 1-12). IEEE.

Octree – Indoor/Outdoor navigation

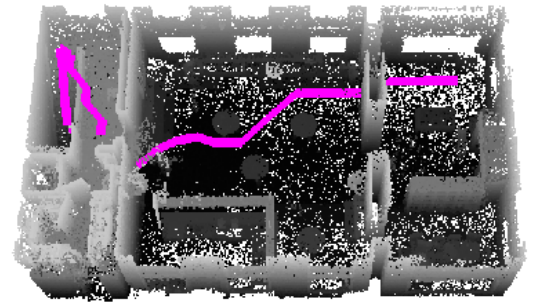
3D raster representation is increasingly gaining the interest of the researchers. They are simple structures but usually **result in large data sets**. Therefore in previous research we have investigated **Octree data structure** and its use for **indoor path computation**.

This research topic will continue and extend previous work by considering rasterization of outdoor space. The goal is to investigate what kind of Octree would be needed for seamless indoor/outdoor navigation.

Path 1



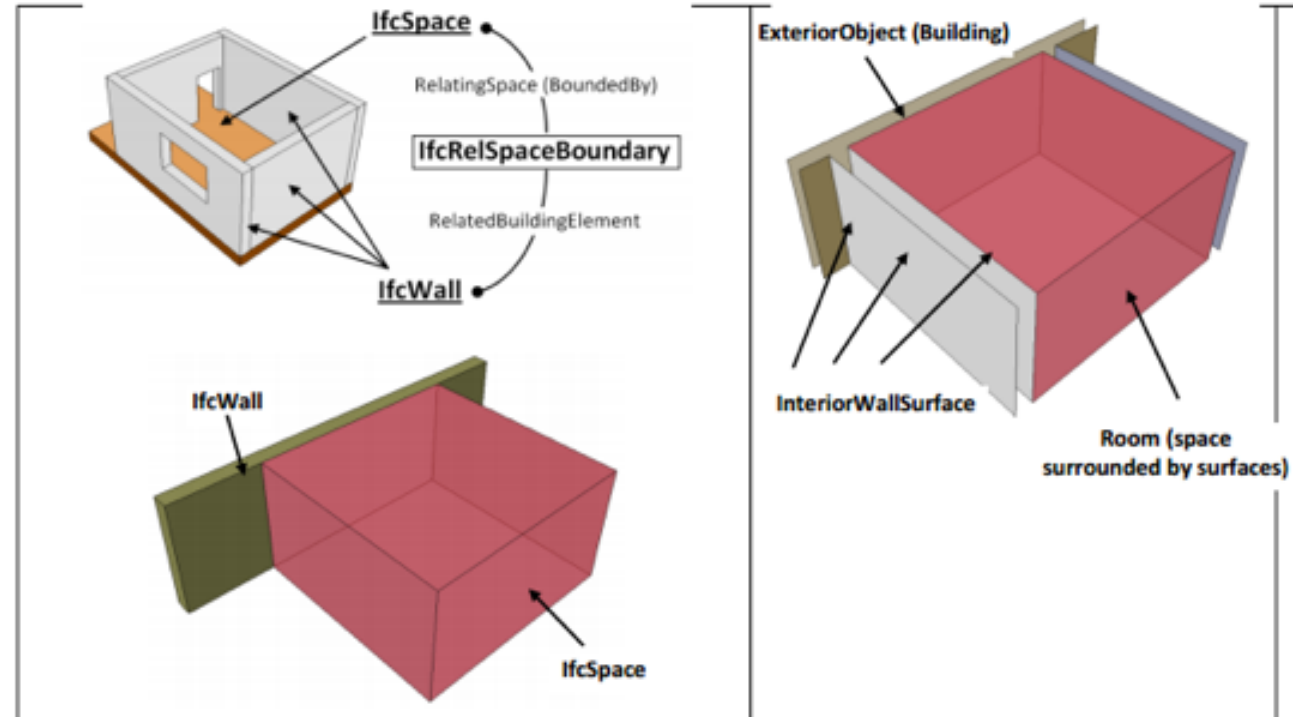
Path 2



Facilidat

Most **building managers have little to no information** about the indoor status of their buildings: the number of buildings, their structure, rooms, size of windows, doors, area of room floors, etc. **Many maintenance daily and yearly tasks** such as cleaning, renovation, painting, refurnishing, safety **are performed in an ad-hoc manner**, which **cost extra effort and money**.

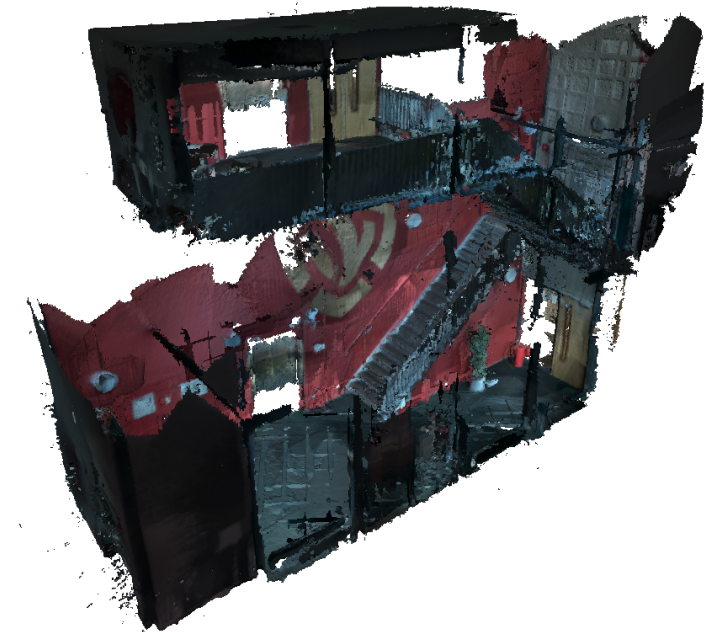
This research will evaluate the suitability of 2 semantic 3D model standards (IFC and CityGML) for facility management purpose. It will also **study the integration of both**, in order to take benefit from each side.



Indoor modelling with the Google Tango

The **Google Tango tablet** is a very intuitive, interactive and **interesting tool for indoor scanning**. The device contains **suitable sensors to rapidly produce 3D models**. But the few apps available for this task are **very limited**, and only provides either an already processed mesh or point cloud samples.

The **goal of this research is to evaluate to which extent** the tablet can be used **for indoor modelling**. It is about **fully exploiting the skills** of the tablet to extract proper **point clouds** and **perform semantically rich surface reconstruction**, by relying on other information such as the scanning **trajectories**, the **coloured pictures** of the environment, etc.



Dynamic changes of the 3D indoor space

In order to perform **fine-grained indoor navigation**, one needs to consider the entire **3D free and non-free space**. The non-free space is often characterized by **furniture elements and people** activities (crowd, queue, etc). The free space that is **available for navigation** cannot be evaluated without considering the obstacles. This problem is even more complex because the **obstacles can move** in the indoor space.

The goal of this research is to investigate the best way to consider the moving objects in an indoor environment to optimally evaluate the real free space available for navigation.

This research is part of www.sims3d.net project.

