Chair of Computational Modeling and Simulation
TUM Department of Civil, Geo and Environmental Engineering
Technical University of Munich

Software Lab:

Modeling:
Mathematics:
Programming:
Science:

BIMLoc: BIM-based Indoor localization with RGB-D Images

Description

Successful deployment of a mobile robot in indoor GPS-Denied environments depends on accurate localization systems. Presently, several indoor localization techniques already exist. While some depend on sensors that have to be installed strategically in known locations on the building (such as Beacons Tags), other less expensive and more user-friendly methods rely only on sensors onboard the robot.

Localization with only the sensors onboard is also possible with current techniques but requires maps generated from data gathered with identical sensor modality used for localization. Moreover, collecting accurate data usually requires tiresome work done by specialists.

To address these challenges, your task is to implement a localization system that allows a robot to estimate its global pose given a BIM model and RGB-D images. The main focus is the prediction of room layout edges from RGB-D images. These edges will allow you to find the robot pose matching the extracted edges to the given model.

Figure 1: Predicted 3D Layout with Non-CuboidRoom [1].

Task

1. **Room layout annotation in RGB-D pictures** (more than 400 images).

2. **Implement and train a technique that predicts the layout from the image**, such as Non-Cuboid Room Layout [1].

3. **Develop an automatic pipeline for Global Localization** in indoor environments using the RGB-D images with the predicted layout and the BIM model. You can use, for instance, LASER [2] or LaLaLoc [3] as reference projects.

4. **Validate your methodology** using a case study that is representative of the TUM main campus.
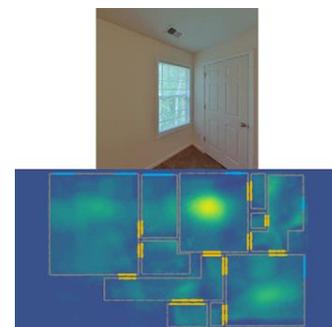
Figure 2: Image localization in floor plan with LASER [2].

Supervisors

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References

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