

2022/05/09

# Master's Thesis Proposals

Presentation material for potential MSc Student candidate

ABB



# Master's Thesis Proposals

## Lifelong mapping in Google Chartographer

### Scope

#### Research topics:

In this project we will examine optimal ways for reducing the graph complexity in the Chartographer SLAM:

#### Goal(s):

1. Identify the current graph and local map management strategy in Google Chartographer.
2. Research and propose optimal ways for improving the lifelong mapping strategy in Chartographer.
3. Update Chartographer with lifelong mapping capabilities.

### Approach

The work will address the following points:

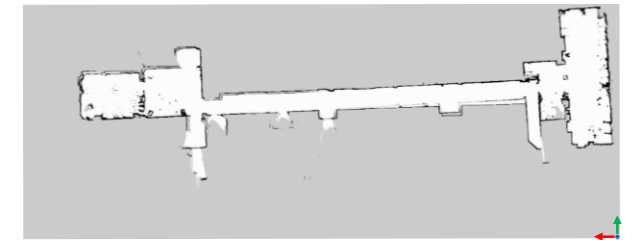
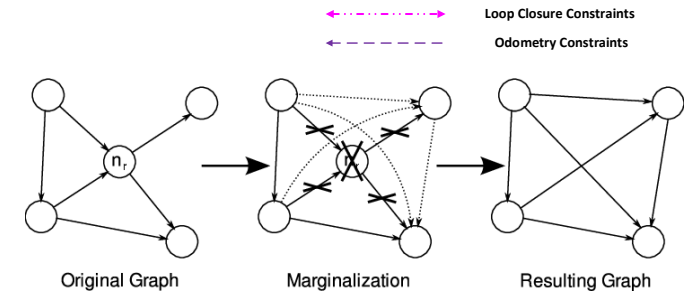
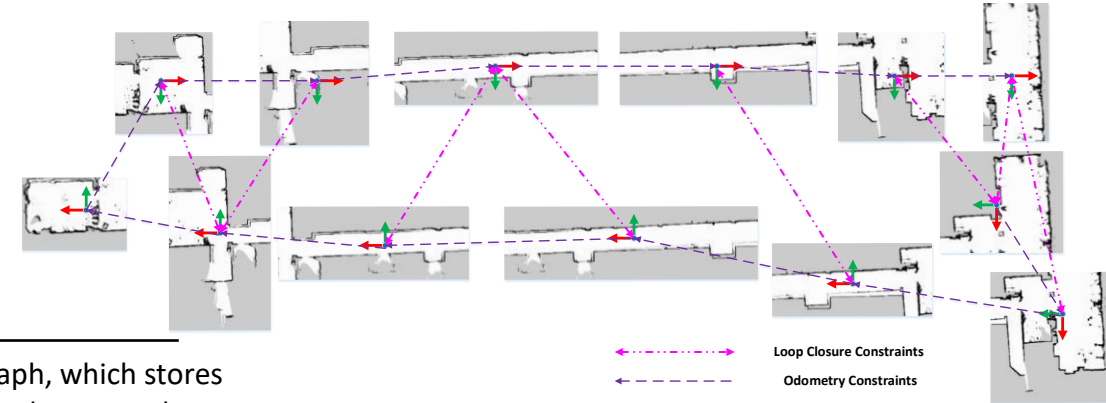
- Perform literature review on the current problem and suggest optimal approaches for Bayesian Graph management.
- Examine Chartographer code and suggest ways for updating the code with graph management techniques.
- Update and test open-source Chartographer code.

### Description

In mobile robotics graph-SLAM, the pose graph, which stores the poses of the robot and spatial constraints between them, is the central data structure in graph-based SLAM. The size of the pose graph has a direct influence on the runtime and the memory complexity of the SLAM system and typically grows over time. A robot that performs lifelong mapping in a bounded environment has to limit the memory and computational complexity of its mapping system. The student will be requested to research potential methods and techniques for eliminating unnecessary graph-nodes and performing optimal map management.

### Required background

- Good initial knowledge on estimation theory and mobile robot SLAM.
- Proficient in C++. Additional knowledge on Python and Matlab is a plus.
- ROS-knowledge and preferably experience with ROS navigation stack



### Timeline

- Start: between June. 2022 and November 2021
- Duration: 6 months
- Place: ABB CRC (Västerås)
- ABB will cover the accommodation in Västerås

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