ETH zürich

Closed-loop multi-sensor SLAM using factor graphs for fixed-wing UAV.

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Master Thesis

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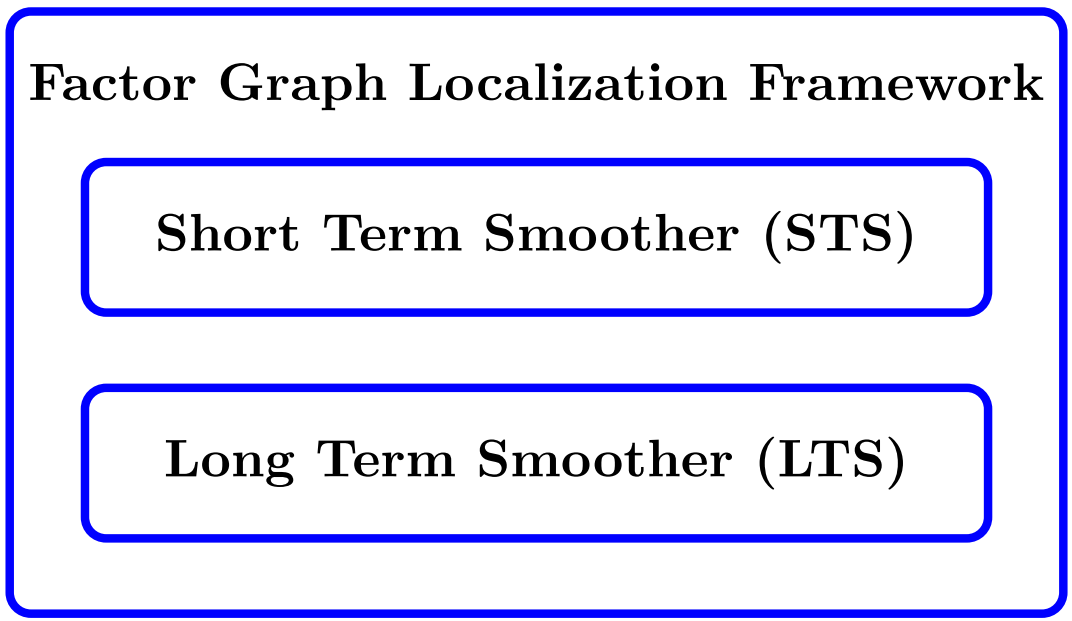
Motivation

Develop localization framework which can simultaneously:

- Estimate local navigation solution with minimal latency
- Find optimal solution given all the measurements

Approach

Splitting the problem into short and long term problems (FIX)



Work done so far

Backbone of the localization framework

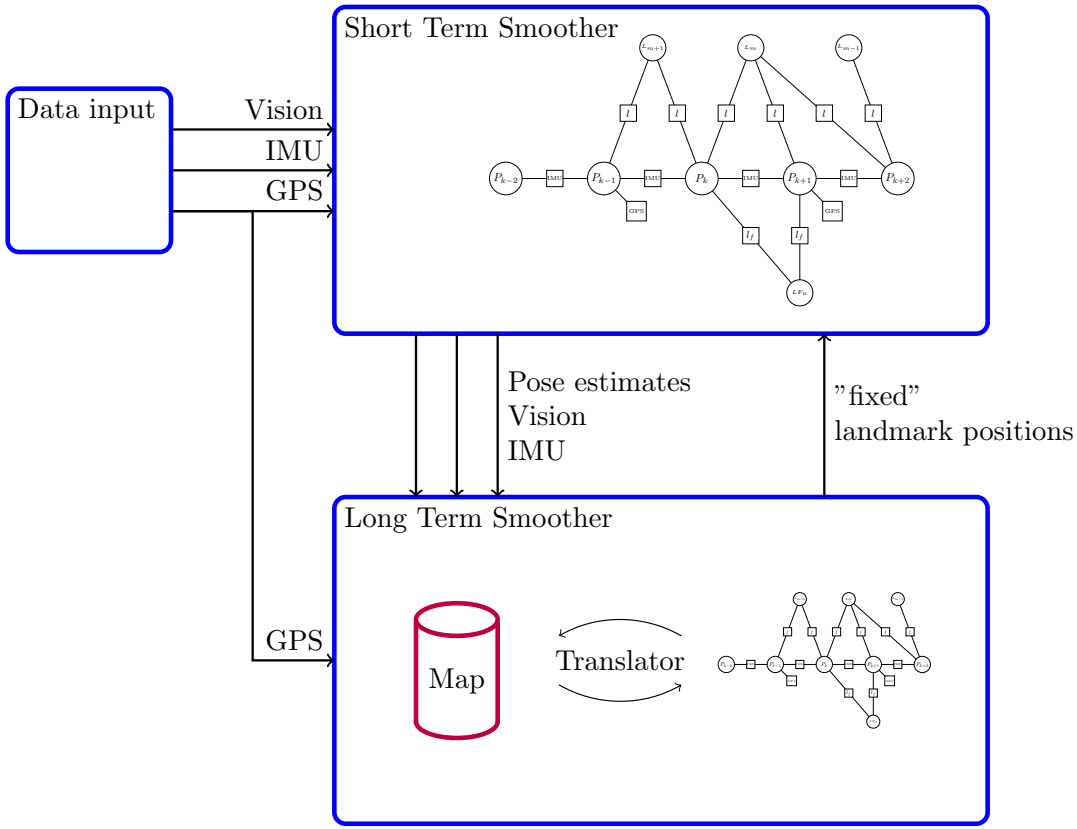
- Short Term Smoother
  - building a full factor graph given sensor data
  - estimating position and passing data to LTS

Work done so far

Backbone of the localization framework

- Long Term Smoother
  - building a map with the input data
  - "translating" the map to a factor graph
  - optimizing the factor graph and updating data in the map

Short and Long Term Smoother



Current challenges

- Reading landmarks from the map and translating them into a factor graph
- Inserting fixed landmarks into STS

HERE THE LANDMARK IDEA

Future work

- 3-stage landmark initialization
  - Stage 1: compute 3D landmark coordinate and initialize the feature as binary factor (state x_k and x_{k+1}).
  - Stage 2: formulate the feature re-projection factors connecting the 3D landmark state and pose.
  - Stage 3: once uncertainty converges marginalize landmark state and switch back to binary factor formulation.
- Sliding-Window STS
  - Reduce the STS problem to a sliding-window factor graph

Overview

Adding a video

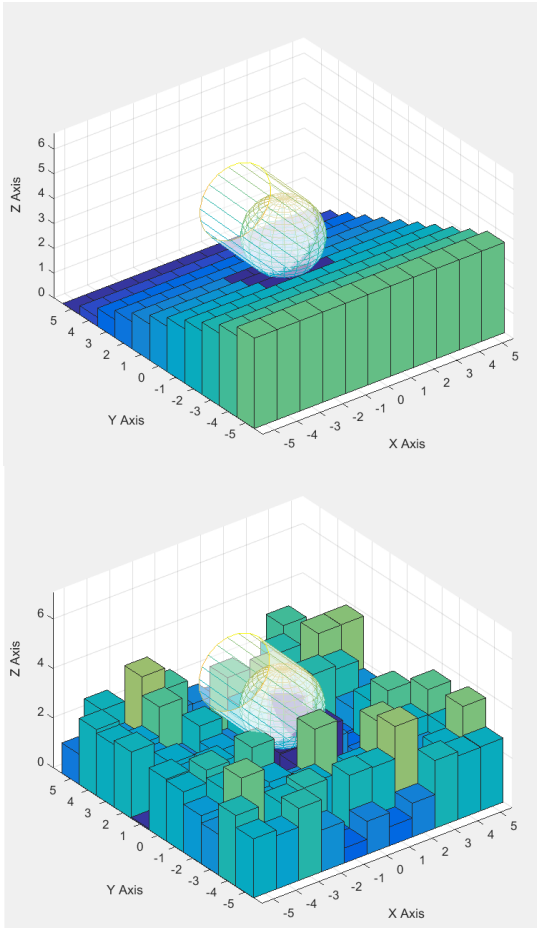
Example Slide

Adding a video

LittleDog walking over rough terrain (S. Schaal, “The latest version of the LittleDog Robot,” 2010. https://www.youtube.com/watch?v=nUQsRPJ1dYw)

Adding a video - Example Slide

- Point 1
- Point 2
  - Point 1.1
  - Point 1.2



Caption