



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

- Short - local navigation solution
- Long - solution given all data

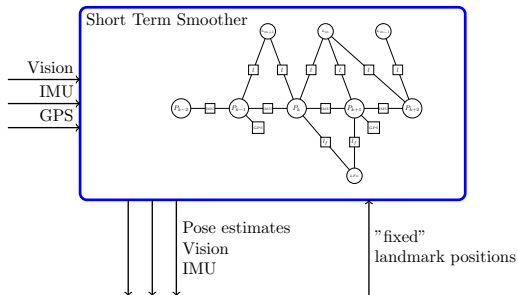
Factor Graph Localization Framework

Short Term Smoother (STS)

Long Term Smoother (LTS)

Work done so far - STS

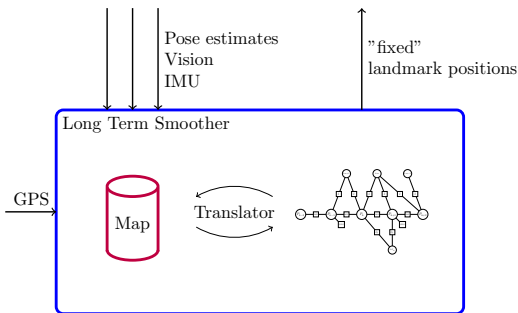
- Short Term Smoother
 - building a full factor graph given sensor data
 - estimating position and passing data to LTS



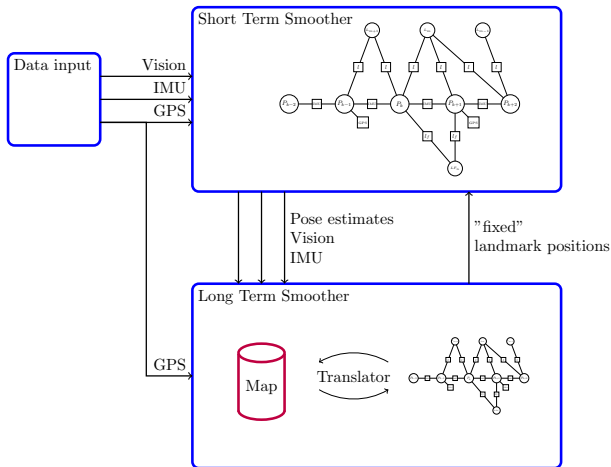
Work done so far - LTS

■ 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

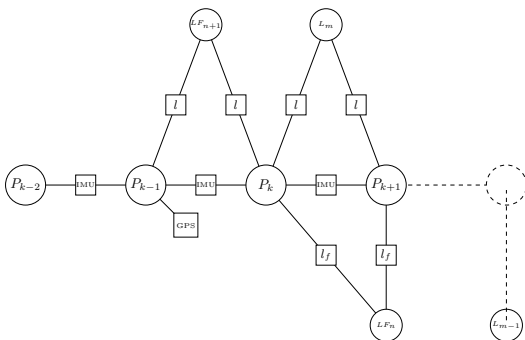


Localization framework (STS and LTS)



Current challenges

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



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

Discussion