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6DOF SLAM using 2D Laser Range Finders and IMU

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ITC

INDOOR MAPPING (IM)

- (terrestrial, airborne) laser scanning
- (terrestrial, aerial) photogrammetry
- GPS, …

} Mapping, modelling, and navigation outdoors

WHAT ABOUT INDOORS?

Mapping indoor environments

Terrestrial laser scanning: Speed?
Number of points?
Price?

Indoor Mobile Mapping System

INDOOR MOBILE MAPPING SYSTEM (IMMS)

IMMS

- Hardware
  - Moveable Platform
  - Synchronized
  - Calibrated

} Navigation / Data-capturing **Sensors**

- Acquired data

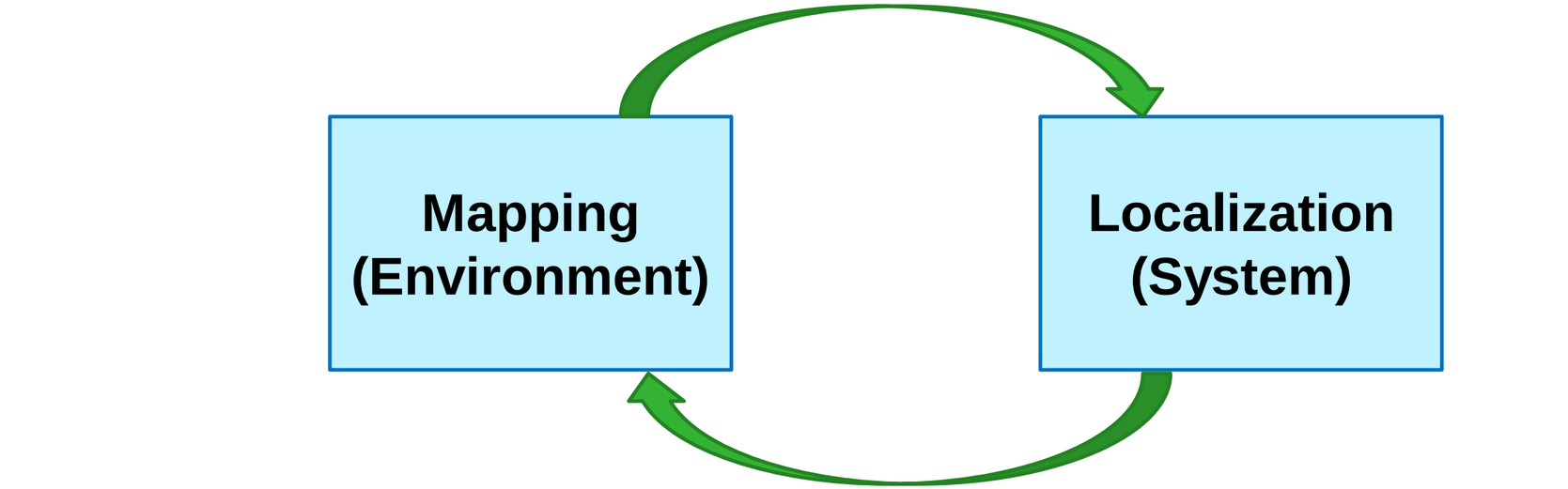
Images → Camera-based system: Texture-less environment? Fast movement?

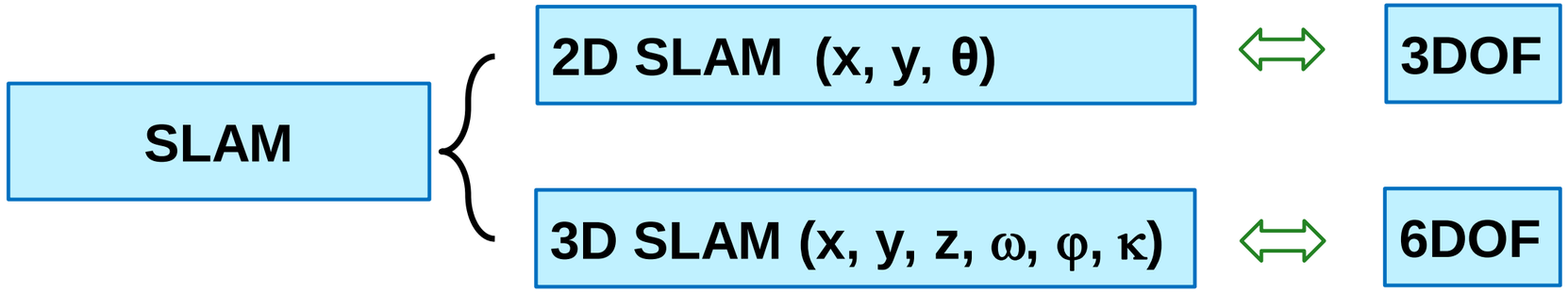
And/OR

Laser points → Laser-based system

GPS does not work indoor! **SLAM, IMU, ……**

SIMULTANEOUS LOCALIZATION AND MAPPING (SLAM)





STRUCTURE OF THE PRESENTATION

- Related Works
- ITC Backpack system
- Best Configuration (evaluation)
- Data (IMU)

Commercial Indoor Mobile Mapping Systems (IMMS)

Trimble IMMS

(www.applanix.com)

NavVis M3

(www.navvis.com)

Viametris i-MMS

(www.viametris.com)

ZEB REVO

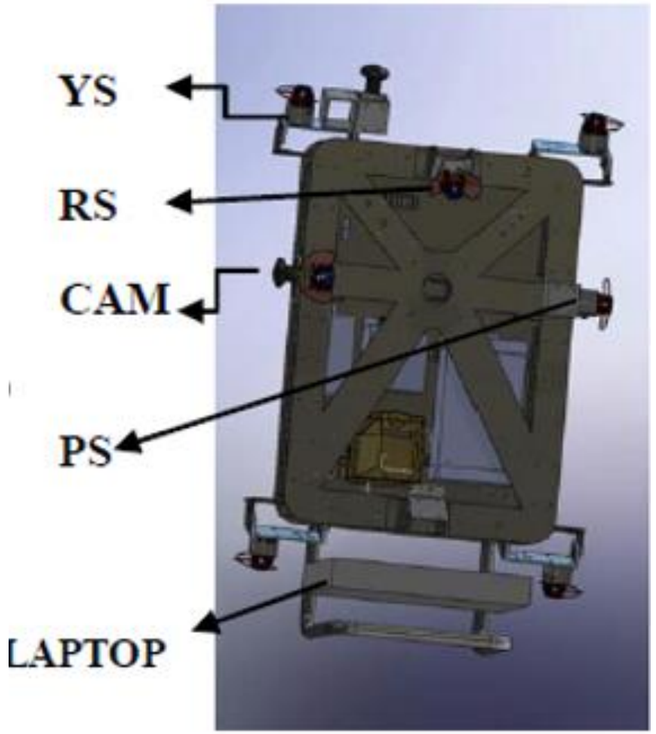
(www.geoslam.com)

Trolley-based IMMS

Hand-held IMMS

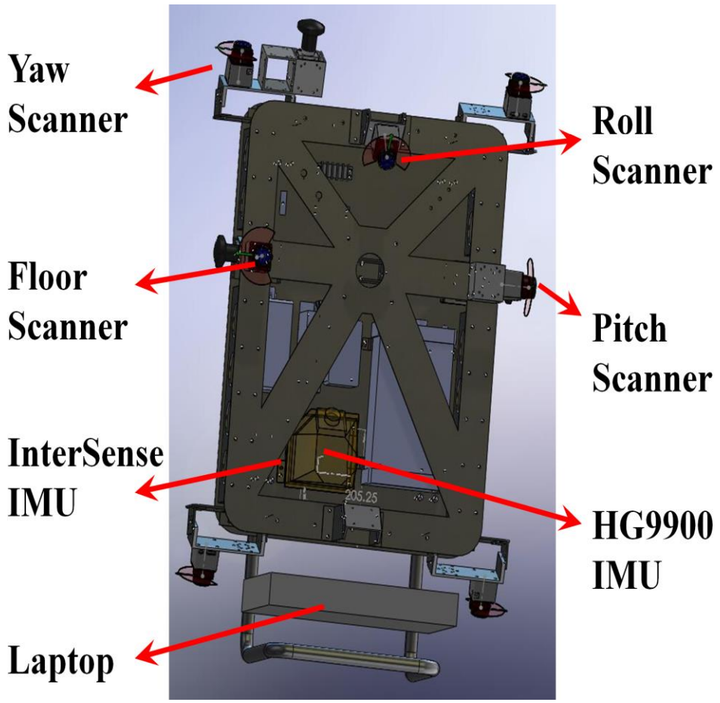
Wearable IMMS (Other Researchers)

VOSM and ICP-VO algorithms



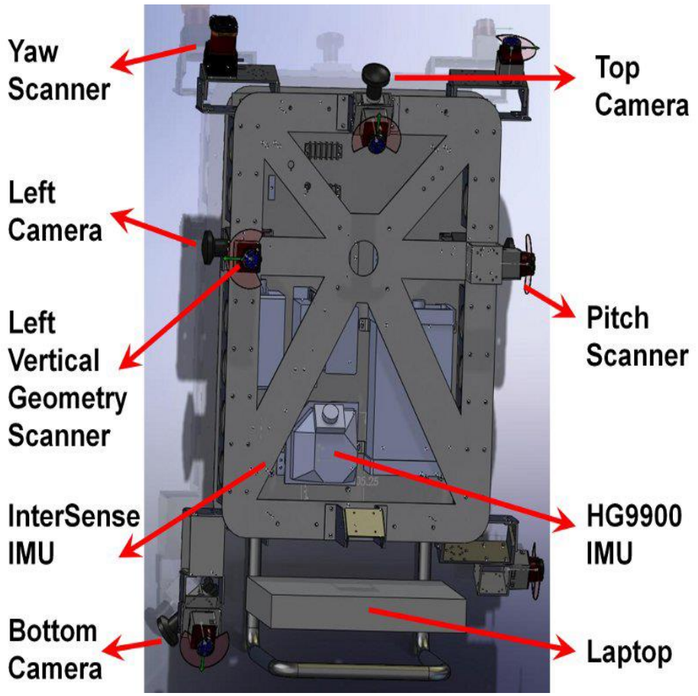
Naikal et al., (2009)

Four algorithms (scan-matching)



Chen et al., (2010b)

Adding three cameras



Liu et al. (2010)

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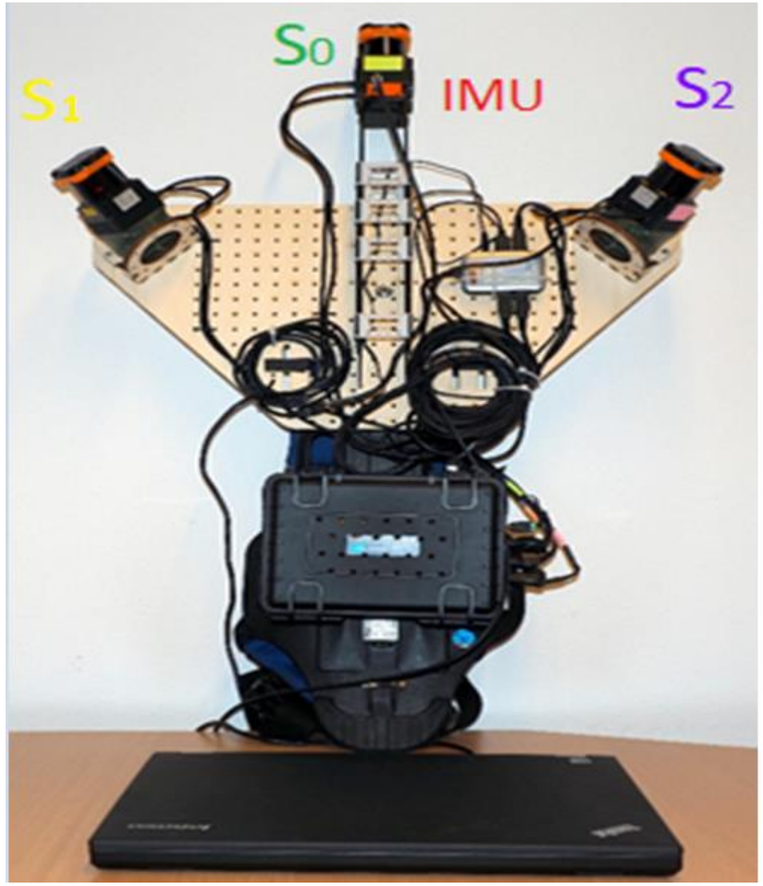
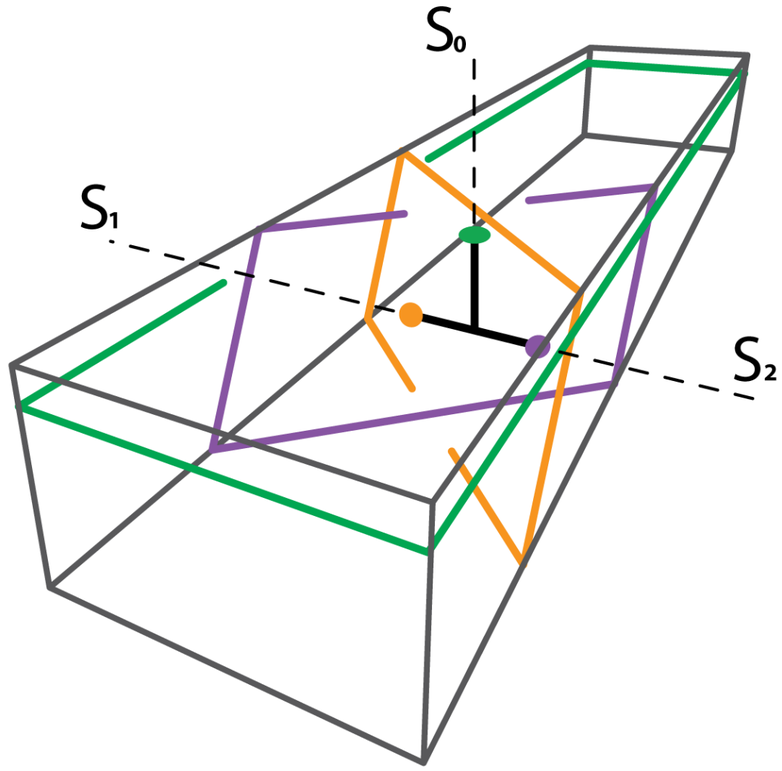
ITC Backpack system 2017

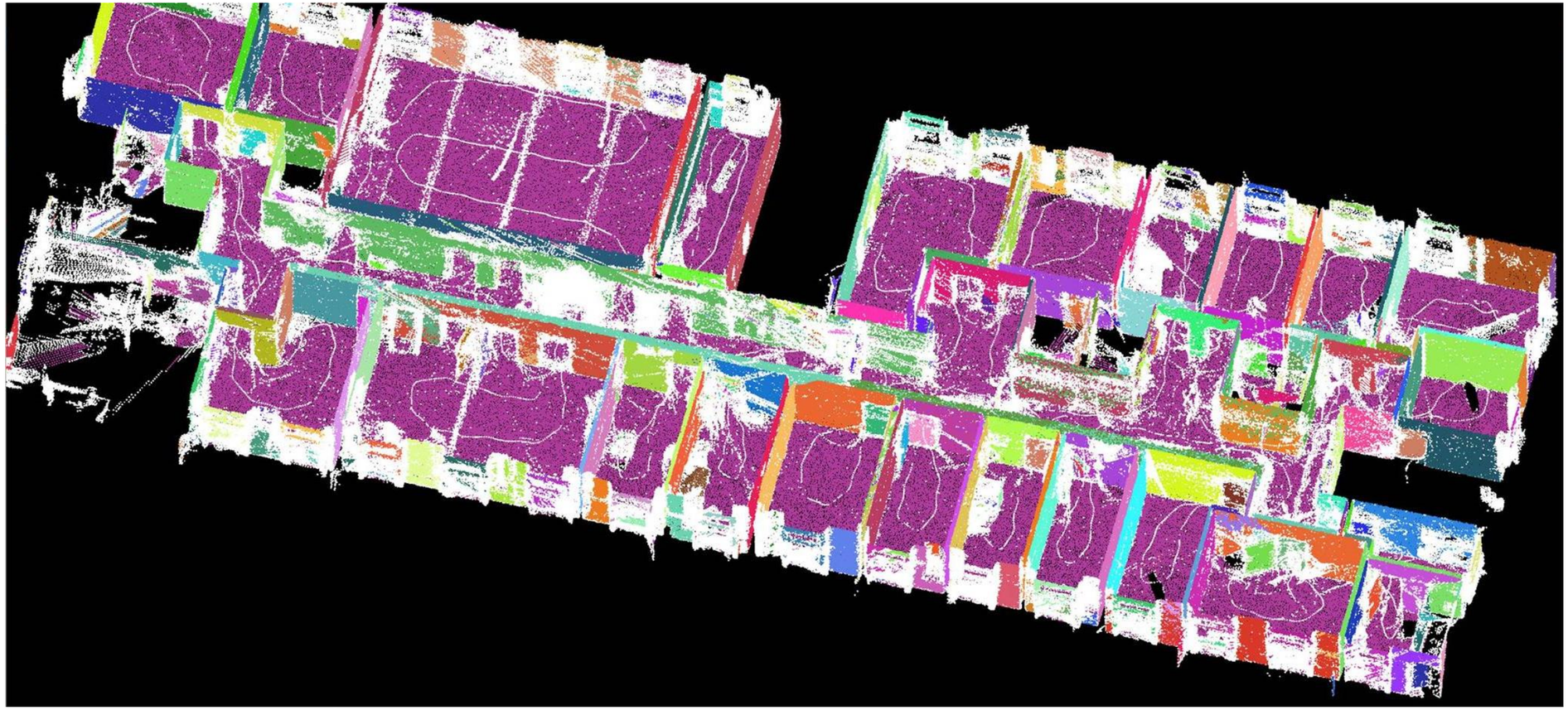


DATA

2D scanners



Reconstructed Point Cloud



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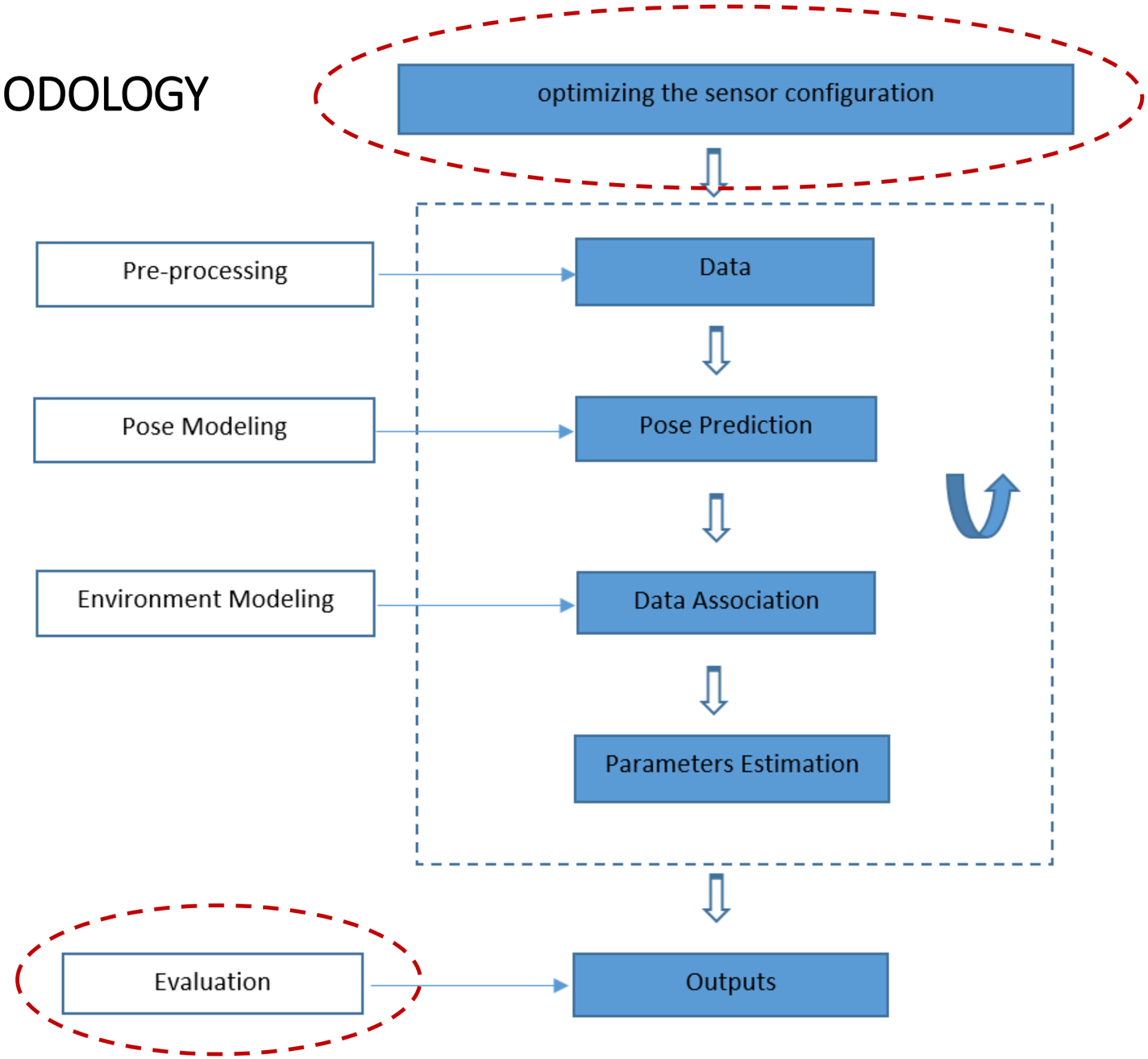
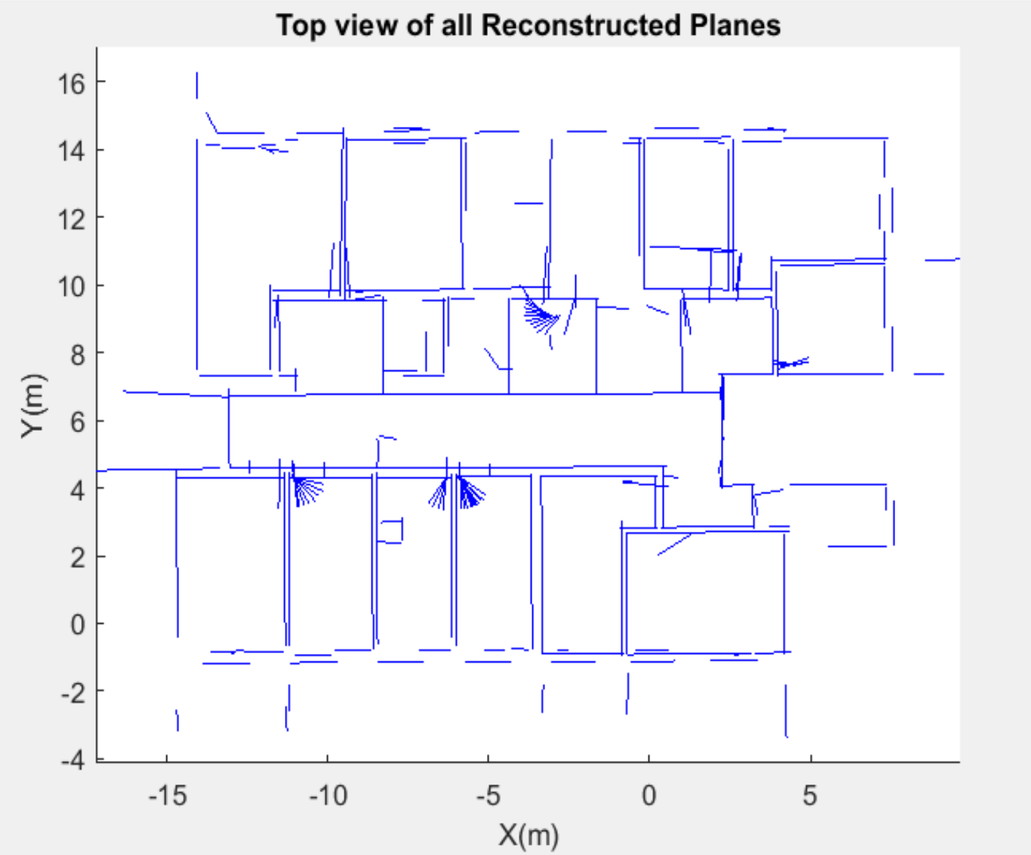
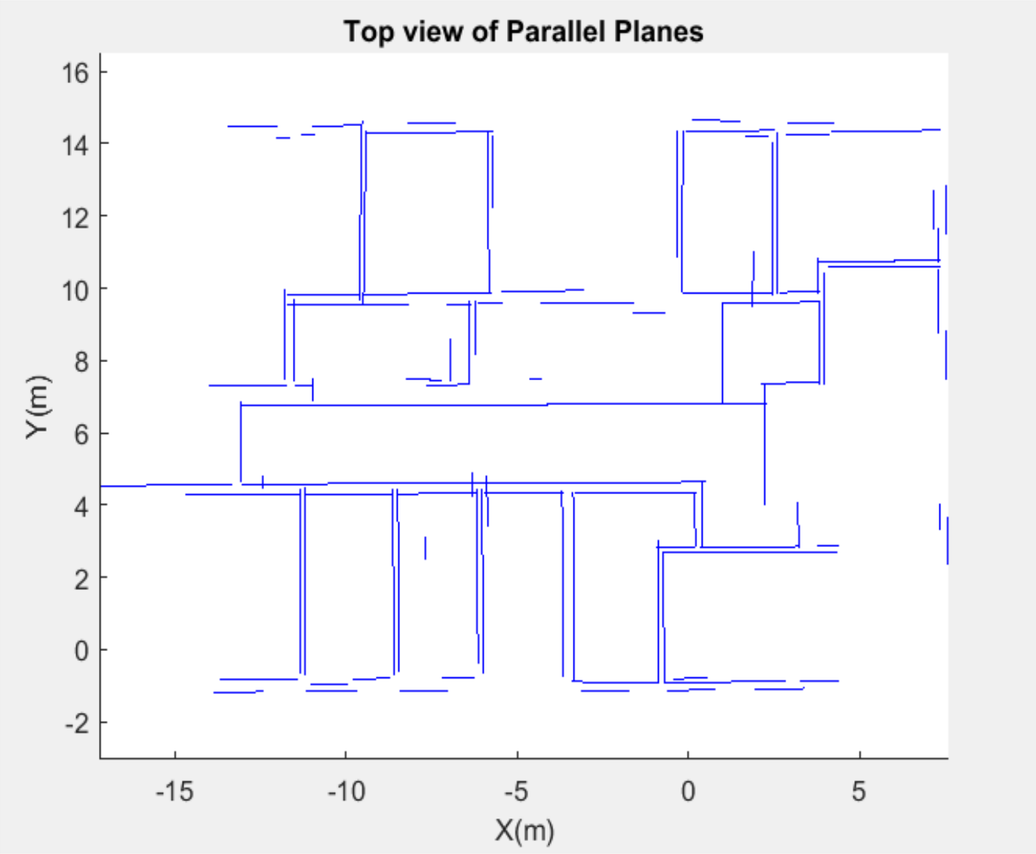
PROPOSED METHODOLOGY



RECONSTRUCTED PLANES

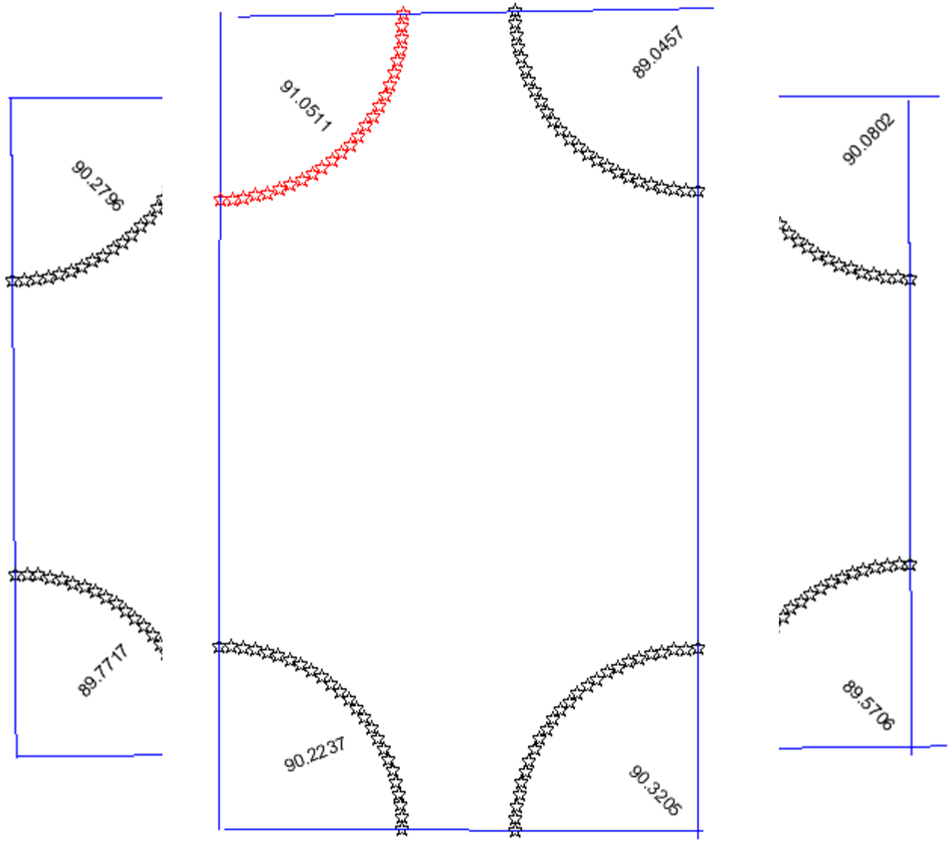
Parallel Planes (walls)

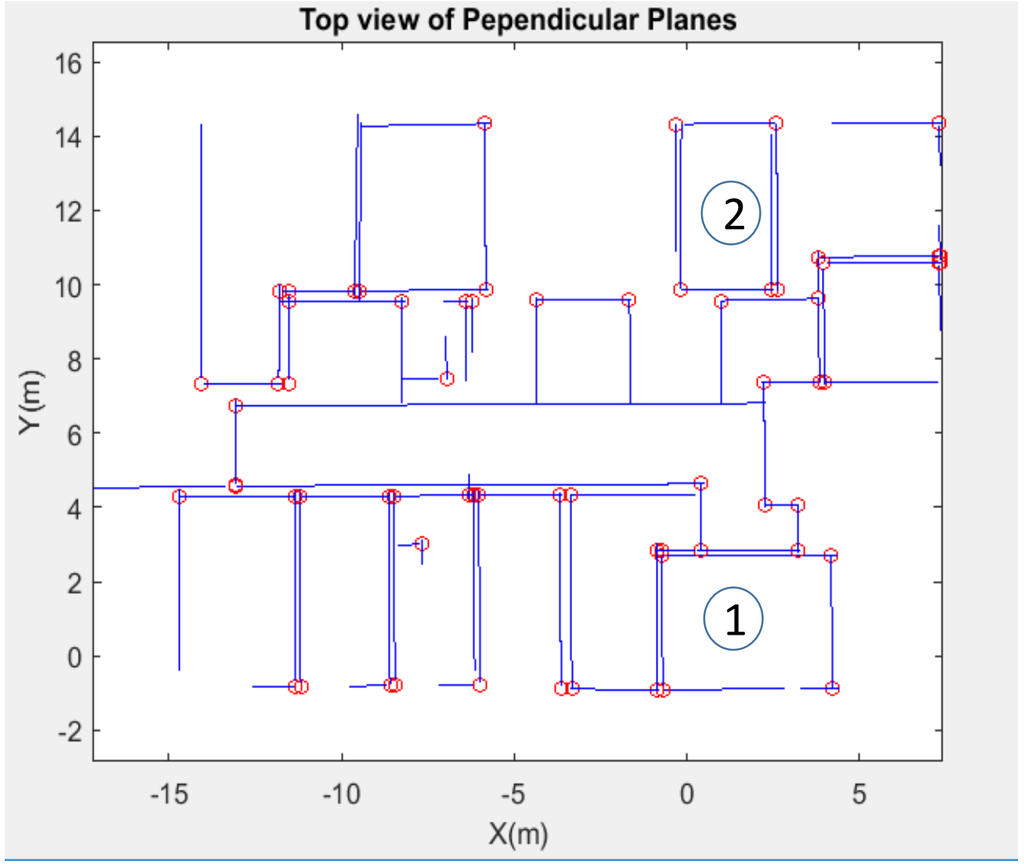




RECONSTRUCTED PLANES

Perpendicular Planes





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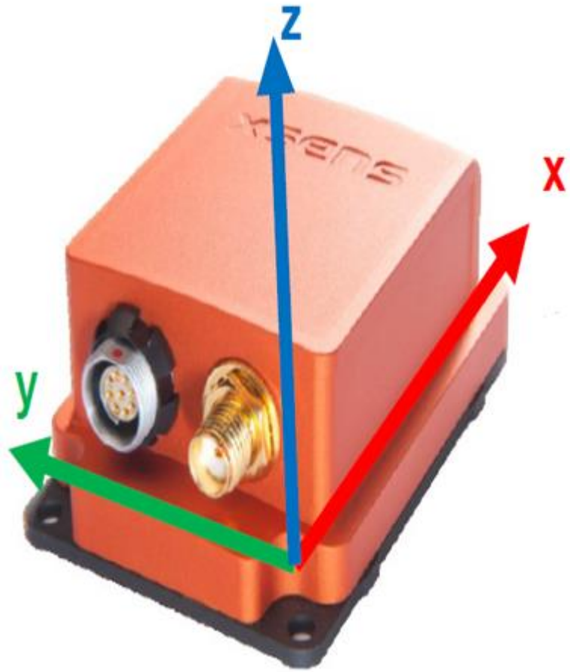
IMU PERFORMANCE

CHANGE IN ORIENTATION

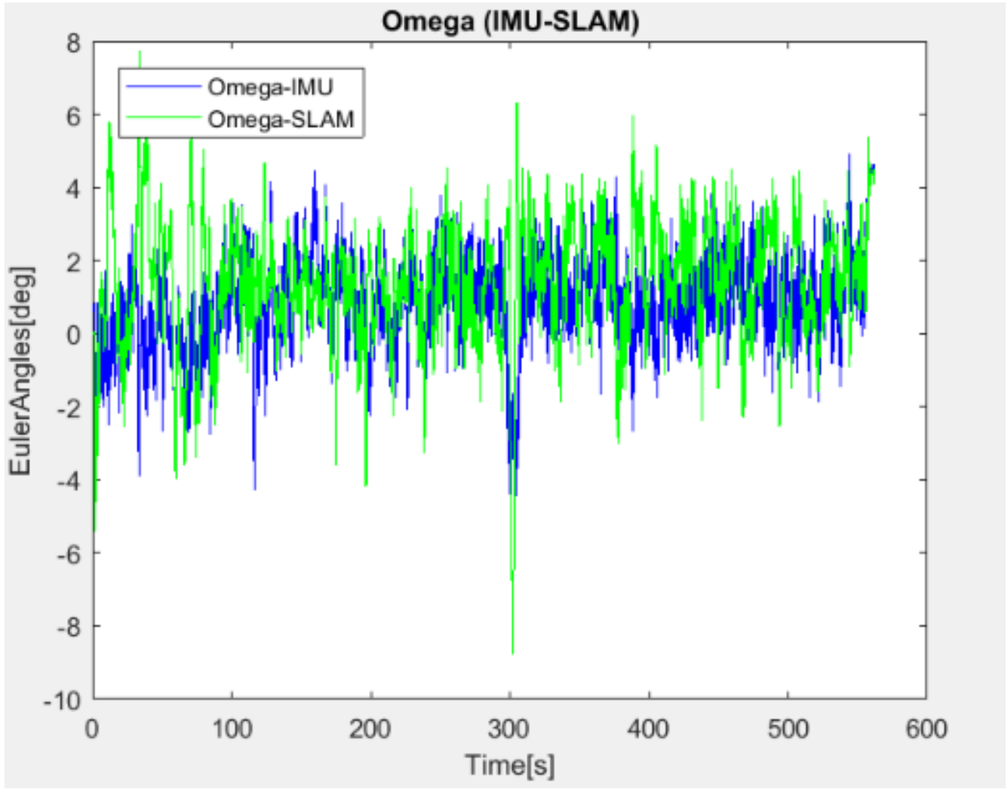
+

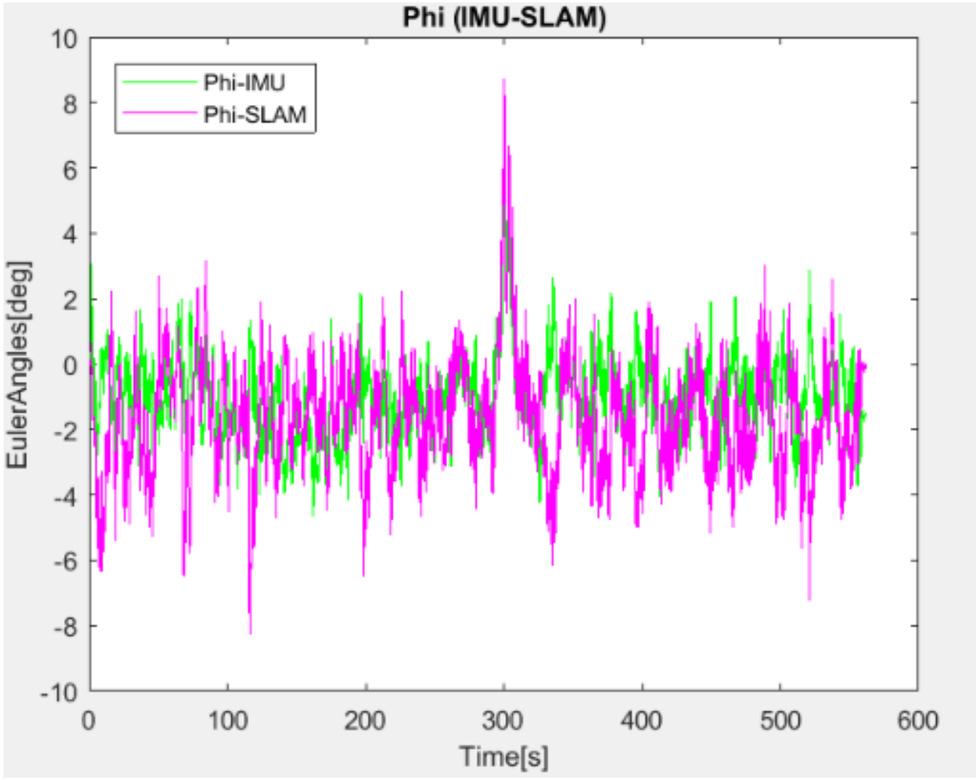
CHANGE IN POSITION



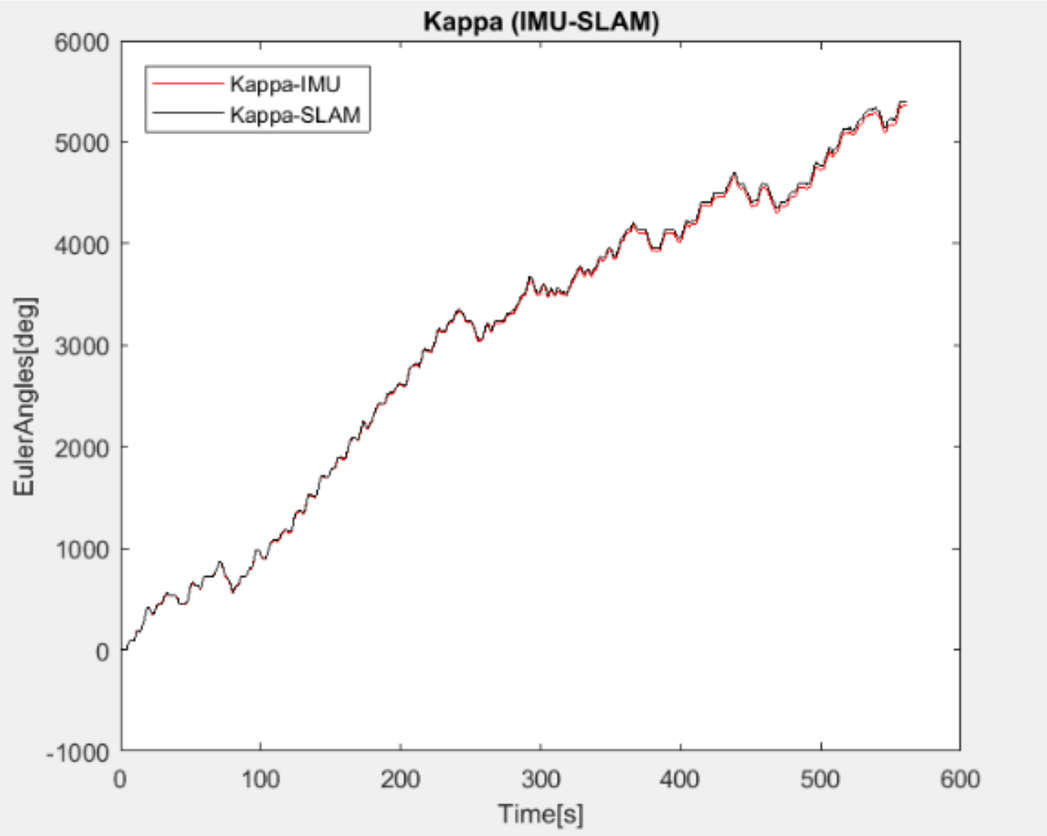
WORK IN PROGRESS

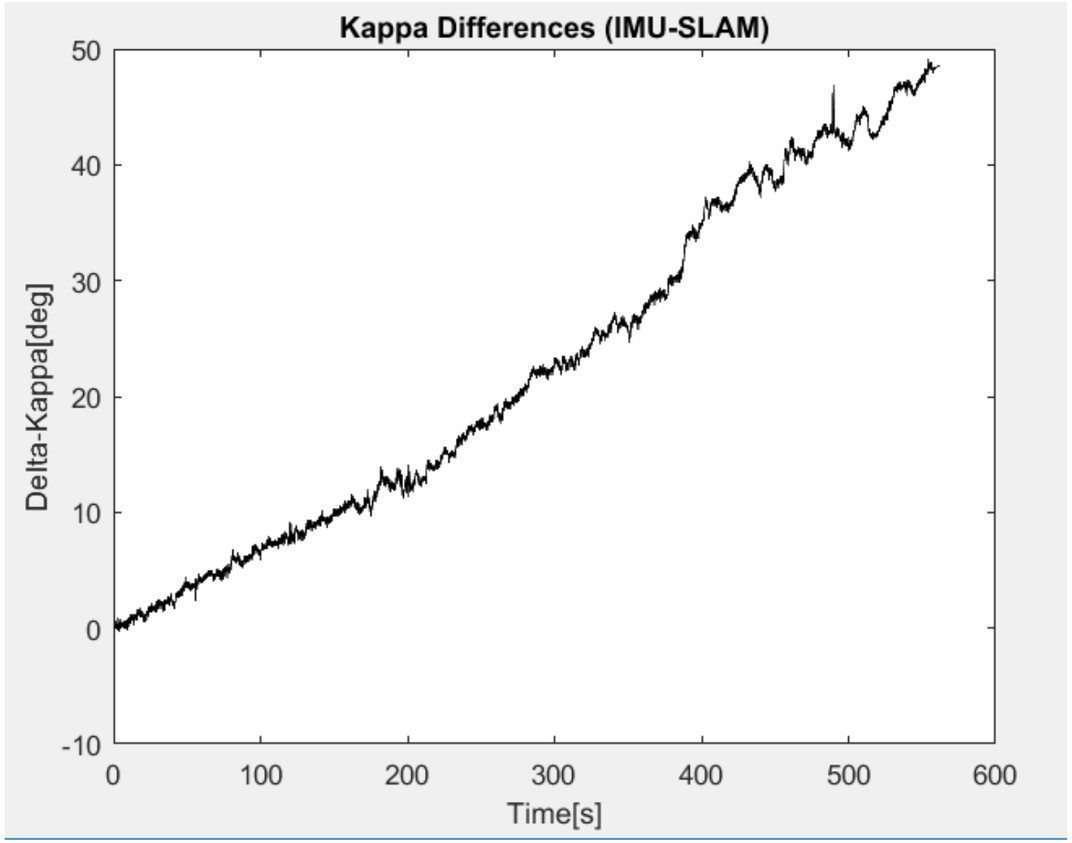
IMU_SLAM ORIENTATION





IMU_SLAM ORIENTATION





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Thank You for your Attention

Questions?

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