VSR Intern Mid-Presentation

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Contents

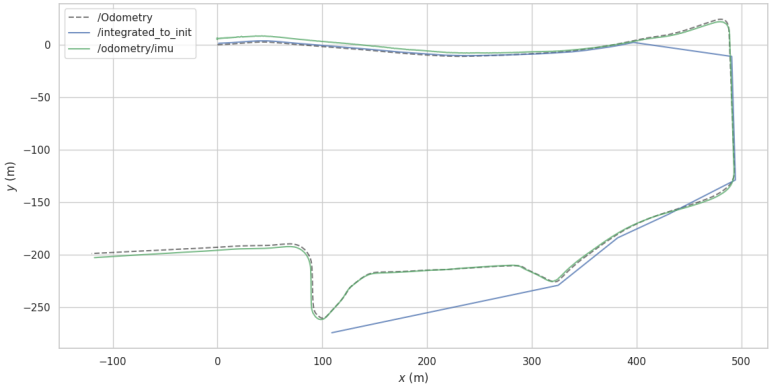
- Weeks 1-5
  - Study and testing
  - HeLiMOS and 4D LiDARs
- Dense mesh generation
  - Minor project work
- S-Graphs
  - (for low-dynamic object detection)

Weeks 1-5

- HeLiMOS labeling
  - Labeling dynamic points for HeLiMOS dataset

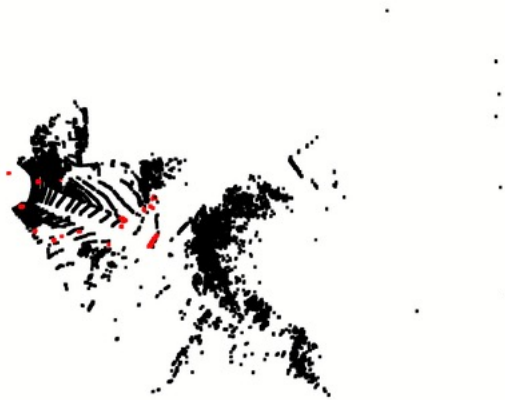
- Comparison of odometry methods
  - Compared FAST-LIO2, LIO-SAM, LeGO-LOAM
  - Using *EVO* to get relative pose error (RPE)

- Aeva 4D LiDAR
  - Used point velocity visualize dynamic points
  - Histogram of point velocities to determine threshold [repo]



(above) Comparison of trajectories

```
100000 100000
bin -1 [-inf,  0.0): 0
bin  0 [ 0.0,  0.2): 86183
bin  1 [ 0.2,  0.5): 11999
bin  2 [ 0.5,  0.7): 908
bin  3 [ 0.7,  1.0): 119
bin  4 [ 1.0,  1.2): 117
bin  5 [ 1.2,  1.4): 97
bin  6 [ 1.4,  1.7): 57
bin  7 [ 1.7,  1.9): 5
bin  8 [ 1.9,  2.2): 7
bin  9 [ 2.2,  2.4): 1
bin 10 [ 2.4,  2.6): 0
bin 11 [ 2.6,  2.9): 0
bin 12 [ 2.9,  3.1): 0
bin 13 [ 3.1,  3.4): 6
bin 14 [ 3.4,  3.6): 14
bin 15 [ 3.6,  3.8): 0
bin 16 [ 3.8,  4.1): 0
bin 17 [ 4.1,  4.3): 0
bin 18 [ 4.3,  4.6): 0
bin 19 [ 4.6,  4.8): 0
bin 20 [ 4.8,  5.0): 0
bin 21 [ 5.0,  5.3): 0
bin 22 [ 5.3,  5.5): 0
bin 23 [ 5.5,  5.8): 0
bin 24 [ 5.8,  6.0): 0
bin 25 [ 6.0,  6.2): 1
bin 26 [ 6.2,  6.5): 42
bin 27 [ 6.5,  6.7): 226
bin 28 [ 6.7,  7.0): 145
bin 29 [ 7.0,  7.2): 6
bin 30 [ 7.2,  inf): 67
```



(left) Point velocity histogram; and
(above) visualization using thresholds

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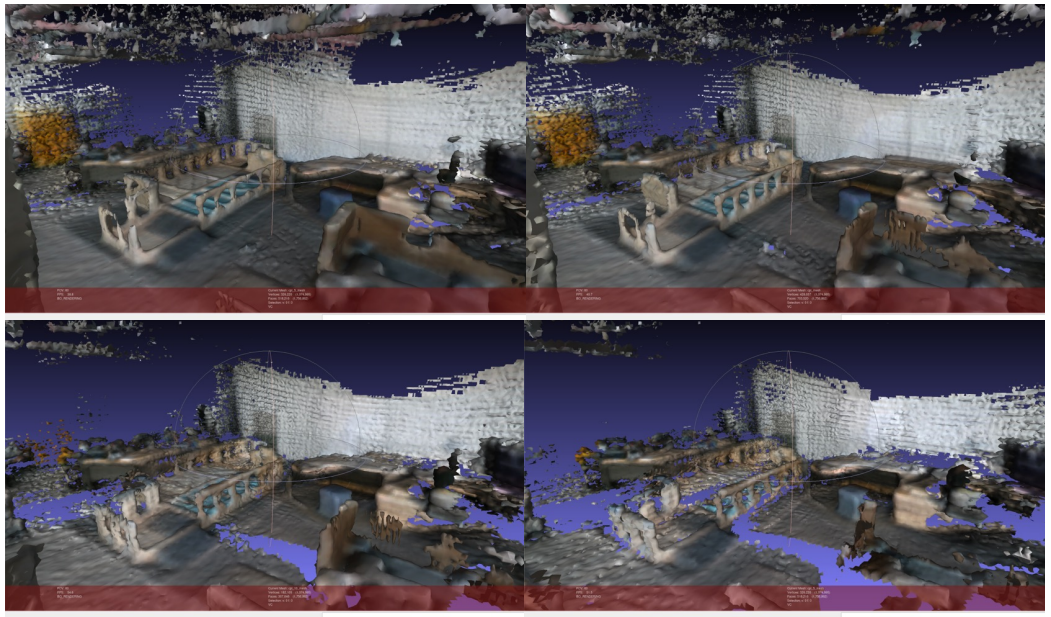
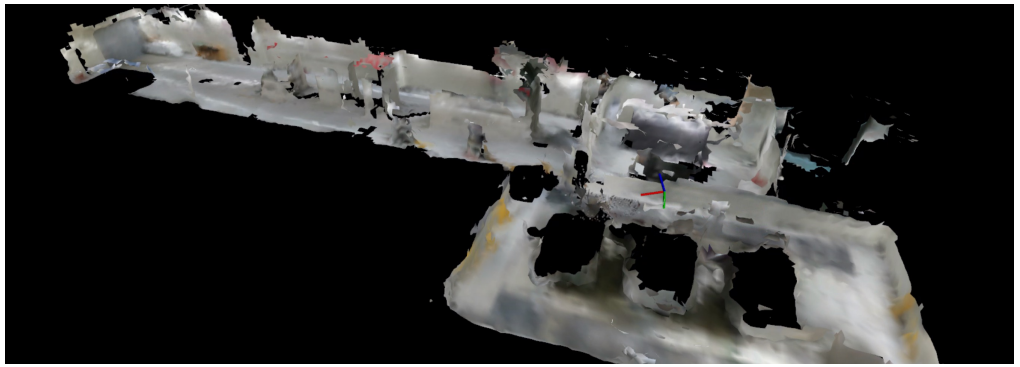
Dense Mesh Generation

- Goals
  - Switch from VoxBlox to VDBFusion
  - Reject motion blur from mesh
- Work
  - Lidar-camera-odometry data from E11
  - Laplacian blur detection to reject blurred frames from mesh generation [repo]
- Future
  - VoxBlox has fuller map but with low definition
  - Projection via semantic segmentation



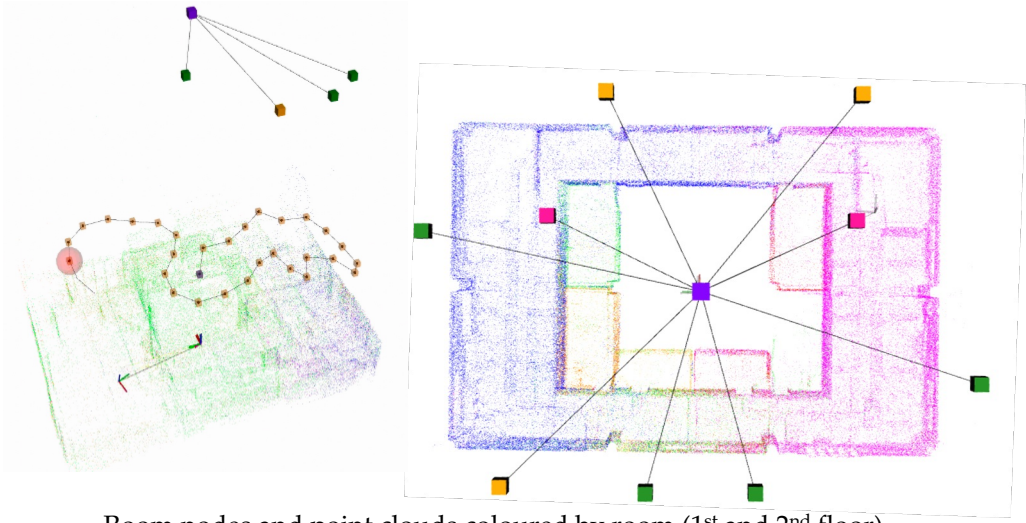
Various blur rejection thresholds: 0 (top left), 5 (top right), 10 (bottom left), 15 (bottom right)



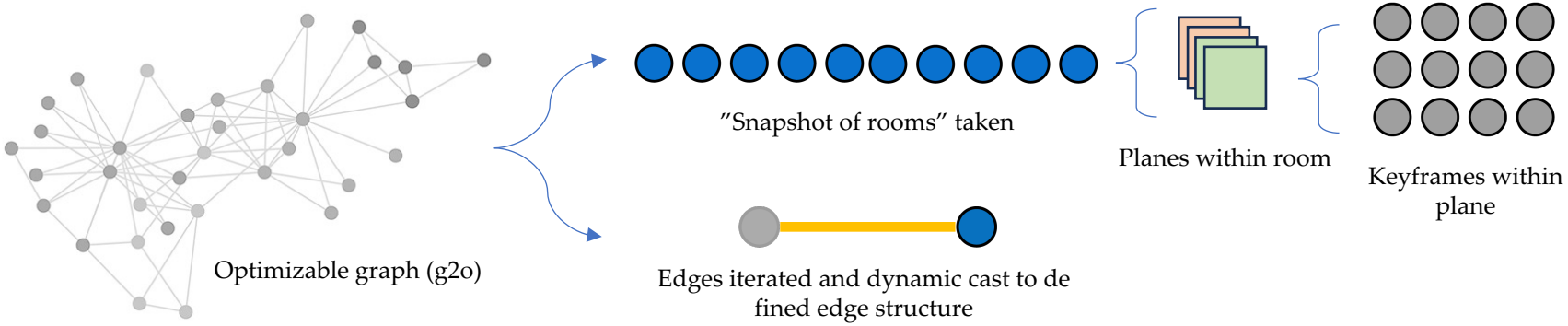
Previous VoxBlox mesh: well defined map but low definition

S-Graphs

- Goals
  - Employ room segmentation and isolate odometry (keyframes) by room
  - Identify issues / suitability
- Work
  - Grouped keyframes by room (Pohang dataset)
  - Identified segmentation issues [repo]

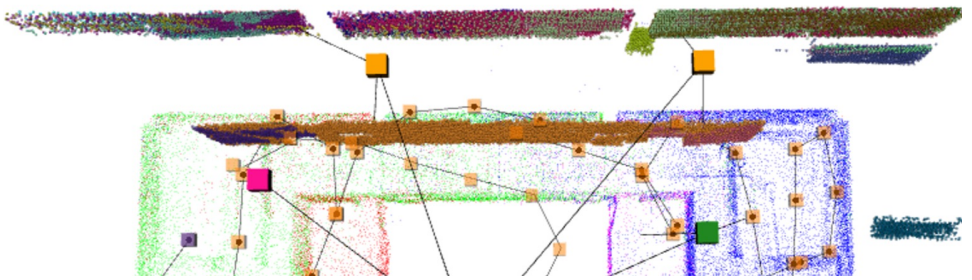


Room nodes and point clouds coloured by room (1st and 2nd floor)



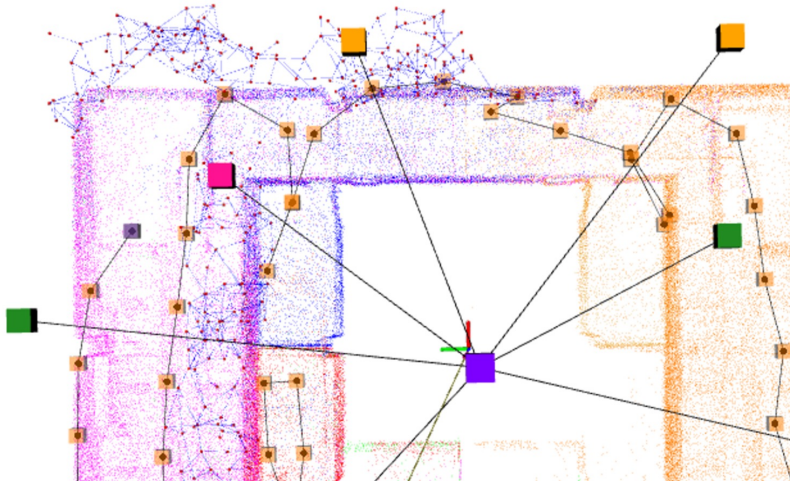
Uses / future work with S-Graphs

- Improve room segmentation
  - Alter or reject algorithmic approach (i.e. GNNs)
  - Over-segmentation of wall (plane registration failure)



Over-segmentation of a wall plane due to protruding columns

- Swap VoxBlox sparse skeleton graph
  - Bulky in implementation and under-segments rooms



Sparse graph of room indicated by pink node and blue cloud extending beyond the actual room

- Exploit odometry (keyframes) clusters for other tasks
  - Low-dynamic object detection by room
  - i.e. occupancy grid by room