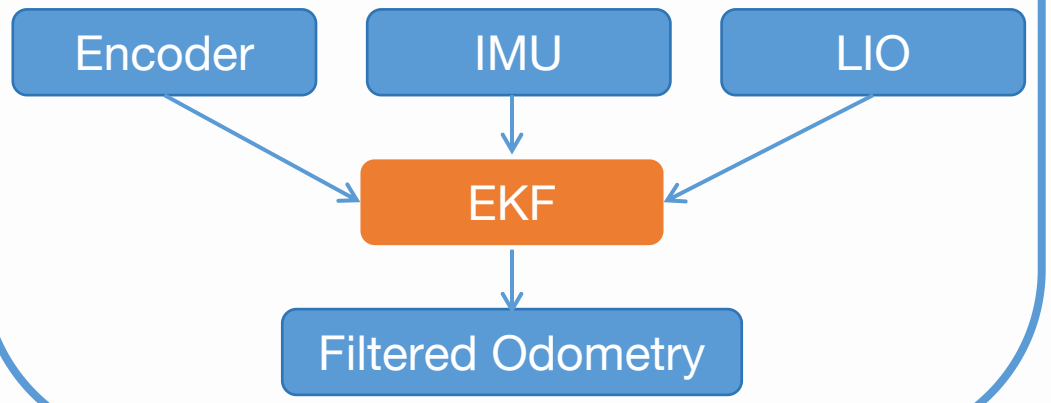
Agile Navigation on Uneven Terrain

High Frequancy Localization

Therefore, for quick obstacle avoidance, we need precise and real-time localization updated at over 100 Hz, while the 3D lidar sensor samples at merely 10 Hz.

To tackle this challenge, we fused the encoder measurement (1000Hz) and IMU measurement (400Hz) with the lidar intertial odometry (10Hz) with Extended Kalman Filter.



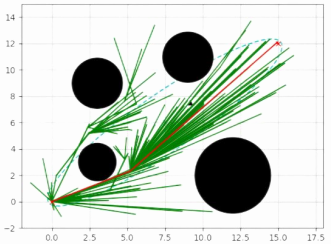
Traversability Analysis

We implemented the point cloud segmentation algorithm proposed by *Fast Segmentation of 3D Point Clouds for Ground Vehicles* to identify traversable zone in uneven terrain

Trajectory Planning and Tracking

We used the A* algorithm for global path searching and MPPI algorithm for local path tracking.

For more efficient path searching, we plan to adopt informed RRT* algorithm optimized for our scenario in the future.



Relevant video: https://www.youtube.com/watch?v=mgK62YdBWW0