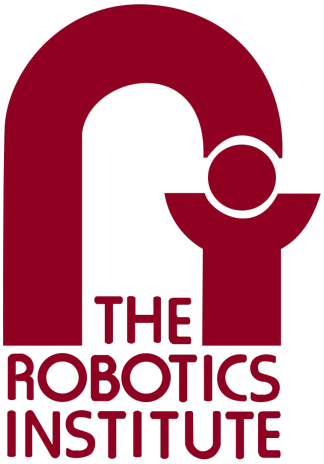
Reading Assignment 1



ORB-SLAM / VLOAM

16-833A Spring 2025

Author: **Boxiang (William) Fu**
Andrew ID: boxiangf
E-mail: *boxiangf@andrew.cmu.edu*

March 22, 2025

Carnegie Mellon University
Robotics Institute

1 ORB-SLAM

The ORB-SLAM algorithm is a real time feature-based monocular SLAM system. The map grows with scene visual content (not time) and could be used for lifelong operation. The system utilizes three threads for tracking (localizing the camera using ORB features or re-localization to determine when to insert a new keyframe), local mapping (process new keyframes & culls old keyframes and uses bundle adjustment to reconstruct the camera pose), and loop closing (fuses duplicate points and reduces accumulated drift).

2 VLOAM

The VLOAM algorithm uses a monocular camera and a 3D lidar to do motion estimation and generate a map of the environment. It runs visual odometry at 60 Hz to output frame-to-frame motion estimation by matching visual features between consecutive frames. It runs at a high rate but is susceptible to drift. The 3D lidar runs at 1 Hz and associates the lidar depth map to visual features. It refines motion estimates and corrects drift. The motion estimate is very accurate and ranked 1st on the KITTI benchmark.