Carnegie Mellon University
The Robotics Institute

Visual Odometry
for Multiple Monocular Camera

Sha Yi, Chaohui Gong, Howie Choset

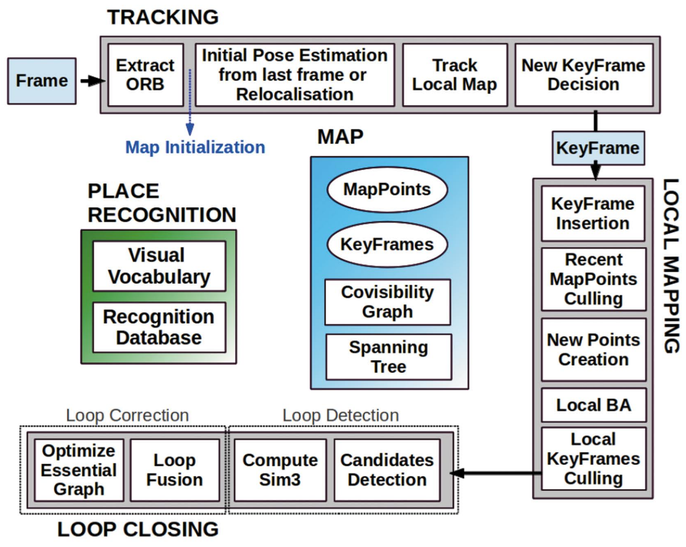
Biorobotics Laboratory

Introduction

Localization is a crucial part of locating robots in different environment. In this case, visual odometry is introduced to localize the robot by tracking visual features. We choose monocular camera for their fast frame rate. We make use of the method proposed by Mur-Artal et. al (2015) to build the system, which includes tracking, local mapping, and loop closing.

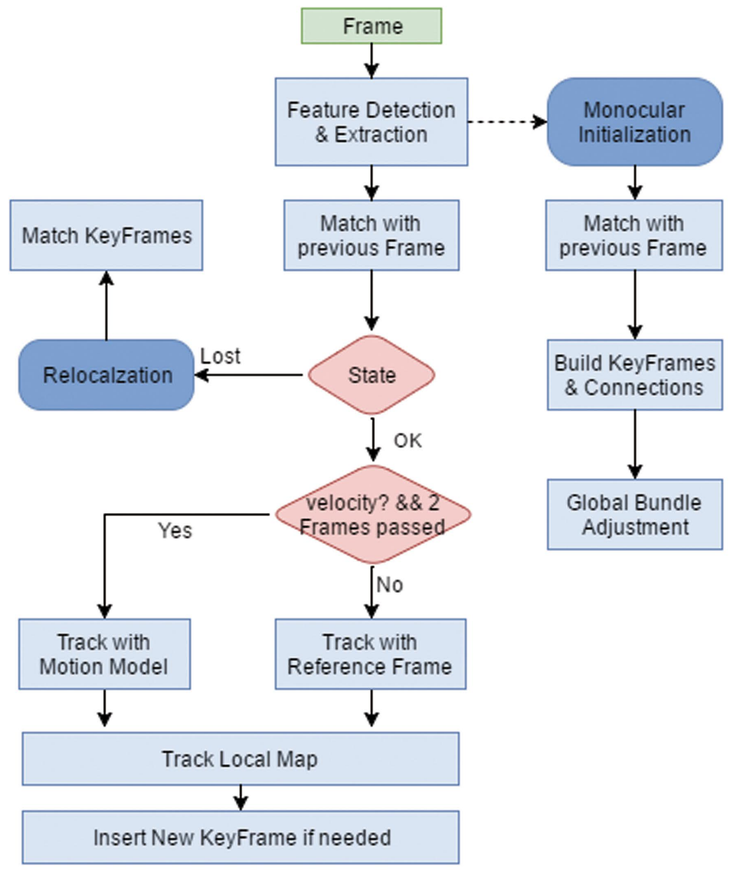
Method

The following diagram shows the relationship between the three threads: Tracking, Local Mapping, and Loop Closing.



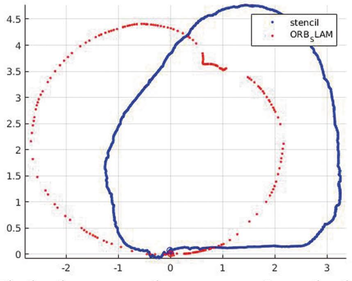
Mur-Artal, R., Montiel, J. M. M., & Tardós, J. D. (2015). ORB-SLAM: a versatile and accurate monocular slam system. *IEEE Transactions on Robotics*, 31(5), 1147-1163.

A detailed diagram of the Tracking thread is shown here:

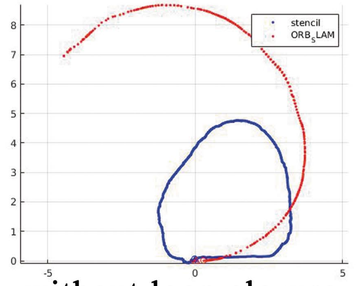


Result

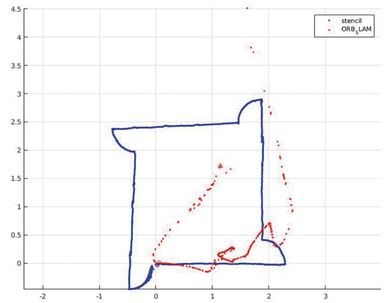
- IMR: Wheeled Robot



With loop closure & global bundle adjustment



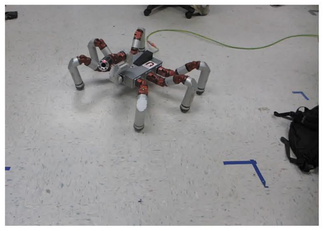
without loop closure



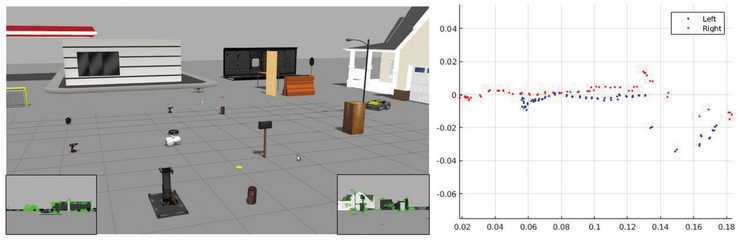
Replace constant velocity model with command velocity input from joystick

Applications

Modular snake in feature-rich environment



Snake monster



Left and right camera simulation in Gazebo

Future Work

-Integrate the visual system with IMU
-Modify motion model with input from other sensors
-Apply proper image filter to enhance the robustness of feature detection