

SLAM-OB for SLAM Competition @SLAM FORUM 2023

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June 29, 2023

1 Sysytem overview

The proposed algorithm is a monocular VIO algorithm. It uses measurements from the IMU and the monocular image. The feature points in image front-end are the Quadtree distributed FAST key points. The motion tracking uses LK-OpticalFlow method. A keyframe-based sliding window BA algorithm is used to fuse the image and IMU measurements in the backend. It uses the schur-complement marginalization method to keep the prior information for measurments which has been slided out of the window.

Doing this, the robustness of the system is greatly improved under long-time static state.

The visual front-end tracking is based on feature point tracking, which can establish a stable feature point matching relationship between frames. By using effective image processing algorithms and data structures to maintain tracking information, it can effectively eliminate invalid feature points and mismatch points, improving the matching accuracy and reliability. At the same time, we design strategies based on the image's tracking state and IMU measurements to deal with situations such as fast translation and rotation. It can identify various motion state modes, improve the accuracy and quantity of feature point extraction, and adapt to many different complex scenes.

We design a loosely coupled relocalization method that utilizes feature matching and 3D point clouds from multiple image frames, achieve high-precision local relocalization with little computational resource demand and short relocalization response time.

2 Evaluation hardware configuration

The proposed algorithm is evaluated on a desktop without GPU acceleration. Hardware configuration is listed in Table 1.

Table 1: Hardware Configuration

Item	Configuration
CPU	13th Gen Intel® Core™ i7-13700KF × 24
MEMORY	16GB
DISK	1TB
OS	UBUNTU 20.04LTS

3 System paramters

All the sequences are evaluated with the same set of paramters. Some key parameters are listed in Table 2.

Table 2: System Paramters

Parameter	Value
window size	11
max feature	150
max solver time	40ms
acc. white noise	0.1
acc. random walk	0.001
gyro. white noise	0.005
gyro. random walk	0.00004