

SLAM-OB for FPV VIO Competition IROS2020

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1 System overview

The proposed algorithm is a stereo VIO algorithm. It uses measurements from the IMU and the stereo images of the Qualcomm Snapdragon flight board. The feature points in image frontend 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. However, different from the well-known keyframe based sliding window algorithm, the window in our system is divided into two parts. The first half only contains keyframes' poses and the associated landmarks. The last half contains both IMU measurements and images, the images in this part need not to be keyframes. See Fig 1. Doing this, the robustness of the system is greatly improved under long-time static state. It also uses the schur-complement marginalization method to keep the prior information for measurements which has been slid out of the window.

The proposed algorithm is causal, no loop closure nor batch optimization of the whole trajectory is applied.

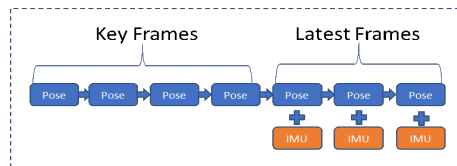


Figure 1: Sliding Window

2 Evaluation hardware configuration and timing

The proposed algorithm is evaluated on a LENOVO THINKCENTER desktop, without GPU acceleration. Hardware configuration is listed in Table 1. Processing time of each sequence is listed in Table2.

Table 1: Hardware Configuration

Item	Configuration
CPU	Intel Core i7-6700 CPU @3.40GHz \times 8
MEMORY	16GB
DISK	1TB
OS	UBUNTU 16.04LTS

Table 2: Processing Time

Sequence	Time(s)
indoor_forward_12	100.798
indoor_forward_11	133.210
indoor_45_16	73.910
indoor_45_3	119.977
outdoor_forward_10	205.592
outdoor_forward_9	161.319

3 System paramters

All the sequences are evaluated with the same set of paramters. Some key parameters are listed in Table 3. The IMU noises are derived from the counterpart of OPENVINS as those from the calibration file seems not suitable for the proposed algorithm.

Table 3: System Paramters

Parameter	Value
window size	11
max feature	150
max solver time	40ms
acc. white noise	4.0000e-1
acc. random walk	3.0000e-4
gyro. white noise	1.6968e-04
gyro. random walk	1.9393e-05