3D Reconstruction on an IMU enabled Mobile Device

Mini Project - CSD310

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Objective

3D Reconstruction on an IMU enabled mobile device.

Plan

1. Position and Orientation estimate from IMU sensors.
2. Refining the position and orientation using local regression, smoothening and Kalman filter.
3. Generate corresponding points between images.
4. Triangulation
5. Bundle Adjustment
6. Dense 3D Reconstruction

Present Progress

1. Position and orientation estimate from sensors.
2. Refinement and smoothening of sensor data.
3. Calculating Rotation Matrix (R) and Translation Matrix (T) using the refined data.
4. All this done as soon as a particular frame is captured.
5. Tracking and correspondence generation running in real time at 8 FPS on 640*360 resolution on phone.
6. Triangulation working on phone using the calculated R,T and tracked data.

Difficulties

Incorrect Tracking

Errors in point tracking at times thereby leading to improper triangulation

Figure: Incorrect Correspondence

Figure: Correct Correspondence

Difficulties

Sensor Errors

- Sensor data can at times drift leading to incorrect extrinsic parameters estimations and hence erroneous sparse reconstruction.
- Bundle adjustment will resolve this error.

Whats next

- Improving the tracking obtained from the KL tracker using Kalman filter
- Optimizing the data processing to improve the FPS.
- Test and optimize bundle adjustment to run on the phone
- Dense tracking and correspondence generation using GPU for dense 3D reconstruction.

Thank You