7P

Integrated Positioning and Navigation

Assignment 6

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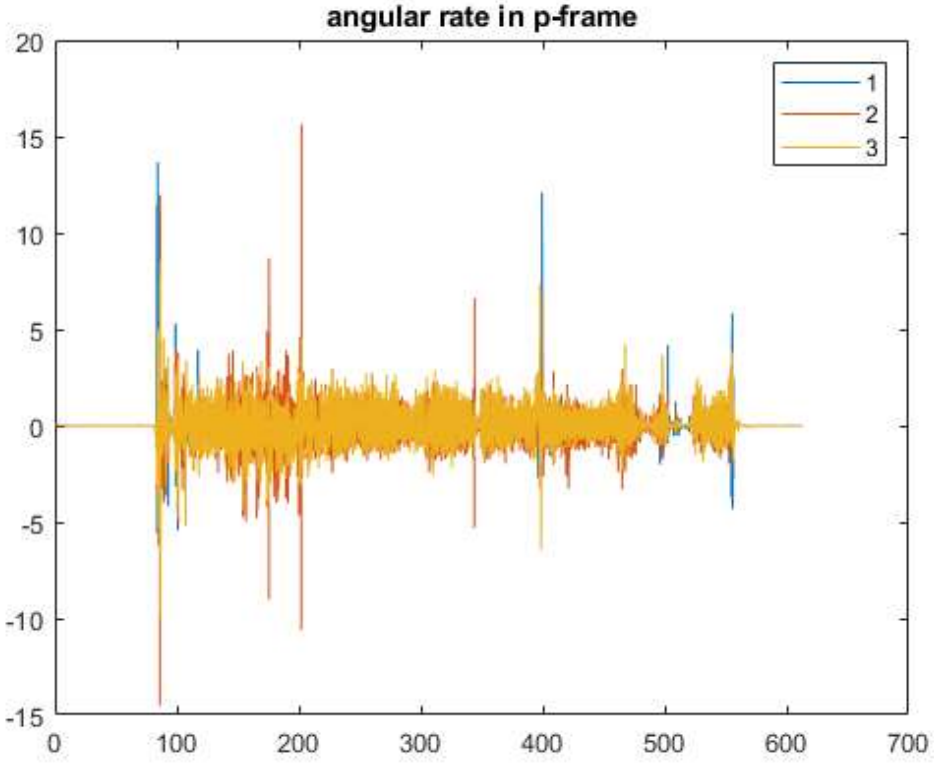
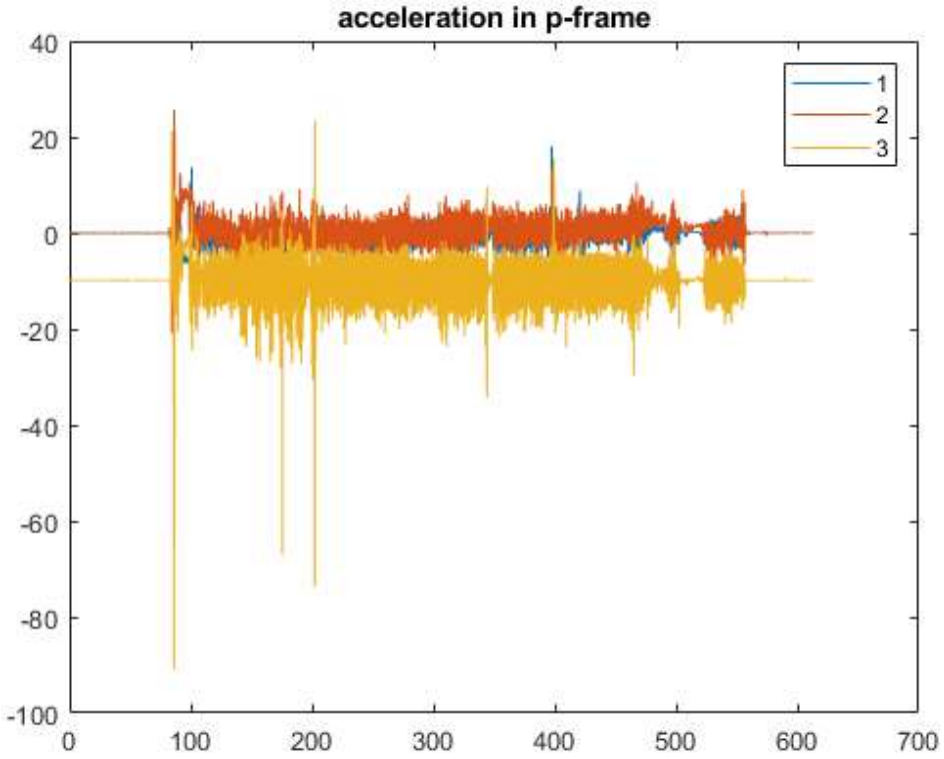
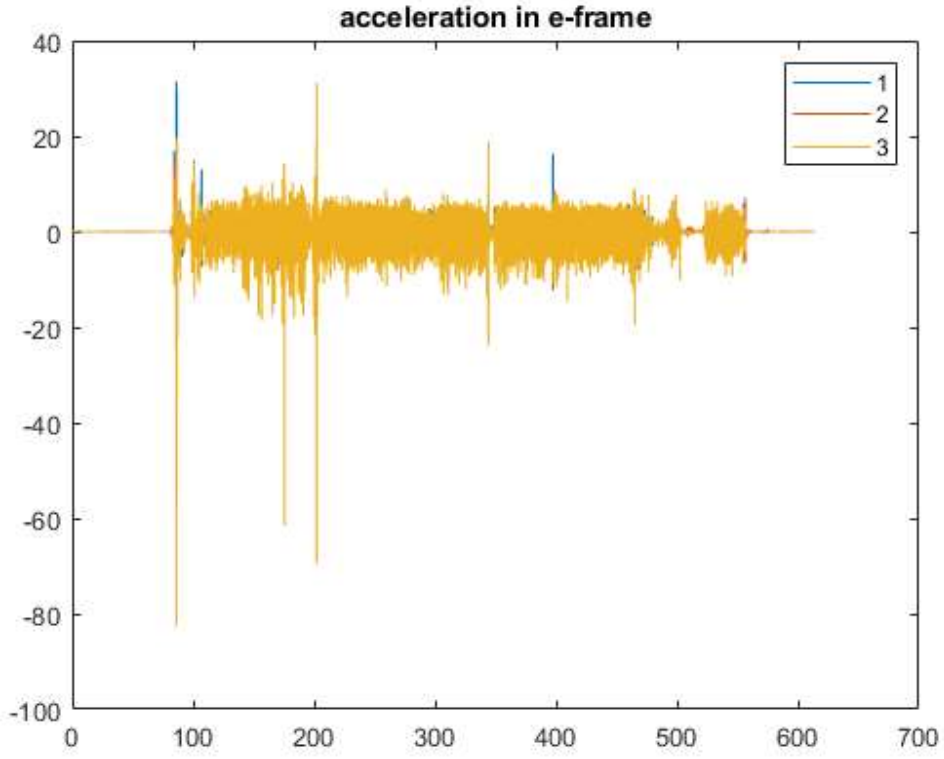
1. Data from IMU output

1.1 angular rate

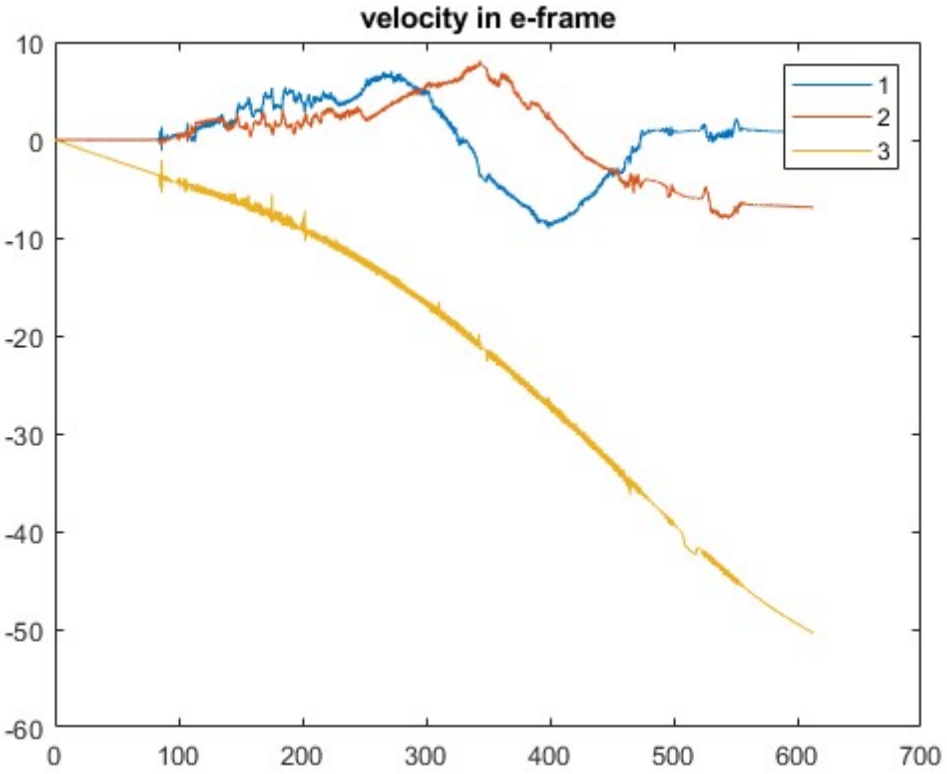


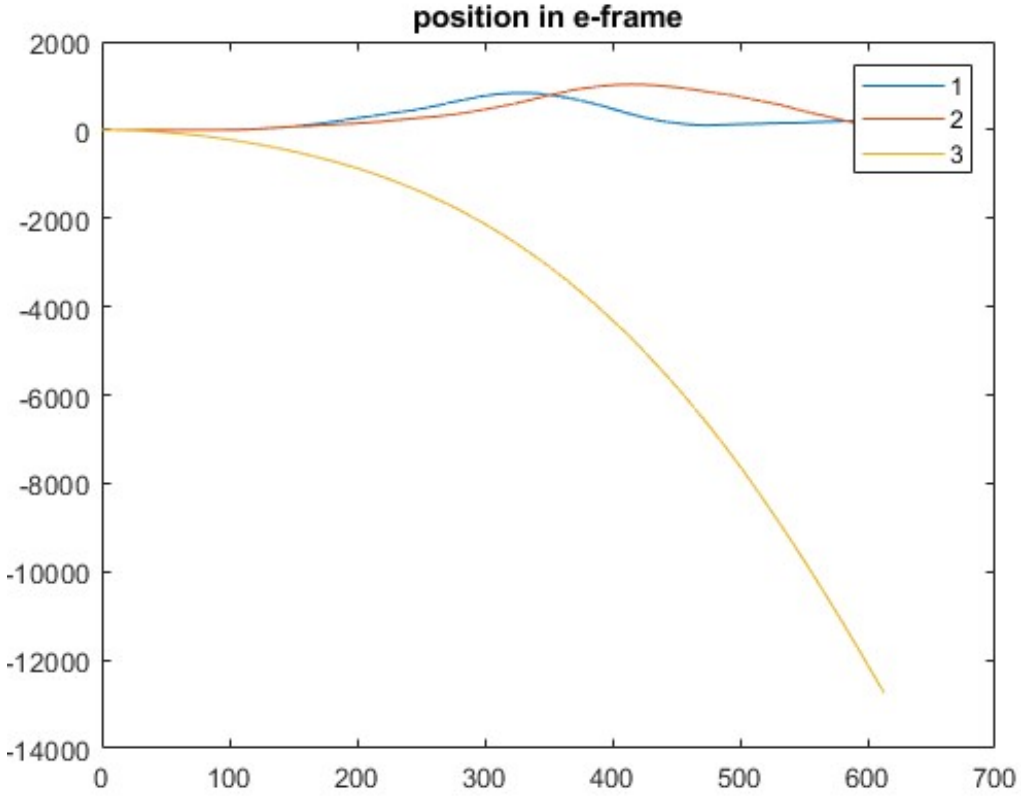
1.2 acceleration

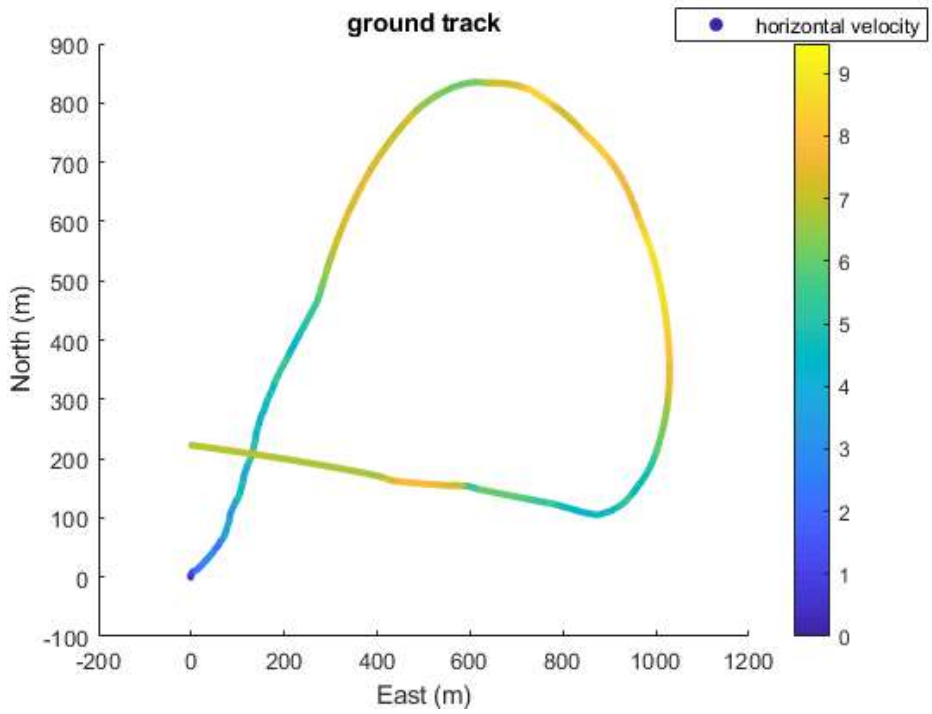




2. Integrated velocity and position







3. Discussion

3.1 experiment route

Stationary on the table -> **swing for several circles** -> go out and downstairs -> out the building in the north side -> form a clockwise circle around the building -> go into the building from the south side -> take the elevator to the 3rd floor -> go back to the office -> back to the origin on the table

3.2 evaluation

Obviously there was something wrong with the sensor data except those about the east-west part. As we can see from the acceleration & angular rate figures, there are some outliers that lead the integration to a wrong direction, which might because of the thing like I rolled the IMU quickly after taking it from the table and some other disturbances.

3.3 discussion

3.3.1 Is the sensor quality sufficient for navigation over a longer time span?

No. In our case even for a 5 minutes' walk the result is not acceptable.

3.3.2 How does the sensor calculate the acceleration in NED-system? How trivial is this?

The sensor first measures the acceleration in yaw-pitch-roll system, as well as the angular rates, and then transfer the acceleration into NED-system with DCM.

3.3.3 Compare the solution to that with accelerometer and gyro raw data.

There are apparently differences, which come from the built-in compensation components in the IMU, such as the magnetometer which takes into account the magnetic effect around the environment.

FEATURES

- Vector Processing Engine (VPE) 1.0 Toolboxes
  - Real-time magnetic & acceleration disturbance rejection
  - Adaptive signal filtering
  - Dynamic filter tuning
  - On-board Hard & Soft Iron compensation
- Coning & sculling integrals (ΔV's, Δθ's)
- User configurable messages using simple VectorNav binary protocol
- On-board World Magnetic and Gravity Reference Models
- On-board gyro drift compensation
- Multi-sensor synchronization
- Inputs for external magnetometers or velocity measurements (Airspeed, GPS)
- Barometric pressure sensor