LAB-2 Report

-Niket Purohit

The term "RTK" stands for real-time kinematics. To attain positional precision of 1 cm, a GPS receiver with RTK capability receives both the regular signals from the Global Navigation Satellite Systems and a correction stream. GNSS includes satellites from the USA's GPS, Russia's GLONASS, China's Beidou, and Europe's Galileo (Europe). An RTK receiver adds an RTCM correction stream to these signals and uses it to determine your location in real time with a 1 cm accuracy.

RTN surveying is much like RTK. The main distinction is that RTN surveying employs a calculated or "virtual" reference station, as opposed to RTK surveying, which physically locates the reference station at a permanent or semi-permanent location.

While analyzing data between RTN GNSS and GNSS we can draw a clear line of distinction. Usually used in field work, RTN needs to be set up in the required are before the user wants to collect data on their cellphone. While RTN are not aligned perfectly to the datum truth, it is true that it does give a much clear data than GNSS without RTN. It does use a virtual reference station unlike RTK which is more accurate and give more accurate data with a physical location.

ANSWER FOR REPORT RELATED QUESTIONS –

a) From our previous work we have seen that an RTK GNSS data gives a much accurate data as compared to the data collected without RTK GNSS. The error in northing and easting was reduced significantly in the abovementioned method whereas in LAB1 the data as well as the scattering was prominent.

When using a "true" position as a reference, the error in RTK GNSS navigation represents the difference between the estimated position and the true position. This error is typically small, on the order of centimeters, which is significantly better than the accuracy of GNSS without RTK.

b) The measured data is very accurate and centric to our work. We see through scatter plots that the data distribution is on point and the error is reduced significantly.

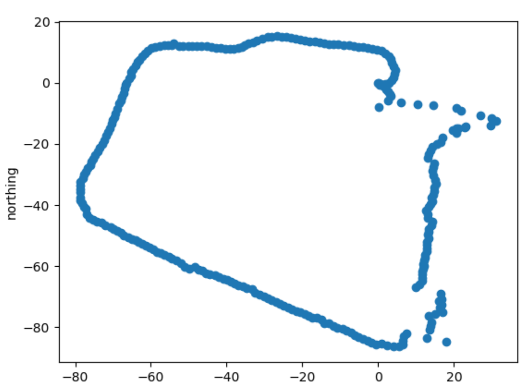

Figure 1: Berakhis Walking

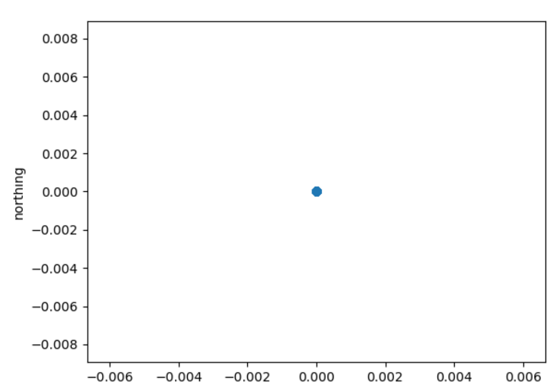

Figure 2: Berakhis Stationary

We notice how the measurement for the stationary data is accurate to a mere centimeter and we get a good idea of position. While in LAB1 below how the stationary data in a closed area was scattered in pieces.

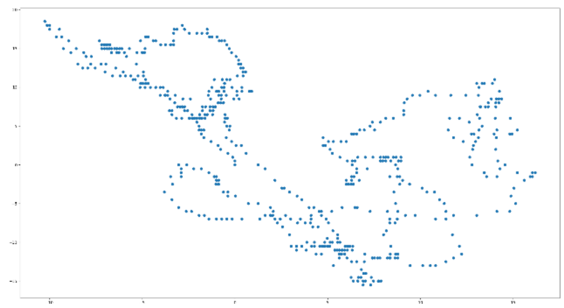

Figure 31: Closed space data without RTK

c) The data distribution is prominently different from the one we collected in LAB1 majorly because of the precision brought in by the RTK. This method allows us to accurately look in to the GPS data and get the GNSS to minimal deviation through physical data collection's precision. With the inclusion of RTK we get the position accuracy down to mere decimal points. The errors collected are as following –

Berakhis

Northing Error – 0000016.00 Easting Error – 000014.5

Centennial

Northing Error – 0000002.50 Easting Error – 000003.04

The GNGGA value in RTK is also around 4-5 which is impressive as it gives more precision. The HDOP value is around 1-2 which is lesser than the values we found in LAB1.

d) We see a little difference in HDOP and VDOP in the GNSS values when they are in an open area as compared to the occluded area. Since there are lesser hinderance in open area, the value is significantly better there as compared to the one in the occluded areas however with the rover attached, we do see that the scattering does not have much deviation when compared to the scattering graphs we got in LAB1.

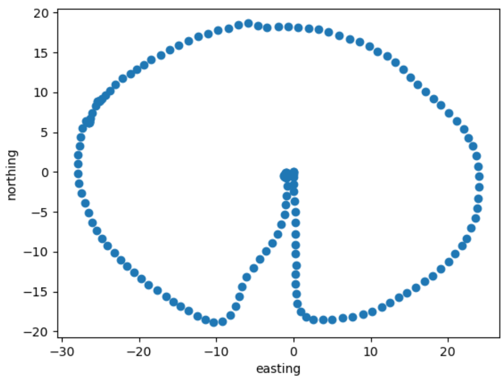

Figure 4: Centennial Walking data

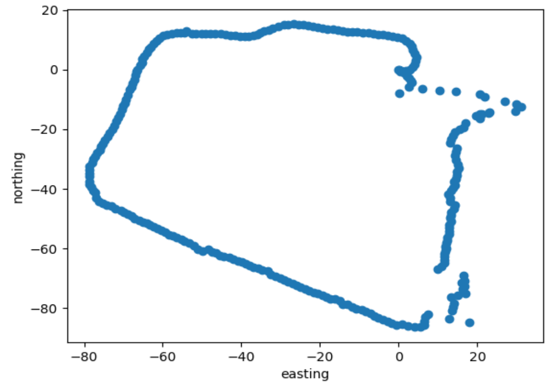

Figure 5: Berakhis Walking

e) The stationary data is similar to the moving data, but the prominence is in the northing and easting as there are lesser obstacles in the open area. We see in the centennial data that the scattering is not visible same as in berakhis' data but the error data in northing and easting mentioned above is a little more in berakhis. The altitude and HDOP values too are very accurate but not too accurate when we take the real vales. This is still significantly better than the values accumulated in LAB1.

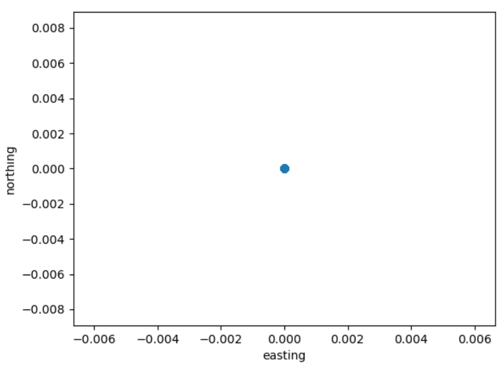

Figure 6: Berakhis Stationary

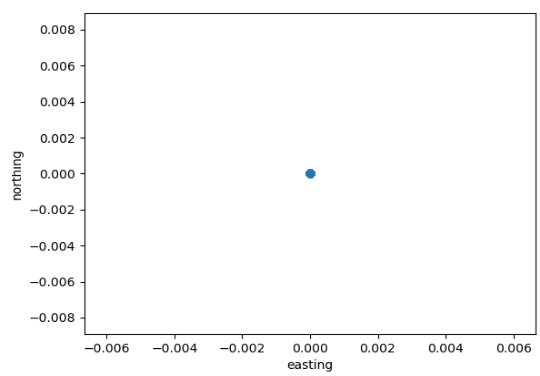

Figure 7: Centennial Stationary

Acknowledgement:

The data collected has been the one provided to me by the professor as my group was unresponsive. I acknowledge and thank the professor for the guidance and help. The real values taken have been through the Maps app from my cellphone and can be a little different for moving while calculating error as I had no knowledge of the area for movement and hence the slight northing, easting, altitude and HDOP values may have some deviations.