LAB #2 RTK GPS Lab

What is RTK GPS:

RTK GPS (Real-Time Kinematic Global Positioning System) is a high-precision satellite navigation technique used for real-time, centimeter-level accuracy in determining the precise location of a mobile receiver by receiving correction data from a reference station, making it essential for applications like surveying, construction, agriculture, and autonomous vehicles.

What is the difference between RTN GNSS and GNSS:

GNSS (Global Navigation Satellite System): GNSS is a general term that refers to a satellite navigation system that provides global positioning and navigation services. The GNSS systems can have an accuracy of up to a few feet or meters.

RTN GNSS, on the other hand, is a specific implementation of GNSS that uses a network of permanently established reference stations with known locations. These reference stations continuously receive signals from GNSS satellites and calculate correction data based on the errors in the satellite signals. This correction data is then transmitted in real-time to mobile GNSS receivers, allowing them to achieve much higher accuracy, often in the centimeter-level range.

Error Source:

The source of error in RTK GPS can be a lot of things and some of them can be multipath reflection, obstruction and receiver and antenna quality and other various factors that can contribute to the error in a RTK GPS.

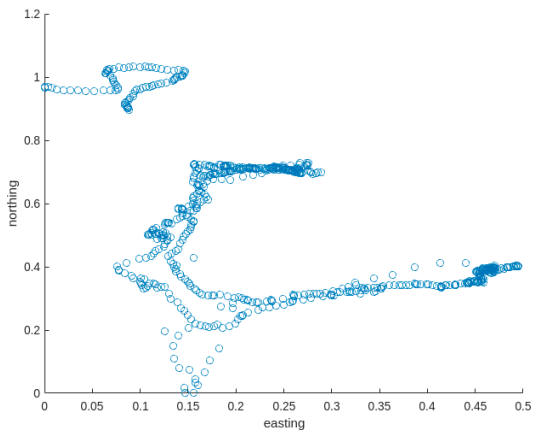
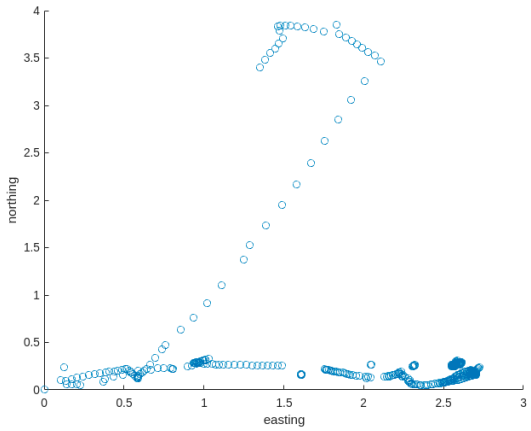
A) Accuracy of RTK GNSS system vs standalone GNSS system:

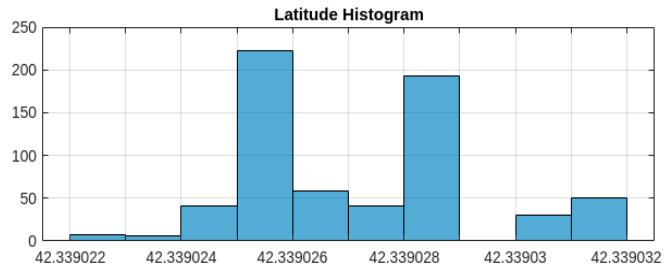
We can observe that RTK GNSS is more reliable in terms of accuracy while in moving but there is no significant difference in the stationary data, both the RTK GNSS and the standalone GNSS system have error scattered in a random manner and no conclusion can be drawn on the error distribution in the stationary data set.

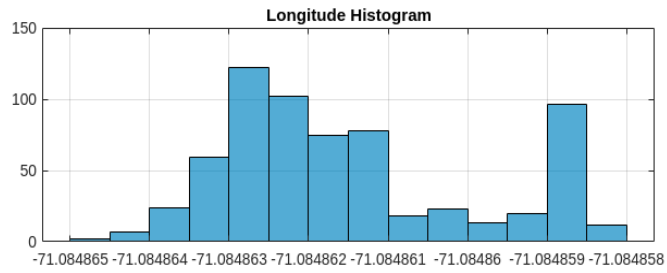
B) Range and shape of position:

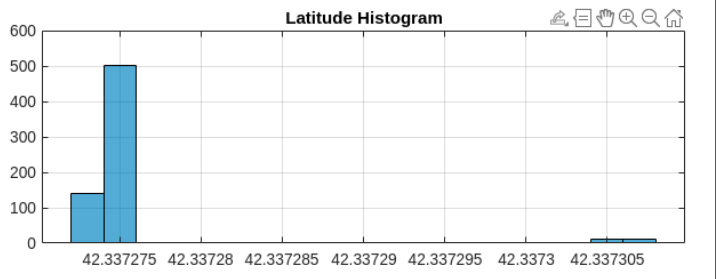
With the shape of the histogram we can determine the mean data of the stationary data in occlusion with certainty but the open data is distributed along the mean, although the mean is significant but there are other points with large data logged close to the mean.

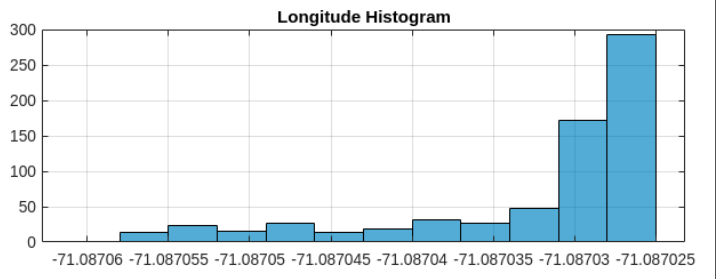
The range of the data in the open case, ranges with an error of 1 meter in northing and 0.5 meter in easting . In occlusion the data ranges from 4 meter in northing and 3 meter in easting.

	
Stationary data in open	Stationary data in occlusion







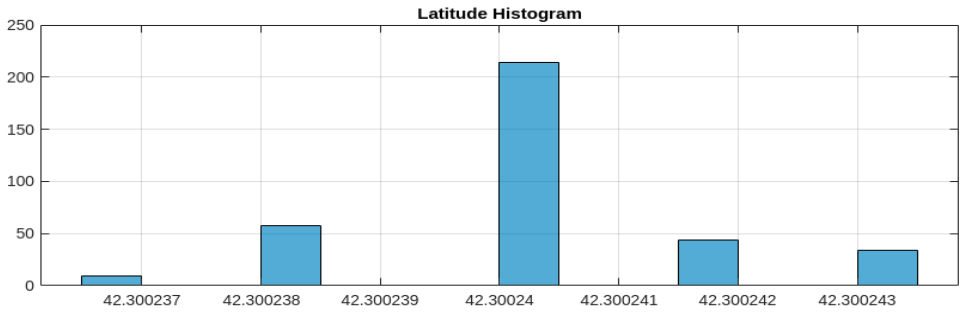


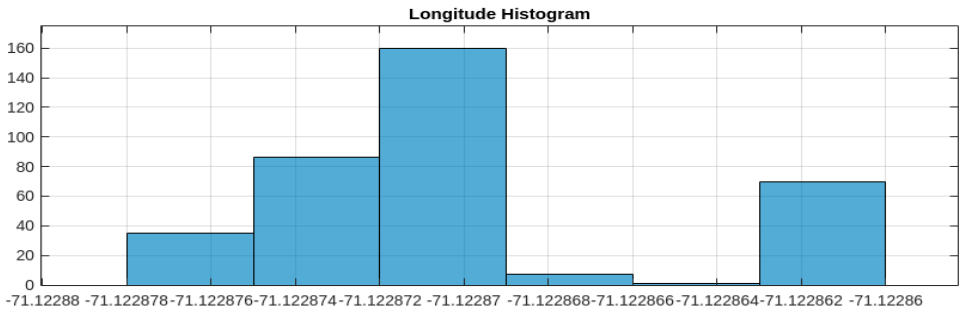
Stationary data in open

Stationary data in occlusion

C) comparison of histogram from LAB 1:

We can observe that the histogram of both the labs are similar with the actual position being concentrated in the mean position. The error distribution is very random and no actual conclusion can be drawn from the dataset.



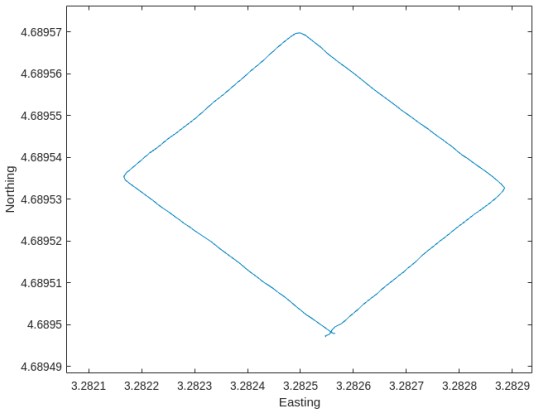
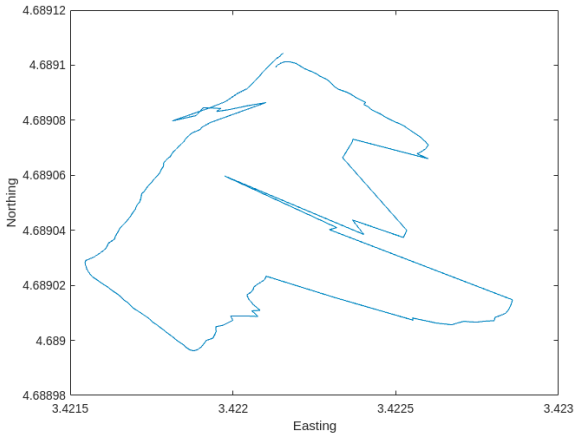


Histogram of data from lab 1

D) Moving data in open vs occlusion:

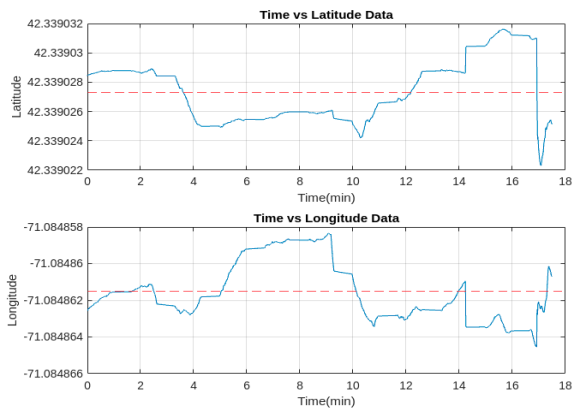
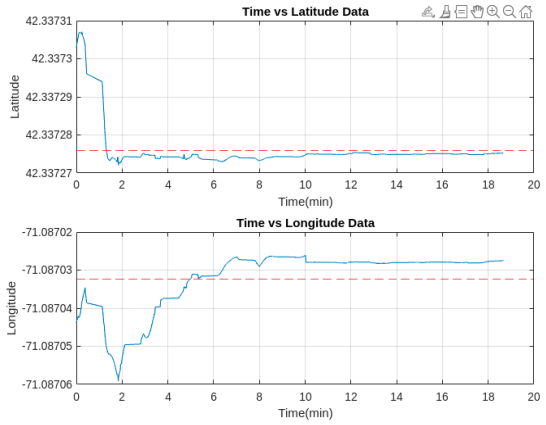
We can observe that the data in the open is very close to the actual path taken in the shape of square and the accuracy is very close to the centimeter and in the occlusion case the graph has certain peaks and fall which indicate error in the gps data and a factor of things could contribute to the error which could include multipath error and obstruction.

Yes, the GNSS is in float quality when in occlusion, and fix quality in open areas is a major contribution to the error.

	
Walking data in open	Walking data in occlusion

E) Stationary data in open vs occlusion:

We can observe that the data in the open starts with the initial point the mean and is randomly distributed along the mean of the data while the data in the occlusion is very far from the mean in the initial start and later most of the data is along the mean line. No, the GNSS fix quality has no effect on the data in open and occlusion.

	
Stationary data in open	Stationary data in occlusion