EECE: 5554; Robot Sensing and Navigation
Lab 2

Dhruv Bansal

(Note: All the timesteps are in seconds for every graph, also for moving data, there was some issue with normalizing of easting data when plotting, the values on the moving data for northing vs easting, the values for northings are correct but for easting they be below 100 meters.)

Occluded Environment:

Stationary Data:

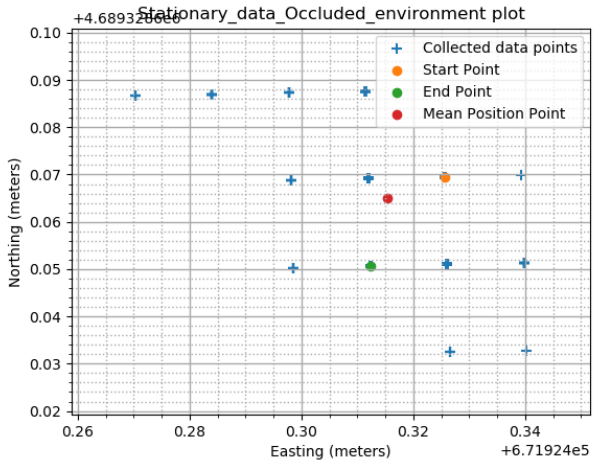

Figure 1

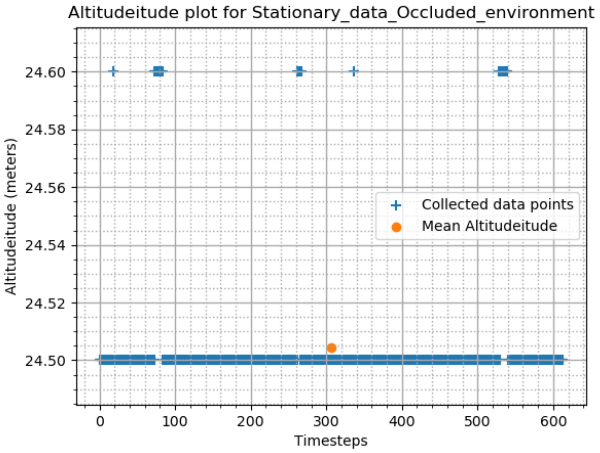

Figure 2

Moving Data:

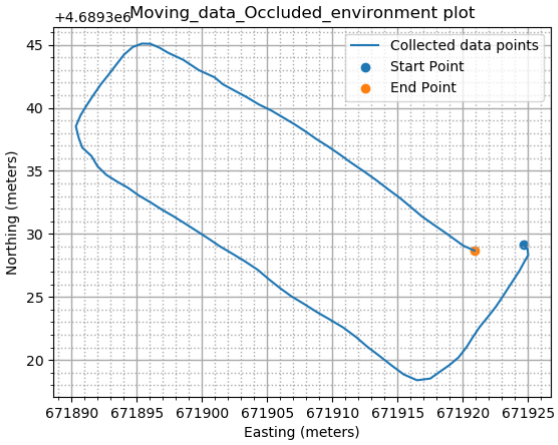

Figure 3

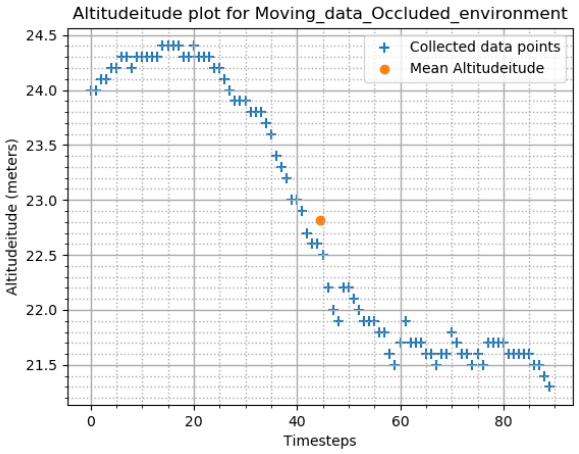

Figure 4

Open Environment

Stationary Data:

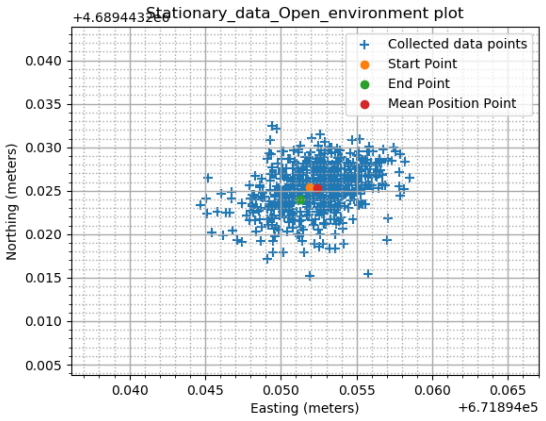

Figure 5

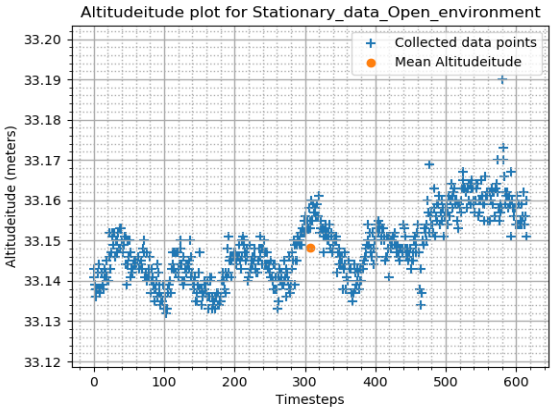

Figure 6

Moving Data:

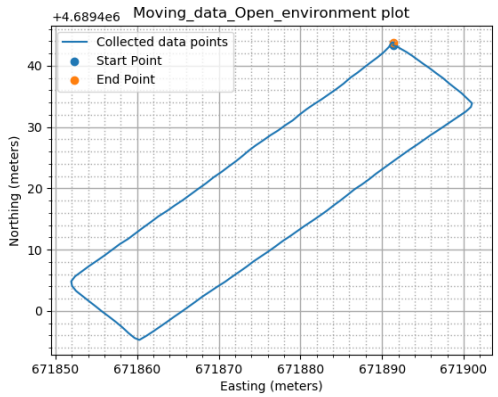

Figure 7

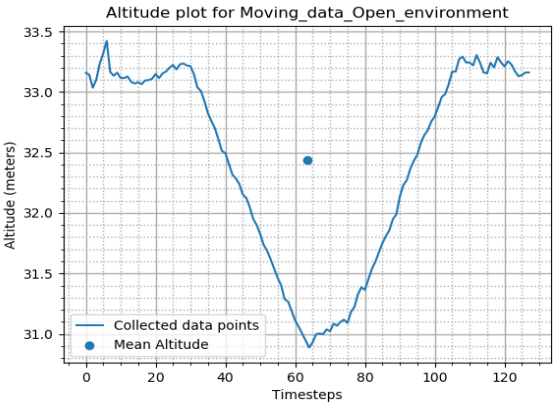

Figure 8

Observations and Conclusion

- **Moving Data:**
  From the plots we can see that the data collected while moving around in an occluded environment is much better for the RTK-GPS than the normal GPS, even with the reflections and canopy the RTK-GPS accuracy is quite better as we can see from Figure 3. We also get the similar results when looking at the Altitude plot: the change in the altitude is limited to between 50 cm - 100 cm and not more than that in figure 4.
  Comparing the Moving data when collected in an open environment is more accurate than the data from the occluded environment. It can be seen in Figures 7 and 8, where on an average the error was around 50 cm. Also, the northing vs easting graph shows that the readings were

pretty accurate. The GNSS fix quality gets affected due to the presence of surrounding objects which sometimes causes a loss of signal or poor quality output.

- **Stationary Data:**
  First looking at the occluded stationary data graph in figures 1 and 2. In figure 1 it can be clearly seen that the errors in the northing and easting values are limited to 5 cm, and looking at figure 2 for the altitude, we get very few outliers, but most of the data is consistent.
  Looking at the stationary data collected in an open area is plotted in figures 5 and 6. From figure 5 we can see that the data is all collected as a cluster, northing and easting varying by at max 3 cm around the mean position. The graph when compared with the data from a simple GPS is much better and accurate.

From our observations we can conclude that RTK GPS have much better accuracy than a normal GPS, which is due to the additional noise correction module which is kept stationary. Also, it is very much clear that the data collected in an open environment is more accurate and the reason is the absence of reflective materials in the surroundings like building, reflective object, trees etc. Hence, we can say that the RTK GPS is a very good sensor to be used in for navigation, able to provide measurements with accuracy under a few centimeters.