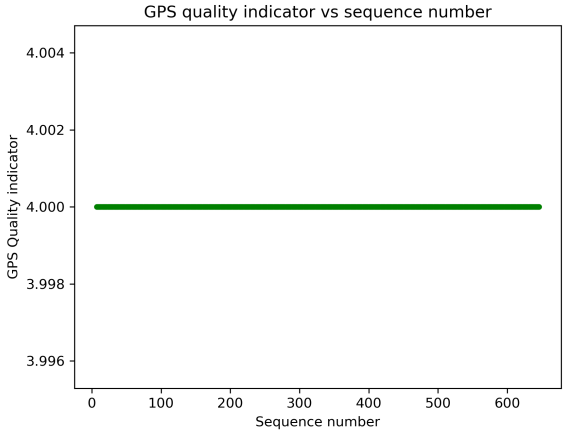
LAB2 Report

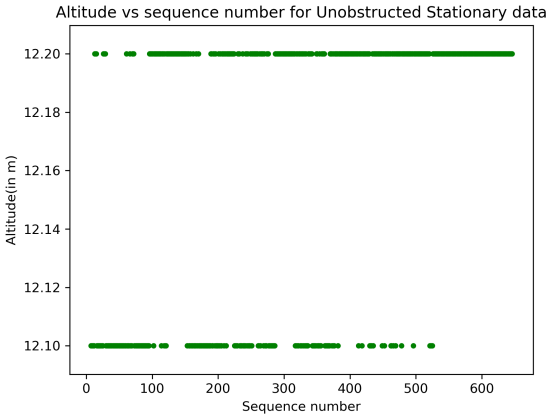
We have used the RTK GPS data of group 2 for the Project and all analysis has been conducted using their rosbag data.

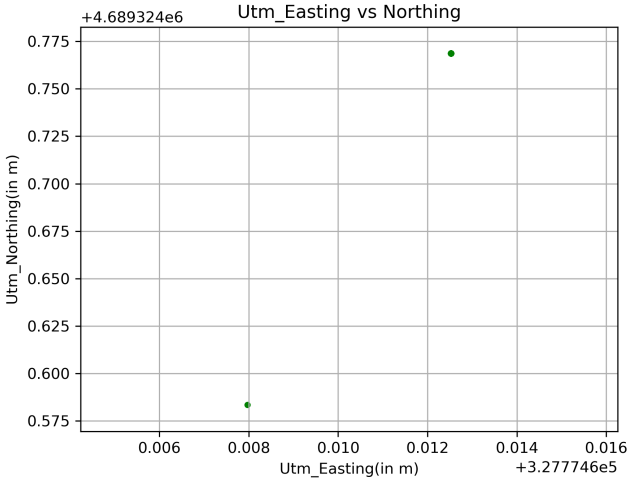
RTK GNSS Surveying is a method to obtain accurate GPS Data by using 2 GPS modules viz. Base and Rover. The base is usually set up in an open environment on a known spot whose latitude and longitude coordinates are known to us. The base station receives data from GPS Satellite and computes the error as its coordinates are already known and passes these errors through the radio to the rover. The rover subtracts these errors and thus we get more accurate and precise GPS location.

The errors obtained through RTK GNSS Surveying are further less than GPS Navigation as the latter uses code based positioning system having a bit rate of 1MHz and the GNSS Surveying uses carrier based bit rate of over 1000 times that of the GPS Navigation. Hence its more accurate than GPS Navigation.

Stationary Unobstructed Data:

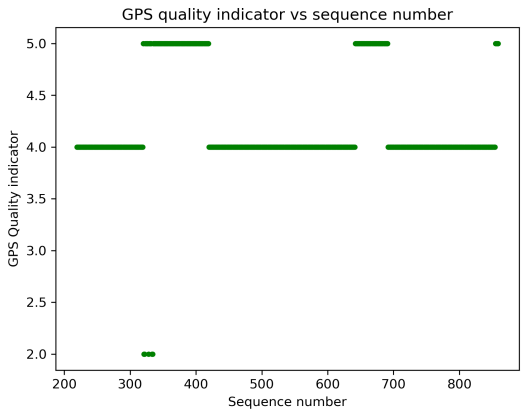


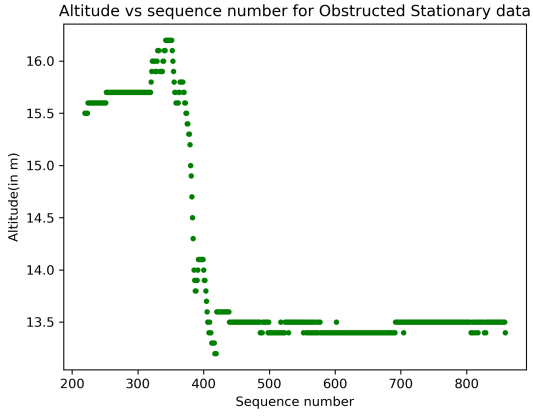


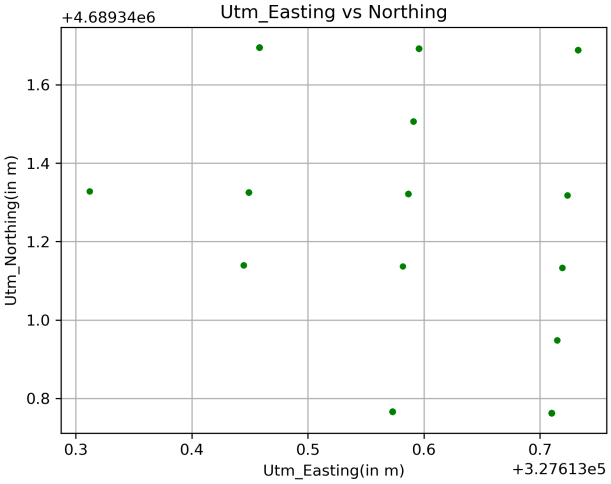


The GPS data obtained by the rover for a stationary point is obtained after subtracting errors from the base station GPS values. The standard deviation of the values from the mean base point are 7.315mm in easting and 0.0713mm in northing. These standard deviations are way less then what we had observed in LAB 1 while using GPS puck, hence we can conclude that RTK GPS is much more accurate and provides us with accuracy in millimeters. The error estimates are nothing but standard deviation and as we can see they have significantly reduced although the data obtained is through RTK Float and not RTK Fix. For RTK fix we can assume more precise data which will further reduce the error estimates.

Stationary Obstructed Data

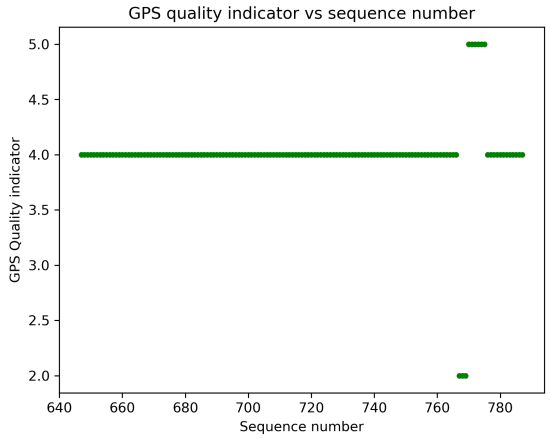


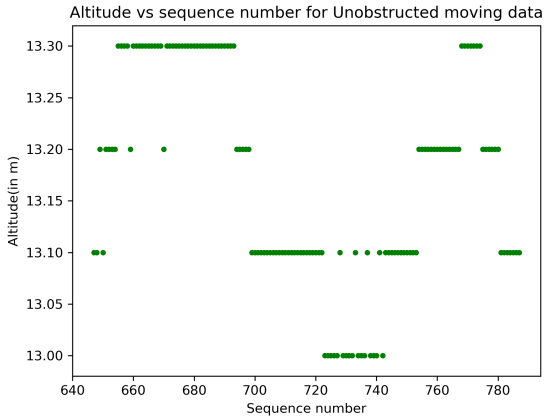


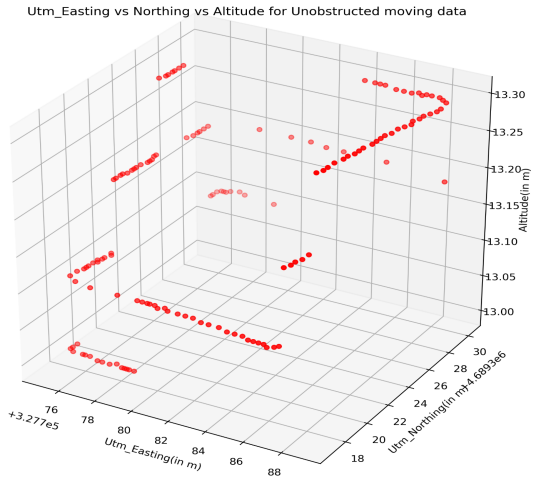


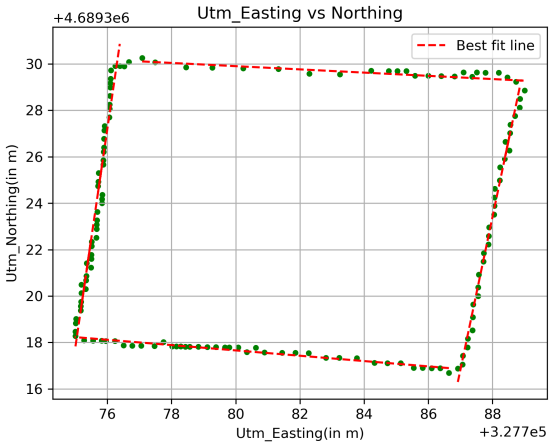
We can observe from the data that due to various interferences caused by trees and buildings the error in GPS increases, which does not allow us to get as accurate data as obtained under the clear sky. This gives us error estimates more than that of the Stationary clear data and increases the standard deviation values to 0.38m in easting and 0.098m in northing. We can also notice that for this data we have received RTK Float data for the most amount of time and intermittently have received RTX Fix data.

Moving Unobstructed Data:



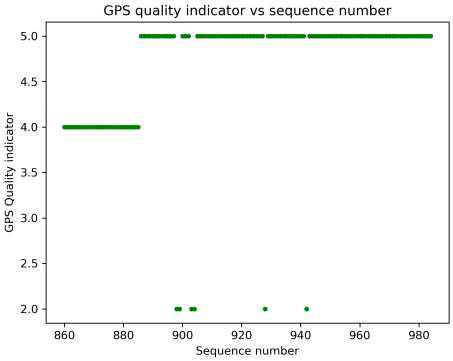


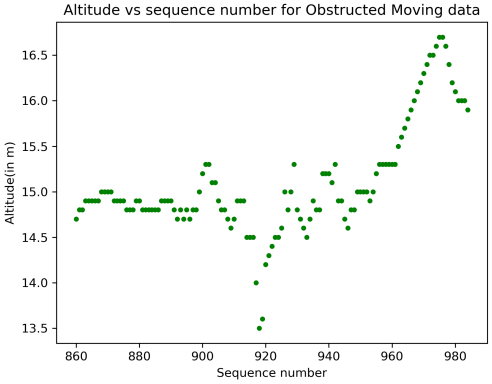


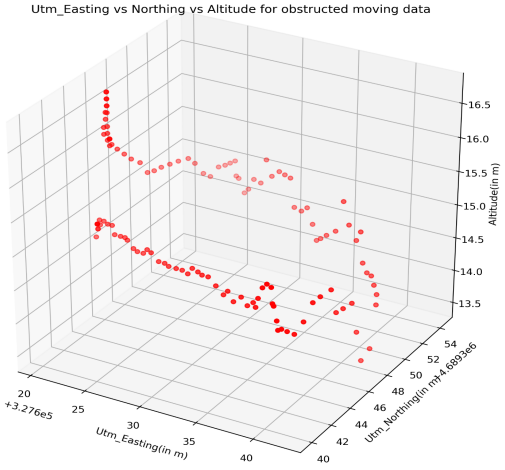


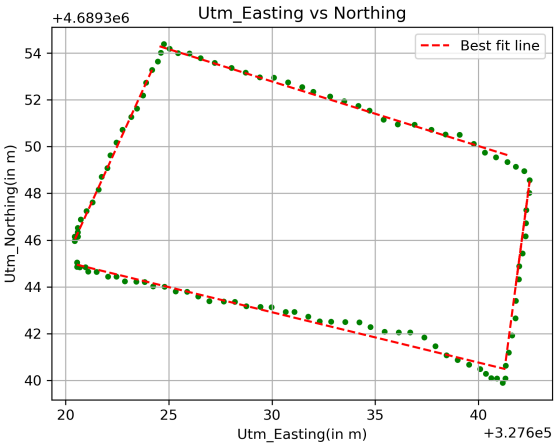
While taking moving clear data, we can see that the line of best fit and the RTK GPS points obtained, more or less coincide and as a result we only do have a standard mean deviation of 10cm. While we observe the altitude we can see that it also has a maximum standard deviation of 10cm which is quite accurate.

Moving Unobstructed Data:









Obstructed data due to the presence of signal bouncing from trees and buildings causes errors in the GPS signal data received. As we move the signals would further bounce from different buildings which cause errors. The errors are also caused as the measurements are taken by us while keeping the sensor in our hand. But these errors as compared to the clear data it has a mean error of 18cm as against the moving unobstructed data. We can also notice that except for the starting data obtained is through RTK Float and then it improves to give us RTK FIx values.

Conclusion

From analyzing the stationary and moving unclear data we can see that the moving data is much more accurate than the stationary data. This is due to the fact that the satellites compensate for velocity as it assumes that the gps is not stationary and is moving. However, while obtaining clear data we can see that the stationary data is more accurate than the moving data as it is able to compensate for the errors more effectively.

References

https://www.youtube.com/watch?v=zt4d-VmC5Mc