LAB 1 Report

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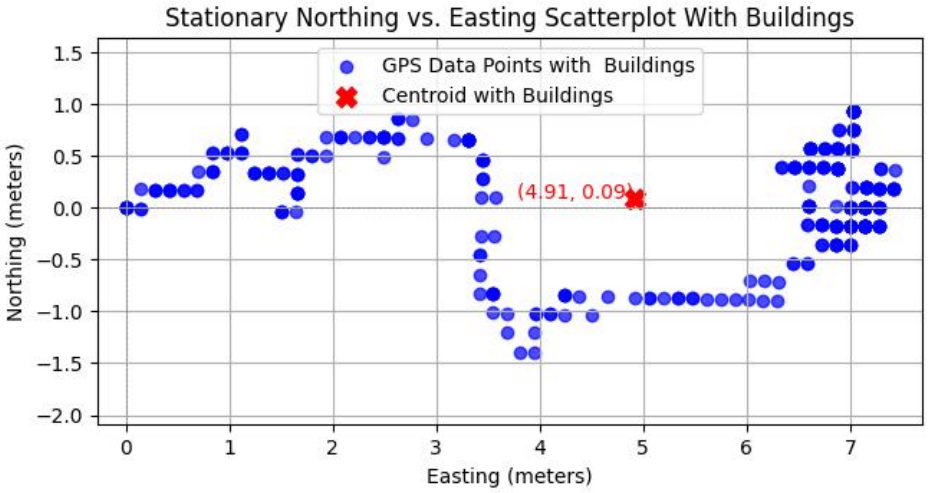
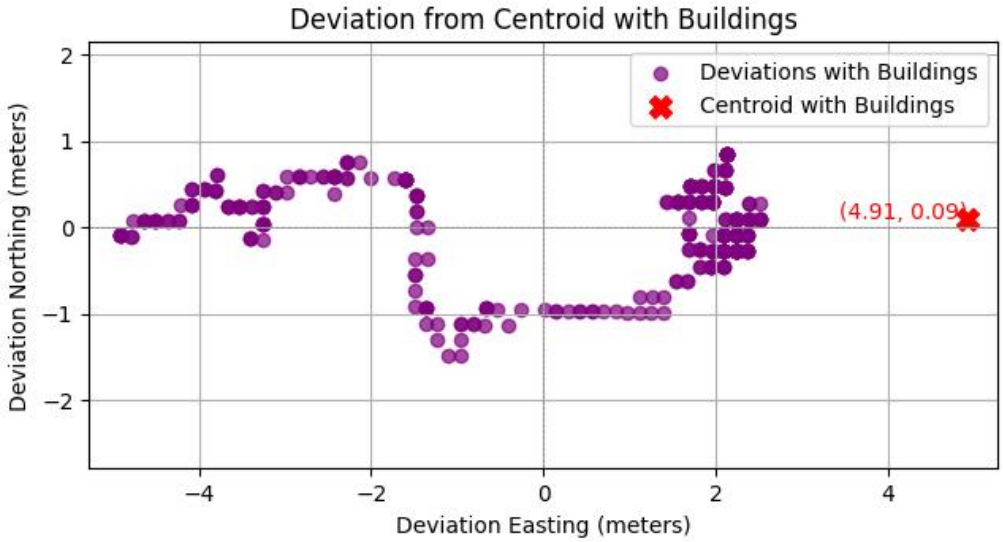
For better viewing of plots view in the analysis folder, plots added here are re-sized to fit in the documents.

Stationary Data Analysis

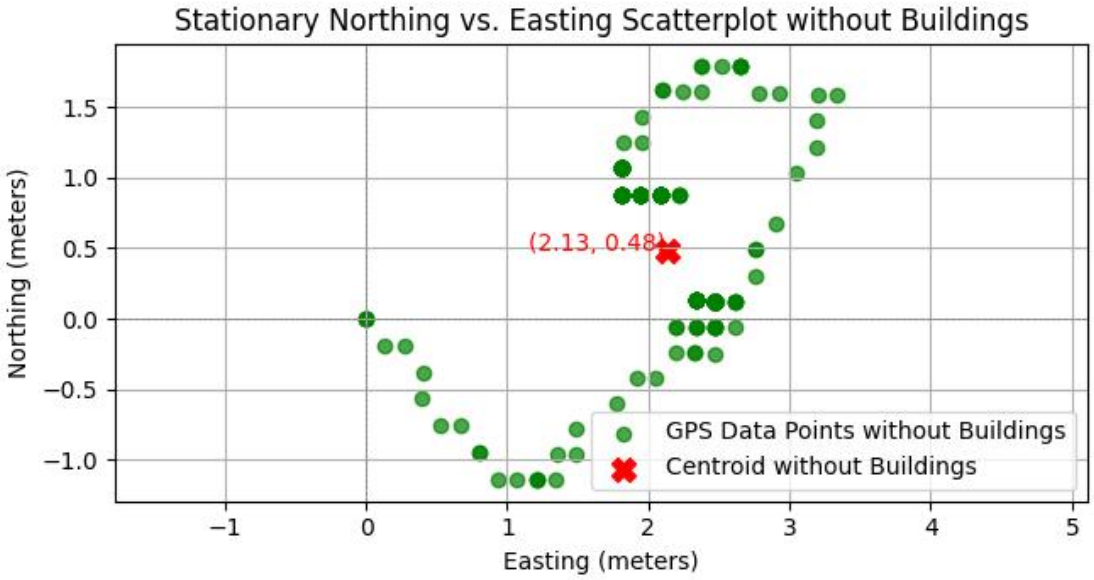
The objective of this lab1 is to write a ROS node to collect the GPS data and plots the data. Below are the few plots and its analysis.



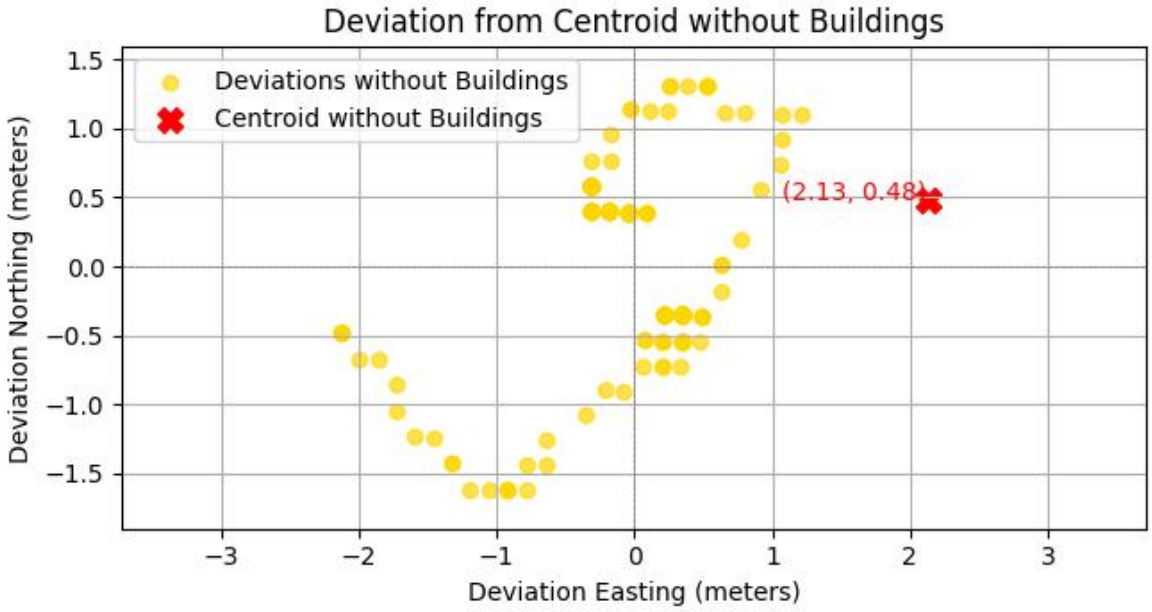
The above plotted data is stationary data of Northing VS Easting with buildings. The centroid of the collected data is 4.91 and 0.09. It can be seen the data plotted are scattered around with tolerance of plus or minus 4 meters. Which proves that there is more chance of getting noises when there are more buildings.



After calculation of deviations there the data has been sifted left which in results increase of tolerance to -4.5 meters to 2 meters. So if we measure the gps data the accuracy will be plus or minus of 6.5 meters.

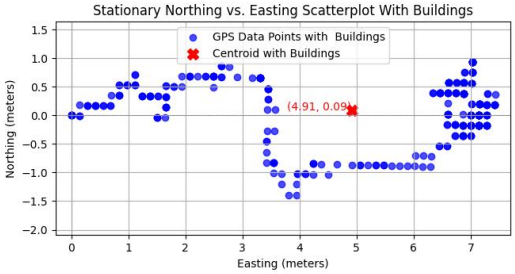


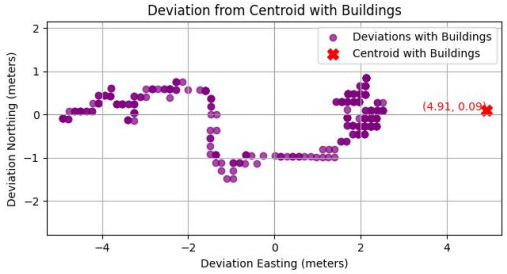
The above given data is collected without building and we observe that the data is scattered very less when compared to with buildings. The centroid is 2.13 and 0.48. The tolerance is plus or minus of 3 meters, which is less than with buildings.

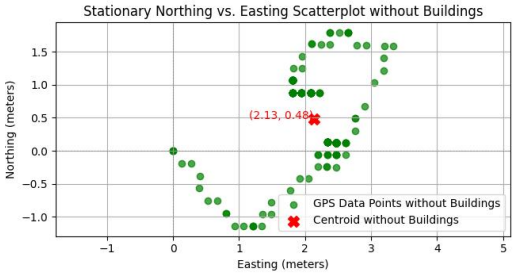


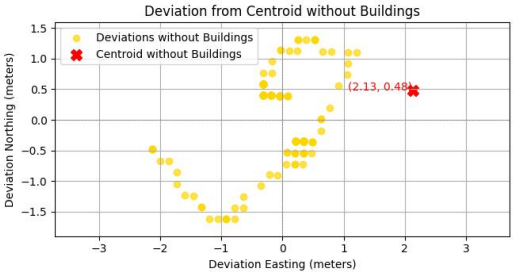
After calculation of deviations there the data has been sifted left which in results increase of tolerance to -2 meters to 1 meters. So if we measure the gps data the accuracy will be plus or minus of 3 meters. Form the above plot we can understand that data collection will be more accurate when it is collected without buildings.

For better comparison the all the above shown data is plotted in single graph got better understanding.

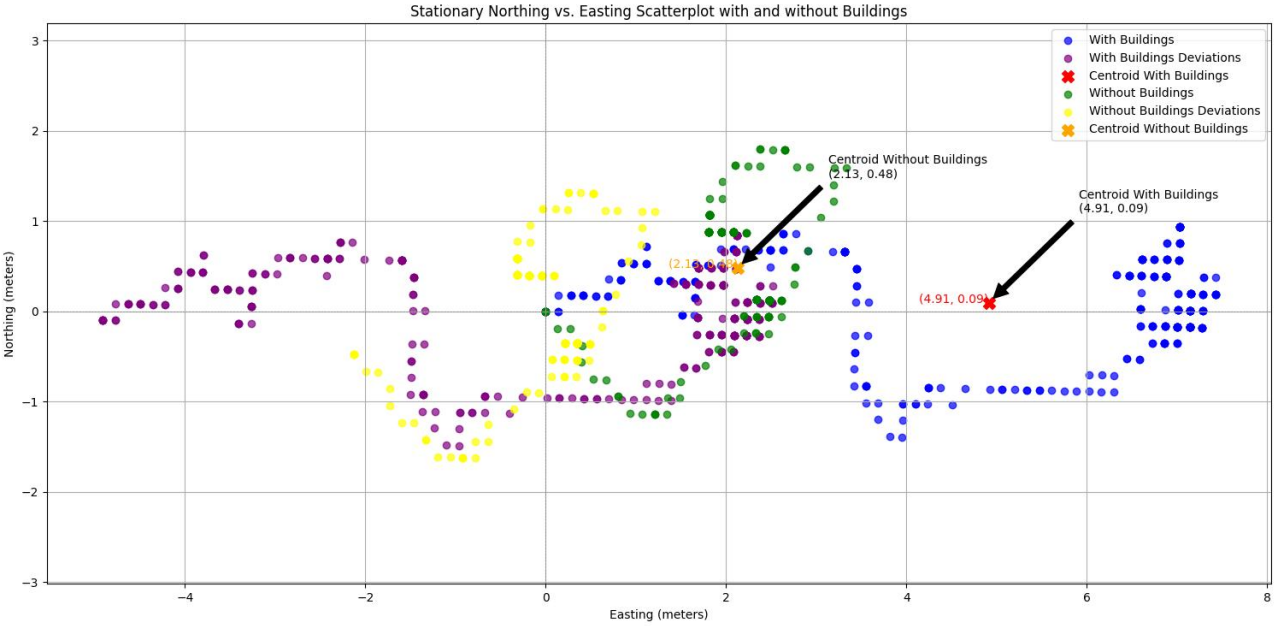




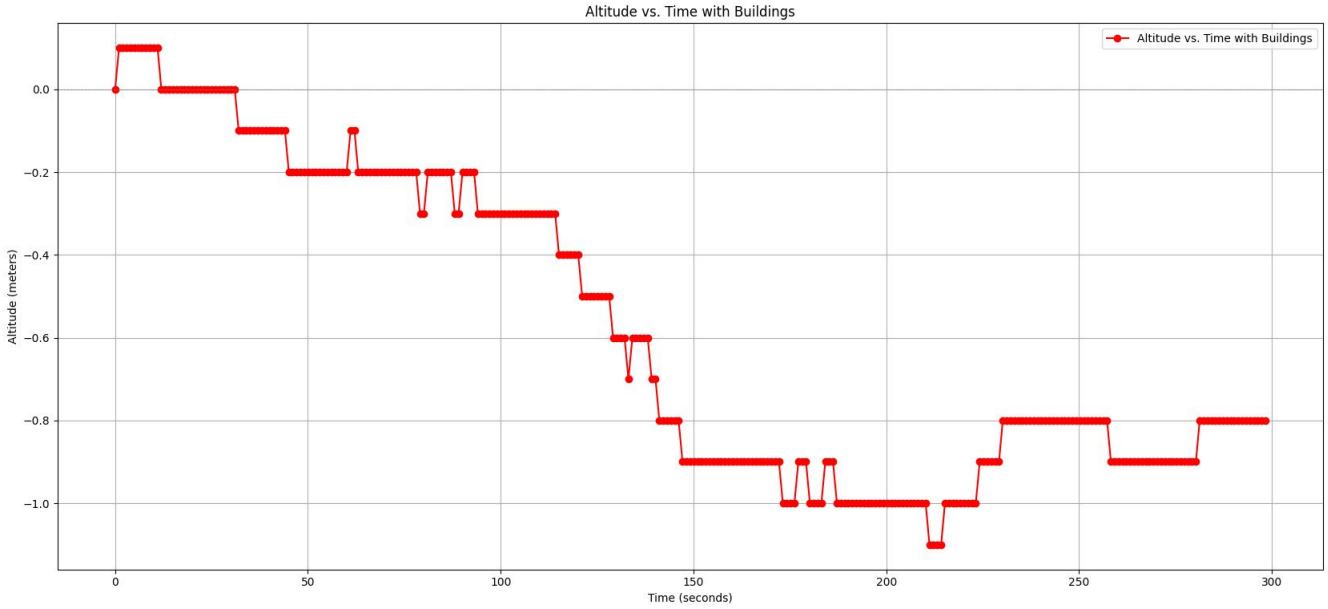




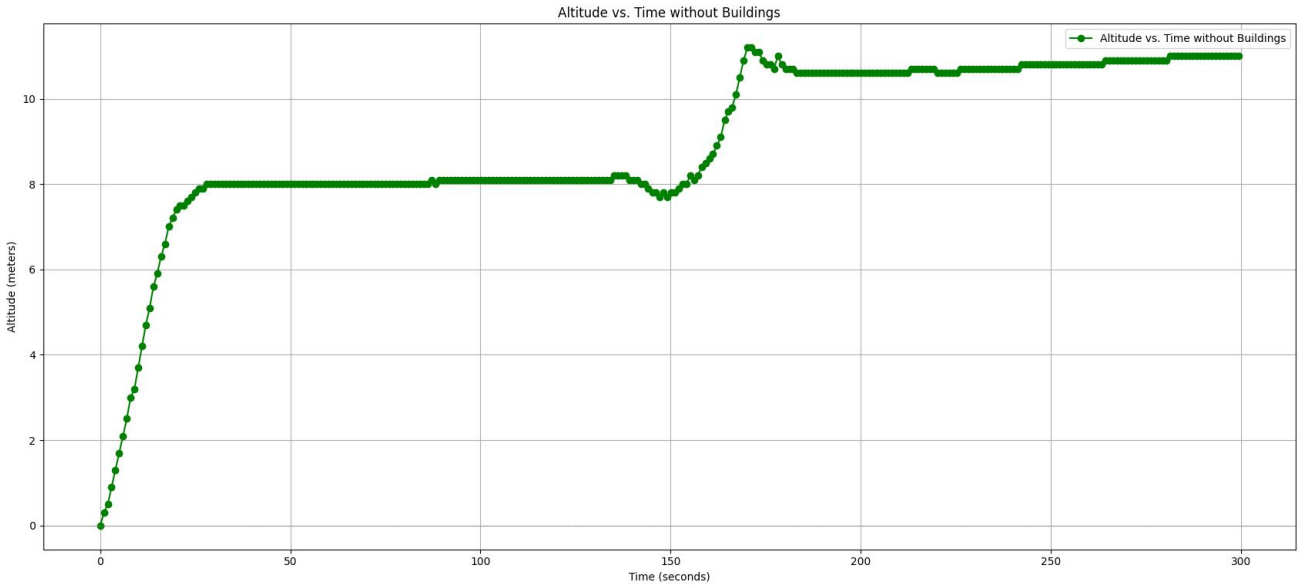
All Data in same plot



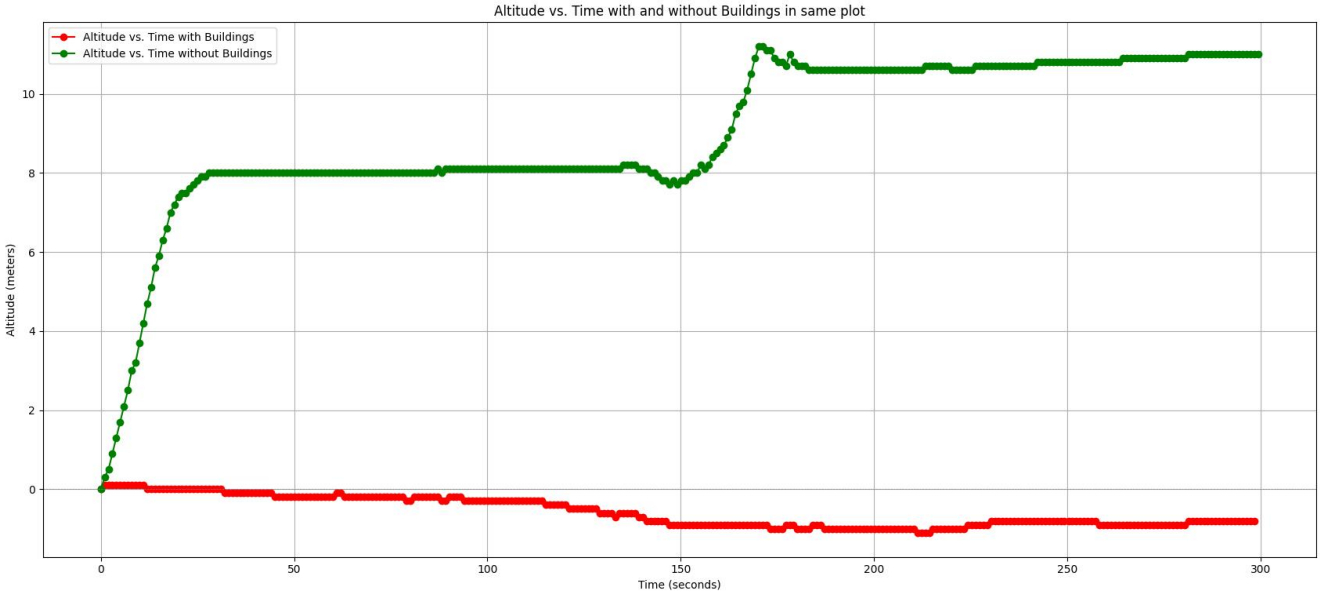
The below given data is Altitude VS Time when collected with buildings and it can be seen the data is continuously dropping. This is because we are holding the gps in hand and also default error from gps data.

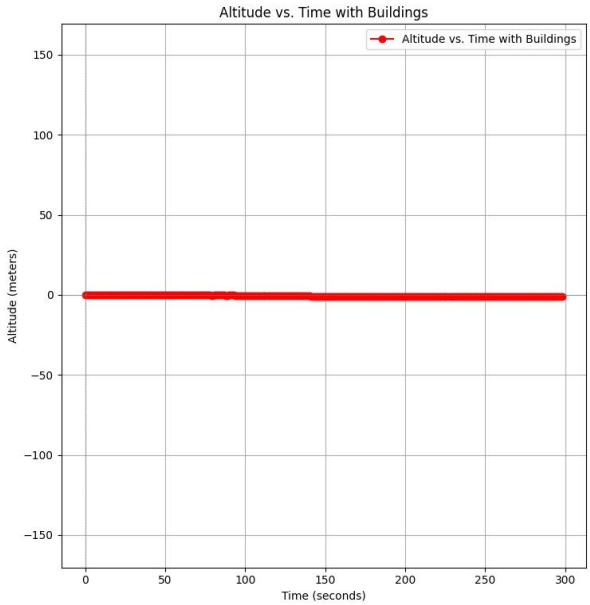


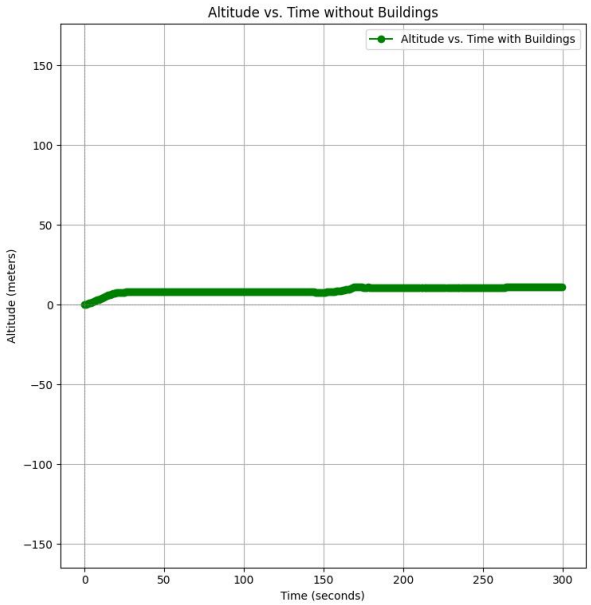
The below plotted data are collected without building and it can observed that data is being stable for some time and again changes due to noises from sensors. This shows that altitude from without buildings are more accurate.



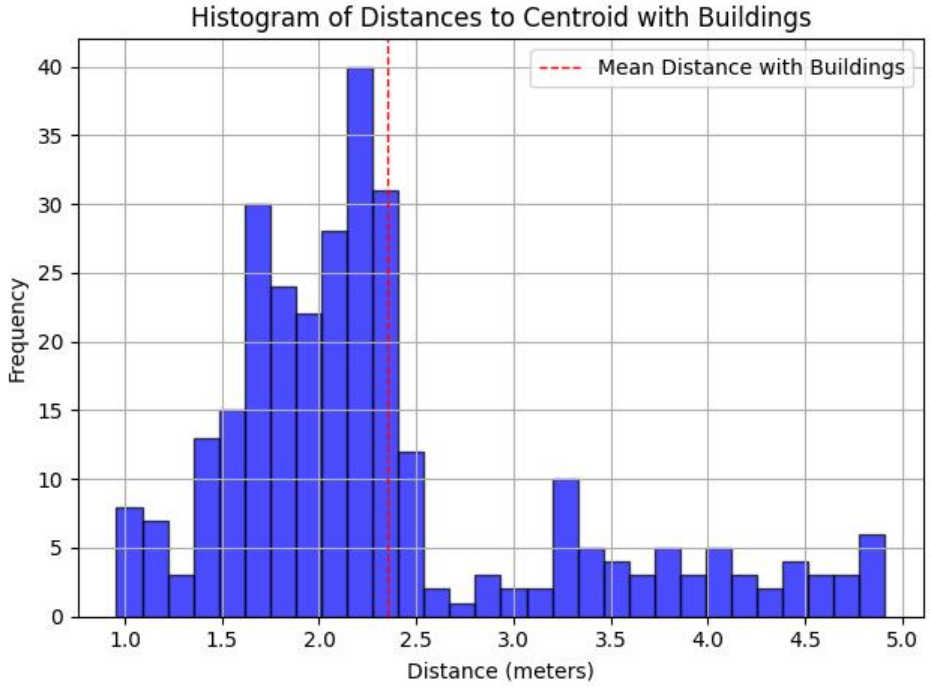
For better understanding and comparison both altitude plots are given in the same plots.



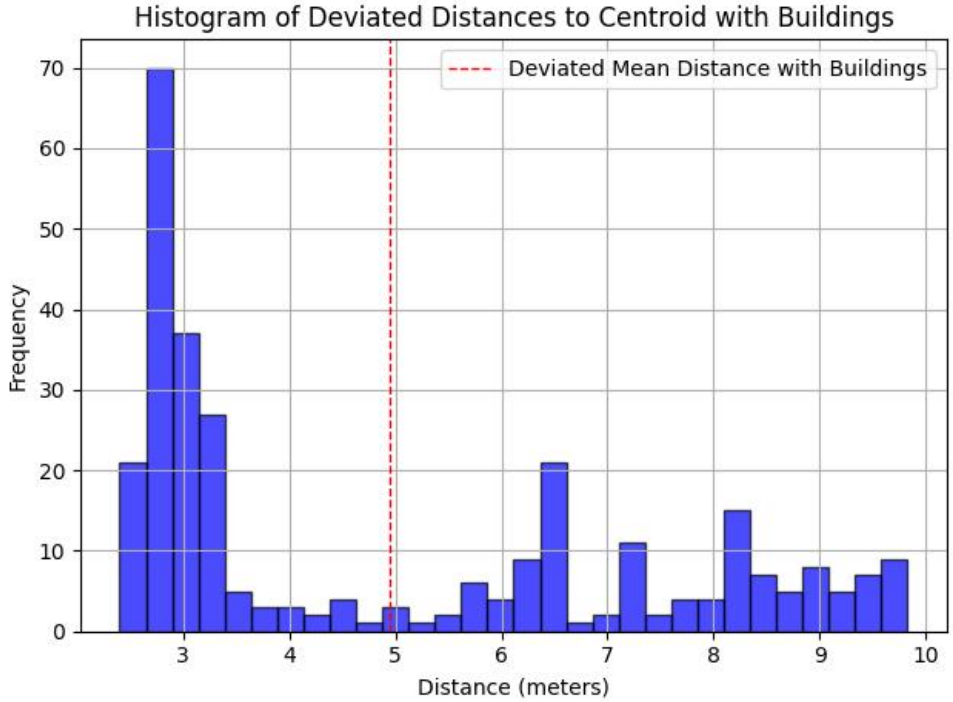




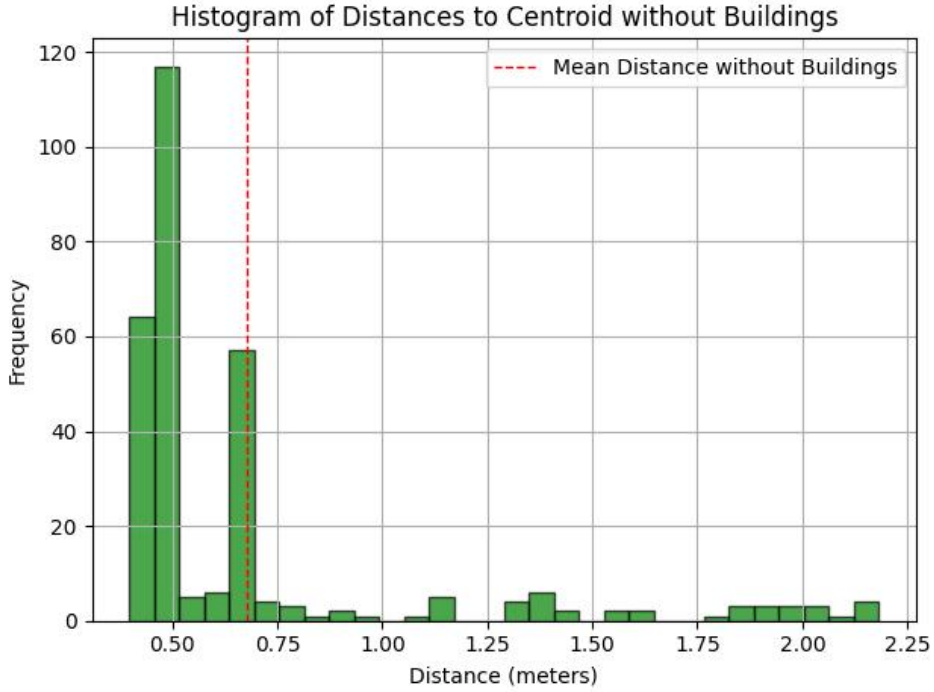
The below given image is the Histogram of Distance to Centroid with buildings. The data is plotted are calculated using euclidean distance. The formula is $d = \sqrt{((x2 - x1)^2 + (y2 - y1)^2)}$. The mean is more shifted towards right from the origin which shows that are less accurate with buildings.



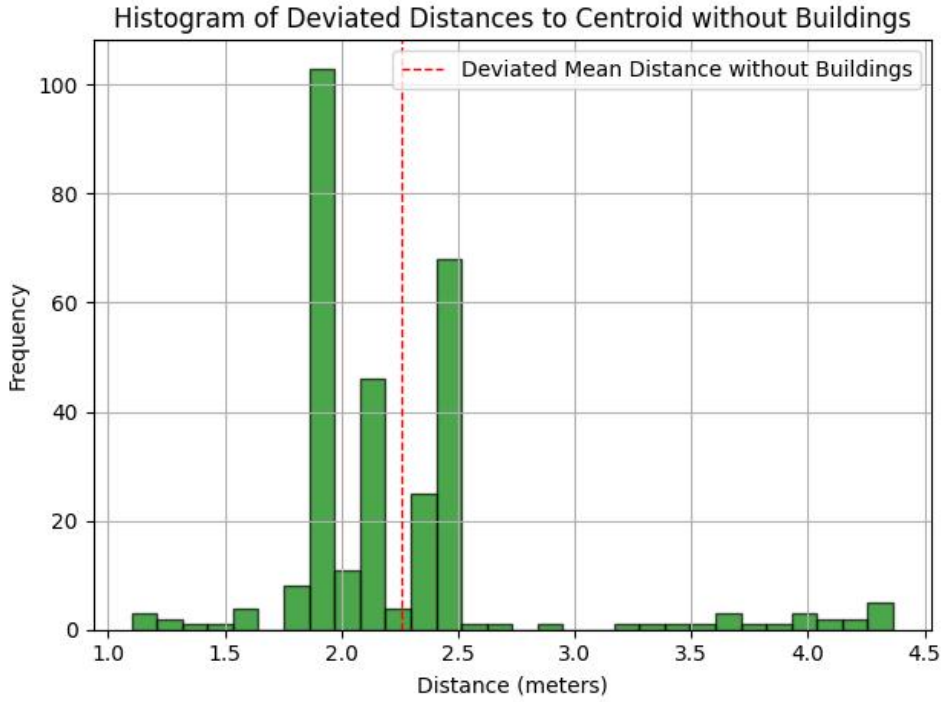
The below given plot is calculated from the points that are deviated from centroid. With buildings it can be seen that mean is more shifted from the origin. Thus the data is less accurate.



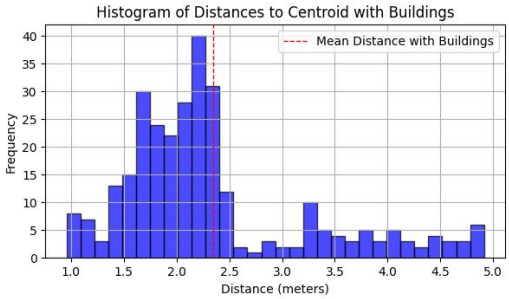
The below given image is the histogram of distance to centroid without buildings. The mean is less shifted from origin when compared to data collected with buildings. Which states that the data are more accurate when collected without buildings.

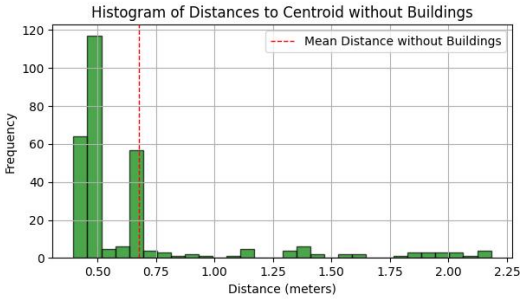


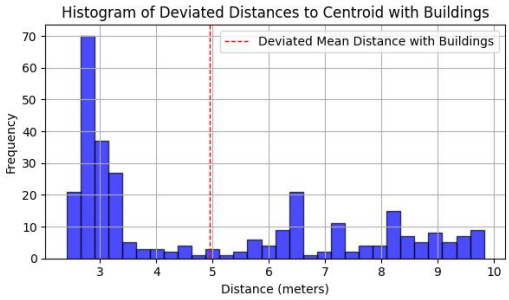
The below given plot is calculated from the points that are deviated from centroid. Without buildings it can be seen that mean is less shifted from the origin. Thus the data is more accurate.

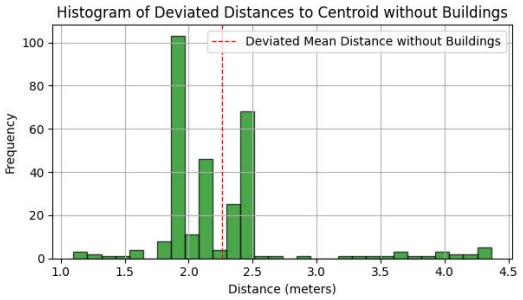


For better understanding and comparison all the histogram plots are plotted in the same plot.



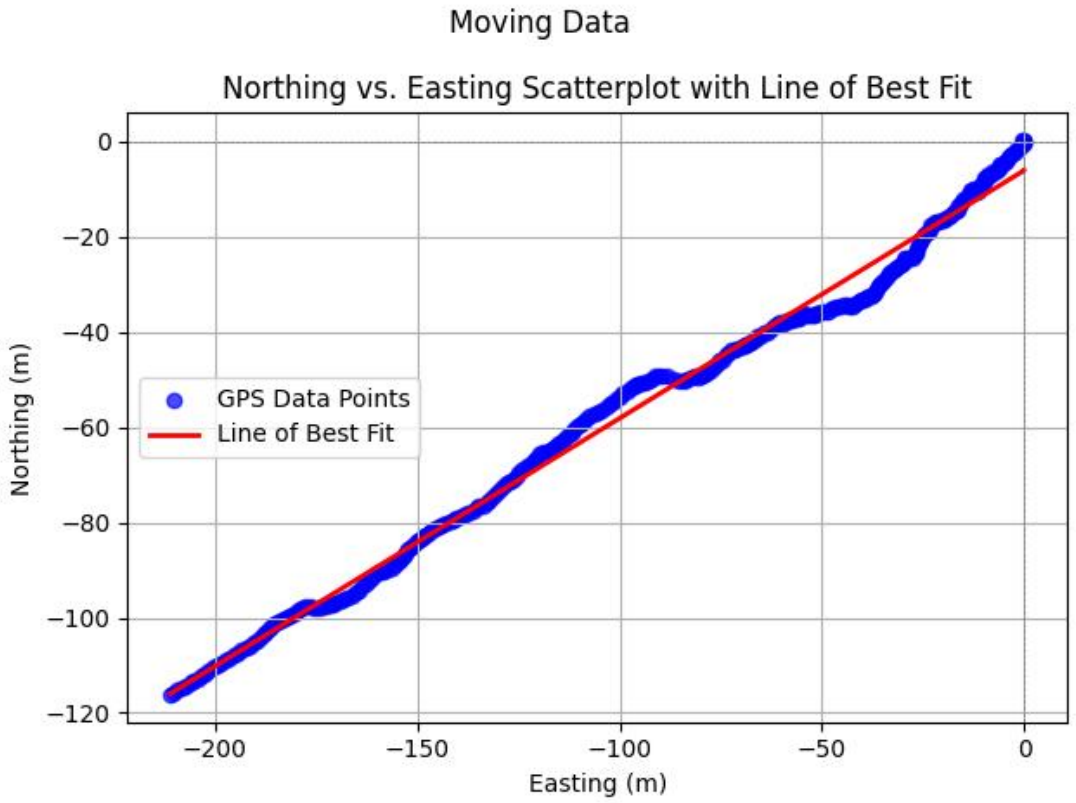




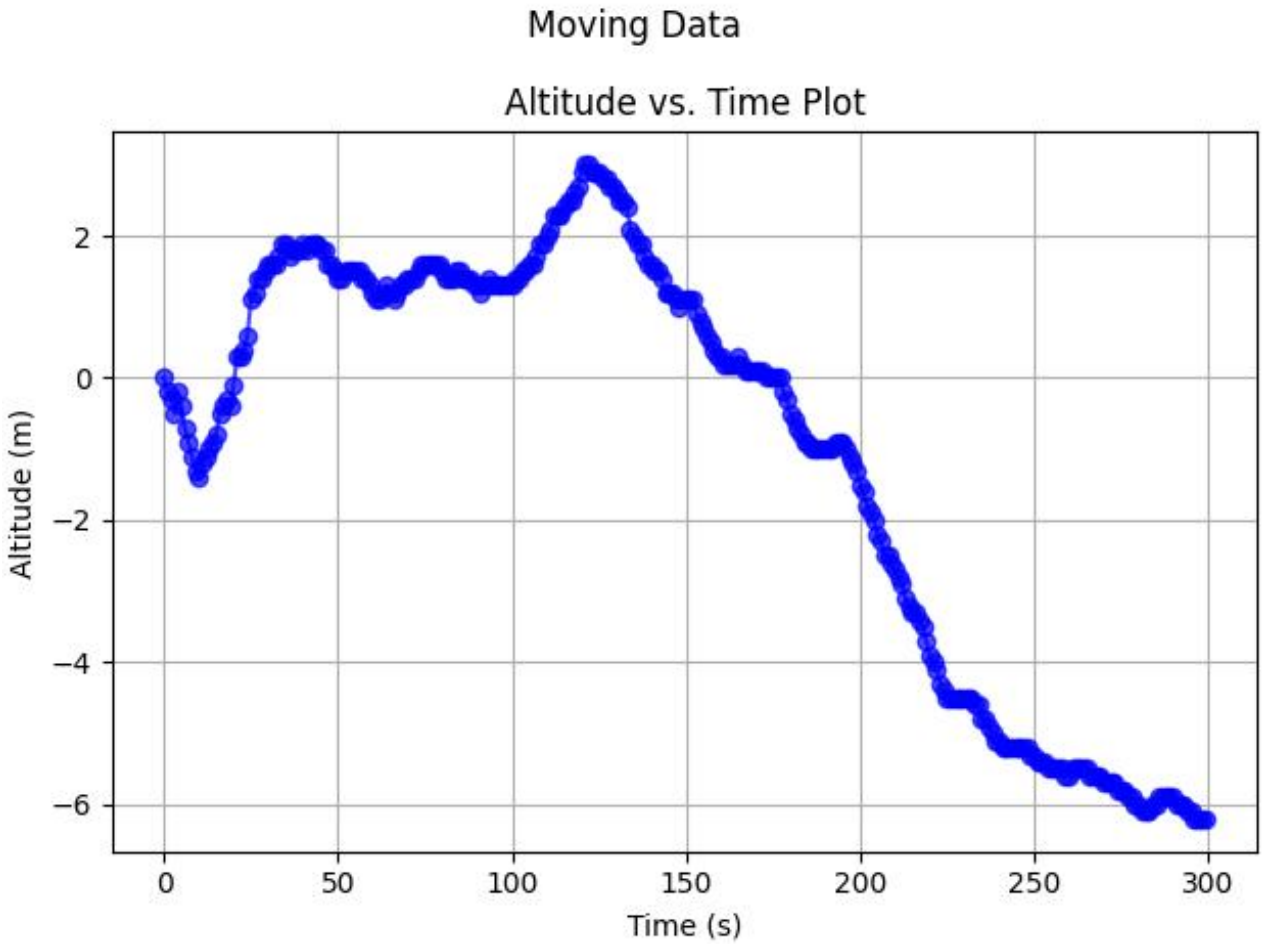


Moving Data Analysis

The below given plots is collected when walking with gps in hand in a straight line. With the collected data is plotted as a scatted plot and drawn an best fix straight line to check the straightness of the collected data. With the noise in sensor there is a little bit of deviations but the plot looks like a straight line.



The below given plot is moving data altitude plot and it can be seen that the data altitude is varied over a period of time as it is due to height change in the plain while collection of data and also due to noise from the sensor.



Summary:

It has been observed that this sensor has lots of noise while collection of data. And the Data collected without buildings are more accurate than with buildings. To increase the accuracy of sensor fusion with IMU, and EKF (Extended Kalman Filter) can be used. And also multiple GPS can used to collect data and it can fused together with sensor fusion.