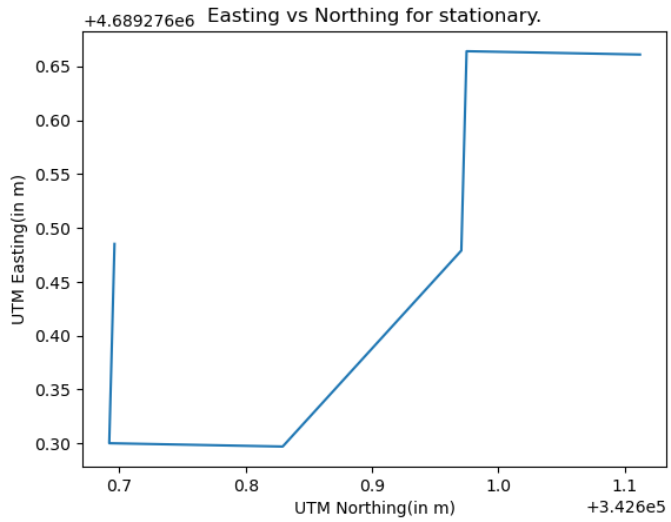
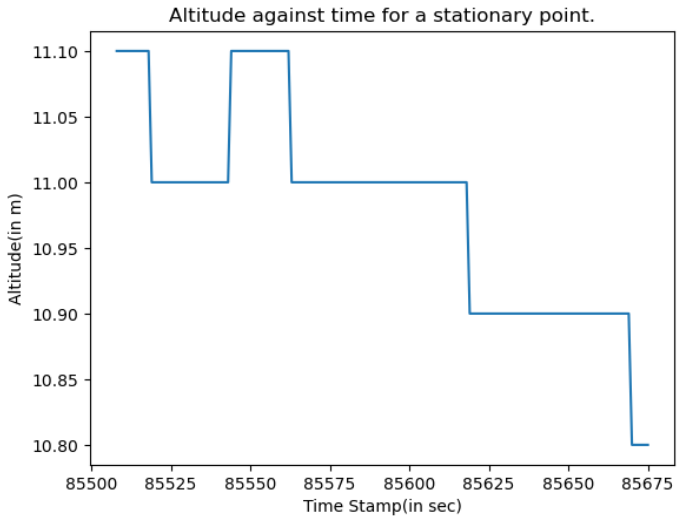
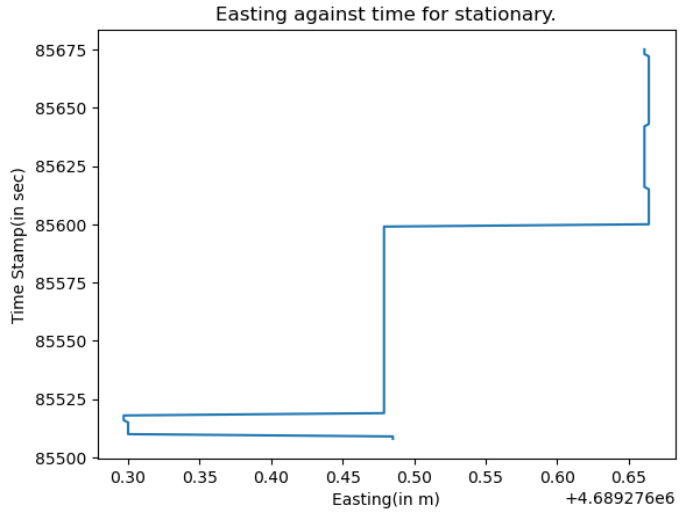
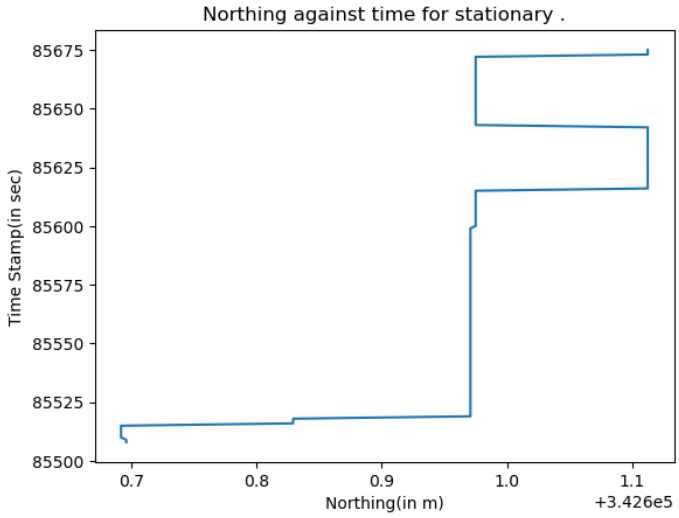
Lab 1

Stationary Data









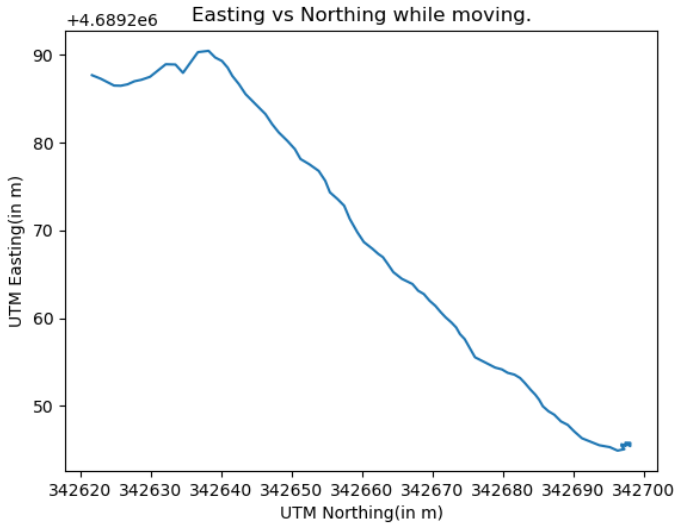
The graphs plotted above are from gps readings taken in ten minutes at a stationary point with nine satellites in view of the module as seen from the GPGGA strings obtained. Observations are:

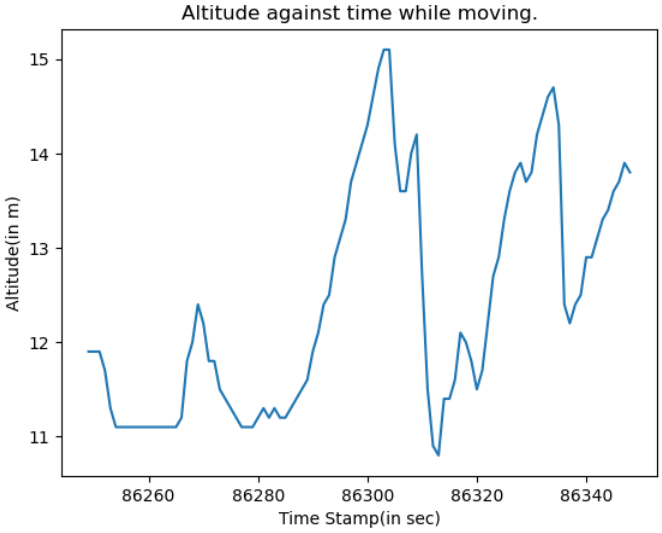
- The altitude varies from 11.10m above mean sea level to 10.8m in a span of 10 min (with a slower sampling rate).
- Easting against Northing plot can be though of as a map of movement in the given time span. However, for a stationary point, this plot should be a single point. The readings obtained varies with a difference of 35 cm in Easting and a difference of 41.61 cm in Northing.
- The data showed a significant amount of drifting, despite being anchored to a spot.

Walking Data

The two graphs obtained from GPS readings while walking in a straight line are shown as follows:

- The altitude shows incredible variations throughout the data collecting period. This is a variation between 11 m to 15 m.
- The Easting vs Northing map shows an almost straight line with a slight deviation in the beginning which might be attributed to a ‘warm start’ wherein, the GPS having been extensively used to collect data at a single point experiences an almost instantaneous change in position whilst receiving information from the same satellites. This might be the reason for the deviation in path at the starting(342620 Northing).
- Another observation was that the data obtained while moving suffers fewer deviations(actually follows a straight path) as compared to the reading fluctuations observed when staying stationary. That is there is less GPS drifting recorded while moving.
- The altitude variation may be the effect of atmospheric errors and multipathing.





Common inference

The data collected from the two experiments have shown deviations from the expected and these might be attributed to the choice of location of data collection. The data was collected at a small park surrounded by tall buildings and small trees. This could’ve caused:

- Signal interference, where signals from satellites might be blocked by the buildings and hence do not reach the puck. Also called shadowing, where signal attenuation mainly occurs; leaving it more vulnerable to noise, cancellation and interference from signals by other satellites.
- Multipathing, caused by signal reflections from obstructions such as buildings, vehicles, trees, and the like. This might cause the puck to receive delayed signals and as the GPS functions by calculating the position (as a function of time taken for the signal to travel), it overestimates the distance. This miscalculation, scaled by the number of satellites in view, is finally factored in for overall position determination. This causes significant deviations in positions.

- Clock errors, orbit errors and atmospheric errors are not accounted for as a base station is not used here.

The GPS puck would have greater accuracy in an open area with less obstructions such as a rooftop of some building or a field of any kind.
