LAB 2 - RTK GPS Data Collection and Analysis

Purpose:

To collect the RTK GPS data and analyze it while stationary and moving to measure the actual sensor error.

Methodology:

In order to collect the GPS data using two **RKT boards** which are communicating with each other through telemetry radios , a **rosnode** is written to read the raw data from the sensor and convert the GNGGA GPS latitude and longitude data into UTM system. This UTM data along with latitude, longitude, altitude is published to rostopic and recorded in a rosbag file. This bag file is converted into a CSV file which is used for sensor error analysis. The GPS data is collected while stationary and moving.

Data Collection Location:

Data was collected in Clemente Field, an outdoor open space which is not obstructed by tall buildings, trees etc and also in west village quad which is obstructed by buildings.

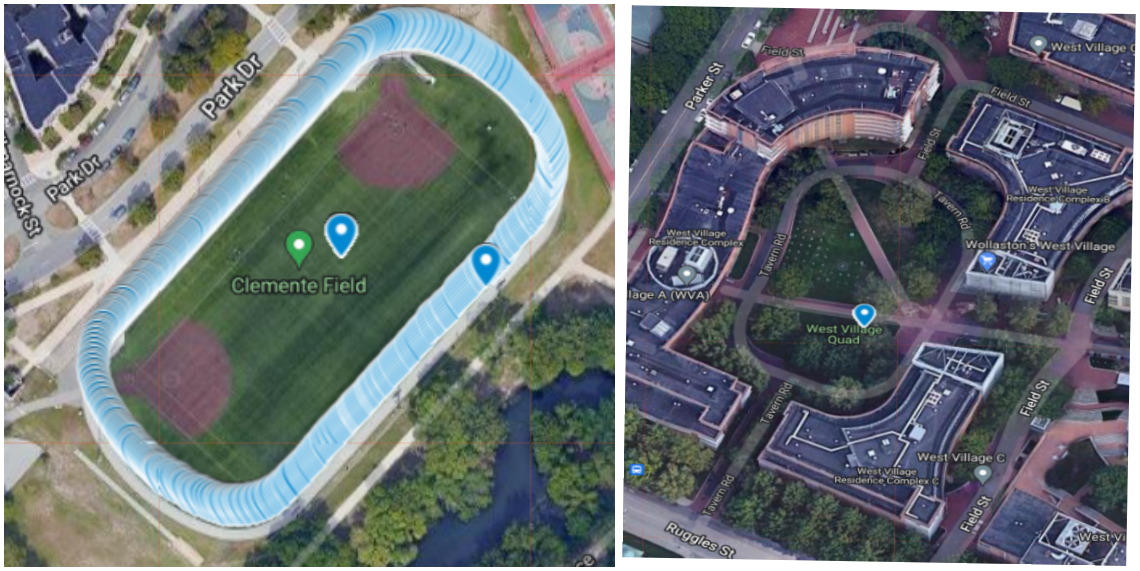
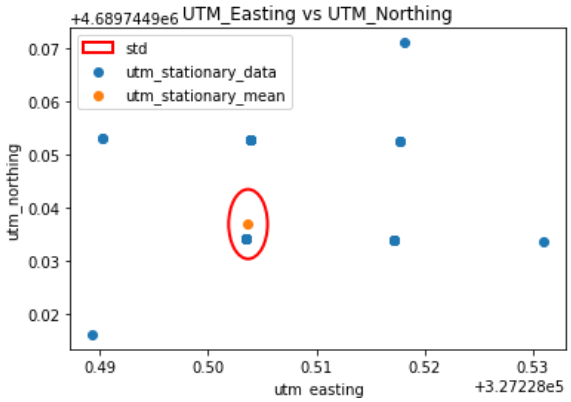


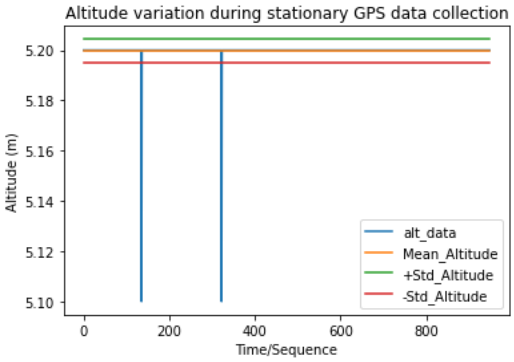
Fig 1. Left Clemente Field Open GPS Data Collected, Right West Village obstructed GPS Data Collected

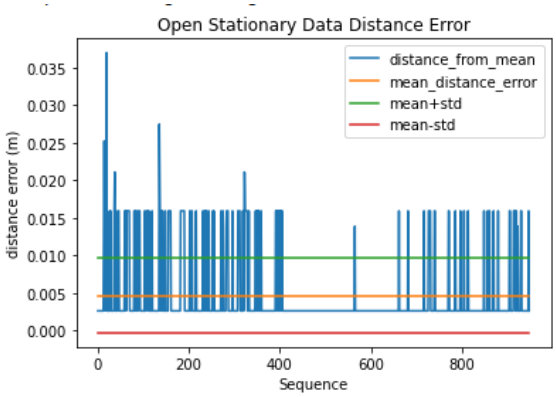
Stationary GPS data is collected inside the field and moving data is collected while walking around the field.

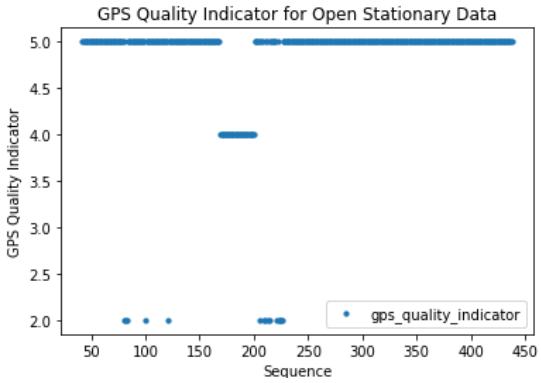
*Note: Data is collected from Team 7

Open Stationary GPS Data Analysis:





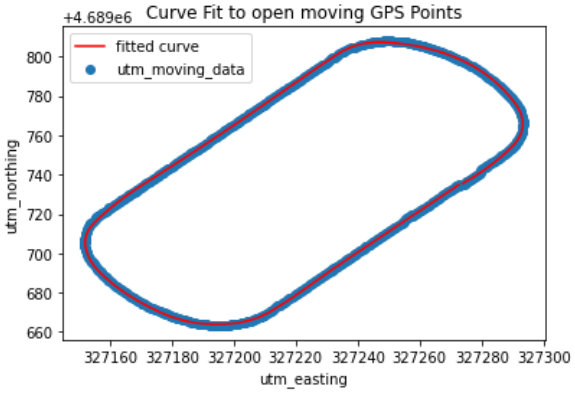


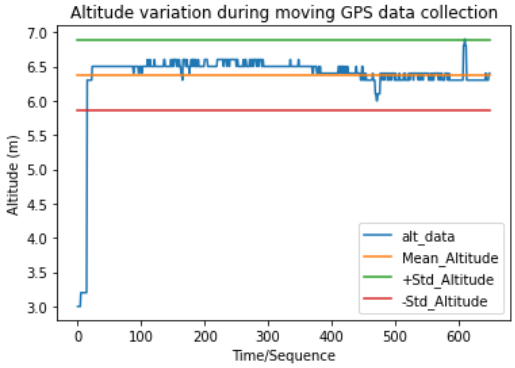


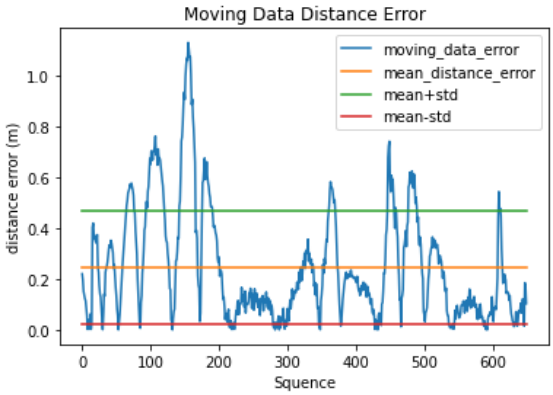
Stationary GPS Data	UTM Easting	UTM Northing	Altitude (m)	Sensor Accuracy
Mean	327228.503	4689744.93	5.1997	**0.005 m Or 0.5 cm**
Standard deviation	0.00179	0.006	0.0045	

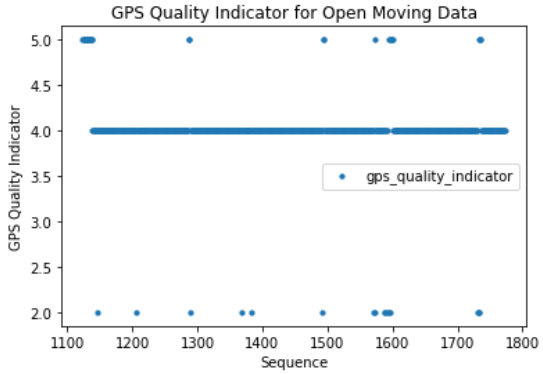
RTK GPS Sensor accuracy of 0.5 cm when operated in open stationary GPS data collection

Open Moving Data GPS Analysis:





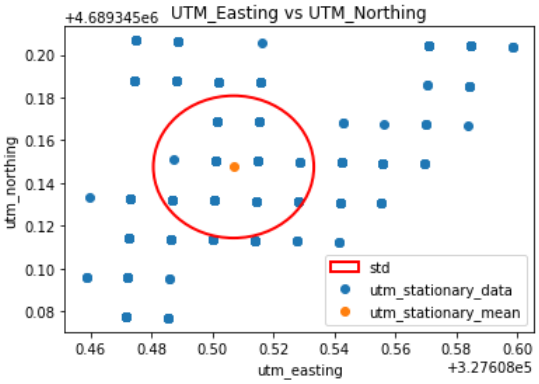


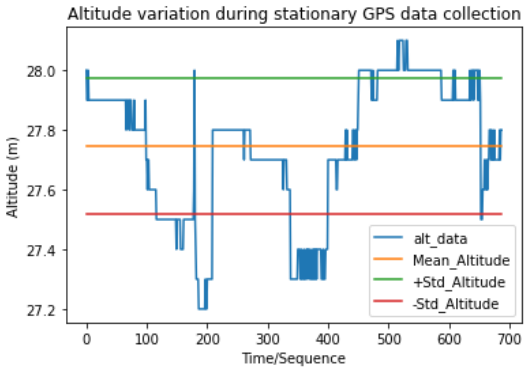


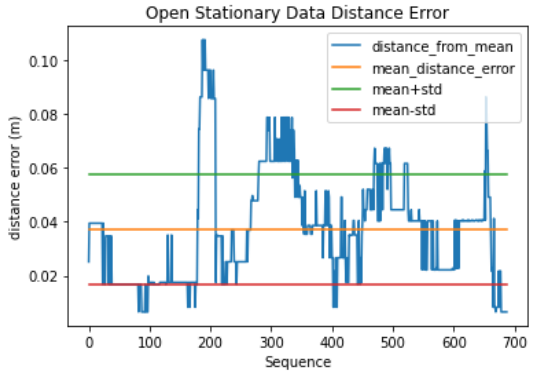
	Curve Equation	Sensor Accuracy
Open Moving GPS Data	Fitted Curve is a interpolated curve of 3 degree and having smoothness constant of 100	**0.25 m or 25 cm**

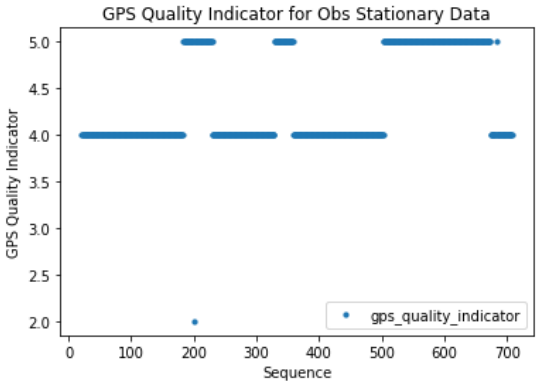
RTK GPS has 25 cm level accuracy when operated in open moving areas

Obstructed Stationary GPS Data Analysis:





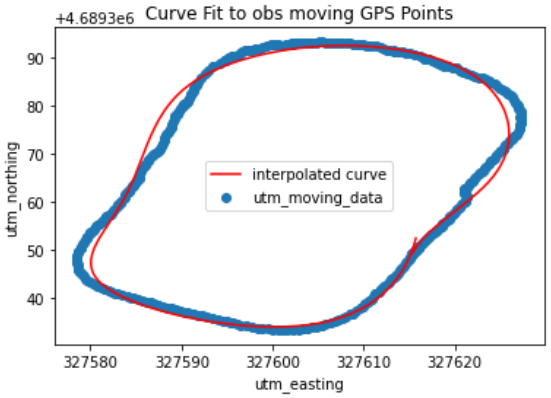


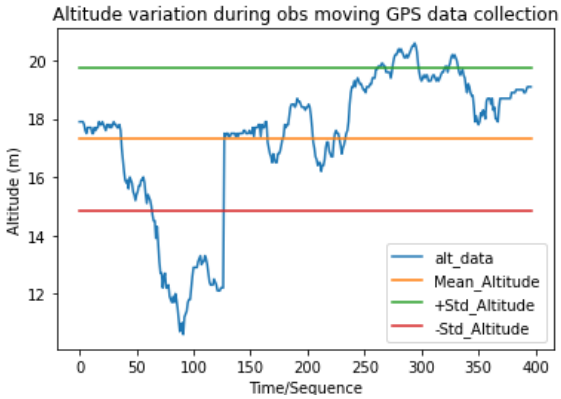


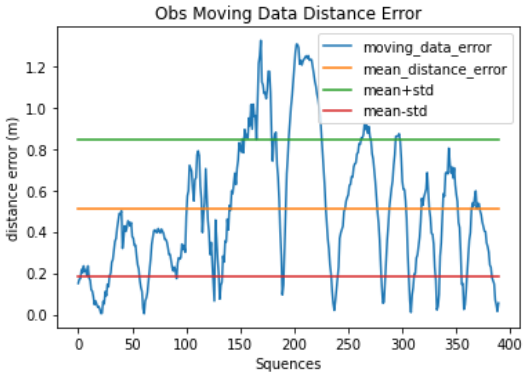
Obs Stationary GPS	UTM Easting	UTM Northing	Altitude (m)	Sensor Accuracy
Mean	327608.50	4689345.147	27.7443	**0.04 m Or 4 cm**
Standard deviation	0.02634	0.03328	0.2279	

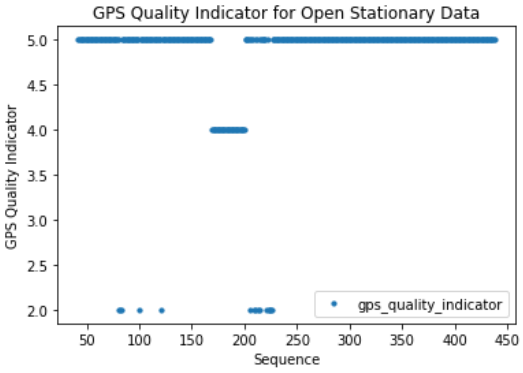
RTK GPS Sensor accuracy of 4 cm when operated in obstructed stationary GPS data collection

Obstructed Moving Data GPS Analysis:









	Curve Equation	Sensor Accuracy
Obstructed Moving GPS Data	Fitted Curve is a interpolated curve of 3 degree and having smoothness constant of 450	**0.5 m or 50 cm**

RTK GPS Sensor accuracy of 50 cm when operated in obstructed moving GPS data collection