LAB 1 - GPS Data Collection and Analysis

Purpose:
　　　To collect the GPS data and analyze it during stationary and walking in a straight line and to measure the actual sensor error.

Methodology:
　　　In order to collect the GPS data using **USB based GNSS puck**, a **rosnode** is written to read the raw data from the sensor and convert the GPGGA 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 during stationary and also when walking in a straight line.

**Data Collection Location:**
　　　Data was collected in Cater Playground, an outdoor open space which is not obstructed by tall buildings, trees etc which can be used for measuring actual sensor error.

Fig 1. Cater Playground. **Stationary Data** - Inside blue circle. **Walking data** - Along the yellow line

　　　Stationary GPS data is collected inside the center blue circle in the field and straight line GPS data is collected by walking from one end of the field to the other end as highlighted in yellow in the above image which is about 111 meters along.
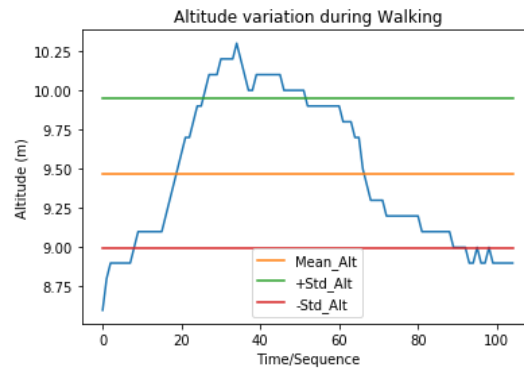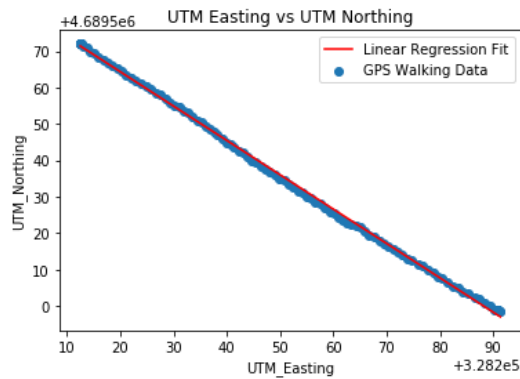
Stationary GPS Data Analysis:
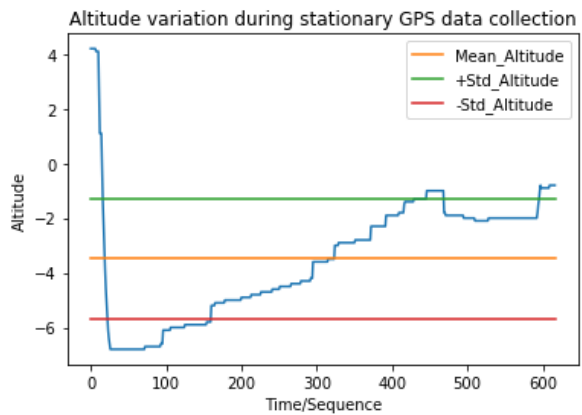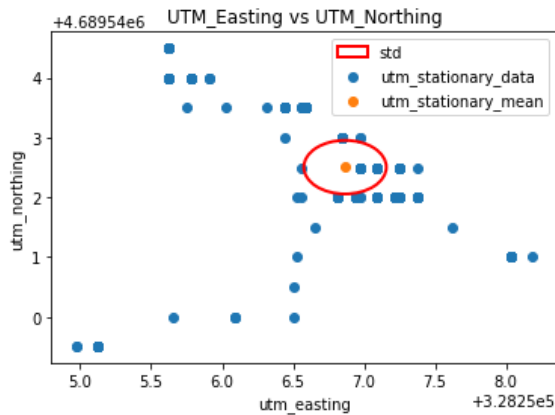
Stationary GPS Data	UTM Easting	UTM Northing	Altitude (m)
Mean	328256.866	4.6895e+06	-3.4867
Standard deviation	0.582030	8.96636e-01	2.1978

Sensor has the standard deviation of 0.58 and 0.89 UTM easting and Northing for stationary data

Walking Straight Line Data Analysis:

	Line Equation	Error
Walking GPS Data	UTM_Northing = UTM_Easting*m+c m = -0.943 , c = 4999337.92	Mean Square Error = 0.62024 r2_score = 0.99892

Latitude and Longitude Plots of GPS data collected in Google Maps: