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EECE 5554
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GPS Report

Introduction

GPS navigation is used so frequently for people as it is so readily available in people's cars and on their phones. However, there is some inaccuracy in GPS data as it's not perfect to a person's position. In fact, there is actually error in a person's position both while moving and while stationary.

Methods

Data was collected by group member Kevin Sinaga for 10 minutes using a GNSS puck in a stationary position as shown with an 'X' in figure 1. Data was collected while walking across the Harvard Bridge as designated by the black line in figure 1.

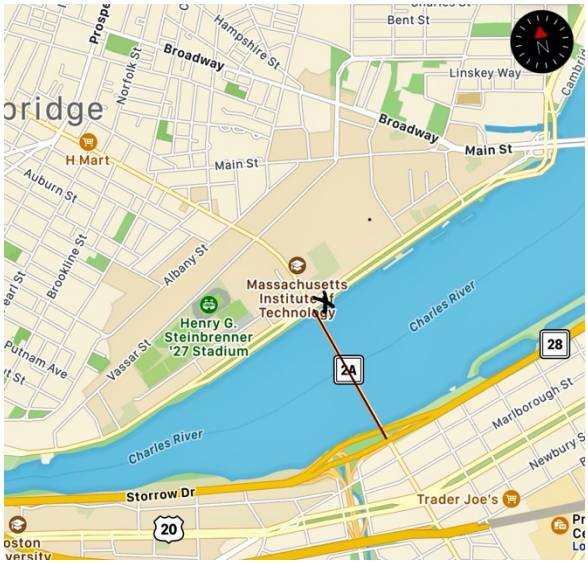


Figure 1: Location of data collection was at Harvard Bridge for moving and near MIT for stationary

Analysis

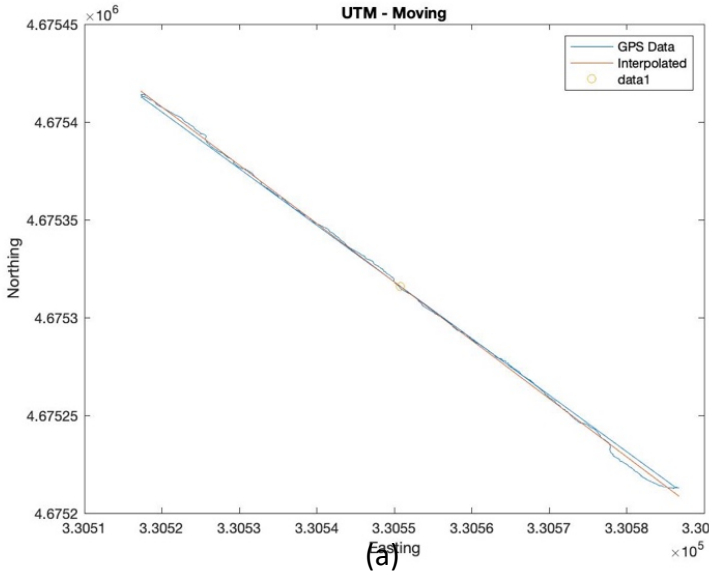
The data showed some error in both northing and easting while moving. However, the error seemed to be the same shape, the error in easting was slightly smaller than the error in northing. Therefore, this shows the error is consistent and most likely attributed to the change in position which would scale the error accordingly.

The distance traveled from east to west across the MIT bridge is smaller than the distance traveled from north to south. Therefore, the scale of the error in easting is smaller than that of the error in north to south.

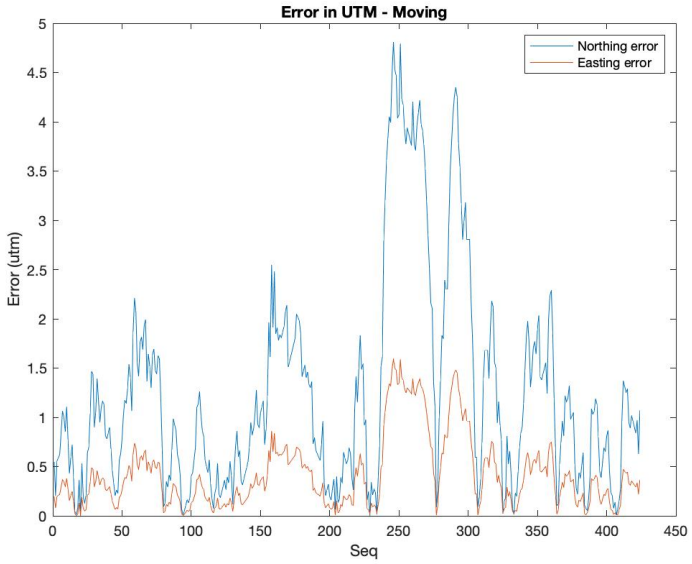
The error that still exists is propagated created through several factors outside of a GPS user's control. Each one of the GPS data points were created using 9 satellites. These 9

satellites have a varying geometry to the position of the person and can create error when each are trying to capture the position of the person while they are on a bridge. Furthermore, error is created due to the factors around the person, such as atmospheric conditions, signal blockage from the bridge itself, and signal delay from the transmission of signal given that the signal travels at the speed of light. Since the next position is dependent on the previous position these sources can compound giving an error anywhere between 0 to 5 UTM depending on the distance traveled in a direction.

Stationary data presents a different situation as shown in figures 3a and 3b. where there is drifting. The drifting mostly occurs easting. This can also be shown through the varying geometry in the 9 satellites and the signal delay through the buildings as it was taken next to MIT.

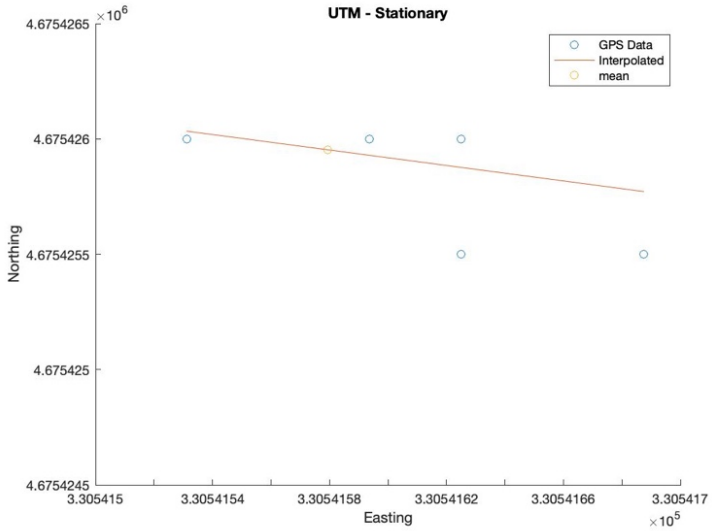


(a)

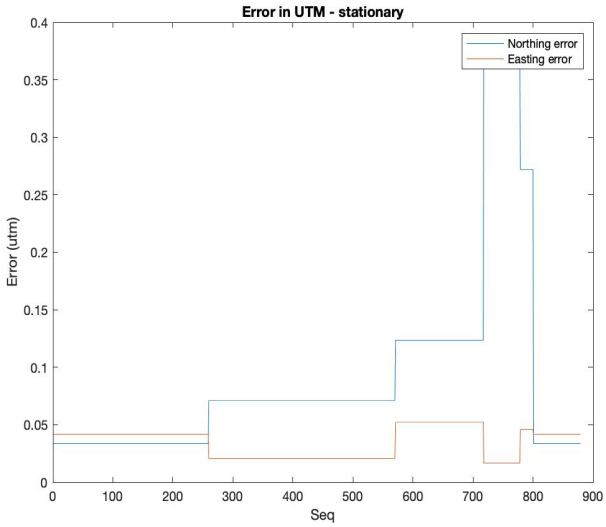


(b)

Figure 2: (a) The UTM data for moving. (b) The Error in UTM data for moving.



(a)



(b)

Figure 3: (a) The UTM data for stationary. (b) The error in stationary data.