Yao Zhou_EECE5554_Lab1

EECE5554 Lab1 Report

1. Analysis of stationary data
   a. Data overview

      I took the stationary data collection on a park bench near the Malden center subway station with my teammate Shuchong Wang. Within the ten minutes of collecting data, we moved the GPS device with tiny left, up and down to detect errors in the collected data. During collecting data, we use rosbag to record related topics, and then we read it to generate stationary_data.yaml. The Figure 1, The red dot shows the row data I have collected by using the GPS sensor, the data noise and data offset is obvious.

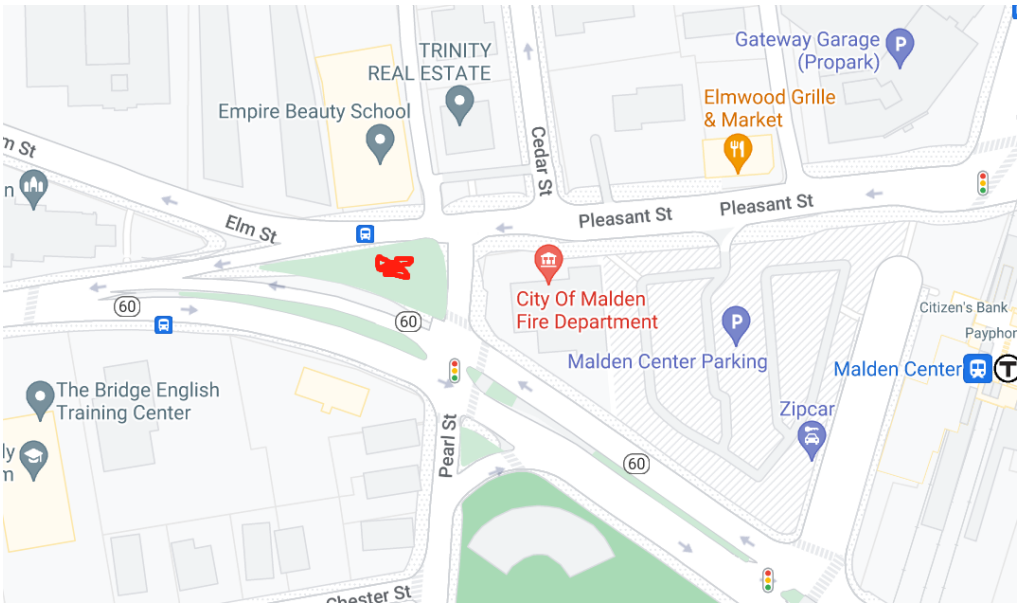

Figure 1 Data From GPS

   b. Data Analysis

      The following figures were made by Python matplotlib, We can see that Figures 2 and 3 represent the longitude and latitude detected by GPS, respectively, while Figure 5 represents the location determined by the longitude and latitude. In Figure 5, we can see that the specific position of the GPS detector is shifted up, down, left and right, which is in line with our experiments on error detection when collecting data. Additionally, Figure 4 represents the altitude of the GPS detector, however the collected data is not at a horizontal plane as expected, these expectations vary based on the actual location. Multipath effects from nearby buildings and trees will result in increased positional variability.

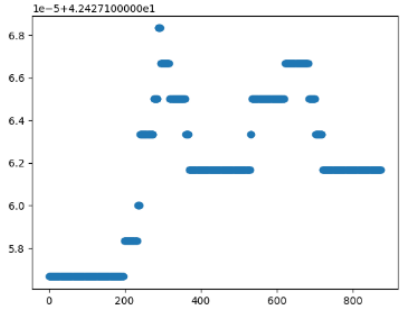

Figure 2 Latitude from GPS

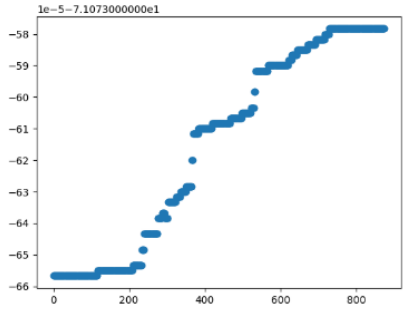

Figure 3 Longitude from GPS

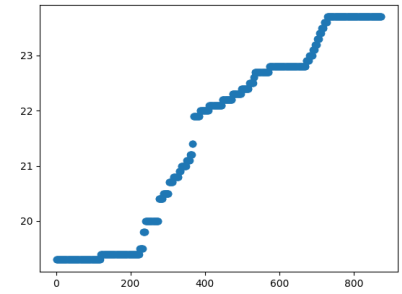

Figure 4 Altitude from GPS

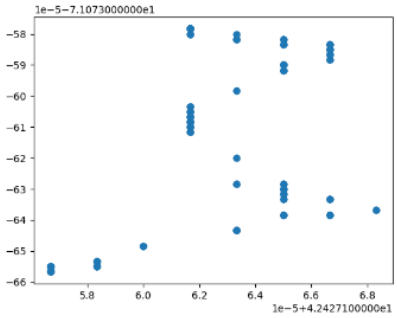

Figure 5 Position from GPS

2. Analysis of moving data
   a. Data overview

   As shown in Figure 6, I walked 100 meters along Centre St. In this 100 meters, we crossed the bridge from below and waited for the traffic lights at the intersection, which resulted in the noise and repetition of the raw data.

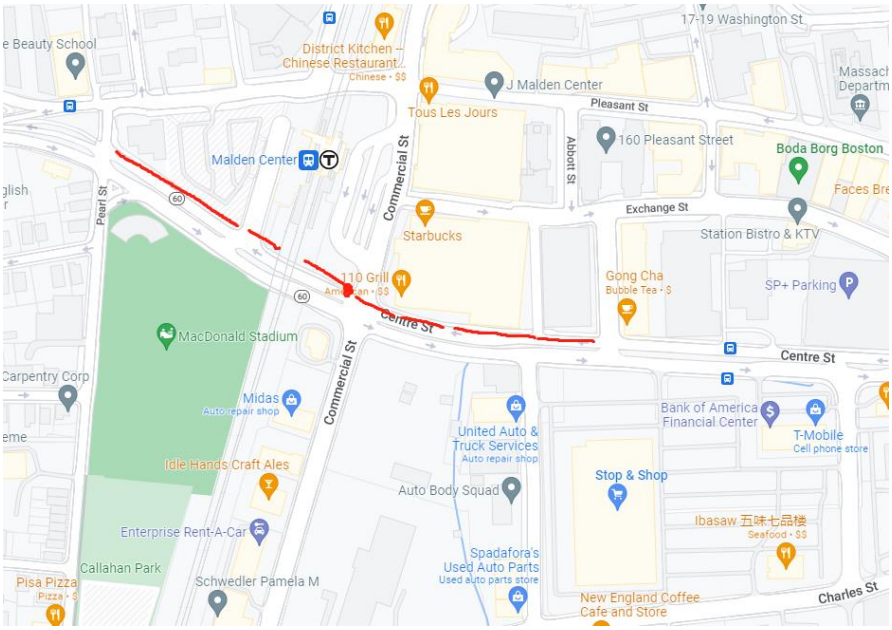

Figure 6 Walk Data from GPS

   b. Data Analysis

   The following figures show the GPS longitude, latitude, altitude and position(based on the latitude and longitude) information. Some of the data are

missing show up in this moving prosses, due to the shield by building and also railway bridge I mentioned before. Although we have data missing and noise effect, in the final generated position path map (Figure 5), the direction of the route track is basically the same as that of the map label track. In terms of height, after we expand the detection range, we can observe the change of altitude more obviously, which is also reflected on the actual road.

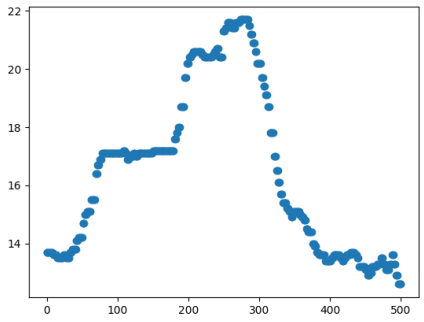

Figure 7 Altitude from GPS

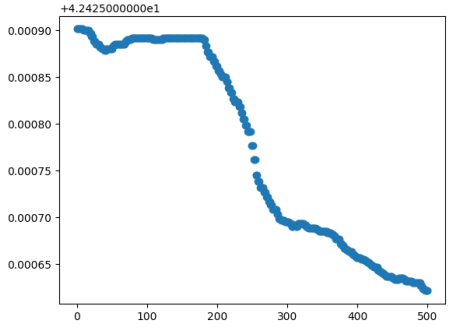

Figure 5 Latitude from GPS

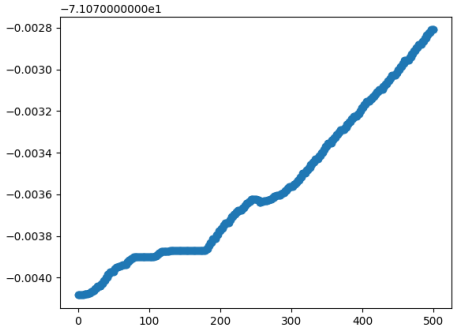

Figure 2 Longitude from GPS

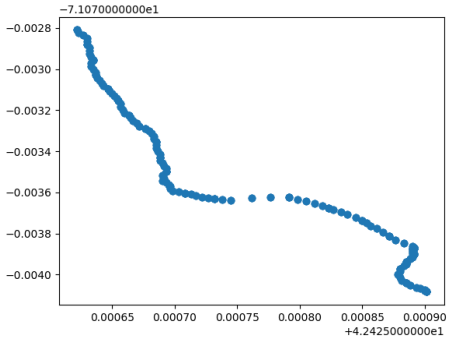

Figure 3 Position from GPS

3. Conclusion

In conclusion, comparing to moving GPS recordings, the effects of small noise and interference are more pronounced in stationary GPS data collection. Besides, tall buildings or bridge on the road would interrupt signal and make it impossible to collect data. Meanwhile, compared with the detection of latitude and longitude, GPS has a larger error in the collection of altitude data.