Example of Constant Offsets for Attitude Determination

After analyzing the data I discovered that the body coordinates were wrong which caused the results to be out of range. According to the Local Level coordinates and Body coordinates that was originally set, the location of R1 and R2 are on different side of the Base (see Figure 1 and 2).

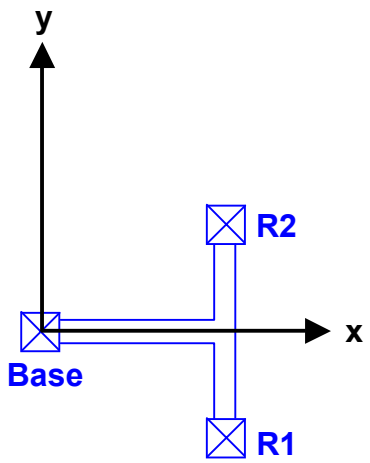

Figure 1: Body Coordinate

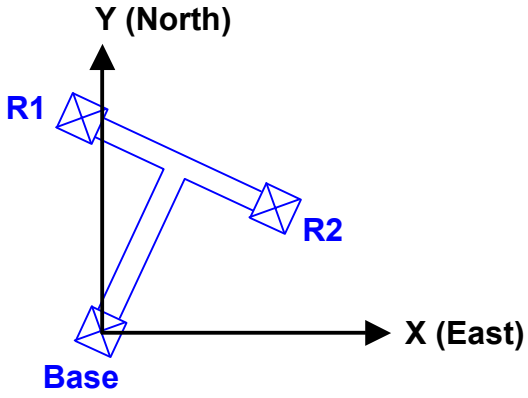

Figure 2: Local Level Coordinate

According to the data collected by the GPS receivers and by convention we defined the Body Coordinate as follow (see Figure 3):

- Base (x,y,z) = (0.0, 0.0, 0.0)
- R1 (x,y,z) = (1.763, 2.480, 0.0)
- R2 (x,y,z) = (-1.839, 2.480, 0.0)

And the Local Level Coordinate:

- Base (x,y,z) = (0.0, 0.0, 0.0)
- R1 (x,y,z) = (2.867, -1.013, -0.015)
- R2 (x,y,z) = (1.885, 2.454, -0.016)

With the above configurations, we came up with the following result (see Figure 4):

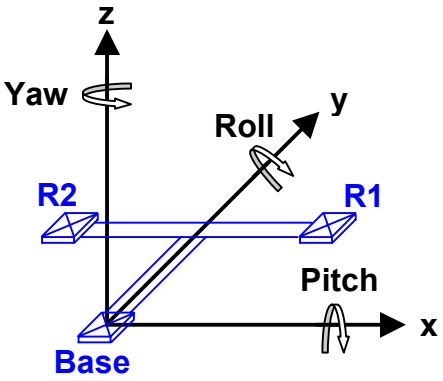

Figure 3: Body Coordinate

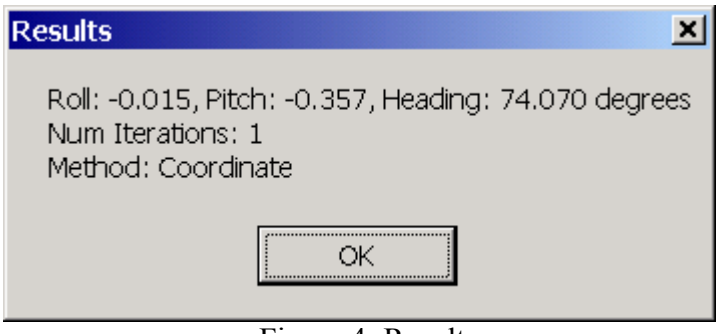

Figure 4: Results

Recommendations and Result

Some of things that can help avoid some of the problems are to keep a consistent coordinate frame (see Figure 5a and b).

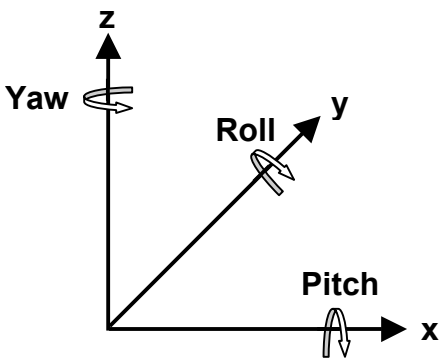

Figure 5a: Body Coordinate

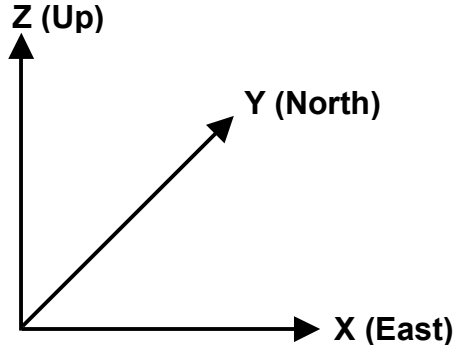

Figure 5b: Local Level Coordinate

According to Figure 5a and b they both follow the right-hand system. A left hand system may be use, make sure both the Body Coordinate and Local Level Coordinate follow the same system. With this particular data set the problem has to do with the mix up of R1 and R2 (see Figure 1 and 2). After fixing the problem, we were able to get fixed ambiguities around 471106 second. The reason for the long duration was due to having only 5 satellites. Figure 6 shows the attitude plot.

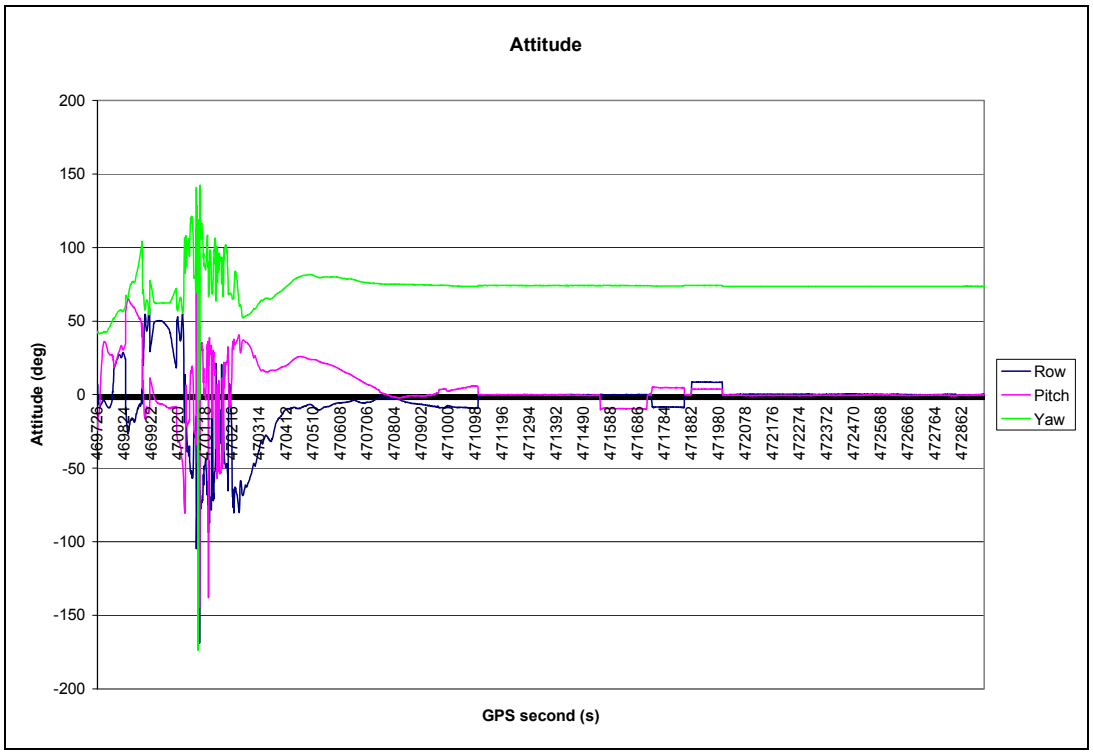

Figure 6: Attitude Plot