

This week we are attempting to change the initial roll pitch and yaw angles to produce a much clearer output as to the movement of the vehicle as far as position. We found that this exercise was not productive as no matter the combination of numbers we were still getting significant drift in every axis. The best results we received was drift on the order of  $10^{-3}$  on one axis and  $10^{-1}$  on the others. We found that the better approach is to leave the directional cosine matrix and continue compensating through the slope. Looking at the uncompensated velocity shown below one can see that if the wave from the beginning of the movement until the end of the wave were shifted down and then integrated it could be closer to the actual picture we are looking for. The position we actually got is also shown below.

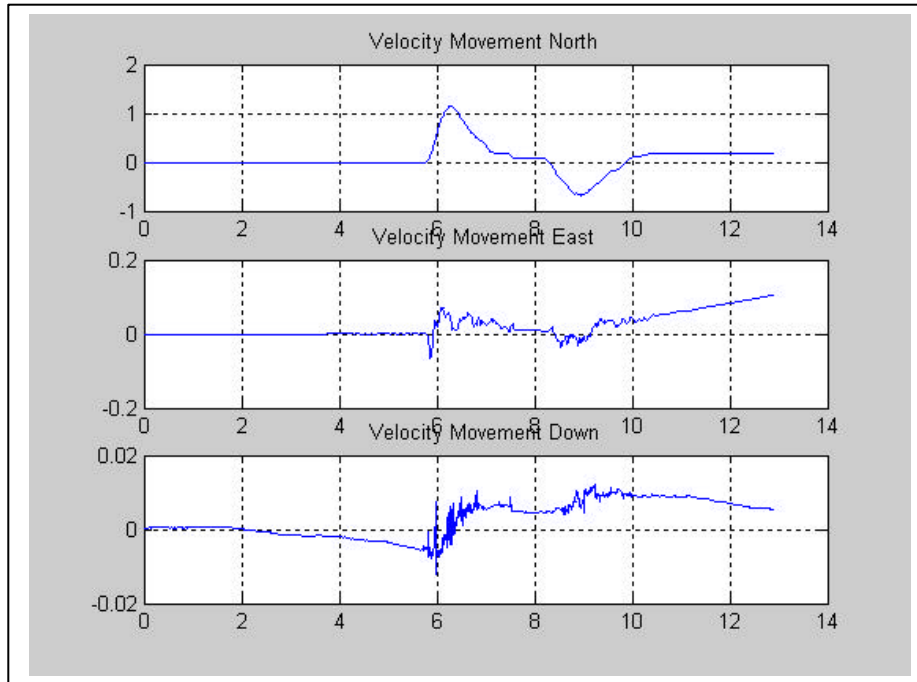


Figure - Velocity of the IMU moving 1 meter north and then back

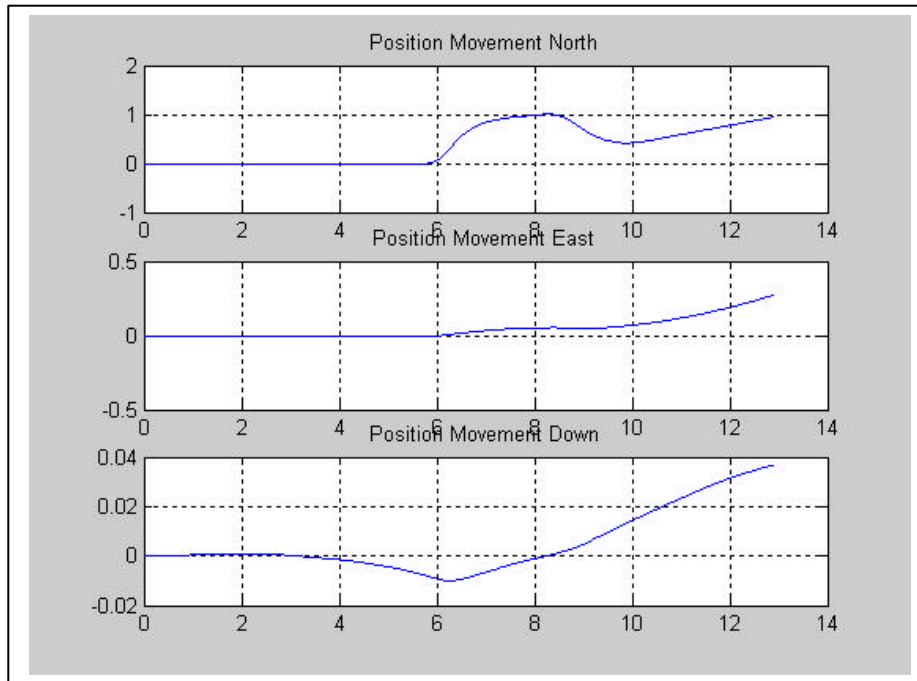


Figure -Position of IMU moving 1 meter north and then back

To accomplish this we setup a if statement to check for change in velocity. If the velocity does not change within the time step more than  $(\pm).0005$  m/s then it is set to the previous value. If it is above this value then it is added to the previous value minus the slope and a constant factor. This constant factor is an error correction individual to the movement of the vehicle. This constant factor helps bring the velocity at the tail end of the samples closer to the zero point where they should be. This correction also improves the response of the position function. These factors are shown below with correction added to the x axis only.

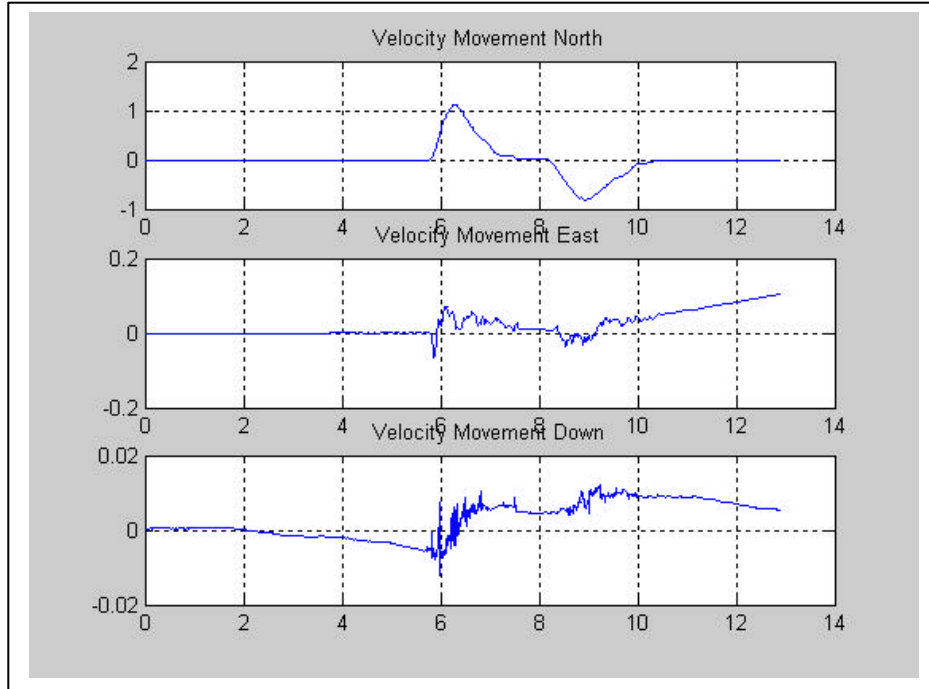


Figure -Velocity with error correction ( North component)

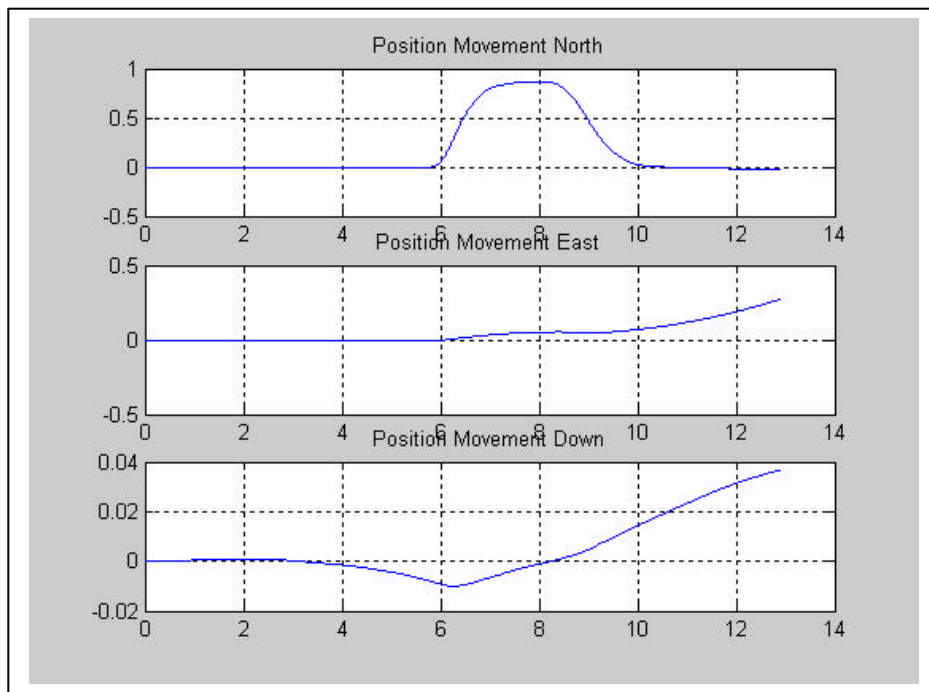


Figure -Position with error correction (North Component)

The problem with this error correction is that it seems to be completely independent in each test. We can find no relationship between any known or calculated quantity in any of the tests that gives a clue as to what the error correction should be. The values are all over the map as well. In the 5 tests we tested the values of the error correction factor ranged between .0005 and .000125. This range is large enough that a single value cannot be chosen to be the correction for all tests. When a generic error correction is used the results from the test above are shown (using the average of the max and min from above).

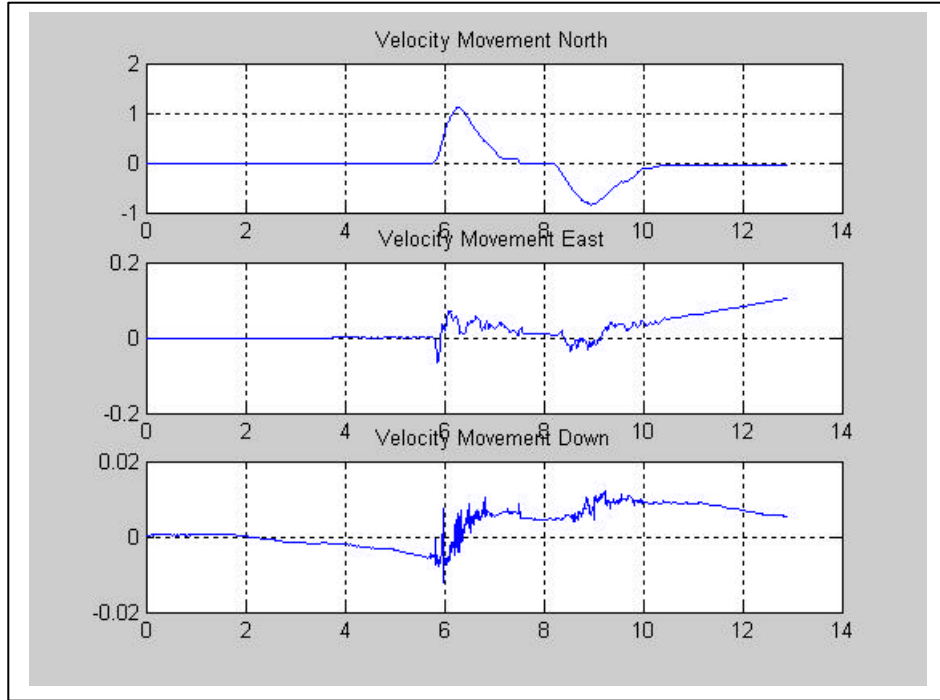


Figure - Generic correction to above velocity

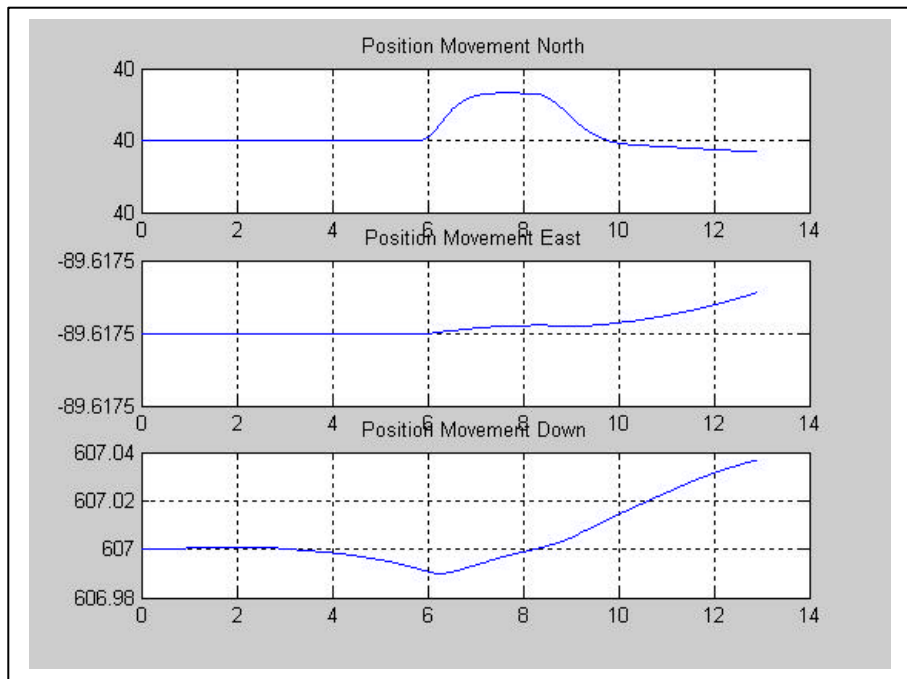


Figure -Generic correction to above position

Although this test is alright some of the other tests were much worse with a generic correction shown on the following page.

The following is the IMU moved a meter forward and a meter back taken at a later date than the above data.

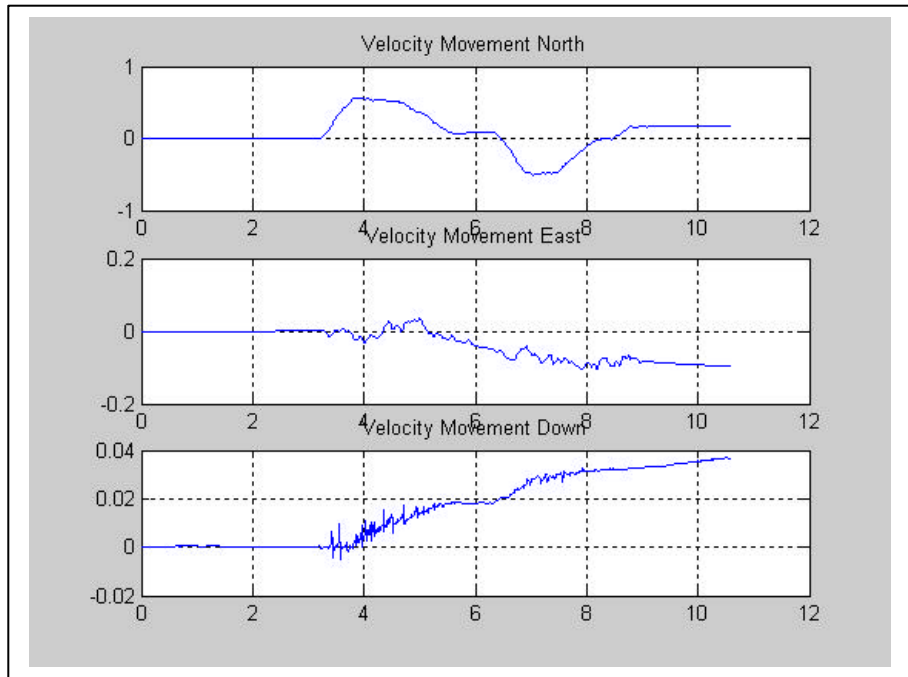


Figure -Generic corrected velocity

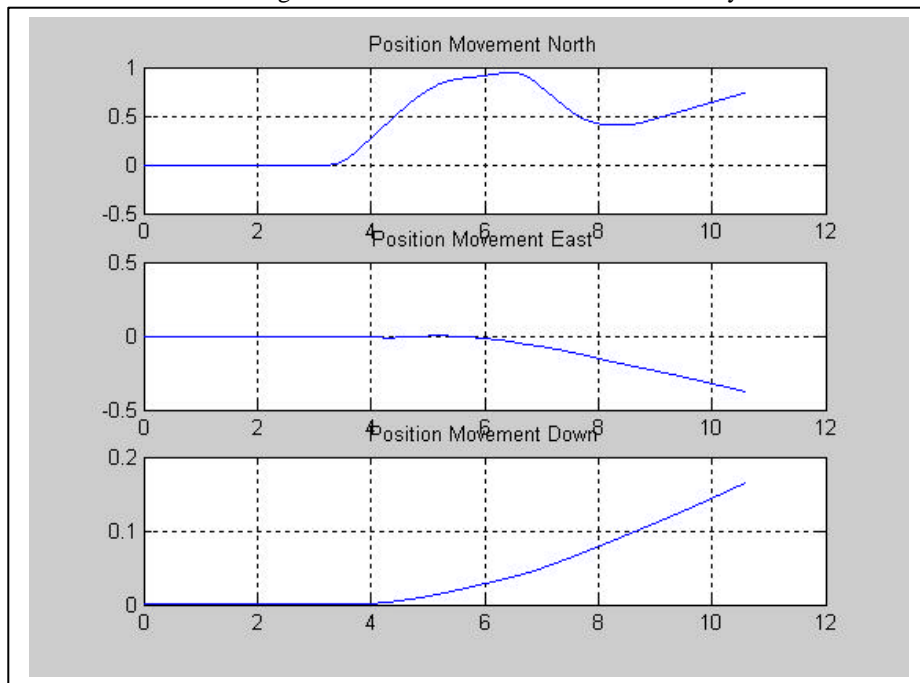


Figure -Generic corrected Position

