CSE 562 HW2 Writeup

1. Estimating Bias and Variance of the sensors

Setup: For each sensor (acceleromter, gyroscope x y and z), the bias and variance of the sensor was measured by placing the device on a flat surface. In order to distinguish between the bias of the sensor and possible unevenness of the surface, two measurements were taken: one with the device faceup and the other with the device rotated 180 degrees along each axis (opposite orientation).

The results show that the sensors are extremely accurate, which makes sense since this is a brand new iPad.

Sensor	Measurement 1	Measurement 2	Final
Accel x bias	0.0171684265	-0.0020197113	0.0075743576
Accel x variance	0.0000004746	0.0000002272	0.0000003509
Accel y bias	-0.0021667236	-0.0046984283	-0.00343257595
Accel y variance	0.0000005648	0.0000004047	0.00000048475
Accel z bias	-0.9946879425	1.0085699280	0.00694099275
Accel z variance	0.0000003899	0.0000011542	0.00000077205
Gyro x bias	-0.0019894287	-0.0021531566	-0.00207129265
Gyro x variance	0.0000012448	0.0000013173	0.00000128105
Gyro y bias	0.0025964314	0.0022990870	0.0024477592
Gyro y variance	0.0000015830	0.0000015377	0.00000156035
Gyro z bias	-0.0054439183	-0.0052292873	-0.0053366028
Gyro z variance	0.0000011927	0.0000011448	0.00000116875

2. Below is the graph when the phone is held still at the identity orientation. Notice that in part 1 the phone was resting on a table, whereas in part 2 the phone was physically held. This is why there is more error in part 2 (introduced by slight human movements). As expected, the gyroscope has global drift, the accelerometer has more short term noise, and both together is smoother and more accurate.