

Sensor Models

Accelerometer

$$y_{A,t} = a_t - g_t + v_{A,t}$$

where $y_{A,t}$ = accelerometer signal
 a_t = sum of the acceleration
 g_t = gravity
 $v_{A,t}$ = accelerometer measurement noise

The acceleration is modeled as a first-order low-pass filter with white noise

$$a_t = c_a a_{t-1} + w_{a,t}$$

Gyroscope

$$y_{G,t} = \omega_t + b_t + v_{G,t}$$

where $y_{G,t}$ = gyroscope signal
 ω_t = angular velocity
 b_t = gyroscope offset
 $v_{G,t}$ = gyroscope measurement noise

The process model of the gyroscope offset is as follows

$$b_t = b_{t-1} + w_{b,t}$$

where $w_{b,t}$ = process white noise

Reference:

*Daniel Roetenberg, Inertial and Magnetic Sensing of Human Motion, Ph.D. Thesis, Twente University, 2006.

*H. J. Luinge, Inertial Sensing of Human Movement, Ph.D. Thesis, Twente University, 2006.

* can be downloaded from:

<http://www.xsens.com/index.php?mainmenu=technology&submenu=papers>