# Body Kalman Filtering

## Body center point location

State vector s:

where

(x, y, z) = location of the world object center point  
(vx , vy , vz) = velocity of the object  
(ax , ay , az) = acceleration of the object

State equation in differential form:

State equation in difference form:

where is the time increment and Gaussian noise with covariance R.

Measurement equation

Where is Gaussian noise with covariance matrix Q.

Kalman filter initialization:

where x(0), y(0), z(0) is the first location measurement.

where α, β and γ are believed variances of location, velocity and acceleration.

where , and are believed variances of location, velocity and acceleration.

Where q is the believed measurement variance.

Kalman filter update: