# Image Object Kalman Filtering

## Bounding box line location

State vector s:

where

l = location of the bounding box line in the image (xmin , xmax , ymin , ymax)  
v = velocity of the line in the image  
a = acceleration of the line in the image

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) is the first location measurement.

where α, β and γ are believed variances of location, velocity and acceleration, for example 1.

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Where q is the believed measurement variance. It is larger than system variance because the objects have tendency to move smoothly, but the bounding boxes exhibit more random behaviour. Q can be set to 10, for example.

Kalman filter update: