System Description:

The filter is meant to track the movement of an object moving in 3D space.

The object will be subject to:

* gravitational acceleration,
* control forces to combat gravity,
* wind,
* control forces to combat wind,
* control forces used for transversal of the 3-D space,
* drag forces.

These forces, such as drag can be non-linear, and wind random. However, without knowledge of the control inputs and without significant winds perhaps a linear model can be chosen.

Also, the object is not necessary subject to acceleration due to transversal as it can attempt to hold its position. Therefore, the filter must be careful not to misinterpret noise as a higher-order term.

Input to the object detector comes in the form of a series of 2-D frames, taken at discrete time intervals.

Distances in the frame are measured in pixels, subject to the resolution of the camera. Time is measured in seconds, where the discrete time interval between each frame is given by the reciprocal of frames per second, or .

Measurements to the Kalman filter come in the form of detection coordinates, which have been assigned to each track according to the Euclidean distance of the detection to the predicted location of the track. This means that measurements will not be located more than a threshold value away from the prediction. The noise present in the measurements is subject to the image transformations performed on the frame, as well as the detection parameters, with better processing generally resulting in lower noise. However, due to limitations in the processing and assignment methods, there is a possibly of noise being introduced in the form of missing detections or incorrect assignment.

Measurement noise is therefore deemed to be numerically strongly related to the threshold value chosen for assignment. I.e. the measurement noise is expected to be limited to the threshold value chosen.

Choice of Filter:

Filter Parameters: