State-space model

Derivation of Kalman filer

Nonlinear Kalman filter

The state-space model is defined by the following pdfs

$$\underbrace{f\left(x_t|x_{t-1},u_{t-1}\right)}_{\text{prediction}}\ \underbrace{f\left(y_t|x_t,u_t\right)}_{\text{filtration}}$$

For standard case (linearity, normality and known matrices M, N, A, B) these pdfs are generated by the equations

$$\begin{aligned} x_t &= Mx_{t-1} + Nu_{t-1} + w_t \\ y_t &= Ax_t + Bu_t + v_t \end{aligned}$$

where M, N, A, B are matrices, w_t and v_t white noises with covariance matrices r_w and r_v.

Estimation of the state x_t can be performed by Kalman filter

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[xt,Rx,yp] = Kalman(xt,yt,ut,M,N,F,A,B,G,Rw,Rv,Rx)
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where Rw, Rv and Rx are covariance matrices of prediction model, filtration model and state estimate.

Program and its description

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