Robotics Project
Kalman Filter

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December 6, 2015

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Abstract

Kalman filter.

1 Introduction

In this project we will use Kalman filter to estimate the motion path of an aircraft.

1.1 Physics model

The following model defines the signal value.

$$x_t = Ax_{t-1} + Bu_t + w_{t-1} \tag{1}$$

Which is

$$\begin{bmatrix} p_x^{(t)} \\ p_y^{(t)} \\ v_x^{(t)} \\ v_y^{(t)} \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & 0 & t & 0 \\ 0 & 1 & 0 & t \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}_{\text{state transition}} \begin{bmatrix} p_x^{(t-1)} \\ p_y^{(t-1)} \\ v_x^{(t-1)} \\ v_y^{(t-1)} \end{bmatrix} + \underbrace{\begin{bmatrix} t^2/2 & 0 \\ 0 & t^2/2 \\ t & 0 \\ 0 & t \end{bmatrix}}_{\text{control matrix}} \begin{bmatrix} a_x^{(t-1)} \\ a_y^{(t-1)} \end{bmatrix} + w_{t-1} \tag{2}$$

2 Conclusion