

Kalman Filtering Tutorial

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Abstract:

In many applications, it is desirable to estimate a state (e.g. strain, acceleration, temperature) that cannot be directly measured. In such applications, what's known as an "observer" is designed to assimilate measured data with a dynamic system model to produce an estimate of the immeasurable system states. A specific example would be estimating the strain at some position in a wing, when only acceleration measurements at the fuselage are available. For this tutorial, a control systems oriented overview of observers in general and Kalman filters specifically will be discussed. Theoretical foundations will be covered, and several examples will be worked. Extensions to nonlinear systems (a.k.a. the extended Kalman filter) will also be discussed, with hardware demonstrations, if time permits. Attendees are encouraged to bring their own examples of applications that require or could benefit from state estimation.