Filter is usually used to refer to system that is designed to extract information about a prescribed quantity of interest from noisy data. In particular, estimate the value taken by some random variable given the observation of some other random variable. With this aim, for instance Kalman filter, finds applications in many diverse fields: industrial processes, communications (Digital communication and signal processing), radar, sonar, navigation, spacecraft, seismology, biomedical engineering, and financial engineering among others.

The Kalman filter is implementable in the form of an algorithm for a digital computer, which was replacing analog circuitry for estimation and control at the time that Kalman filter was introduced. This implementation may be slower, but it is capable of much greater accuracy than had been achievable with analog filter. The Kalman filter does not require that the deterministic dynamic or the random process have stationary properties, and many application of importance include non-stationary stochastic processes. It is compatible with the state-space formulation of optimal controller for dynamic systems. It caters for the dual properties of estimation and control for systems. The Kalman filter provides the necessary information for mathematically sound, statistically-based decision methods for detecting and rejecting anomalous measurement.

In this paper we discuss the basic methodology for solving state space system. In particular, we discuss the Kalman filter in the context of Bayesian technique.

Download the complete presentation here.