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State prediction and parameter identification in stochastic linear State-Space models with time-variant parameters

F. Öztürk

Ankara University, Ankara, Turkey, ozturkf@ankara.edu.tr

Abstract

The Kalman filter is an efficient recursive filter that estimates the internal state of a Linear Dynamic System from a series of noisy measurements. It is used in a wide range of engineering and econometric applications from radar and computer vision to estimation of structural macroeconomic models. Generally, parameters in the state equation have known static values, which are some natural constants related to phenomena under study. When there exist unknown, time-invariant state parameters, they must be identified. This problem can be solved by Kalman Filter via state augmentation. What can we do when some parameters in the state equation are unknown and time-variant. When the dynamic underlying the parametric variation is a known function of time, then it can be integrated with the state dynamic, simply by augmentation. What can we do when some unknown state parameters appear randomly from a known static distribution. This study dwell on the problem of state prediction and identification of unknown time-variant parameters.

Key Words: State-Space Model, Estimation, Prediction, Kalman Filter.

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