INSTITUTUL DE MATEMATICĂ "SIMION STOILOW" AL ACADEMIEI ROMÂNE

Conferința lunară

On the optimal filtering of signals generated by linear systems subjected to multiplicative and additive white noise perturbations. An overview

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Abstract: The filtering is one of the important problem in control field, signal processing, comunication, etc. In a standard setting, a filtering problem ask for the estimation of a unknown signal z(t) generated by a dynamical system **G**, under the assumption that only the values y(.) of another signal generated by the same dynamical system are available for measurements. This topic was developed starting with the works of Hopf and Wiener in the 1940's for military applications, continuing with the famous results of Kalman and Bucy at the beginning of 1960's. The main disadvantage of the Kalman filter is that for the designing of its feedback gain the perfect knowledge of the mathematical model of the dynamical system is required. This fact is not possible if the dynamical system under consideration is affected by unpredictable external disturbances.

A reliable description of this type of phenomena may be obtained by including some multiplicative white noise perturbations in the mathematical model of the system under consideration. In this case, the mathematical model of the dynamical system **G** is described by a system of Ito differential equations in the continuous time framework or a system of difference equations with multiplicative white noise perturbations in the discrete time case.

In the case of signals generated by dynamical systems described by Ito differential equations or difference equations with state multiplicative white noise perturbations, the standard Kalman filter doesn't provide acceptable results. In the same time, the stochastic version of the Kalman filter cannot be used because its implementation requires the reproduction of the white noise which affects the considered dynamical system.

In this talk I'll provide an overview of the main approaches of the designing of the optimal and implementable filters which are working well in the presence of the state multiplicative white noise perturbations in both discrete time and continuous time framework.