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Review of the Dissertation Thesis of Ing. Peter Matisko

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Introduction

This report is commissioned by The Committee for Defence of Dissertation Theses in Control Engineering and Robotics at Faculty of Electrical Engineering, Czech Technical University in Prague. My task is to provide feedback on

- to what extent the subject of the thesis is relevant to current needs of the scientific community,
- to what extent the main objectives of the work have been fulfilled,
- to what extent the methods used in the thesis have been appropriate,
- what the main results and contributions of the work are,
- to what extent the work is important for the further development of science,
- whether the thesis satisfies conditions of a creative scientific work.

Relevance to current needs of the scientific community

Kalman filters are a fundamental tool in estimation and control. In order to tune the filter the engineers need a dynamical model including a stochastic noise description. Hence, this is a most relevant problem in control engineering and robotics.

The main objectives of the work

The main objective of this thesis is to estimate the stochastic properties of controlled systems. In particular, optimality tests for the Kalman filter, estimation and lower error estimation bounds of the noise covariances and detection of colored noise.

The main methods of the work

The thesis is mainly theoretical with numerical simulation evaluations. It would have been of interest to evaluate the methods on real industrial data.

The main results and contribution of the work

The main outcomes of this thesis are two reviewed and accepted journal publications, and three solid conference papers. This confirms that the work is of good international standards. The thesis is extremely well written!

The importance for the further development of science

I find the connection to the state of the art of covariance matrix estimation in statistics and signal processing somewhat missing. For example Professor Petre Stoica at Uppsala University, Sweden, has been very active in the area of the thesis and his book on Spectral Analysis of Signal contains a lot of very useful Cramer Rao Bounds results, for example the Slepian- Bang Formula (Appendix B, Equation (B3.3)), which I think is related to Equation (6.36) in the thesis. This would be a fruitful area for further work.

The conditions of creative scientific work

The applicant has been first author of all publications and proved good ability of creative scientific work.

Final Recommendation

The author of the thesis provided to have the ability to perform research and to achieve scientific results. I do recommend the thesis for presentation with the aim of receiving the Degree of Ph.D.