Estimation of Models with Uniform Innovations and its Application on Traffic Data

[1]Pavelková Lenka

The contribution summarizes the results achieved by the author in the field of developing of a linear uniform state model (LU model) and its estimation.

The main motivation of this research was the search for a model that is both easily identifiable and suitable for the estimation of the bounded quantities. By the LU model, the state and output innovations are considered to have the uniform distribution. The system states and parameters are estimated on-line with fixed memory on the sliding window. The sliding window as the alternative of the forgetting allows to catch the slow parameter changes. The MAP estimation of the LU model reduces to the linear programming.

The proposed approach provides the following advantages: (i) it allows estimation of the innovation range and (ii) it allows (without excessive computational demands) to respect ,,naturally" hard, physically given, prior bounds on model parameters and states, (iii) it enables the joint estimation of parameters, state, and innovation bounds, whereas the realistic hard bounds on the estimated quantities reduce the ambiguity of the model (arising from estimating a product of two unknowns), (iv) it provides an easy entry of of the partial knowledge on the parameters.

The illustrative example with traffic data will be presented. There, the length of the queues on the controlled intersection will be estimated.

References

[1] L. Pavelková, Approximate on-line estimation of uniform state model with application on traffic data, *Tech. Rep.* DAR 2008/2, ÚTIA AV ČR, Praha, 2008.

[2] L. Pavelková, Problem of state filtering in case of partially known system matrices, in *Proceedings of the 9th International PhD Workshop Information Technologies & Control. Young Generation Viewpoint*, Ljubljana, October 1-3 2008, pp. 1–6, Jozef Stefan Institute, accepted.

[3] M. Kárný, J. Böhm, T. V. Guy, L. Jirsa, I. Nagy, P. Nedoma, and L. Tesař, *Optimized Bayesian Dynamic Advising: Theory and Algorithms*, Springer, London, 2005.

[4] S. Boyd and L. Vandenberghe, *Convex Optimization*, Cambridge University Press, 2004.

[1]Institute of Information Theory and Automation, Adaptive Systems department, *pavelkov@utia.cas.cz*