# Approximate On-line Estimation of Uniform State Model with Application on Traffic Data

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The model predictive control (MPC) is an advanced method of process control [1]. The controller relies on the dynamic model of the process obtained by the system identification. The control quality depends strongly on the quality of the used model.

The linear models are often employed for the approximated description of the nonlinear controlled system due to the simplicity of the identification algorithms. However, this models have only limited validity. The nonlinear models describe the system generally much better than the linear ones but their identification is a nontrivial task.

The author aim is to present a model that is both easily identifiable and sufficiently precise. The state model with uniform innovations (SU model) introduced by author in [2] proposes an alternative to the standardly used linear state-space model with normal innovations that leads to the Kalman filter. By the SU model, the state and output innovations are considered to have the uniform distribution. This assumption implements the nonlinearity into the originally linear system. 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 SU model reduces to the linear eventually convex programming.

The main advantages of the proposed model are the simplicity of the estimation algorithm and the possibility to estimate both the parameters and states including the innovation boundaries.

The contribution will be concerned with the problem of the approximative solution of the on-line joint state and parameter estimation. An illustrative example with the traffic data will be given. Here, the length of the car queue on the signalized intersection is estimated.

## References

[1] E. F. Camacho and C. Bordons *Model Predictive Control*. Springer, 2004.

[2] L. Pavelková and M. Kárný and V. Šmídl, "Towards Bayesian filtering on restricted support," *Proceedings of NSSPW '06. Cambridge*, Nonlinear Statistical Signal Processing Workshop 2006. Cambridge (GB), 13.-15.09.2006.