

Model Predictive Control with Utilization of Elements of Artificial Intelligence

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Abstract:

Utilization of elements of artificial intelligence in predictive control is appropriate when controlled systems are hardly describable by classical mathematical models (transfer functions, state space models) and hardly controllable by classical methods (PID controllers). In this case a model of the controlled system in the form of neural network is appropriate. It is not then possible to formulate the quadratic programming problem when the predictor has the form of a neural network. Evolutionary algorithms must be then used in the optimization part of the predictive control. The work will be focused on optimization of computational complexity of neural networks and evolutionary algorithms namely by means of parallelization of computation.

Literature:

- [1] E. F. Camacho, C. Bordons, Model Predictive Control, Springer-Verlag, London, 2004.
- [2] M. Morari, J. H. Lee, Model predictive control: past, present and future. Computers and Chemical Engineering, 23, 1999, 667-682.
- [3] J. A. Rossiter, Model Based Predictive Control: a Practical Approach, CRC Press, 2003.
- [4] D. W. Clarke, C. Mohtadi, P. S. Tuffs, Generalized predictive control, part I: the basic algorithm. Automatica, 23, 1987, 137-148.
- [5] D. W. Clarke, C. Mohtadi, P. S. Tuffs, Generalized predictive control, part II: extensions and interpretations. Automatica, 23, 1987, 149-160.
- [6] DU, K., M. N. S. SWAMY. Neural networks in a softcomputing framework. London: Springer, 2006. 566 s. ISBN 1846283027; 1846283035; 9781846283024.
- [7] D. SIMON, Evolutionary optimization algorithms: biologically-Inspired and population-based approaches to computer intelligence. Hoboken, New Jersey: John Wiley & Sons Inc., 2013. ISBN 9780470937419; 0470937416.