Fuzzy predictive filtering in nonlinear economic model predictive control for demand response

The performance of a model predictive controller (MPC) is highly correlated with the model's accuracy. This paper introduces an economic model predictive control (EMPC) scheme based on a nonlinear model, which uses a branch-and-bound tree search for solving the inherent non-convex optimization problem. Moreover, to reduce the computation time and improve the controller's performance, a fuzzy predictive filter is introduced. With the purpose of testing the developed EMPC, a simulation controlling the temperature levels of an intelligent office building (PowerFlexHouse), with and without fuzzy filtering, is performed. The results show that the controller achieves a good performance while keeping the temperature inside the predefined comfort limits. Fuzzy predictive filtering has shown to be an effective tool which is capable of reducing the computational burden and increasing the performance level of the control algorithm.

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy, Department of Electrical Engineering, Center for Electric Power and Energy, Distributed Energy Resources, Energy System Management, University of Lisbon, Østfold University College
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Number of pages: 6
Pages: 1-6
Publication date: 2016

Host publication information
Title of host publication: Proceedings of 2016 IEEE Electrical Power and Energy Conference
Publisher: IEEE
ISBN (Print): 9781509019199
(2016 ieee Electrical Power and Energy Conference (epec)).
Keywords: Optimization, Buildings, Resistance heating, Computational modeling, Aerospace electronics, Predictive models, smart buildings, Branch-and-bound optimization, demand response, fuzzy predictive filtering, nonlinear economic model predictive control
DOIs:
10.1109/EPEC.2016.7771725
Source: FindIt
Source-ID: 2349602708
Research output: Research - peer-review › Article in proceedings – Annual report year: 2016