A MULTIPARAMETRIC PROGRAMMING ROLLING HORIZON SCHEDULING FRAMEWORK: APPLICATION IN A NETWORK OF COMBINED HEAT AND POWER SYSTEMS

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Introduction. We introduce a new approach for the reactive scheduling of production systems with uncertain parameters of bounded form. The proposed method follows a state-space representation for the scheduling problem, and relies on the use of a rolling horizon framework and multiparametric programming (mp) techniques. We show that by considering as uncertain parameters the set of variables that describe the state of the system at the beginning of the prediction horizon, we can effectively formulate a set of state-space mp problems that are solved just once and offline. In contrast to existing methods, the repetitive solution of a new mp after each disruptive event is avoided. The results of the parametric optimization are used in a rolling horizon basis without the need for online optimization. The proposed mp rolling horizon (mpRH) approach is applied in the scheduling of a network of combined heat and power (CHP) units.

Materials and methods. The salient features of the proposed approach are that we show how one can: (i) transform optimization problems into typical control problems (by using a state-space representation), (ii) avoid online optimization by using state-of-the-art multiparametric programming techniques, and (iii) derive the necessary set of mp problems. MATLAB (Parametric Optimization Toolbox - developed in CPSE) and GAMS software have been used.

Results and discussion. The mpRH was applied successfully in the scheduling problem of a network of CHP systems. As expected, negligible response times to disruptions were observed.

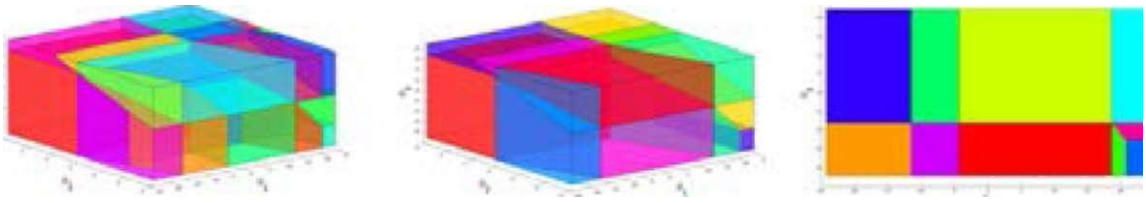

Figure 1. A representative example of the output of multiparametric programming.

Conclusions. In the proposed approach, we avoid online optimization, a fact that ensures the fast response to disturbances. Also, the control system structure is simpler, because the optimization component is absent. To date, the main limitation of the proposed method is the increased computational burden for solving big mp problems. It should be emphasized that mpRH is the first reactive scheduling approach based *completely* in offline optimization.

References.

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