Baldivieso-Monasterios, Pablo R.; Trodden, Paul A.
Coalitional predictive control: consensus-based coalition forming with robust regulation.
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Summary: This paper is concerned with the problem of controlling a system of constrained dynamic sub-
systems in a way that balances the performance degradation of decentralized control with the practical
 cost of centralized control. We propose a coalitional control scheme in which controllers of subsystems
 may, as the need arises, group together into coalitions and operate as a single entity. The scheme em-
 ploys a robust form of distributed model predictive control for which recursive feasibility and stability
 are guaranteed, yet – uniquely – the reliance on robust invariant sets is merely implicit, thus enabling
 applicability to higher-order systems. The robust control algorithm is combined with an algorithm for
 coalition forming based on consensus theory and potential games; we establish conditions under which
 controllers reach a consensus on the sets of coalitions. The recursive feasibility and closed-loop stability
 of the overall time-varying coalitional control scheme are established under a sufficient dwell time, the
 existence of which is guaranteed.

MSC:
93B45 Model predictive control
93C30 Control/observation systems governed by functional relations other than differential equations
 (such as hybrid and switching systems)
93A14 Decentralized systems
91A14 Potential and congestion games

Keywords:
model predictive control; decentralization; switched systems

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