

# Diagnosis of Multi-Robot Coordination Failures Using Distributed CSP Algorithms

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**Abstract.** With increasing deployment of systems involving multiple coordinating agents, there is a growing need for diagnosing coordination failures in such systems. Previous work presented centralized methods for coordination failure diagnosis; however, these are not always applicable, due to the significant computational and communication requirements, and the brittleness of a single point of failure. In this paper we propose a distributed approach to model-based coordination failure diagnosis. We model the coordination between the agents as a constraint graph, and adapt several algorithms from the distributed CSP area, to use as the basis for the diagnosis algorithms. We evaluate the algorithms in extensive experiments with simulated and real Sony Aibo robots and show that in general a tradeoff exists between the computational requirements of the algorithms, and their diagnosis results. Surprisingly, in contrast to results in distributed CSPs, the asynchronous backtracking algorithm outperforms stochastic local search in terms of both quality and runtime.