

Asynchronous Forward-Bounding for Distributed Constraints Optimization

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Abstract. A new search algorithm for solving distributed constraint optimization problems (*DisCOPs*) is presented. Agents assign variables sequentially and propagate their assignments asynchronously. The asynchronous forward-bounding algorithm (*AFB*) is a distributed optimization search algorithm that keeps one consistent partial assignment at all times. Forward bounding propagates the bounds on the cost of solutions by sending copies of the partial assignment to all unassigned agents concurrently. The algorithm is described in detail and its correctness proven. Experimental evaluation shows *AFB* outperforms synchronous branch and bound by many orders of magnitude, and reveals a phase transition as the tightness of the problem increases. This demonstrates that asynchronous forward bounding has an analogous effect to the phase transition that has been observed when local consistency maintenance is applied to MaxCSPs.

Key Words: Distributed Optimization, Constraints, Distributed Search