

Asymmetric Distributed Constraint Optimization

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Abstract. The standard model of distributed constraints optimization problems (DCOPs), assumes that the cost of a constraint is checked by one of the agents involved in the constraint. For DCOPs this is equivalent to the assumption that each constraint has a global cost which applies to each of the participating agents and in other words that all constraints are symmetric. Many multi agent system (MAS) problems involve asymmetric constraints. For example, the gain from a scheduled meeting of two agents is naturally different for each of the participants. In order to solve Asymmetric DCOPs (ADCOPs), one needs to design algorithms in which all agents participating in a constraint independently check the gain for each of them. This naturally brings up the question of privacy, enabling agents to keep their cost (or gain) of constraints private, at least partially. The present paper presents search algorithms for ADCOPs which handle asymmetric constraints in a privacy preserving manner. New versions of Asynchronous Forward Bounding and of Synchronous Branch & Bound are proposed. In addition, two local search algorithms are presented in which agents negotiate moves prior to assigning values. All algorithms are empirically evaluated, and their performance in terms of run-time, network load and solution quality is presented.

Keywords: Asymmetric DCOPs, Distributed optimization