

Distributed Optimization for Cooperative Agents: Application to Formation Flight

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We present a simple decentralized algorithm to solve optimization problems involving cooperative agents. Cooperative agents share a common objective and simultaneously pursue private goals. Furthermore, agents are constrained by limited communication capabilities. The algorithm is based on dual decomposition techniques and appears to be very intuitive. It solves the dual problem of an artificially decomposed version of the primal problem, replacing one large computationally intractable problem with many smaller tractable problems. It returns a feasible solution to the primal problem as well as an upper bound on the distance between this solution and the global optimum. Both convex and nonconvex examples are presented, the complexity of the convex case is analyzed, and the savings in complexity are demonstrated for both examples. Finally, by showing that there is no duality gap in these examples, optimality is certified.