

On the in-the-middle algorithm and heuristic for large scale integer programming and the max-sum problem

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We consider a very simple algorithm to solve large scale 0-1 integer linear programs - and a simple heuristic to encourage convergence to an integer solution. These algorithms have been extensively used for solving large integer optimization problems in airline scheduling applications, and we give some background and describe this application.

We show how to adapt this linear programming based approach to the max-sum problem, how different kinds of efficient constraint updates can be designed, and basic notions of consistency. We further discuss the close relationship between these algorithms and other algorithms such as max-sum diffusion, generalized iterative scaling and the max-sum algorithm.

We finally discuss fundamental modelling and benchmarking issues, and how to combine linear and max-sum constraints in the same problem.