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Multistage deterministic optimization problems: hardness and approximability compared to static analogues

We review the recent results for the multi-stage deterministic problems introduced by Gupta et al. and Eisenstat et al., both in ICALP 2014. We are given a discrete time horizon and a set of instances of a combinatorial optimization problem, one for each time step. It is required to find a sequence of solutions, one solution per instance, optimizing the quality of the solution at each time step and stability (moving costs or profit) between solutions at successive time steps. For a sequence of solutions of a minimization multistage problem, the service cost is defined as the sum of the cost of the solutions of each individual instance over the time horizon, while the moving cost is defined as the sum of the costs induced by changing the solution at successive time steps of the time horizon. The goal is to find a sequence of solutions minimizing the sum of the service cost and the moving cost.