Exercises for Algorithmic Game Theory

http://www.mpi-inf.mpg.de/departments/d1/teaching/ss11/AGT/

Assignment 6 Deadline: Fr 27.5.2011

Exercise 1 Greedy mechanisms for single-minded bidders

Consider variants of the greedy mechanism presented in class, where agents are sorted differently, and the payments are adjusted accordingly (payments are still critical). Explain why these variants do not perform as well as the presented mechanism, and explain what exactly is the problem with each of these modifications. Give (small) examples where appropriate.

a) sort agents by decreasing valuation

b) sort agents by increasing size of their desired subset

c) sort agents by decreasing order of $\frac{v_i^*}{|S_i^*|}$

Exercise 2 Double-minded bidders

Consider agents that are interested in two possible subsets. Explain why each of the following attempts to get a polynomial-time truthful mechanism with a good approximation ratio fail, and what exactly goes wrong.

Player $i$ wants to have either subset $S_{i1}^*$ at price $v_{i1}^*$, or subset $S_{i2}^*$ at price $v_{i2}^*$.

a) Use the sorted order from the mechanism for single-minded bidders, but list each player twice (for both of its desired subsets). Apply the greedy mechanism, skipping any player that is already in the set of winners $W$.

b) From the list under a), remove every second occurrence of an agent, so that each agent is listed only once. Now apply the greedy mechanism.

c) Create an instance of a single-minded bidder auction for every possible set of choices of the double-minded bidders. Run every auction and use the one with the highest social welfare.