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9th Exercise sheet for Advanced Algorithmics, Summer 17

Hand In: *Until Wednesday, 28.06.2017, 12:00 am, hand-in box in 48-4 or via email.*

Problem 22

30 points

Consider the following problem P:

Input: Digraph $G = (V, E)$.

Solutions: Acyclic spanning (but not necessarily connected) subgraph $G' = (V, E')$ of G.

Goal: Maximise $|E'|$.

And furthermore the algorithm A:

1. Shuffle V, i.e., draw uniformly at a random a total order $\prec$ on V.
2. Flip a fair coin C.
3. Depending on C do:
   - If $C = 1$ use all *forward* edges (w. r. t. $\prec$), i.e., E' consists of all edges (u, v) with $u \prec v$.
   - If $C = 0$ use all *backward* edges, i.e., E' consists of all edges (u, v) with $v \prec u$.
4. return (V, E').

Show that A is a randomized 2-expected approximation for P.

Problem 23 (postponed to next sheet!)

30 points

Due to a problem with the algorithm presented in class, this problem is postponed to next week.

Prove Theorem 5.8:
`greedyMaxCut` is a (deterministic) 2-approximation for Max-Cut.