Practicals for Introduction to Approximation and Randomized Algorithms

WS2324 - 3. practical

1 Trading

A trader is trying to make as much money as possible by transporting goods. The budget is 10 000 000 Kč and the maximal weight of the load is 1000 kg. Try and design a linear program.

Material	Price per kilo	Profit per kilo
Gold	100 000	100
Silver	14 000	200
Cowry	4000	150
Cocoa	700	10

2 More linear programs

Formulate linear programs for the following problems:

- Shortest s-t path

- Maximal s-t flow

3 ILP

Formulate an integer linear program for load balancing on identical machines.

HW5: Maximal k-cut

For a given graph, partition the vertices into k (disjoint) partitions such that the number of edges connecting vertices from different partitions is as large as possible. The goal is to get a deterministic $(k-1)/k$-approximation algorithm.

Hint: Start with a randomized algorithm for 2-cut.

HW6: Messages on a cycle

We have a ring topology network with n computers and need to send messages between them without overloading any link.

We are given the number of computers n, number of messages m and a list of m pairs (s_i, t_i) which tells us that the i-th message is to be sent from computer s_i to computer t_i.

For each message decide which direction ("clockwise or anti-clockwise") is should be sent so that the maximum number of messages sent over any link is as low as possible. The goal is a deterministic 2-approximation algorithm.

Information

- There will be ten homework tasks in total, each worth four points.

- You have two weeks to solve it.

- You need at least 25 points to pass.

- Submit homework via Owl.

Link: `https://kam.mff.cuni.cz/owl/c/zs2324/apxr/`
Enroll token: 6de8d9714087