ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Distributed Computing Group

Diploma Thesis "Min Max Stretch Trees"

This document describes the subject and the general time schedule of the diploma thesis of Philipp Boksberger in the summer term 2003. Adaptations or changes may be done in accordance with the advisors. The indicated times are rough guide lines and may deviate from the actual times.

Subject:

Suppose we are given a graph G and a corresponding spanning tree T. The stretch of T with respect to G is defined as the length of the longest path on T connecting the endpoints of an edge of G. In general, finding a spanning tree with minimum stretch is NP-hard. Therefore we are interested in approximation results. It seems that even this is a hard problem; no non-trivial approximation algorithm (approximation ratio smaller than $O(n)$) is known for general graphs. The subject of this thesis is to develop approximation algorithms and maybe lower bounds for the minimum stretch tree problem for a number of special graphs.

Time Schedule:

1) Try to solve the problem for (connected) sub-graphs of the rectangular $m \times n$ grid. [4W]

2) If you succeeded in 1): Try to generalize your result to other graphs. [6W]
   If you did not find an approximation algorithm in 1): Try to simplify the graph model such that the problem becomes solvable / Try to solve the problem for other special graphs.
   (You should include unit disk graphs (general, bounded degree, $\Omega(1)$) in your considerations; they often feature simple solutions and they are interesting for our research in mobile ad-hoc networks)

3) Search the literature for related work (most of the related work has been done by David Peleg and his students). [1W]

4) Finally you have two write two documents: [6W]
   a) A report (30 to 50 pages, English or German) which informs about your work and your results. This report should also include a critical view on your work.
   b) A research report (10 pages, English) which summarizes your results in a scientific, compact paper-like form.

General:

- Independent working is expected.
- A possibility to work in the HRS is provided. It is also possible to work at home.
- Two presentations have to be done, one after about two months, the other one at the end of the work.
- At least one meeting with Fabian per week.

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