Chair for Algorithms
and Data Structures
Prof. Dr. Hannah Bast
M. Brodesser/E. Sawin

Efficient Route Planning
SS 2012

`http://ad-wiki.informatik.uni-freiburg.de/teaching`

Exercise Sheet 4

Submit until Wednesday, May 23 at 4:00pm

Exercise 1 (10 points)

Implement the Arc Flags algorithm, restricting yourself to queries with targets in *a single rectangular region only*. For the Saarland dataset use the latitude-longitude rectangle [49.20..49.25] × [6.95..7.05] (Saarbrücken + surroundings), for BaWü use [47.95..48.05] × [7.75..7.90] (Freiburg + surroundings).

As usual, consider the implementation advice given in the lecture and the design suggestions linked from the Wiki.

Exercise 2 (4 points)

For both of our OSM graphs, run the Arc Flags algorithm for 100 random queries. For each of these queries, the target should be a random node from the rectangular region from exercise 1. The source should be an arbitrary random node.

As usual, report your results in a row on the table linked from the Wiki. In particular, report the average query time, the number of settled nodes, and the time needed to precompute the arc flags.

Exercise 3 (4 points)

Write the coordinates of the visited nodes from one of your queries from exercise 2 to a CSV file, upload it to Google Fusion Tables, and visualize it on a map. Put a link to that map on the Wiki, in your row of the table from exercise 2. Also see the explanation there of how to put that link.

Exercise 4 (2 points)

As usual, commit your code to our SVN and check that everything works on Jenkins, and also commit a text file *feedback-exercise-sheet-4.txt* where you briefly describe your experiences with this exercise sheet and the corresponding lecture.

Exercise 5 (0 points, good exercise for exam preparation)

Prove by induction (over the iterations of Dijkstra's algorithm) that the parent pointers, as described in the lecture, indeed form a *tree* rooted at the source node s. Along with that, prove that for each node u in that tree, the path from the root s to u in that tree is indeed a shortest path from s to u.