Institut for Matematik & Datalogi
Syddansk Universitet

January 31, 2008
JBJ

DM201: Graph algorithms with applications — Weekly note 2

Important information:

- Classes are tuesdays 8-10 and thursdays 14-16. We start on January 29. There is an error in the schedule on the web: the thursday class is in each of the following weeks 5-9, 11, 15-17, 19-21. **AND** it is indeed thursdays and not fridays as was announced on the faculty's page (it is corrected now).
- The weekly note will be available each thursday after the classes. It will contain the following information.
  - What material has been covered since the last weekly note.
  - Material for the next week including excercises.

January 29-31, 2008: We recalled basic structures in graphs and digraphs and looked at hamiltonian paths and cycles in special classes of digraphs (including tournaments), euler tours in (di)graphs, strong orientations of graphs, the 2-SAT problem etc. We then covered shortest paths in digraphs including several applications and the Bellmann-Ford as well as the Floyd Warshall algorithm.

February 5, 2008:

- Longest paths in acyclic digraphs with an application to project scheduling. (J) pages 72-76.
- Hamiltonian paths and cycles in semicomplete multipartite digraphs (we focus on extended semicomplete and semicomplete bipartite digraphs. (BG) pages 246-248, 250-253.

Exercises February 5, 2008:

- Show how to obtain an $O(n^2)$ algorithm for finding a hamiltonian cycle in a strongly connected tournament. Hint: first find a hamiltonian path and the convert this into a hamiltonian cycle (which we know exists).
- Recall that an oriented graph is a digraph with no 2-cycles and an in-tournament is a digraph with the property that if $u \to w$ and $v \to w$ are arcs, then there must also be an arc between u and v (in one of the two directions). Show how to decide in polynomial time whether a given undirected graph G can be oriented as an in-tournament by formulating the problem as an instance of 2-SAT. Hint: make an arbitrary orientation D of G and make clauses for each violation of the in-tournament condition in D,
- (BG) 1.62,1.83.

February 7, 2008 Spanning trees, Matroids and the greedy algorithm. (J) chapter 5.1-5.5.