Institut for Matematik og Datalogi
Syddansk Universitet

November 1, 2006
JBJ

DM19 – Fall06 – Weekly note 8

Stuff covered November 1, 2006

Section 34.1. I also gave a number of examples of problems which are polynomially solvable where a seemingly small change of the problem results in a problem that is NP-hard.

Exercises November 7, 2006

- 34.1-3,34.1-5,34.1-6.
- The problem 2-SAT was defined at the lecture. At the home page you will find a set of notes in which it is proved that 2-SAT is in $\mathcal{P}$. You should discuss these notes and prove the various lemmas on the blackboard.
- A digraph is an **in-tournament** if whenever u, v, w are distinct vertices and $u \to w$ and $v \to w$ are arcs then there must be an arc between u and v (the direction is not important). We say that a graph G can be **oriented** as an in-tournament if we can assign an orientation to each edge of G so that the resulting digraph D is an in-tournament. Define the problem **IN-TOURNAMENT_ORIENTABLE** as follows. The input is a graph G and the output is 1 if G can be oriented as an in-tournament and 0 otherwise. Show how to formulate this problem as an instance of 2-SAT. That is, you must find a way of making a formula for a given graph G so that this formula is satisfiable if and only if G can be oriented as an in-tournament. Also consider the complexity of this transformation. Is it polynomial? Hint: consider a reference orientation D of G. Make a variable x_i for each arc a_i of D and let $x_i = 1$ mean that you keep the orientation whereas $x_i = 0$ should mean that you reverse the orientation. Now construct a set of clauses that will force all violating triples u, v, w to be corrected.

Lecture November 8, 2006

Chapter 34.2-34.3 plus part of 34.5. Part of 34.4. will be replaced (next time) by pages 314 and 352-359 from papadimitriou and Steiglitz in the DM19 notes).