Übungsblatt 8

Abgabe: Dienstag, 26.06.07 bis 13 Uhr

Exercise 1   CNF, Resolution   (30 Points)

Minesweeper is a well known computer game played with a rectangular grid of N squares and M mines scattered among them. Initially all the squares are covered so that one cannot see where the mines are. Any square may be probed by an agent; instant death follows if a mine is probed. Minesweeper indicates the presence of mines by revealing, in each probed square, the number of mines that are directly or diagonally adjacent. The goal is to have probed every unmined square. For instance, here is a board after two squares were stepped on:

The following diagram shows a placement of mines that would result in the counts shown above.

Another possible action is to mark a square as having a mine. If all the mines are marked and all the other squares stepped on, the agent reached its goal.

For the following problem, we will assume we have a very small board, with three rows and only one column.

a) [7 pts.] Express the following in propositional logic:

1. If square (2,1) has a count of 1 then square (1,1) does not have a mine and square (3,1) has a mine or square (1,1) has a mine and square (3,1) does not have a mine).

2. Square (2,1) has a count of 1.

3. Square (1,1) does not have a mine.

b) [8 pts.] Prove that square (3,1) has a mine using only equivalence or derivation rules.

c) [5 pts.] Convert a.1 above to **CNF (Conjunctive Normal Form).**

d) [10 pts.] Use your answers to b and a.2 and a.3 to prove that square (3,1) has a mine, using only resolution.