

Assignment 3

Due Date: Nov 9, 2012

Assignment Description:

Minesniffer is a variant of the popular Minesweeper game. The Minesniffer game consists of an $N \times M$ board of cells (N rows and M columns). Each cell may potentially hold one mine. The task at hand is to locate all the cells with mines. Hints to locate them are available in cells that do not have mines. Specifically the cells without mines will be labeled with either a numeric value between 0 and 8 or by "NH" meaning it doesn't have any hint that is relevant to sniff out the mines. The numeric value in a cell in the $(i,j)^{\text{th}}$ position of the board denotes the number of mines in cells adjacent to (i,j) . Cells adjacent to the cell at (i,j) are those bordering it on its left, right, above, below and the corners. Cells where a mine may be located are labeled "X". Here's an example:

1	2	2	1	NH
1	X	X	1	NH
1	2	2	1	NH

(i,j) means the i^{th} row and j^{th} column cell at row i and column j . Assume that the row numbers increase from bottom to top and column numbers increase from left to right. The cell at $(1,1)$ has 3 adjacent cells: $(1,2)$ is labeled with the value 2; $(2,1)$ is labeled with the value 1; $(2,2)$ is labeled X. The 1 in $(1,1)$ means that a mine is located in one of its 3 adjacent cells.

Task 1: You will take a board configuration such as the one shown in the example above and determine if there is a mine located in cells marked X. In particular the outcome will be one of True, False or ?

For the example above both the X's will be true meaning there is a mine in both these cells. On the other hand in a 2×2 board with cells at $(1,1)$, $(2,1)$, $(1,2)$ and $(2,2)$ labeled 1,1,X, X respectively, both the X's will be ? since there could be a mine either in $(1,2)$ or $(2,2)$.

You should take the board configuration and reduce it to a sentence in Propositional Logic. This sentence should be transformed to clause form and propositional resolution should be used to determine the truth values for all the X's.

There is java code for transforming PL sentences into clause form as well as for doing PL resolution in <http://code.google.com/p/aima-java/>. You are encouraged to use that code for this task.

Task 2: Do the same task using the XSB system.

The input to your program will be a file formatted as follows:

1. The first line will have two integers that fix the values for N and M in that order.
2. The next N lines describe the board configuration – one per row.

So the example shown in the table above will be represented like this:

```
3,5
1,2,2,1,NH
1,X,X,1,NH
1,2,2,1,NH
```

We will provide you with some test data.

Notes:

1. Your program should be written in Java.
2. You can work in pairs of two

Submission:

On or before due date you should email to the TA a zip file containing:

- Source code with good documentation
- A report with a critical analysis of the Java vs XSB implementation methods

You have until midnight of the due date to email the zip file. You should sign up for a demo with the TA. On the demo date you will be given your source files that you should compile and demo to the TA. Your program will be tested on different instances of the problem.