Prelimary description: Minesweep

2D1380 Artificial Intelligence - project

(Max grade attainable with this project - 5)

Your team is trying to get a very lucrative deal to develop a system for clearing mine fields. However, before you are given access to the real hardware you have to prove yourself in simulation. The strategy you come up with will be tested in the classical minesweep game for which a typical environment is shown in Figure 1. In this game all squares are initially unknown and you have to open them one by one. The game is over if you open a square with a mine under. You will be evaluated on how many squares you managed to open without being blown up. When you open a square that is next to a mine you will be told how many mines are in the neighboring squares but not where they are. Your task is to use the knowledge you have gained in the AI course to come up with a strategy to clear the minefield in a good way, i.e. without getting blown up.

Since when opening the first square there is no information available and an explosion at this point can not be blamed on your AI system, the game will be considered startd after the first non-mine square has been opened. Your team will get one point per cleared square. If you trigger a mine it will cost you c_{dead}. You also have the option to use a new piece of hardware the allows you to peek at the content of a square before deciding what to do. This will cost you c_{peek} and you can do this only once, but it will give you the same information as if you had opened the square but you do not risk getting killed. At ny time you can decide to stop and collect the points that you have earned so far.

As a final step in the course we will let the agent play each other, 2-2 by letting one agent at a time make a move. The one that gets the most points wins. The players will get the information about a square that is opened by himself and another agent but only the agent that pays for a peek will get this info. Once an agent decides to stop it cannot continue again, since it would otherwise be possible to let the other agent play in solo in risky areas.

To evaluate the performance of your agent you can define minefield in files and play one at a time or in batch mode. The mine files have the following format

```
00000000000000000000000
00000000000010000000000
00000000010000000000000
00000000000000000000000
```

Here the “0” denote squares that are free from mines and “1” means that there is a mine in that place. There is no requirement that the area is square (number of rows and columns the same) but each row/column has the same length.

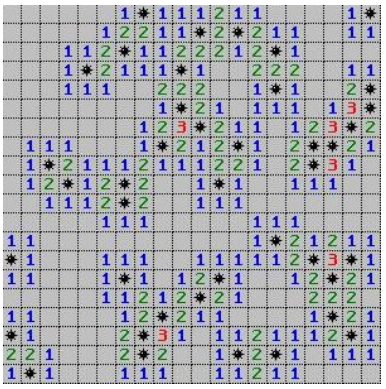

Figure 1: An example of a minefield with all information revealed. You have to open all squares without mines to win.

Software requirement

The system you develop should be able to communicate with the Minesweep server provided in source on the course home webpage. There is an interface for a MineAgent (MineAgent.java) that you can use as a starting point and the program MineClient.java that can connect and communicate with the server. You are free to implement your agent in any language as long as it can communicate with the Minesweep server.

Task

- Design and implement a strategy for minesweeping.
- Investigate how effective the strategy is for different amounts of mines, sizes of the environment, etc. What about the complexity?
- How does the cost for detonating a mine and peeking affect the strategy?
- How does the strategy change if you have another agent on the field?
- Gather statistics to support your claims about the effectiveness.
- What if you know before hand how many mines there are in the field? Would that change the strategy?
- What if the cleaning machine cannot fly around, i.e. you are only allowed to move to squares near to where you are standing[1]? How does this change the problem?

You will get access to a JAVA implementation that you can use if you wish as a starting point, but you are of course free to choose to write your own code from scratch if you prefer.

[1]The first square you can still choose freely