

Minesweeper AI Project

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For
CS-171
Introduction to Artificial Intelligence

World Generator Manual

The Minesweeper World File

If you'd like to create your own custom Minesweeper World, you can create a text file using the following format:

[rowDimension][space][colDimension]

[startingX][space][startingY]

[2D grid of board]

- “StartingX” and “startingY” represent the coordinates of the first tile that the world uncovers for you. This feature is designed to guarantee your agent will be safe on its' first move. When selecting starting tile, the tiles around it will always be safe, namely 0.
- The 2D grid should be a sequence of 0's and 1's. Columns are separated by a single space while rows are separated by a new line. 0's represent safe tiles while 1's represent tiles with mines. The bottom left-most tile should be interpreted as (1, 1).
- If your 2D grid does not contain a “0” such that the immediate neighboring tiles are also 0's, forming a 3x3 square of 0's, then your world will be considered invalid.

Using the Python script

There is a Python script “WorldGenerator.py” that you can use to easily generate a set of worlds. To run the script, issue the command:

```
python3 WorldGenerator.py [numFiles] [filename] [rowDimension] [colDimension] [numMines]
```

The arguments in square brackets are in that order and represent the following:

numFiles	- The number of files to generate
filename	- The base name of the file
rowDimension	- The number of rows
colDimension	- The number of columns
numMines	- The number of mines

Note that all arguments are required and have certain restrictions, which are listed below:

- (1) The minimum number of rows is 4.
- (2) The minimum number of columns is 4.
- (3) The minimum number of mines is 1.
- (4) The number of mines must also be less than or equal to $(\text{rowDimension}) * (\text{colDimension}) - 9$

If any of these conditions are not met, the script will not generate any worlds. Another thing to note is that you can only generate a set of worlds of the same dimensions. In order to generate worlds of different sizes, you need to rerun the script with different command-line arguments.

Using the bash script

Another way to generate worlds is to use the bash script. This script will automatically generate 1000 beginner worlds, 1000 intermediate worlds, and 1000 expert worlds. This script will be used to generate the tournament set of worlds and is a good simulation for your agent's actual performance in the tournament. You can easily change the script to generate a different number of worlds or worlds of different dimensions. You may also write your own bash script. To run the bash script, simply issue the command:

```
./generateTournament
```

There is also a separate bash script for generating “super easy” worlds. This script will be used to generate the tournament set of worlds for the first deadline. To run this script, simply issue the command:

```
./generateSuperEasy
```

Example

```
8 8
1 3
0 0 1 1 1 0 1 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1
0 0 0 0 1 0 1 0
0 0 1 0 0 0 1 0
```

will generate

8		2	2	0	1	1	1	*	*	*	2	*	1
7			0		1			2	3	2	2	1	1
0		0	0	0		0							
6			0		0			0	0	0	0	0	0
5		0	0	0	1	0		1	1	0	0	0	0
4			0		1			*	1	0	0	1	1
1		0	0	1		1							
3			0		1			1	2	1	2	2	*
2		1	2	2	1	*		1	2	*	3	*	3
1		*	0	*	1			*	2	1	3	*	2
2			3		3								
			-		-			-	-	-	-	-	-
2		1	3	1	*	2	2	3	4	5	6	7	8