**Minesweeper**

Minesweeper is a game…. Full details of the game can be found on Wikipedia …

**The Solving Algorithm**

A square’s “value” is the number of unflagged bombs around it (value = base number – surrounding flags).

The first rule is that, if a square’s value is equal to the number of hidden squares around it, then all of the hidden squares must be bombs and so they can be flagged.

A picture containing text, room

Description automatically generatedA picture containing graphical user interface

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The second rule is that, if a square’s base number is equal to the number of flags around it (i.e. its value is 0), then there are no more bombs around it and so all of the hidden squares around it can be cleared.

A picture containing text, scoreboard, first-aid kit

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*More Complex solving*

Although the first two rules are enough to allow the solver to make progress in the game, sometimes there becomes a point at which neither of those rules are applicable, and so some more complex analysis needs to be done.

A frontier square is a square that has been cleared but has at least one hidden square around it:

Table

Description automatically generated*The frontier squares are highlighted in blue*

For each frontier square we shall create a collection of all of the hidden squares around it. A single hidden square can be part of multiple collections. Once all of the collections have been created, we then link up all collections that share a hidden square, and use combinatorics to resolve the linked connections.

There are some cases which are completely unresolvable from a logical standpoint:

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In these cases we use the same collections algorithm, but take a probabilistic approach, finding which hidden squares are least likely to have bombs behind them, and then clearing those squares in order to get more information.

I have written these solving algorithms in python, along with the original game. You can play the original game, and at any point you can press H to show hints, or S to solve. Both the H and S keys only use the basic solving algorithm, if you want to use the complex solving algorithm, then hold down shift whilst pressing on either key.