Philip Kirwin

CMPT440

<p align="center">The Complexity of Minesweeper</p>

For this project, I intend to use a DFA to model the potential game states that can occur during a simplified version of the game "Minesweeper". A DFA can model this game very effectively given that each of the player's actions results in a new board state that makes it very obvious when the player has reached an accepting state, where the game is won, or an error state, where the player has clicked a mine and has lost. Given the great volume of possible board states that can occur in a standard game of Minesweeper, I intend to model especially small boards in order to demonstrate how much more complex games can get simply by a small increase in board size or volume of mines. These models will also be created from the perspective of the player, and thus assume no knowledge of the location of any mines. This way, the DFAs will be a more honest representation of how a player must make decisions and strategize in a typical game of Minesweeper. Each state will then advance based on the remaining possible moves and their possible results, either ending in an error state if the selected space contains a mine, an accepting state if the number of remaining spaces is equal to the number or mines on the board, or a continuing state if neither condition is met. It should thus be expected that increasing the number of spaces on the game board or the number of mines on the board will have a drastic effect on the number of potential board states.

I hope that with this project, I can demonstrate how well-designed Minesweeper is both as a game and as a general application. It is a deceptively simple game from the perspective of the user, but the underlaying ability to handle every potential decision of the user end up getting very complex relative to the size of the game board. As such, I hope that this project can be used

to demonstrate to software developers that their work should reflect the deceptive simplicity of Minesweeper. In other words, Minesweeper is an application that is very simple for users to interact use without having to understand its more complex mechanisms. Additionally, I hope that this project can grant users an appreciation of the inner workings of a seemingly simple software application, which would in turn grant them an appreciation for the much more massive applications that they interact with on a daily basis.