Appendix A: User Manual

Introduction

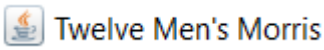
Twelve Men's Morris is a game that can be enjoyed by any skill level, as it is very easy to understand, but difficult to master. The software can be played with two human players, or the option to play against one of the many computer variations is available. There is also an option to pit the computer players against each other, to watch them compete and determine the winner. The purpose of this game is to showcase relatively new AI methods in a game where they have yet to be implemented, and to provide an accessible interface so that newcomers to the game of Twelve Men's Morris will find it easy to use.

System Requirements

- **Operating System:** Windows 7 or later
- **Java:** JavaSE-13 or later
- **RAM:** Minimum of 4GB (recommended 8GB)

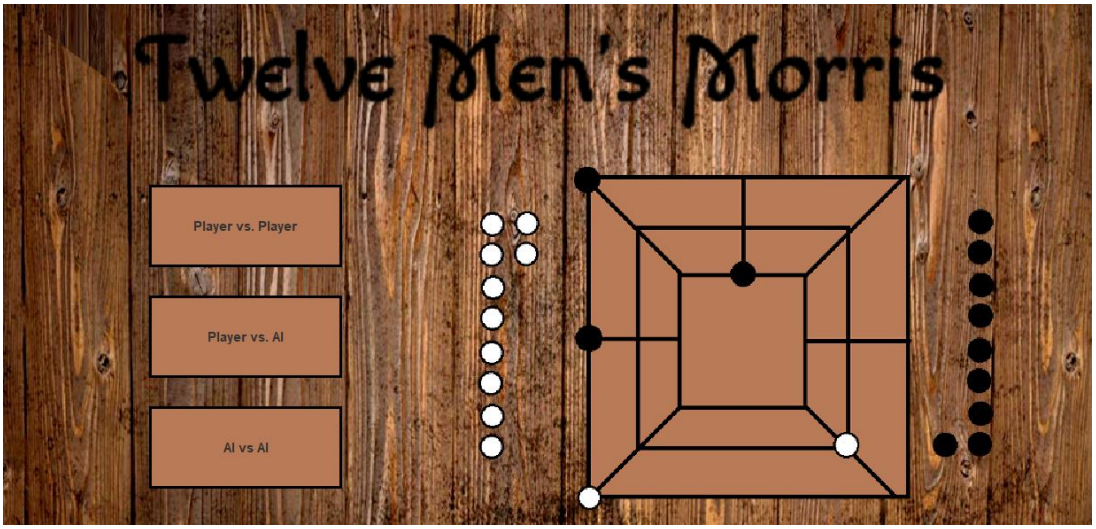
Installation Overview

To install and run the software, please extract the "Twelve Men's Morris Code" folder and locate "Twelve Men's Morris.jar" . This can be run simple by double clicking it, or by running it from the command line (no arguments are necessary). The main menu interface should now be visible. Please contact technical support if any problems occur (see bottom of document).

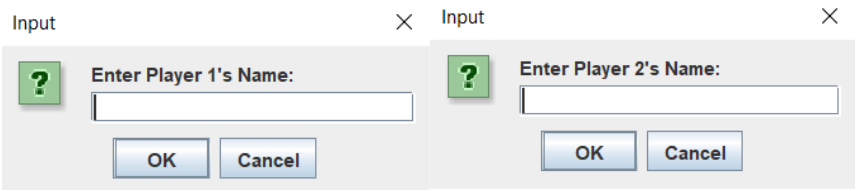


Starting the Game

The game will start with the main menu, where three options are available. Please select the game option required by clicking the relevant button.

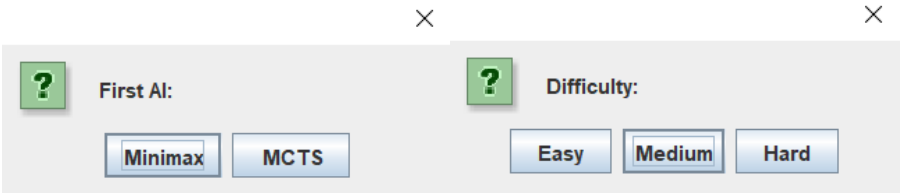


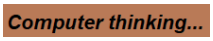
1. Selecting the "Player vs. Player" option will bring up the interface to enter the two names of the players that will be playing. Entering the two names will start the game between two human players.



2. Selecting the "Player vs. AI" option will update the interface to allow for the selection of the AI type, where there is a choice between Minimax and MCTS (Monte Carlo Tree Search). Minimax considers the next best few moves and tries to improve its position in the short term. MCTS may be easier at lower difficulties and is more interested in increasing its chances of winning in the long term.

3. Selecting the "AI vs. AI" option will bring up the interface to make the selection of both AI types, where the difficulty can be set for either.



After any of these options have been selected, the game screen interface will load. When the AI player is thinking of a move, the message 

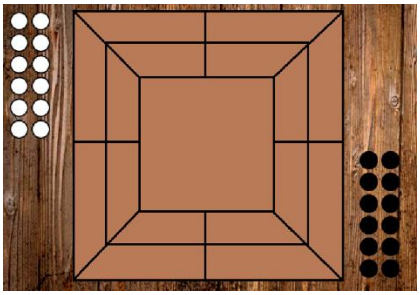
will be displayed on the board, where pieces cannot be placed until the AI is finished thinking.

This concludes the setup process of the game; the next section will discuss the rules and how to make moves using the interface.

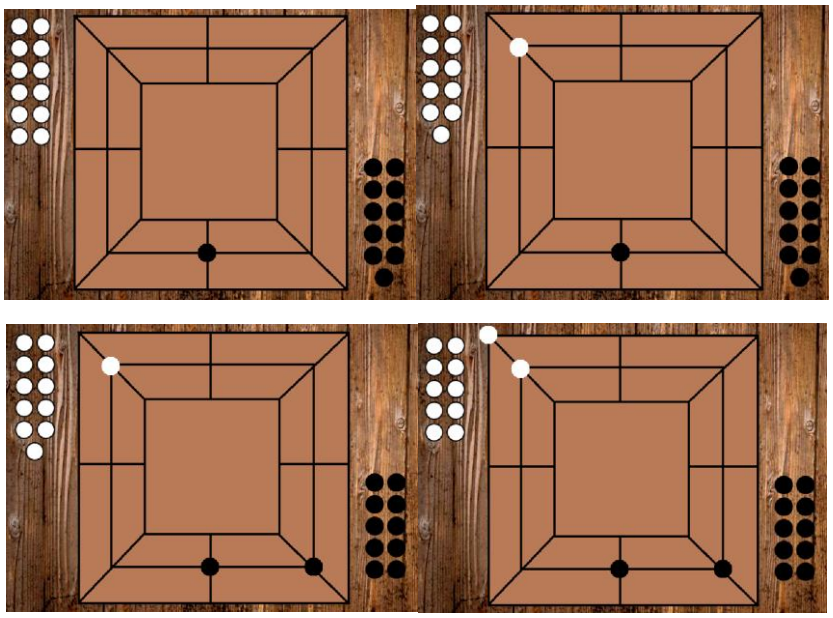
Game Rules

Each player in Twelve Men's Morris initially starts with 12 pieces each, with an empty board, where a player may be randomly selected to start. The current turn will be shown on the bottom right of the screen, e.g. 

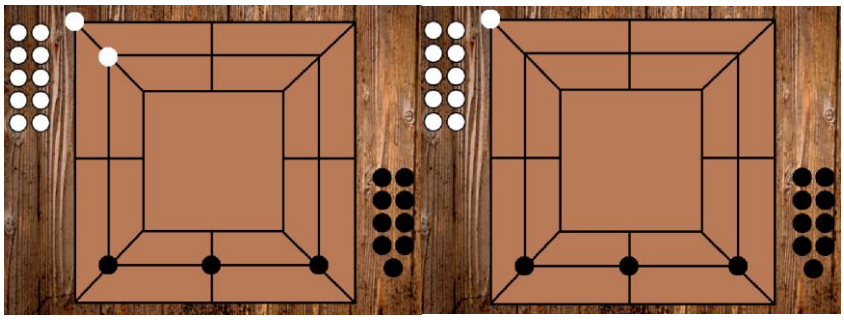
. The aim of the game is to reduce the opponent to 2 pieces, or to block all of their pieces, so that they are unable to move.



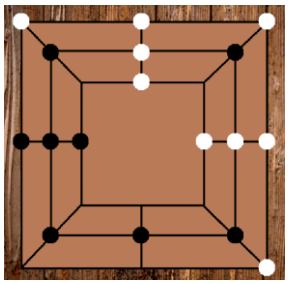
Twelve Men's Morris contains three phases; after a player is selected to start, the first phase begins; the "*placement phase*". The starting player may place a piece at any point on the board where lines meet, which allows for a total of 24 possible positions. A grey outline of a piece will be displayed whenever the mouse hovers over a valid piece position (only applies to human players). If black starts, the following sequence of moves might take place, where turns alternate after each move.



When black places their third piece in a row, it is called a **Mill**. Mills can be created in any direction, including diagonal, as long as there are three pieces in a line. Creating a Mill allows for removal of one of the opponent's pieces, which is now out of the game. If the piece to be removed is in an opponent's Mill, **it cannot be removed**, unless all other opponent pieces are in Mills. Black making a Mill might produce the following sequence of moves:



The placement phase continues until all pieces have been placed on the board. If no Mills were created in this process, and the board is full, the game is a **draw.** Otherwise, if there are empty positions on the board, the "*movement phase*" begins. An example of this is shown:



In the movement phase, players take it in turns to move their pieces adjacently, so long as there is an empty adjacent position to move to. For example, black may choose to make the following move, followed by white making its move:

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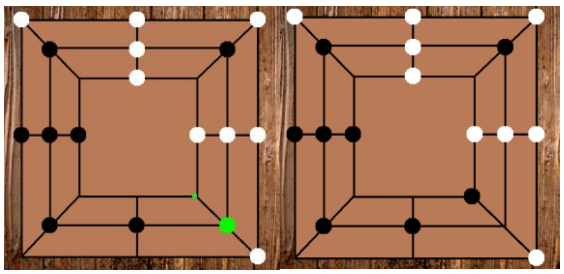

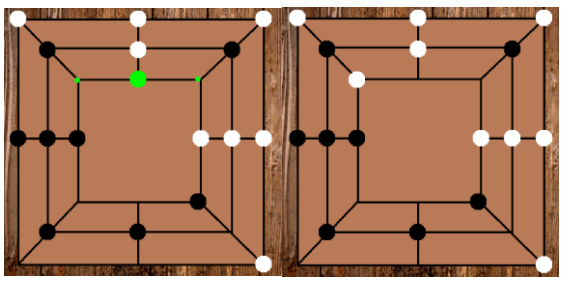

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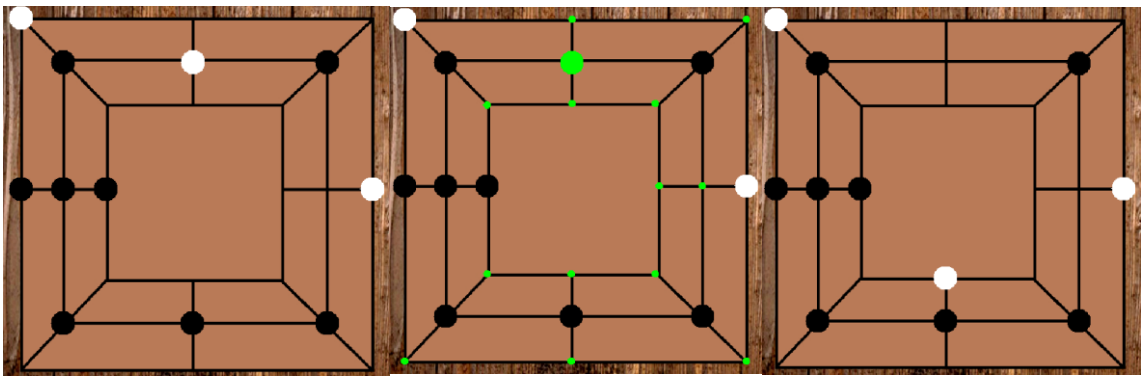
Players should attempt to create Mills, to try and reduce their opponent's pieces to two, or they should also attempt to block all of their opponent's pieces to win. Mills can be created and re-created, so a piece can be moved out of a Mill and moved back inside to allow for an additional piece removal. Players should play strategically to avoid the opponent creating of these configurations. If the game reaches a state where a player only has three pieces remaining, that player enters the "*flying phase*". Instead of moving pieces adjacently, the player is able to move any of their pieces to **any empty position on the board**, as a final attempt to come back from defeat:



Once a player has reduced the opponent to two pieces or the opponent is unable to move, that player will win, and the game will end.

In order to restart the game, simply close the game and run the software again.

Technical Support

Please contact **psyia1@nottingham.ac.uk** for any problems that occur during the installation / playing of the game.