

User Manual

Chess bot

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Glossary

Pawn - a chess piece of the smallest size and value. A pawn moves one square forward along its file if unobstructed (or two on the first move), or one square diagonally forward when making a capture. Each player begins with eight pawns on the second rank, and can promote a pawn to become any other piece if it reaches the opponent's end of the board.

Knight - represented by a horse's head and neck. It may move two squares vertically and one square horizontally or two squares horizontally and one square vertically. Each player starts with two knights on the first row on the b and g files.

Bishop - A piece that moves and captures along diagonals without jumping over intervening pieces. Each player begins the game with two bishops. One starts between the king's knight and the king, the other between the queen's knight and the queen. The starting squares are c1 and f1 for White's bishops, and c8 and f8 for Black's bishops.

Rook - A piece that moves any number of squares horizontally or vertically without jumping, and it may capture an enemy piece on its path; additionally, it may participate in castling. Each player starts the game with two rooks, one in each corner on their own side of the board.

Queen - the most powerful piece in the game of chess, able to move any number of squares vertically, horizontally or diagonally, combining the power of the rook and bishop. Each player starts the game with one queen, placed in the middle of the first rank next to the king.

King - the most important piece in the game of chess. It may move to any adjoining square as well as perform a move known as castling. If a player's king is threatened with capture, it is said to be in check, and the player must remove the threat of capture on the next move. If this cannot be done, the king is said to be in checkmate, resulting in a loss for that player. A player cannot make any move that places their own king in check.

Castling - a move in the game of chess in which a player moves their king two squares toward a rook on the same rank and moves the rook to the square that the king has crossed. It is the only move in chess in which a player moves two pieces in the same move. Castling may be done only if neither the king nor the rook has previously moved, the squares between the king and the rook are unoccupied, the king is not in check, and the king does not cross over or end up on a square attacked by an opposing piece. Castling can be done with either rook.

Enpassant - a move to capture a pawn without moving the pawn onto the captured pawn's square. For this move to be legal one, the capturing pawn must have advanced exactly three ranks to perform this move. Two, the captured pawn must have moved two squares in one move, landing right next to the capturing pawn. Finally, the en passant capture must be performed on the turn immediately after the pawn being captured moves. If the player does not capture en passant on that turn, they no longer can do it later. The capturing pawn is moved behind the captured pawn.

Check - When the King is directly under attack by a piece from the opposing side. Check is a condition that occurs when a player's king is under threat of capture on the opponent's next turn.

Checkmate - any game position in which a player's king is in check and there is no possible escape. Checkmating the opponent wins the game.

Stalemate - When the player can make no legal move and their king is not in check, resulting in a draw/tie.

1 Computer Chess

1.1 Usage Scenario

The user begins using the software, at which point, they are prompted to enter in which color they would like to play as. They enter in “white”, meaning that the computer opponent will play as “black”. The chessboard is displayed to the user on the screen with a representation composed of ASCII characters. The user makes their first move by entering “b2” when prompted for the piece’s position, and entering “b4” when prompted for the position they want to move the piece to. By entering these two positions, the user has moved the white pawn in position b2 two spaces forward to b4. Now the computer must make its move, determining where to go based on an algorithmical calculation. It moves the black pawn at e7 two spaces forward to e5. Play continues like this, switching between the user and computer, until the user has the computer’s king in checkmate, thereby winning the game.

8		bR		bN		bB		bQ		bK		bB		bN		bR	
7		bP		bP		bP		bP		bP		bP		bP		bP	
6																	
5																	
4																	
3																	
2		wP		wP		wP		wP		wP		wP		wP		wP	
1		wR		wN		wB		wQ		wK		wB		wN		wR	
		a		b		c		d		e		f		g		h	

Figure 1: Representation of the starting chess board.

1.2 Goals

The primary goal of this software is to provide the user with the ability to play a fully functional game of chess against a computer. With this goal in mind, the aim is to create an algorithm that quickly responds to players' moves with calculated moves of its own, creating a challenging but fair (and fun) game for the user.

1.3 Features

All of the features found in a traditional game of chess are implemented into this software. At the start of the game, players can choose which color they want to play as. From there, the user can move their pieces; these pieces each have their own way of traversing the chessboard depending on which kind they are. As in a physical game of chess, the pawn may move two spaces forward if it has not moved already, and one space forward if it has; the rook may move horizontally or vertically as long as the space is not occupied by another piece; the knight may move in an "L" shape: either two spaces horizontally and one space vertically, or two spaces vertically and one space horizontally; the bishop may move diagonally for as long as the space is not occupied; the queen may move in any of the eight directions (horizontally, vertically, or diagonally) as long as the space is not occupied; the king may move one space in any direction. In addition to these basic moves, castling and en passant are implemented. The computer is able to make the same moves with its pieces to provide a realistic chess experience. The game continues until a player wins by putting the opponent's king into checkmate. All of this is displayed to the user through an ASCII representation of the board and its pieces after every move is made.

2 Installation

2.1 System Requirements

1. Computer with PC hardware
2. Linux operating system

2.2 Setup and Configuration

1. Program comes in a tar.gz package named JTDAChess.tar.gz
2. Install the package and extract it
3. Unpack the archive and type make to start the program
4. ./JTDAChess to start the game

2.3 Uninstalling

1. Uninstall the program by typing rm JTDAChess in the terminal

3 Chess Program Functions and Features

3.1 Menu Options

The user is able to choose their side of the chess board.

Which side?								
1. White								
2. Black								
1								
You chose white								
8	bR	bN	bB	bQ	bK	bB	bN	bR
7	bP	bP	bP	bP	bP	bP	bP	bP
6								
5								
4								
3								
2	wP	wP	wP	wP	wP	wP	wP	wP
1	wR	wN	wB	wQ	wK	wB	wN	wR
a b c d e f g h								

Which side?								
1. White								
2. Black								
2								
You chose black								
1	wR	wN	wB	wQ	wK	wB	wN	wR
2	wP	wP	wP	wP	wP	wP	wP	wP
3								
4								
5								
6								
7	bP	bP	bP	bP	bP	bP	bP	bP
8	bR	bN	bB	bQ	bK	bB	bN	bR
a b c d e f g h								

Figure 2: Display of chessboard if user chooses white or black, respectively

If you decide to choose the white side the white pieces will face you while similarly for the black side, if you choose black the black pieces will be closest to you as well.

3.2 How to Play

The user will select a piece they want to move and input the pieces' start and end position. For example the user will type in e2, press the enter key, and then press e4 to move the pawn from position e2 to e4.


```
You chose white
Input the space of the piece you would like to move: e2
Input the space you would like that piece to move to: e4
```

8	bR	bN	bB	bQ	bK	bB	bN	bR
7	bP	bP	bP	bP	bP	bP	bP	bP
6								
5								
4					wP			
3								
2	wP	wP	wP	wP		wP	wP	wP
1	wR	wN	wB	wQ	wK	wB	wN	wR
	a	b	c	d	e	f	g	h

Figure 3: Example of how the user would choose to move a piece (red being the user inputs)

The computer opponent will then take its turn. The game continues until one player wins. At the end of the game the user will be presented with a text document of the chess moves that were played.

3.3 Outputting the text file of moves

After every game is completed a text document of the moves that were made during the game will be downloaded.

```
Moves White Black
1      e4      e5
2      kf3     kc6
3      ...     ...
```

Figure 4: Example of what the text document will look like

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Error Messages

You have made an illegal move. Please, make a different move.: This may occur when the player attempts to move a piece in such a way that is not allowed by the rules of chess. For example, if the player tries to move a pawn backwards, this error message may be displayed.

There is no piece you can control in that square. Please choose a different square.: This may occur when the player chooses a position for the initial square but that square has no piece or is attempting to move a piece of the opposite color. For example, at the start of the game White cannot move a black piece.

You have entered an invalid color. Please, enter “black” or “white”.:: This may occur when the player enters a color that is neither “black” nor “white”. For example, if the player tries to enter “chartreuse”, this error message may be displayed.

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