

EECS 22L: Chess Game User Manual

v2.0

Prepared by: Team rand()

Affiliation: UCI Henry Samueli School of Engineering

Developers:

Yongye Li

Mary Campbell

Arjun Sivakumar

Joseph Principe

Cristian Pina Bravo

Zijie Huang

Date:

April 17, 2023

Contents

Glossary	3
1 Computer Chess	8
1.1 Usage scenario	8
1.2 Goals	10
1.3 Features	11
2 Installation	11
2.1 System requirements	11
2.2 Setup and configuration	11
2.3 Uninstalling	12
3 Chess Program Functions and Features	12
3.1 Choosing sides	12
3.1.1 User input	12
3.1.2 Program output	12
3.2 Detailed description of adjustable difficulty levels	12
3.2.1 User input	12
3.2.2 Program output	12
3.3 Detailed description of undo/redo functionality	12
3.3.1 User input	12
3.3.2 Program output	13
3.4 Detailed description of move hints	13
3.4.1 User input	13
3.4.2 Program output	13
3.5 Detailed description of game timer	13
3.5.1 User input	13
3.5.2 Program output	13
Back matter	14

Glossary

- Check: A situation in which a player's king is under threat of capture on their opponent's next turn.
- Checkmate: A situation in which a player's king is in check and there is no legal move to remove the threat.
- Castling: A move to protect the king by having it move "behind" one of its rooks. The space between the king and the rook must be clear, and neither the rook nor the king can have moved in order for castling to be legal.
- Capturing: Any move that takes an opponent's piece.
- Promotion: A situation in which a player's pawn can be upgraded to another piece - except a king - when it has reached the other side of the board.
- Kingside Castling: Castling to the nearer rook. It is denoted by 0-0 in algebraic notation.



Figure 1: Before kingside castling

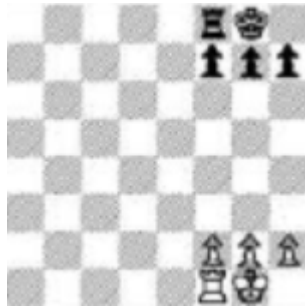


Figure 2: After kingside castling

- Queenside Castling: Castling to the further rook. It is denoted by 0-0-0 in algebraic notation.



Figure 3: Before queenside castling



Figure 4: After queenside castling

- En Passant: A move occurs when a pawn advances two squares forward from its starting position and lands beside an opponent's pawn. In this

situation, the opponent has the option to capture the advancing pawn by moving diagonally behind that piece. This capture must be done on the very next move, otherwise the en passant is lost.

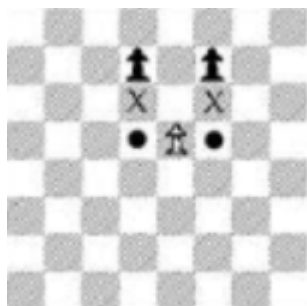


Figure 5: En Passant

- King: A piece that moves from its square to a neighboring square. Denoted as "K" in algebraic notation.

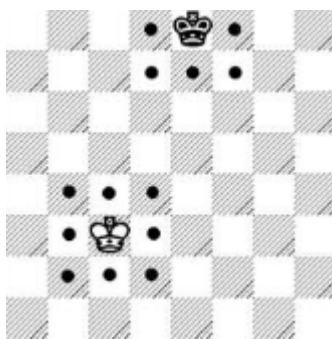


Figure 6: The King

- Queen: A piece that moves horizontally, vertically, and diagonally. Denoted as "Q" in algebraic notation.

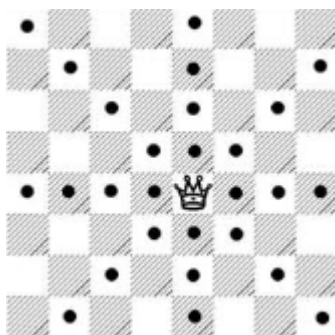


Figure 7: The Queen

- Bishop: A piece that moves diagonally. Denoted as "B" in algebraic notation.

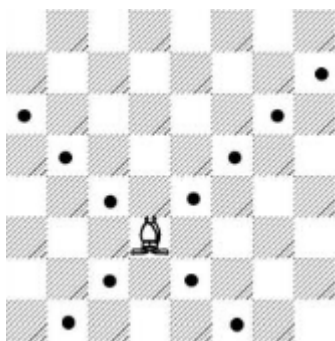


Figure 8: The Bishop

- Knight: A piece that moves in an "L-shape". Denoted as "N" in algebraic notation.

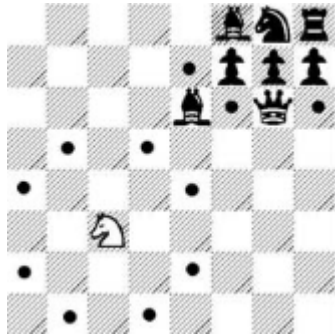


Figure 9: The Knight

- Rook: A piece that moves in its rank or file. Denoted as "R" in algebraic notation.

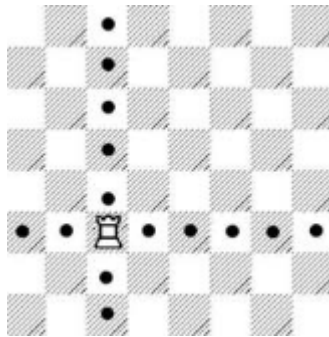


Figure 10: The Rook

- Pawn: A piece that moves one square straight ahead. Can move two squares as its first move. Can En Passant when it is three squares from where it started. Can promote when it has reached the other end of the board. Can be denoted as "P" in algebraic notation.

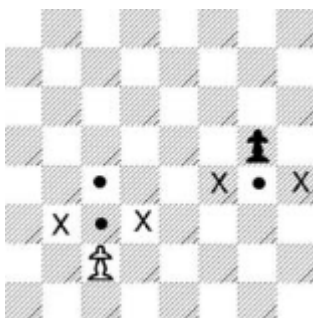


Figure 11: The Pawn

1 Computer Chess

1.1 Usage scenario

- 1) Run the chess game program.
- 2) The main menu appears, offering options to start a new game and exit.
- 3) After choosing new game option, the new menu appears, offering options to select the desired side and return to the main menu.
- 4) After choosing the sides, another new menu appears, offering the options to choose difficulty level of AI and go back to previous menu.
- 5) After choosing the difficulty, The chessboard is displayed with the initial positions of all pieces. The user's chosen side is shown on the bottom of the board, with the opponent's pieces on the top. In the chessboard, we use Arabic numbers to represent the vertical axis, and use alphabetical order to represent the horizontal axis.

8	bR	bN	bB	bK	bQ	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	wK	wQ	wB	wN	wR
	a	b	c	d	e	f	g	h

Figure 12: The initial position of the chessboard

- 6) The game starts, and the "White" side makes the first move.

- 7) In each turn, the player will be asked to make a move. We use, for example, A2A4 to represent that we move the piece from A2 to A4.

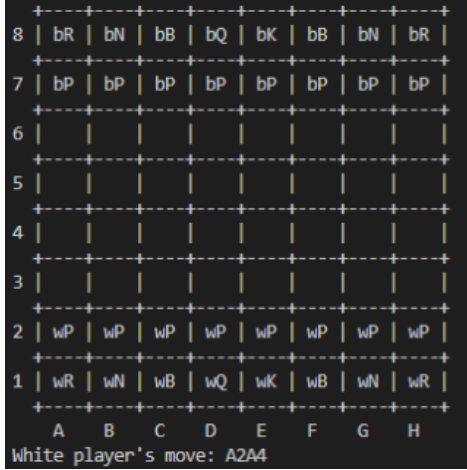


Figure 13: Before the move

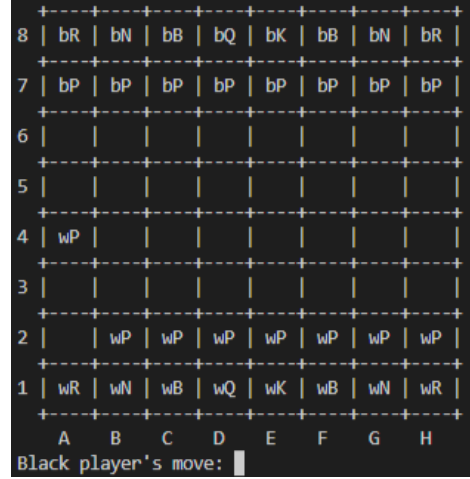


Figure 14: After the move

- 8) During the game, the user can type the "Hint", "Undo" button to get a suggestion for their next move or change their previous move.
- 9) The game continues until a player wins by putting their opponent's king in checkmate, or the game ends in a draw due to stalemate or other draw conditions.
- 10) Once the game is over, the program displays a message indicating the result.
- 11) The user can return to the main menu.

1.2 Goals

The primary goal of this program is to provide a user-friendly interface for playing chess against a computer opponent, with various difficulty levels and features to enhance the overall user experience while following basic principles of software engineering in a team setting. In addition to human vs. computer gameplay, the program also supports human vs. human and computer vs.

computer matches. The program also is designed to keep a readable log of all moves made and the computer opponent will make moves in a reasonable time, usually less than 1 minute per move. This program will require designing the data structures, program modules, and application programming interface (API) functions between modules

1.3 Features

- Follow official rules of chess
- Game interface where player can see the game board and moves
- Choosing sides (white or black)
- Adjustable difficulty levels
- Undo/redo functionality
- Move hints
- Game timer

2 Installation

2.1 System requirements

- RAM: 2 GB
- Disk Space: 200 MB
- Operating System: Linux OS (CentOS-7-x86_64)

2.2 Setup and configuration

To download the program, use the scp command to copy the files from the UCI EECS Linux servers to your local machine. Enter the program's directory. To build the program, type "make"

2.3 Uninstalling

To uninstall the program, simply run a "make clean" command in the terminal.

3 Chess Program Functions and Features

3.1 Choosing sides

3.1.1 User input

Before starting a game, the user can choose which side to play as, either White or Black, by selecting an option from the "Choose Side".

3.1.2 Program output

The program will update the game state to reflect the user's choice of side and display the appropriate color pieces for the user.

3.2 Detailed description of adjustable difficulty levels

3.2.1 User input

The user can select the difficulty level from the main menu by clicking on "Options" and then choosing from the available levels.

3.2.2 Program output

The selected difficulty level determines the strength of the computer opponent.

3.3 Detailed description of undo/redo functionality

3.3.1 User input

The user can undo their last move by clicking on the "Undo" button, and redo a previously undone move by clicking on the "Redo" button.

3.3.2 Program output

The chessboard updates to reflect the new position after undoing or redoing a move.

3.4 Detailed description of move hints

3.4.1 User input

The user can request a hint for their next move by clicking on the "Hint" button.

3.4.2 Program output

The program will display a suggested move for the user, which can be helpful for beginners or when the user is unsure about their next move.

3.5 Detailed description of game timer

3.5.1 User input

The user can enable a game timer by clicking on "Options" and selecting the desired time control settings.

3.5.2 Program output

A timer will be displayed on the screen, counting down for each player. When a player's time runs out, instead of losing the game, the system will automatically make a random legal move for the player.

Back matter

Copyright

- Copyright ©2023 Team rand(). All rights reserved.
- Redistribution or modification of this program is prohibited with the exception of personal/non-commercial use.
- Distribution of this program for commercial use must have our written approval.

Error messages

- Invalid move error: This error occurs when the user tries to make an illegal move. A message will be displayed, prompting the user to make a legal move.
- Invalid Command Error: This error occurs when the user tries to input some illegal command. A message will be displayed, prompting the user to make a legal command.
- Out of memory error: This error occurs when the system does not have enough memory to run the program. It is recommended to close other applications and try again.

Index

- B
 - Bishop
- C
 - Castling
 - Capturing
 - Check
 - Checkmate
- D

- Difficulty
 - Distribution
- E
 - En passant
 - Error messages,
- F
 - Features
- G
 - Glossary
- H
 - Hints
- I
 - Installation
- K
 - King
 - Knight
- O
 - Operating system,
- P
 - Pawn
 - Promotion,
- Q
 - Queen
- R

- Rook
 - RAM,
- T
 - Timer
- U
 - Usage scenario