



Kingdoms!

The Chess Game

Version 1.0

PROGRAMMERS:

Martino Caldarella,
Hanqi Chen,
Ragui Halim,
Hoon Lee,
Jacobis Soriano,
Daniel Truong

BitBots Software Developers from UCI

Table of Contents:

Glossary	2
1. Kingdoms! The Chess Game	
1.1. How to play Chess.....	4
1.2. Goals.....	8
1.3. Features.....	8
2. Installation	
2.1. System requirements.....	8
2.2. Setup and configuration.....	8
2.3. Uninstallation.....	8
3. Chess program functions and features	
3.1. Game rules.....	8
3.2. User interface.....	9
3.3. Choose your opponent.....	9
3.4. Choose your color.....	9
3.5. Undo the previous move.....	9
3.6. Moves' log.....	9
3.7. Quit the game.....	9
4. Back Matter	
4.1. Copyright.....	10
4.2. References.....	10
4.3. Error messages.....	10
4.4. Index.....	11

Glossary:

- **Bishop:** chess piece, refer to “How to Play Chess” to know its moves.
- **Castling:** a special move that may only be used once, performed when moving the King and the Rook simultaneously, refer to “How to Play Chess” to know more
- **Check:** occurs when the king is under threat. In this case, the king has to move or another piece has to be put between the king and the threatening piece.
- **Checkmate:** occurs when the king cannot escape the check. As a result the game ends and the other player wins.
- **Chess:** a game for two players where one player tries to capture the opponent’s king.
- **En Passant:** a special move that occurs when one player moves their pawn forward two tiles forward to avoid capture by the opponent’s pawn, refer to “How to Play Chess” to know more.
- **Files:** columns of the board labeled by the letters a to h.
- **Knight:** chess piece, refer to “How to Play Chess” to know its moves.
- **King:** the most important chess piece, refer to “How to Play Chess” to know its moves.
- **Pawn:** chess piece, refer to “How to Play Chess” to know its moves.
- **Piece:** any of the 32 movable objects used in the chess game.
- **Queen:** the most powerful chess piece, refer to “How to Play Chess” to know its moves.
- **Ranks:** rows of the board labeled by the numbers 1 to 8.
- **Rook:** chess piece, refer to “How to Play Chess” to know its moves.

1. Kingdoms! The Chess Game

The game of chess is an addictively exciting game of strategy! There are millions, possibly billions of players around the world who enjoy playing chess with friends, family, competitively and now, against computers (AI). Kingdoms! The Chess Game, designed by BitBots Software Developers, has made its mission to provide the most versatile and enjoyable platform for chess aficionados.

Fig. 0 Chessboard Layout. Black pieces on top. White Pieces on the bottom.

8	Ro	Kn	Bi	Qu	Ki	Bi	Kn	Ro
7	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa
6								
5								
4								
3								
2	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa
1	Ro	Kn	Bi	Qu	Ki	Bi	Kn	Ro
	A	B	C	D	E	F	G	H

1-1 How to Play Chess:

Like any master chess player, there are basic moves that you need to master before you become one of the greatest chess players of the virtual world! Capture first opponent piece in the way. The basic moves that each piece can perform agree with the standard game rules of Chess!

Chess pieces are named using the two first letters of the name of the Piece: **Ki** for King, **Qu** for queen, **Pa** for pawn and so on. Note that the following figures also include a letter to define the color. In the game the pieces will have different colors.

- Pawns moves :
 - one square forward (they can not move backward), except on the first move in which they can be moved two squares forward (Fig. 1).
 - one square diagonally when capturing an opponent piece(Fig. 2).
 - the pawn can be promoted to any another piece (except for the king) once they reach the end of the opposite side of the board(Fig. 3).

Fig. 1:

8	bRo	bKn	bBi	bQu	bKi				
7	bPa	bPa	bPa						
6				0					
5		0							

Fig. 2

	bPa			bPa	bPa				
		bPa							
			wPa						

Fig. 3

	wPa				wPa	wPa			
		wQu	wKi	wBi	wKn				
	C	D	E	F	G				

- Rook moves:
 - forward, backward, left, and right from 1 to 7 squares as long as they are not obstructed by any other piece (Fig. 4, wRO).

Fig. 4

7	bPa	bPa	bPa			bPa	bPa	bPa	
6			0	bPa					
5			0		wPa				
4			0						
3	0	0	wRo	0	0	0	0	0	0

- Knight moves:
 - two squares forward or backward and one left or right (Fig. 5).
 - one square forward or backward and two left or right.
 - the knight can jump over other pieces.

Fig. 5

6				bPa		0		
5			0		wPa		0	
4					wKn			
3			0				0	
2	wPa	wPa		0		0	wPa	wPa

- Bishop Moves:
 - diagonally from 1 to 7 squares as long as they are not obstructed by another piece (Fig. 6, wBi).

Fig. 6

7	bPa	bPa	bPa				bPa	bPa
6							bPa	
5	0					0		
4		0		0				
3			wBi					
2	wPa	wPa		0			wPa	wPa

- Queen Moves:
 - any direction from 1 to 7 squares as long as it is not obstructed by another piece (Fig. 7).

Fig. 7

8	bRo	bKn	bBi	0	bKi	0	bKn	bRo
7	bPa	bPa	bPa	0	bQu	bPa		bPa
6				0	0	0		
5			0		0		0	
4		0			0			0
3	0		wBi		0			
2	wPa	wPa			0		wPa	wPa
1	wRo	wKn	wBi	wQu	wKi	wBi	wKi	wRo
	A	B	C	D	E	F	G	H

- King Moves:
 - one square in any direction (Fig. 8).

Fig. 8

7	bPa	bPa	bPa		bQu	bPa		bPa
6			0	0	0			
5			0	bKi	0			
4			0	0	0			

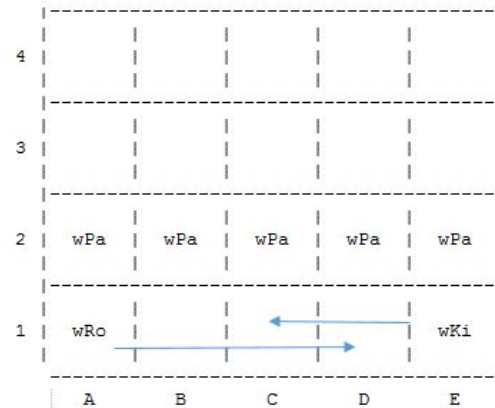
Special Moves: What is a game without the special combos! These two moves that follow are nothing short of spectacular.

- Castling
 - performed moving the King and the Rook at the same time (Fig. 1).
 - the only move in which two pieces can be moved together. Castling consists in moving the king towards one of the two

rooks, and the selected rook is moved on the square that was crossed by the king. This special move can only be performed on certain conditions:

- neither the King or the Rook were previously moved
- there are no pieces between them
- the king is not in check
- the king does not end in check

Fig. 9



- En Passant

- performed by the Pawn.
- Only performed when a player exercises his option to move his pawn two squares on its initial movement and that move places his pawn next to the opponent's pawn (Fig. 10). When this happens, the opposing player has the option to use his pawn to eliminate moved pawn "en passant" or "in passing" (Fig. 11) as if the pawn had only moved one square.
- It can only be used once.

Fig. 10

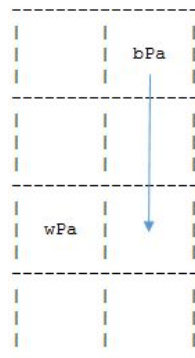


Fig. 11

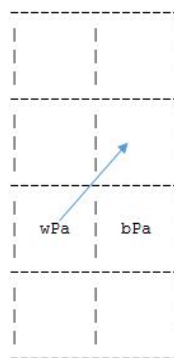
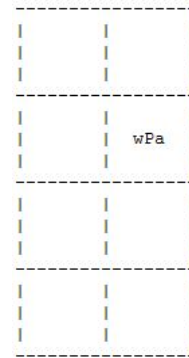


Fig. 12



1-2 Goals:

Player wins when he/she checkmates the king of the opponent's player.
Tie when impossible to checkmate.
Draw when only the two kings are left in the board.

1-3 Features:

1. The game follows the official chess rules.
2. Text-based user interface.
3. Human vs. Computer, and Human vs. Human, Computer vs. Computer
4. Option to choose which color to play as: black or white.
5. Option to undo the previous move.
6. Log of all moves.
7. Quit the game at any time.

2. Installation

2-1 System Requirements:

- Linux OS 2.6.32-696.18.7.el6.x86_64
- PC(x86_64 Server)

2-2 Setup and configuration:

- To run the game, type ./bin/chess.

2-3 Uninstallation:

- No need to uninstall

3. Chess Program Functions and Features

3-1 Game Rules:

We follow the official chess rules. Any illegal move will result in ending the game and the other player will win. You can check chess rules in section 1.

3-2 User interface:

Our user interface is a text-based interface. It prints an intro as well the instruction on how to input moves. It allows the user to interact with the software. The user first inputs the name, then he or she can choose to play with white (the color the makes the first move) or black pieces. A computer vs computer mode is also available. In order to make moves, the player enters the current position of the piece followed by the desired new position. An example of a move is "a2 a4" or "A2 A4", which means move the piece in square "a2" to the square "a4".

3-3 Choose your opponent:

In our game, you can choose to play against the computer or against your friend. You can also choose computer against computer to see how a game is played.

3-4 Choose your color:

You can choose to play with white or black pieces, but remember that the white team always moves first.

3-5 Undo the previous move:

You can undo your last move by typing "undo" instead of your move.

3-7 Quit the game:

You can quit the game at any time by typing "quit".

4. Back Matter

4-1 Copyright:

Copyright © 2018 BitBots Software Developers. All rights reserved.

4-2 References:

- AlphaBeta algorithm:
<https://www.geeksforgeeks.org/minimax-algorithm-in-game-theory-set-1-introduction/>
- Chess rules:
<https://en.wikipedia.org/wiki/Chess>

4-3 Error messages:

1. "Invalid input. Please enter a valid move, 'undo' or 'quit' "
 - a. User attempted to move piece outside the chessboard. User must input a valid square (A1, A2, A3....H8). User is also given the option to undo his or her previous move or quit the game.
2. "You've selected an empty square."
 - a. User attempted to move a piece that does not exist. User must move a piece that does exist.
3. "Not a legal move."
 - a. User attempted to perform an illegal move. Perform only legal moves specified by the official chess rules to avoid this from happening again.
4. "Invalid input. Please enter 'black' or 'white'."
 - a. User chose a color that is neither white nor black. User must choose either white or black.
5. "King will be in check. Select a different move."
 - a. Attempted move will put King in check. User must choose a different move.
6. "Please select white/black pieces only."
 - a. User attempted to move a chess piece that is not their own. User can only move their own color piece.
7. "Invalid input. Inputted %c but expected an input of Q, N, B, or R. Please try again."
 - a. User entered an invalid input. User must input either Q, N, B, or R as inputs.
8. "Could not open file. Aborting..."
 - a. File either could not be found or opened. Contact BitBots Software Developer for support.
9. "Out of memory! Aborting game..."

- a. Some unforeseen error has occurred. Please contact BitBots Software Developer for support.

4-4 Index:

Bishop.....	1-1, 1-2	Installation.....	2
Castling.....	1-1, 1-2	King.....	1-1, 1-2, 1-3, 4-2
Check.....	1-1, 1-2, 4-2	Pawn.....	1-1, 1-2
Checkmate.....	1-1, 1-3	Piece.....	1-1, 1-2, 3-2, 3-4, 4-2
Configuration.....	2-2	Queen.....	1-1, 1-2
Copyright.....	4-1	Rank.....	1-1
En Passant.....	1-1, 1-2	Rook.....	1-1, 1-2
Features.....	3, 4-3	Setup.....	2-2
Files.....	1-1, 3-6	Special Moves.....	1-2
Functions.....	3	System Requirements.....	2-1
Goals.....	1-3	Uninstallation.....	2-3
How to Play.....	1-2		