

King's Gambit Chess User Manual

KGChess v1.0

**Team 20:
King's Gambit**

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Table of Contents

Glossary(Chess Terms).....	1
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1. Computer Chess

1.1 Usage Scenario.....	5
1.2 Goals.....	9
1.3 Features.....	9
GUI.....	9
Gameplay.....	9

2. Installation

2.1 System Requirements.....	10
2.2 Setup and Configuration.....	10
2.3 Uninstalling.....	10

3. Chess Program Functions and Features

3.1 Main Menu.....	11
3.2 Human vs Human.....	11
3.3 AI vs Human.....	12
3.4 AI vs AI.....	14
3.5 Move Logs.....	14
3.6 Take back move.....	15

4. Back Matter

4.1 Copyright.....	16
4.2 Error Messages.....	16
4.3 Index.....	17

Glossary

<u>Abbreviation</u>	<u>Chess Piece</u>	<u>Movement</u>
P	Pawn	<ul style="list-style-type: none">- Pawn chess pieces can only move directly forward 1 space.- Pawns can only move forward two spaces only on the first move.- Pawns can move diagonally when capturing.- Once the player is on the other side of the chess board, the pawn can be “promoted” into any other piece (bishop, knight, rook, queen).
K	King	<ul style="list-style-type: none">- The King can move one square in any direction.- The King cannot move into a square that puts them in a “check” position.
Q	Queen	<ul style="list-style-type: none">- The Queen can move in any direction on a straight or diagonal path.
N	Knight	<ul style="list-style-type: none">- The Knight can move forward, backward, right or left two squares and then must move one square in either perpendicular direction. This makes an “L” shaped movement.- The Knight can skip over any other piece to reach its destination.

B	Bishop	<ul style="list-style-type: none"> - The Bishop can move diagonally in any direction. - The Bishop cannot move through any piece obstructing its path.
R	Rook	<ul style="list-style-type: none"> - The Rook can move forward, back, left, or right as long as there is nothing obstructing its path.
ch.	Check	<ul style="list-style-type: none"> - When the King is under attack, this is called a check. - the King must move out of the check.
e.p.	En passant	<ul style="list-style-type: none"> - Special pawn capture - Can only occur immediately after a pawn makes a move of two squares from its starting square - Capturing pawn must have advanced exactly three ranks to perform this move
Mate	Checkmate	<ul style="list-style-type: none"> - When a player's king is in check and there is no way to avoid the threat
O-O	Castle King's side	<ul style="list-style-type: none"> - The King can move up to two squares and exchange places with the Rook on the King's side of the board.
O-O-O	Castle Queen's side	<ul style="list-style-type: none"> - The King can move up to two squares and exchange places with the Rook on the Queen's side of the board.

Term

Definition

Board	A slab prepared with a chequered pattern for playing chess
Castling	A simultaneous move (the only one in chess) whereby a previously unmoved King moves 2 squares toward an unmoved Rook and the Rook is moved to the other side of the King.
Check	A move which attacks the opposing King.
Checkmate	A move which attacks the opposing King, and which the opponent cannot get out of.
Chessboard	See Board
Defence	An opening played by Black, or a series of moves taken to protect a piece or position which is under attack.
Discovered check	A check given by a line-piece when a shielding piece or pawn is moved out of the way.
Endgame	The stage of the game with few pieces or when Queens are exchanged and the middle game is over.
En passant	A special method of capturing, only available to a pawn on its fifth rank.
File	The eight vertical columns on the board, numbered a to h.
Fork	A double attack when one piece, such as a Knight, attacks two or three pieces at once.
Gambit	A chess opening in which a player offers a pawn (or more) for fast development and an attack
J'adoube	Said to indicate an intention only to adjust a piece on the board without necessarily moving it to a different square. [j'adoube – I adjust]
Major piece	Queen or Rook.
Man	See Piece
Match	A series of games.
Middlegame	The part of the game which follows the opening.
Minor piece	Bishop or Knight.
Notation	The method of writing down chess, moves which involves rank and file and piece:
Opening	The start of the game, about a dozen moves.
Piece	Any piece or man, sometimes excluding pawns
Pin	When a piece does not move because to do so would expose a more valuable piece to capture.

Promotion	Promotion is what happens when a pawn reaches the other side of the board (that is, the 8th rank) and cannot move further. Then it becomes any other piece on the board, except the king. Players usually promote their pawns to a Queen (called Queening)
Queening	see Promotion
Rank	The eight horizontal rows on the board, labelled 1 to 8.
Resign	To concede loss of the game. A resignation is usually done by knocking over one's King, stopping the clock, offering a handshake or saying "I resign".
Repetition	see Threefold Repetition
Sacrifice	The intentional loss of material to get a more important result.
Stalemate	Where a player is not in check, but has no legal moves. It is a draw in modern chess.
Threefold Repetition	A player can claim a draw if the same position occurs three times, or will occur after their next move, with the same player to move. The repeated positions do not need to occur in succession.
Zugzwang	A position, usually in an ending, where the player to move loses because they must move.

1. Computer Chess

1.1 Usage Scenario

- **Scenario**

- User boots up the computer and opens the game to start.
- User assumes a Game Player Role and is assigned to black or white.
- User selects begin match and can view game status including check game status
- User “Makes Moves” such as placing a symbol on an open square on the Game Board.
- User “Makes Move” and places a symbol on an occupied square on the Game Board. Results in Original symbol continue to occupy the square but allow the Game Player to select another square.
- User uses symbols representing chess pieces to take opponents chess pieces by selecting them according to rules of chess.
- Users goal is checkmate and whichever player gets checkmate first receives a victory and game ends
- Asking user whether they want to save the game log or not
- Returns to main menu after game ends

- **Text-based GUI:**

- Navigation through main menu

```
Welcome to KGChess!
Please make a selection
1. Human vs. Human
2. Human vs. AI
3. AI vs. AI
4. View most recent game's move log
5. Exit Game
Choose option: █
```

Figure 1: Menu Screen w/ User being prompted for input

- Initial board layout (8x8 board)

Two sides: white vs. black corresponding to player 1 and player 2.

Each player will have 16 pieces at the beginning arranged in two rows.

```
Chess Game Started. Human vs. Human
+---+---+---+---+---+---+---+---+
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

(White's Turn) Please enter your move:
```

Figure 2: Board where the game is just started and White is prompted to make a move

- After white makes a move

```
(White's Turn) Please enter your move: e2e4
Confirming White moves pawn from e2 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

(Black's Turn) Please enter your move:
```

Figure 3: Board after White has made a move and Black's input is being prompted to make a move

- When white castles king's side

```
(White's Turn) Please enter your move: e1g1
Confirming White moves king from e1 to g1

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

(Black's Turn) Please enter your move:
```

Figure 4: Board when White castles kingside

- When white castles queen's side

```

(White's Turn) Please enter your move: e1c1
Confirming White moves king from e1 to c1
+---+---+---+---+---+---+---+---+
8 | bR |   | bB | bQ | bK | bB |   | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   | bN |   |   | bN |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   | bP | bP |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   | wP |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   | wN | bP | wB |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP | wP | wP |   | wQ | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 |   |   | wK | wR |   | wB | wN | wR |
+---+---+---+---+---+---+---+---+
    a   b   c   d   e   f   g   h
(Black's Turn) Please enter your move:

```

Figure 5: Board when White castles queenside

- When white finds checkmate

```

(White's Turn) Please enter your move: f3f7
Confirming White moves queen from f3 to f7
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP |   |   |   | wQ | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   | bP | bP |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   | bP |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   | wB |   | wP |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP |   | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB |   | wK |   | wN | wR |
+---+---+---+---+---+---+---+---+
    a   b   c   d   e   f   g   h
Checkmate! White wins!

```

Figure 6: Board when White has won through checkmate

1.2 Goals

- **Goals of chess:**

- Win material from the opposing player as much as you can. The person with more materials has more fighting power
- Develop pieces to full potential. Developed pieces have more fire-power than undeveloped pieces
- Keep your king safe while trying to expose your opponent's king. An exposed king is more vulnerable to checkmate.
- Win. There are different ways to win. Either you checkmate your opponent, or you make your opponent lose on time (if you are playing a timed chess match).

1.3 Features

- **GUI:**

- Main menu
- Play as white or black
- View move log
- Select Human Vs AI
- Select Human vs Human

- **Gameplay:**

- Display board
- Play Human vs Human
- Play Human vs. AI
- Undo move
- Game clock/timer (user can set time)
- Stalemate support
- Castling support
- En passant support

2. Installation

2.1 System Requirements

- Recommended OS: Linux (CentOS release 6.10, Kernel: 2.6.32-754)
- Memory: At least 512MB RAM
- Game Storage: 1.03 Megabytes
- Dependencies: SDL (GUI to be implemented in later version)

2.2 Setup and Configuration

- **Clone files from GitHub**

git clone <https://UCINETID@github.uci.edu/EECS-22L-S-21-Team-Projects/Team20.git>

- **Get tar.gz archive**

cp ~Team20/bin/KGChess.tar.gz

- **Extract tar.gz package**

gtar xvzf bin/KGChess.tar.gz

- **Change current directory to KGChess**

cd KGChess

- **Compile and generate executable**

make all

- **Run program**

bin/KGChess

2.3 Uninstalling

- **Remove executable and object files**

make clean

- **Remove all files (includes .c and .h files)**

make cleanall

3. Chess Program Function and Features

3.1 Main Menu

The user would be prompted with inputting a number (1-4) corresponding to what they want to do.

```
Welcome to KGChess!
Please make a selection
1. Human vs. Human
2. Human vs. AI
3. AI vs. AI
4. View most recent game's move log
5. Exit Game
Choose option: █
```

Figure 7: Main Menu where the user is prompted to input an option

User Inputs:

- 1: Starts a game against another human
- 2: Starts a game against AI
- 3: Displays the previous game's move log
- 4: Exits the program

3.2 Human vs. Human

- Board is displayed and the user is prompted to input a move.
“x#y#”: Moves piece “x#” to “y#” on board

```
Chess Game Started. Human vs. Human
+---+---+---+---+---+---+---+---+
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

(White's Turn) Please enter your move:
```

Figure 8: Start of a Human v. Human game where White is prompted to make a move

- Player 1 and player 2 will select their move in turn.
- If a user wants to move a chess piece, they would need to input the place where the chess piece is at the moment and then input the desired valid location.
 - **Example:** to move a white pawn from e2 to e4, you input “e2e4” and AI responds by making a valid move.
- The human player can withdraw previous moves. (via. Take Back Moves Feature).
 - After each move the player will be asked if they want to take back the previous move.
- When there is a winner, the user will be asked if they want to save the play log or not (via. Move Log Feature).
- Return to the main menu.

3.3 AI vs. Human

- User selects “Human vs Ai” input (2)
- User selects what color to be and Ai is assigned the remaining color
- Board is displayed and User is prompted to input a move.

User Inputs:

“x#y#”: Moves piece “x#” to “y#” on board
(Figure on next page)

Chess Game Started. Human vs. AI																			
	+	-	-	+	-	-	+	-	-	+	-	-	+	-	-	+	-	-	+
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			
(White's Turn) Please enter your move:																			

Figure 9: Start of a Human v. AI game where White is prompted to to make a move

- If a user wants to move a chess piece, they would need to input the place where the chess piece is at the moment and then input the desired valid location.
 - **Example:** to move a white pawn from e2 to e4, you input “e2e4” and AI responds by making a valid move.
- The human player can withdraw previous moves. (via. Take Back Moves Feature).
 - After each move the player will be asked if they want to take back the previous move.
- When there is a winner, the user will be asked if they want to save the play log or not (via. Move Log Feature).
- Return to the main menu.

3.4 AI vs AI

- Users will be able to select the “AI vs AI” option in the menu by inputting “3”.
- Once AI vs AI is selected the board is loaded and the teams are assigned to the AIs.
- AI’s will continue to make moves back and forth until a winner is decided. Once A Ai wins it will ask for a move log and if not, it will return to the main menu.

3.5 Move Logs

- The user is prompted after the game is finished whether or not they want to save the game log.

```
1. Create a move log text file
2. Back to main menu
Choose an option:
```

Figure 11: Menu to save the move log to a text file where user is prompted to input an option

User Inputs:

1: The game is saved in a text file

The User is then prompted to input a name for the text file.

```
Enter a name for the move log text file:
```

Figure 12: User is prompted to input a name for the move log file

User Inputs: [FileName]

2: Returns back to the main menu

Example move log (save in file name: testlog.txt):


```
#KGChess
Version: v1.0
Filename: hi.txt
Date: Sun May 9 22:10:53 2021

#Winner
White

#MoveLog
1. e2e4 a4a5
2. d5d1 f7f5
3. f3f4

#EOF
```

Figure 13: Move log being displayed

3.6 Take Back Move

- After each move, the user is prompted with the ability to take back a turn after at least one turn has been completed.
- User Inputs:
 - “undo”: This reverts the game back two turns so the user can change their original move
 - “x#y#”: The game continues as normal

4. Back Matter

4.1 Copyright

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4.2 Error Messages

Error codes:

Error #	Problem	Solution
-1	Invalid move! (Obstacle in path of move)	Choose a different destination in user Input
0	Program successfully launches and exits upon completion	N/A
1	Invalid move! (If user moves to an illegal position)	Choose a different destination that the piece is able to perform
2	Invalid move input! (If user enters a move that can't be read)	Carefully enter the input in proper notation with no spaces and capitals
3	White to move! (if user is white and tries to move a black piece)	Wrong origin in user input, choose different spot
4	Black to move! (is user is black and tries to move a white piece)	Wrong origin in user input, choose different spot

Index

A

Abbreviations	1
AI vs. Human	10
AI Difficulty	12

B

Back Matter	15
-------------	----

C

Computer Chess	5
Chess Program Function and Features	7
Copyright	15

E

Error Messages	15
----------------	----

F

Features	7
----------	---

G

Glossary	1
Goals	7
GUI	7
Gameplay	8

M

Main Menu	10
Move Log	13

S

Scenario	5
System Requirements	9
Setup and Config	9