TheQueensChess V3
Team Name: Queen's Gambit
Team 18
Jonathan Sugijoto, Eesha Jain, Devin Reyes, Jixin Gong, Michael Nguyen*

Software Title: TheQueensChess
Version: V3
Affiliation: University of California, Irvine

*Extenuating Circumstances: did not contribute

# Table of Contents

# Glossary of Chess Terms:

**Check:** When a player is in check, this means that the king is in danger, but not yet defeated. A move must be made to get the king out of check. The king cannot remain in check.

**Checkmate:** Checkmate is when the king is in a position where he is no longer able to defend himself, and therefore the game is lost.

**Stalemate:** When neither side is able to attack or defend; a draw.

**Castling:** If the king and the rook have not moved from their starting positions, and the spaces between them are empty, the king moves two in the direction of the rook, and the rook 'jumps' one square over the king (all horizontally).

**En Passant:** When a pawn moves diagonally to capture an adjacent piece

**Pawn Move:** The pawn can move either one or two spaces vertically in front of itself on the first move, and from there on can only move one space in front of itself, or diagonally to kill. It can also move diagonally to kill on the first move, if the opportunity presents itself. The pawn cannot move diagonally if it is not killing.

**Rook Move:** The rook can move vertically and horizontally in any direction given that no other pieces are blocking it.

**Knight Move:** The Knight can move in an L formation. It is the only piece that can jump over other pieces (with the exception of a king and a rook in castle). An 'L formation' means 1 in front and 3 to the right or left, OR 3 in front, and 1 to the right or left.

**Bishop Move:** The bishop can move diagonally in any direction given that no pieces are not blocking it.

**Queen Move:** The queen can move in any direction as long as no pieces are blocking her. She cannot jump over the pieces.

**King Move:** The king can move one step in any direction and cannot jump over pieces

# 1. Computer Chess

## 1.1 Usage Scenario

After starting the executable file, the initial menu displayed will have 4 options as follows in Figure 1.10. Input in a valid option in order to continue.

```
Welcome to Queen's Gambit Chess

=================
    Main Menu
=================
1. Player v AI
2. Player v Player
3. Settings
4. Exit Game
Choose Option: █
```

Figure 1.10: The initial menu that the user would see upon starting the executable file.

After starting a game, please select the piece you would like to use using the coordinates on the sides, in the form of [LETTER][NUMBER]. Then, choose where to place that piece in an empty spot on the board.

    Ex: a1

```
Human v. Human game started

   +----+----+----+----+----+----+----+----+
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
Player 1 please choose your piece to move: █
```

Figure 1.11: The initial board displayed after selecting a Human v. Human game mode.

## 1.2 Goals

The goal of our program is to create an intuitive chess experience, more specifically:
- Working pieces
- Castling
- En passant
- Checks and Checkmates
- AI

## 1.3 Features

- Implementation of En passant and castling special moves
- Fully functioning AI opponent
- Chess pieces that follow each of their respective moves and rules
- Players are allowed to choose their sides for AI game (white or black)
- Move list that updates as the game progresses
- Replay.txt generated of the last game played on exit
- Challenge Scenario: Start at a set board that has been precreated and play against an AI

# 2. Installation

## 2.1 System Requirements

1. The application will be run off of a linux terminal
   a. Running CentOS, version 6.10
   b. Example: UCI EECS Server
2. Storage Required: 17 M

## 2.2 Setup and Configuration

1. Unzip the tar file with the command "tar -xvzf Chess_Beta_src.tar.gz"
2. Run the makefile command 'make all'
3. Run the executable ./bin/chess
4. Choose an option from the menu and reference the User Manual as needed

## 2.3 Uninstalling

Delete the relevant files:
- tar file
- Makefile
- C files './src/*.c'
- Binary executable './bin/chess'

# 3. Chess Program Functions and Features

## 3.1 Human v Human

Human v Human support algorithm

```
Human v. Human game started

  +----+----+----+----+----+----+----+----+
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
Player 1 please choose your piece to move:
```

Figure 3.10: Initial board after selecting the Human v. Human game started

```
Player 2 please choose your piece to move: e7
Player 2 please choose your final  move: e5

  +----+----+----+----+----+----+----+----+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +----+----+----+----+----+----+----+----+
7 | bP | bP | bP | bP |    | bP | bP | bP |
  +----+----+----+----+----+----+----+----+
6 |    |    |    |    |    |    |    |    |
  +----+----+----+----+----+----+----+----+
5 |    |    |    |    | bP |    |    |    |
  +----+----+----+----+----+----+----+----+
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
Player 1 please choose your piece to move:
```

6

```
[Player 1 please choose your piece to move: h5
[Player 1 please choose your final  move: f7

   +----+----+----+----+----+----+----+----+
8 | bR |    | bB | bQ | bK | bB |    | bR |
   +----+----+----+----+----+----+----+----+
7 | bP | bP | bP | bP |    | wQ | bP | bP |
   +----+----+----+----+----+----+----+----+
6 |    |    | bN |    |    | bN |    |    |
   +----+----+----+----+----+----+----+----+
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
PLAYER 1 HAS WON, THANKS FOR PLAYING!
```

Figure 3.12: Player 1 Wins the game as the black King is in checkmate

## 3.2 Human v AI

Human v AI support algorithm

```
Human v. AI game started

   +----+----+----+----+----+----+----+----+
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
Player 1 please choose your piece to move:
```

```
     +----+----+----+----+----+----+----+----+
  8  | bR | bN | bB | bQ | bK | bB | bN | bR |
     +----+----+----+----+----+----+----+----+
  7  | bP | bP | bP | bP |    | bP | bP | bP |
     +----+----+----+----+----+----+----+----+
  6  |    |    |    |    |    |    |    |    |
     +----+----+----+----+----+----+----+----+
  5  |    |    |    |    | bP |    |    |    |
     +----+----+----+----+----+----+----+----+
  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
Player 1 please choose your piece to move:
```

Figure 3.11: Player will have an instant response from the AI after making a move

```
Player 2 please choose your piece to move: f8
Player 2 please choose your final  move: b4

     +----+----+----+----+----+----+----+----+
  8  | bR | bN | bB | bQ | bK |    | bN | bR |
     +----+----+----+----+----+----+----+----+
  7  | bP | bP | bP | bP |    | bP | bP | bP |
     +----+----+----+----+----+----+----+----+
  6  |    |    |    |    |    |    |    |    |
     +----+----+----+----+----+----+----+----+
  5  |    |    |    |    | bP |    |    |    |
     +----+----+----+----+----+----+----+----+
  4  | wP | bB |    | wP |    |    |    |    |
     +----+----+----+----+----+----+----+----+
  3  |    |    |    |    |    |    |    |    |
     +----+----+----+----+----+----+----+----+
  2  |    | wP | wP |    | wP | wP | wP | wP |
     +----+----+----+----+----+----+----+----+
  1  | wR | wN | wB | wQ | wK | wB | wN | wR |
     +----+----+----+----+----+----+----+----+
       a    b    c    d    e    f    g    h
PLAYER 2 HAS WON, THANKS FOR PLAYING!
```

Figure 3.12: Player 2 (AI) Wins the game as the white King is in checkmate

## 3.3 Settings



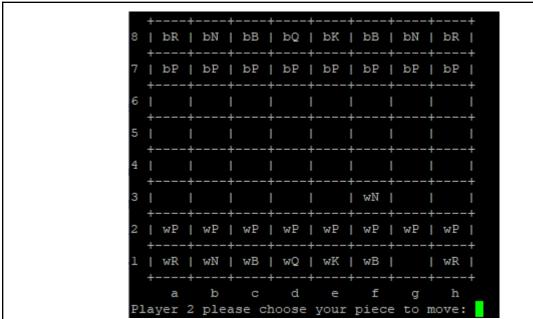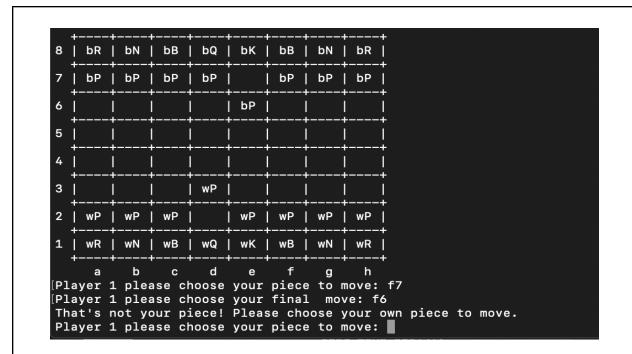Figure 3.30: Settings Options after selecting the 'Settings' option in the main menu



Figure 3.31: After selecting the first option in the settings menu, you will now play as Player 2 in the AI gamemode. Selecting the reset button will put you back as Player 1 in the AI gamemode

# 4. Back Matter

## 4.1 Copyright

## 4.2 Error Messages

```
    +----+----+----+----+----+----+----+----+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
    +----+----+----+----+----+----+----+----+
7 | bP | bP | bP | bP |    | bP | bP | bP |
    +----+----+----+----+----+----+----+----+
6 |    |    |    |    | bP |    |    |    |
    +----+----+----+----+----+----+----+----+
5 |    |    |    |    |    |    |    |    |
    +----+----+----+----+----+----+----+----+
4 |    |    |    |    |    |    |    |    |
    +----+----+----+----+----+----+----+----+
3 |    |    |    | wP |    |    |    |    |
    +----+----+----+----+----+----+----+----+
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
[Player 1 please choose your piece to move: f7
[Player 1 please choose your final  move: f6
That's not your piece! Please choose your own piece to move.
Player 1 please choose your piece to move: ▮
```

ERROR CODE 1: That's not your piece! Please choose your own piece to move.
When this error occurs, please retry a move that moves your own piece and not the opposing sides.

```
    +----+----+----+----+----+----+----+----+
 5  |    |    |    |    |    |    |    |    |
    +----+----+----+----+----+----+----+----+
 4  |    |    |    |    |    |    |    |    |
    +----+----+----+----+----+----+----+----+
 3  |    |    |    | wP |    |    |    |    |
    +----+----+----+----+----+----+----+----+
 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
[Player 1 please choose your piece to move: f7
[Player 1 please choose your final  move: f6
That's not your piece! Please choose your own piece to move.
[Player 1 please choose your piece to move: e1
[Player 1 please choose your final  move: c3
Invalid Move! Please try again.
Player 1 please choose your piece to move: █
```

ERROR CODE 2: Invalid Move! Please try again.
When this error occurs, you have made an invalid move.

# 4.3 Index