Queen Chess

Final Software Release: Version 1.0

Team 18 - The Queen
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Glossary:

Adjournment
The game is temporarily paused to be finished later

Algebraic Chess Notation
Refers to the labeling on the board. The columns are labeled a-h from left to right from the white player's point of view. The rows are labeled 1-8 with 1 being closest to the white player. It allows the game to be recorded using alphanumeric coordinates representing the squares

Adjust
To move a piece without touching, a player must first say "I adjust"

Castling: This special move involves the king and either one of the original starting rooks of the same color. It consists of the king moving two squares towards the rook of choice on the player's first rank (row closest to the moving player), then the rook moves on to the square next to the king in which the king has already crossed. Castling is only allowed if the king and the rook involved have never moved, the squares between the king and rook are not occupied, the kind is not in check, and the king does not end on on or cross over a square that would make it in check

Check
Occurs when the King is in a position such that it is vulnerable to capture

Checkmate
Occurs when the King is in check and there is no way to escape capture

En Passant
This is a special pawn capture which can occur immediately after a player moves a pawn two squares forward from its starting position, and an opposing pawn captured has the same pawn moved only one square forward. The opponent captures the just-moved pawn as if taking it "as it passes" through the first square. The resulting position is the same as if the pawn had moved only one square forward and the enemy pawn had captured normally.
The en passant capture must be done on the very next turn, or the right to do so is lost. Such a move is the only occasion in chess in which a piece captures but does not move to the square of the captured piece. If an en passant capture is the only legal move available, it must be made

Pieces
Each player begins with 16 pieces: 8 pawns, 2 bishops, 2 knights, 2 rooks, 1 queen, 1 king.

- **Pawn**
  This piece can only move forwards towards the opposing ends of the board. It can move diagonal if it is capturing an opponent's piece. The pawn has the option of taking two steps from its starting position; afterwards, it can only move one step forwards. If a pawn reaches the end of the board, it can promote to another piece (promotion). A pawn also has a special "en passant" move.
- **Rook**
  This piece can move either horizontally or vertically across the board
- **Bishop**
  This piece can move diagonally along the board following the white squares or black squares, respective to the square it initially starts on
- **Knight**
  This piece can jump over pieces, moving one square horizontally/vertically and two more squares at a right angle or two squares horizontally/vertically and one more square at a right angle
- **Queen**
  This piece can either move horizontally, vertically, and diagonally across the board
- **King**
  This piece can move one space in any direction so long as it is not into a check. It also has the special move of castling.

Promotion
If a player's pawn advances to the opposing end of the board, it can be "promoted" or exchanged for the player's choice of a queen, rook, bishop, or knight.

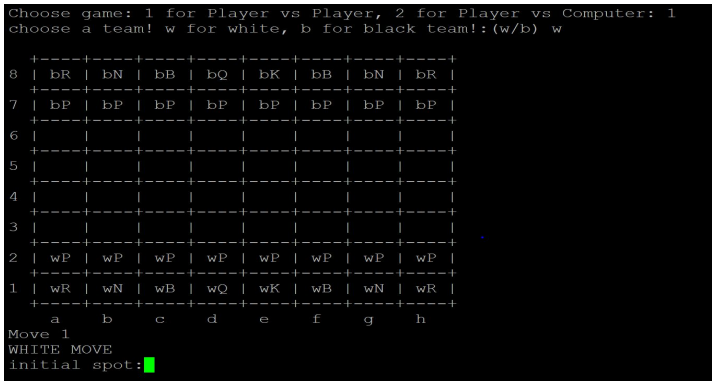
Resign
A player gives and concedes the loss of the game

Stalemate
Occurs when a player whose turn it is has no possible legal moves and his/her king is not check. It results in a draw between the players

Chapter 1: Computer Chess

1.1 Usage Scenario

This program will enable a classical game of chess between two opponents. Whether Player 2 is an artificial intelligence or human being can be decided by Player 1 on the menu screen. Then the player will be asked to choose a team color. Once the specific game options are selected, the match will begin, resulting in a logic-inducing game known as chess.



1.2 Goals

The primary objective of the game of chess is to “checkmate” the opponent’s king. This means that the king has been placed in “check” by his opponent, but has zero moves to escape the position, resulting in the end of the game. Every player has a different style in chess, as there are in the multi-millions number of configurations for a game, there are a few general good tactics to play by. One is that during the opening game, the player who controls the center of the board more completely is considered to have an advantage. Furthermore, another would be to use the special move, called castling, to move the king to a more protected position.

1.3 Features

The general features of chess include an equal starting position on opposite sides of the board, in which the entire second line is an array of pawns. The rest of the pieces are initialized on the previous line with the more valuable pieces. Pawns are commonly utilized extensively in the opening game in order to establish presence in the center board, as well as to open up opportunities to develop the more valuable pieces.

The following are the basic functions that the game will support:

1. The game follows the official rules of chess
2. The program shows a game interface where the player can see the game board and make moves
3. The program supports an interactive player (human user) and an automatic player (computer)
4. The human user chooses the side to play (white or black)
5. The program keeps a human readable log of all the moves (in a text file)
6. The computer player makes its moves in reasonable time (less than 1 minute per move)

Chapter 2: Installation

2.1 System Requirements:

Operating System	Linux or Windows with access to a Linux environment
CPU	Intel Core 2 (Intel Core 5 recommended)
Memory	50 MB RAM (100MB recommended)
Hard Disk Space	10 MB Available
Media	CD-ROM, 2x or higher

2.2 Setup and Configuration:

1. Type "git clone https://github.uci.edu/20SEECS22L/Team18.git" into the Linux command line.
2. In the Linux Command line, type "tar -xvzf Chess_V1.0_src.tar.gz".
3. Then type "make" to compile the program.
4. Then type "make test" and enjoy the game!

2.3 Uninstalling:

1. Make sure the game is not running.
2. Type "*make Clean*" into the Linux command line.
3. Type "*rm 'textfile_name'.txt*" into the Linux command line.

FAQs about Installation:

"What are the recommended specifications?"

The minimum system requirements make Queen Chess compatible with your system, but having the recommended specs makes the gameplay smooth and lag-free.

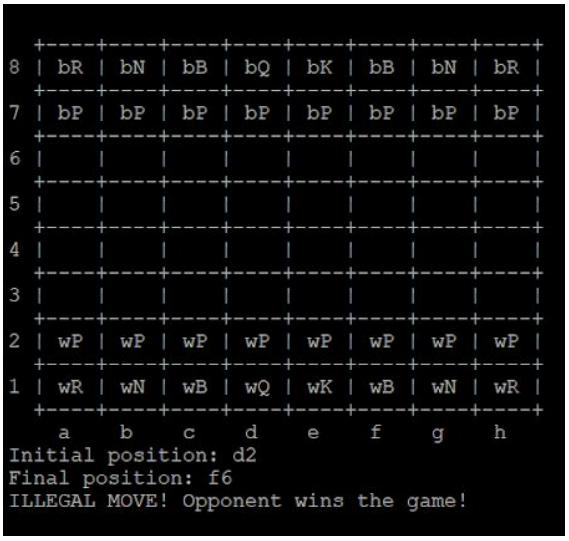
"Can I play Queen Chess on my Mac?"

Unfortunately right now, Queen Chess will not run on Mac due to a directory error. We are looking into this and hope to have it fixed in the near future!

Chapter 3: Chess Program Functions and Features

3.1 Rules for chess

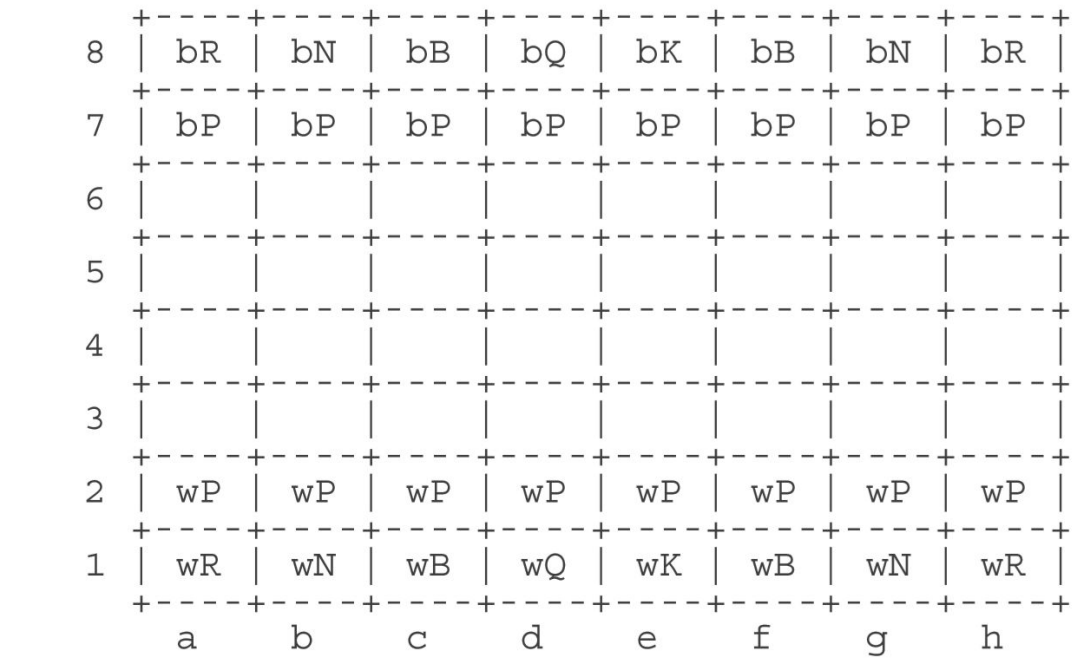
The game follows the official rules of chess. If the user inputs an illegal move, that player would lose the game. For example, if the user attempted to make an illegal move using one of the white pawns, the game would end and the opponent would win like so:



Refer to the glossary of terms to see which moves are legal/illegal based on the piece type.

3.2 Game board and game interface

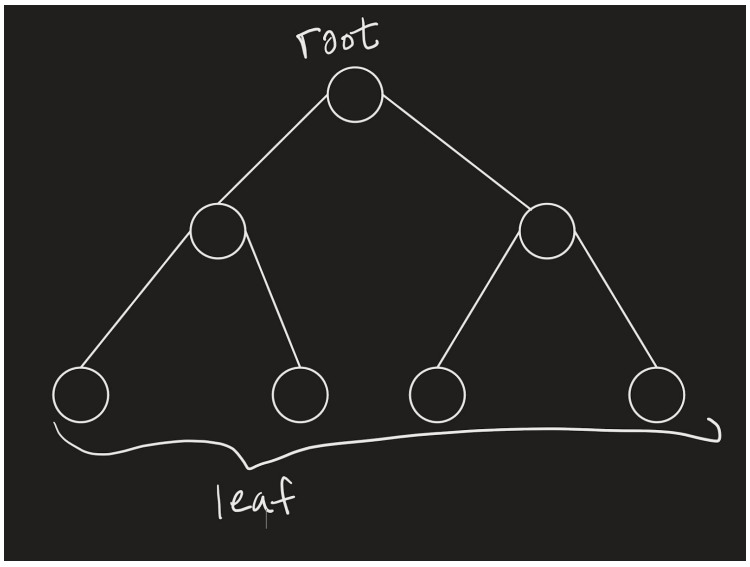
The game will be implemented using ANSI text-based chess board.



In each turn, there will be a prompt for the user to make a move. The user will have to input the initial position to the final position. For instance, if the user chooses the white pieces and the position of the pieces are as the ones above, then one possible move would be d2 d4. Where d2 is the initial position of the white pawn and the final position d4.

3.3 Types of Game Play

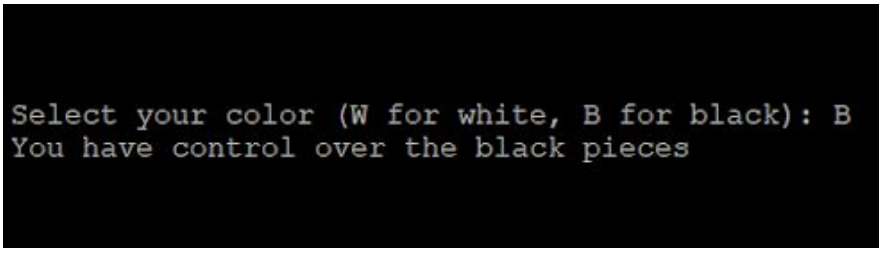
The most basic version of our program supports an interactive player (human user) vs. an automatic player (computer). The computer will run on some version of the minimax algorithm, but this may change as development continues. A basic example of this algorithm is shown below:



The minimax is represented as a binary tree where the root contains the current state of the chessboard and the children contain different scenarios and positions of the most optimal case.

3.4 Choosing a side

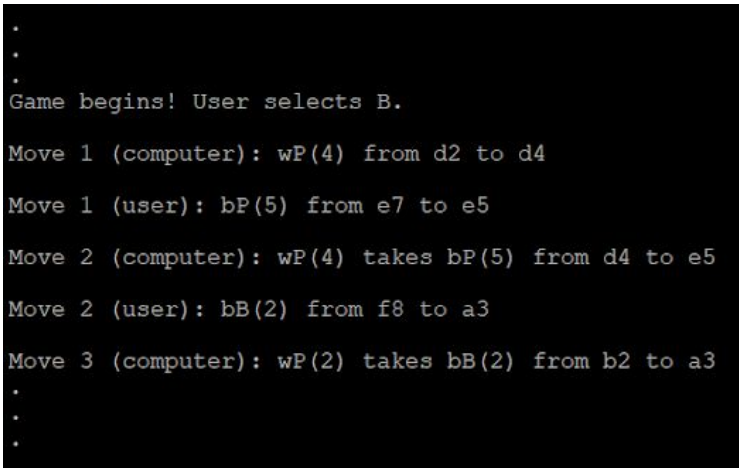
As soon as the user starts the game, he/she will be prompted to choose what side to play.



Whichever side the user chooses to play as, determines which moves are legal/illegal for them to play. For example, if they choose to play using the black pieces, attempting to move a white piece would result in an illegal move, thus losing the game.

3.5 Readable logs

The program will record all moves made throughout the game and output it in a human readable log in the format of a .txt file:



3.6 Computer gameplay

Whenever it's the computer's turn, turn on the timer and if the timer reaches 60 seconds, then stop the algorithm and return the most optimal move. This can be done using the *time.h* library in C which will return the best move for the computer if the 60 second limit has elapsed. At its most basic form, the following data type and function from the library will be used to implement a timer:

time_t: This data type stores a clock time as an integer.

clock(): This function returns the processor time used within a given program.

Terms of use

Common Error Messages:

- “Error! Illegal Move!”
    - This error message is given when the player attempts to make a move not allowed by the rules of chess.
- “Error! Choose a color!”
    - This error message is given when the user attempts to play the game without choosing which color they would like to play as.
- “Error! Invalid Input!”
    - This error message is given when the player inputs the move they wish to make incorrectly.

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