Team 9
Jeffrey Ching, Jayniel Gagui, Fabian Hernandez, Vanessa Lauridsen, Varvara Vorobieva, Tangqin Zhu

Chess GPT
User Manual

Version Alpha
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Appendix A: Glossary

Bishop: This piece moves diagonally, either on only white squares or only black squares, as long as there are no other pieces in the way.

Capture: This is the act of taking an opponent's piece from the board.

Castling: This move involves the king and the rook swapping positions. If neither of the pieces has moved, the king may move two squares to either side, with the rook moving to the other side of the king.

Check: This is an attack on the king, which the king can escape either from moving out of that tile or having another piece block the attacking path.

Checkmate: This is an attack on the King that an opponent cannot escape. A checkmate results in a loss for the person controlling the king.

En passant: In this move, a pawn that moves two squares forward can be taken by an opposing pawn that is directly next to it on the following move.

King: This piece cannot be taken off the board. The aim of the game is to capture the opponent's king, whilst keeping yours safe. The king moves one square at a time in any direction. Putting your own king in a check or a check-mate scenario is illegal.

Knight: This piece can jump over other pieces. This piece moves in an 'L' shape-two squares vertically and one horizontally, and vice versa.

Pawn: This piece can only move one space at a time, except for its first move, which it can make 2 spaces up. The pawn cannot move backwards.

Promotion: A concept that describes a pawn's ability to become any piece the player wants, if it has reached the end of the board

Queen: This piece can move to more squares than any other piece. It moves vertically, horizontally, and diagonally, as long as there are no other pieces in the way.

Rook: This piece moves vertically and horizontally, as long as there are no other pieces in the way.

Stalemate: This is a situation in which the player to move is not in check, but they cannot move any of their pieces.

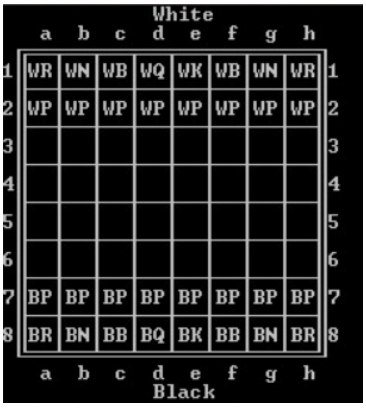
Tutorial

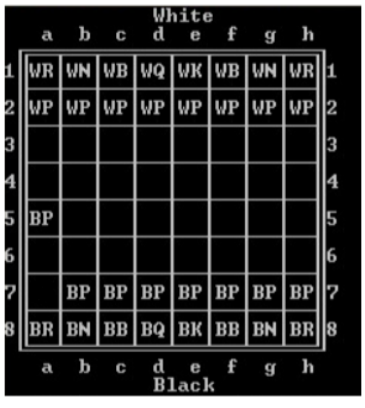
1.1 Usage Scenario

When functioning properly, the Chess GPT program should welcome the user to the program and explain to the user that the program is intended for a human to play the classical game of Chess with the AI programmed as the other player. It will then prompt the user to input their preference for which side they would like to play.

```
Welcome to ChessGPT!
Please select an option from the menu below

1. Begin a chess game.
2. Tell me a joke.
3. Quit this program.

Enter your choice: 1

Please select the side you would like to begin on.
Enter '1' for white and '2' for black.
Remember, white begins the game.

Enter your choice: 2

Great! Now please input on the keyboard the rank & file of the space where you want to move is currently and then the space on the board
you want to move your piece to. For example, if I wanted to move the pawn at a7 to the space a5, I would input 'a7a5' on the keyboard.

Enter your move: a7a5
```

Then, the Chess board will be presented to the user, as it appears below. The white side will make the first move and confirmation will appear on the screen, as the board should now reflect the updated state of the game. When it is the user's turn to move, the user will input the rank & file of the piece they intend to move, and the rank & file of the space where they intend to move their piece. For example, the user will input 'a7a5' on the keyboard if they would like to move their black leftmost pawn at position a7 two spaces up to a5, as depicted on the screenshot below.





Capturing a piece works the same as moving a piece, except the piece that is being captured will no longer be displayed on the board, and will be replaced with the piece that captured it.

After the first move is made by the user, when it is their turn, they will always be presented with two options, to make a move or to surrender. After this, the user and the computer will take turns moving their pieces according to the chess rules that are displayed in the glossary.

This will carry on until the match reaches a stalemate or either king is put into a checkmate, given that the user does not choose to surrender.

1.2 Goals

The goal of the program Chess GPT, is to make the most fun, and most intelligent version of chess, while following the classical rules and goals of the board game and winning the tournament.

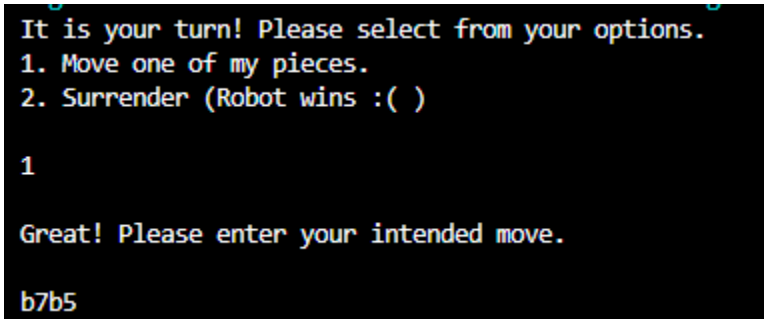
The goal of this program is to implement this using the limited data structures available within the C language and make the application easy to understand and enjoyable for the user. The goal is also to implement a structure within the program that detects the legal moves for each piece and notifies the user if they are intending to make an illegal move.

1.3 Features

The Chess GPT program comes jam packed with exciting features like ‘move’, ‘capture’, ‘surrender’, ‘check’, ‘checkmate’, ‘stalemate’, ‘castle’, ‘en passant’ and ‘move log’.

Chess GPT also comes with encouraging remarks toward the newbie chess player, but will react poorly to having their pieces taken by the user.

Move and surrender will be the two options the user is presented with during the beginning of their turns.



If the user ever inputs an illegal move, the program should present an error message and return the user to this 'turn menu' presented above.

If the user or the program puts the other into 'check', a message will appear on the screen notifying the user of the 'check'.

If the user or the program are 'checkmated', the user is notified of which side won, and is returned back to the main menu of the application.

If the user wishes to 'castle', or complete 'en passant', just like with 'capture' or 'move', all they need to do is input the move of their piece, as previously discussed and the program will complete the move for them, as long as it is legal.

If any move results in a 'stalemate', the program will notify the user of this, and return the user to the main menu.

All interaction with the program is done through the keyboard, and the input data type that is needed for a move or menu selection should be clearly stated by the program in the prompt. The user should be presented with examples whenever input is requested from the user, to mitigate user error. If an incorrect input is presented by the user, the prompt will loop until the correct input is presented.

The 'move log' is presented, along with the updated game board, after every move. The 'move log' is the history of the moves that have been completed by the program and the user. Each move begins with the letter W or B, white or black, then with the move syntax that the user has been using. For example, if the last move made was a black pawn from a7 to a5, then the code in the 'move log' should be "Ba7a5".

Installation

2.1 System Requirements

Hardware Requirements:

- Computer (x86_64 server)

Software Requirements:

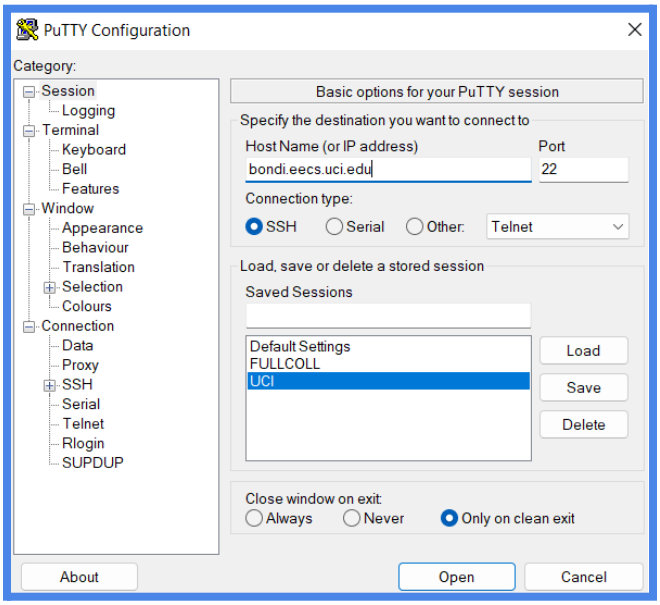
- Linux OS (CentOS-7-x86_64)

2.2 Setup and Configuration

Accessing The Linux Server

To access ChessGPT you must first install a SSH client such as PuTTy for Windows computers in order to access the shared Linux server.

After installation, open PuTTy and under host name you must either use *bondi.eecs.uci.edu* or *crystalcove.eecs.uci.edu* as shown below:



Note: Make sure SSH is selected under connection type and port is set to 22.

Navigating the Linux Server

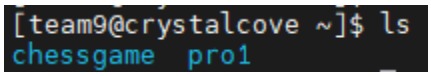
To install our program, you should first make a directory in order to organize the installation of the game. You can name the directory to your liking, but in this case we'll name the directory "chessgame". To do this type the command as shown below:

mkdir chessgame

```
[team9@crystalcove ~/chessgame]$ mkdir chessgame
```

To confirm that the directory was made, type the command as shown below:

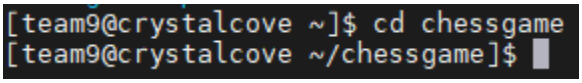
ls



We should now see that the directory chessgame was created.

Next, we want to move into the chessgame directory, type the command as shown below:

cd chessgame



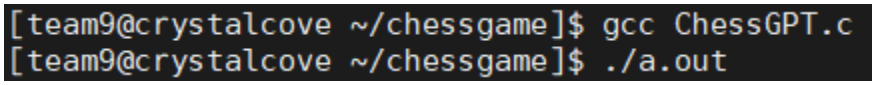
Now that we're in the correct directory, we can now copy the game into the directory by typing the command as shown below:

cp ~eecs22L/public/y23/ChessGPT.c

The final step is to compile and run the program. To do this type the following two commands and the game will execute.

gcc ChessGPT.c

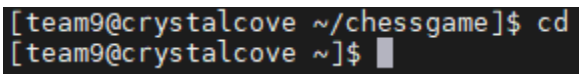
./a.out



2.3 Uninstalling

To uninstall the game, we need to move out of the directory. To do this type the command as shown below:

cd



Now that we're back to the main directory, we can now delete the chess game directory containing the game. To do this type the command as shown below:

rm -rf chessgame

```
[team9@crystalcove ~]$ rm -rf chessgame
[team9@crystalcove ~]$
```

The uninstall is now complete.

Documentation of Functionality

3.1 Main Menu:

The Main Menu will consist of the following:

- Option for Player vs Player
- Option for Player vs A.I.
- Option for A.I. vs A.I.
- Exit

The user will be asked to type PvP, PvE(A.I), EvE. Depending on the option the user will be up against another user, an A.I., or watch the A.I. go at it vs another A.I.

```
Welcome to ChessGPT
Type <PvP> for player vs player mode
Type <PvE> for player vs AI mode
Type <EvE> for AI vs AI mode
Type <Exit> to quit game
```

3.2 Chess Pieces:

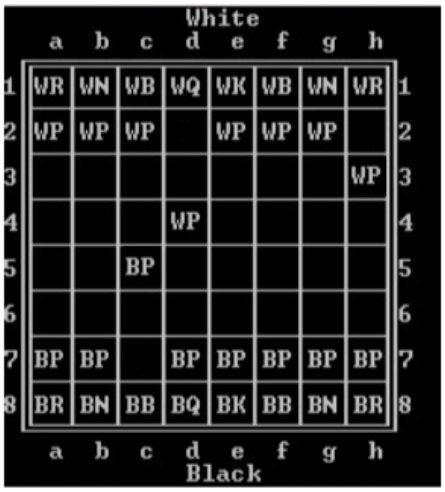
Each chess piece will have their own ways to move on the board:
(Glossary explained this already)

- **Pawns**: move forward 1 block in their file, unless in the original position where they can move an extra block. If a pawn makes it to the end of the board, it can be promoted to any piece except king.
- **Rooks**: can move anywhere horizontally and vertically in a straight line on the chessboard.
- **Knights**: Can move in an L shape 3 long, 1 to the right or left side.
- **Bishops**: Can move anywhere diagonally.
- **Queen**: Can move anywhere diagonally and horizontally.
- **King**: Can move diagonally and horizontally in only one block.

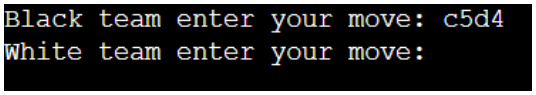
3.3 Capture:

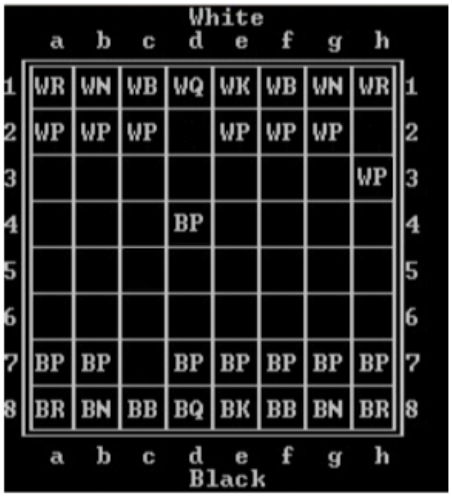
In chess you need to eliminate enemy pieces to, most importantly, checkmate the king to ensure victory. Therefore chess pieces can “capture” enemy chess pieces, which are eliminated for the rest of the game.

Example:



In this scenario, the black pawn in c5 can move diagonally to capture the white pawn in d4. The user can type ‘c5d4’ and the white pawn will be captured.



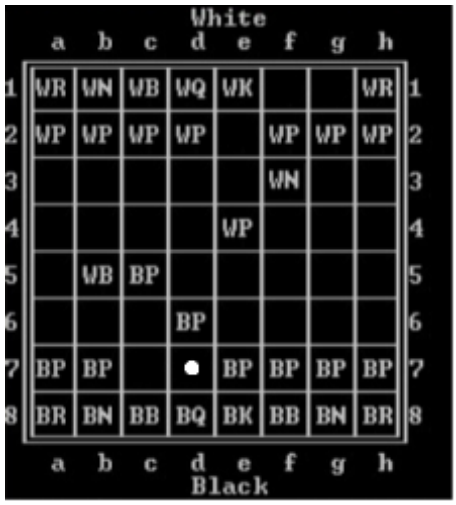


3.4 Check and Checkmate:

If the king is going to be captured in the next enemy turn the check or checkmate would be called. You or the enemy are required to resolve this, if

it is able to be resolved then that is a check. If the king is in a situation where there is no alternative way to get out of check, that is a checkmate and whoever checkmated the other player wins.

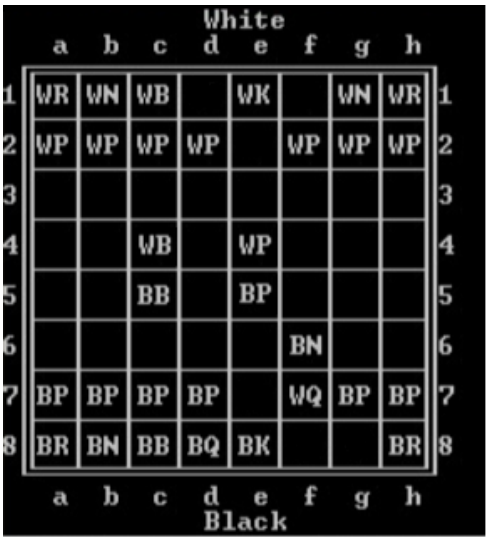
Example: Check

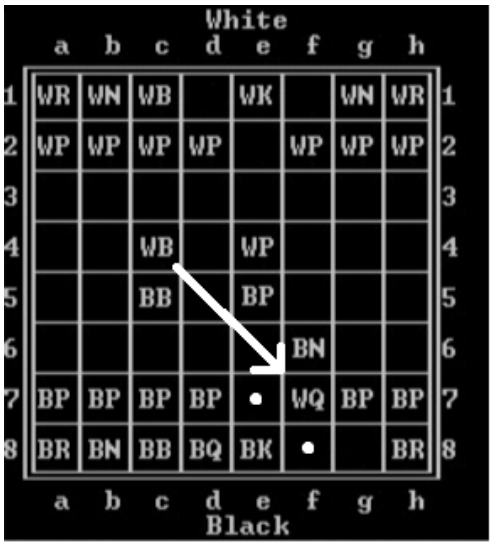


In this situation the black team is in check because the white bishop in b5 can capture the black king in e8. To prevent the king from being captured, the black team has to block the bishop's path. The black team in this situation has three options to block the bishop:

- Move the queen from d8 to d7
- Move the bishop from c8 to d7
- Move the black knight from b8 to d7

Example: Checkmate






```
Black team has been checkmated. White team wins!
Thanks for playing!
```

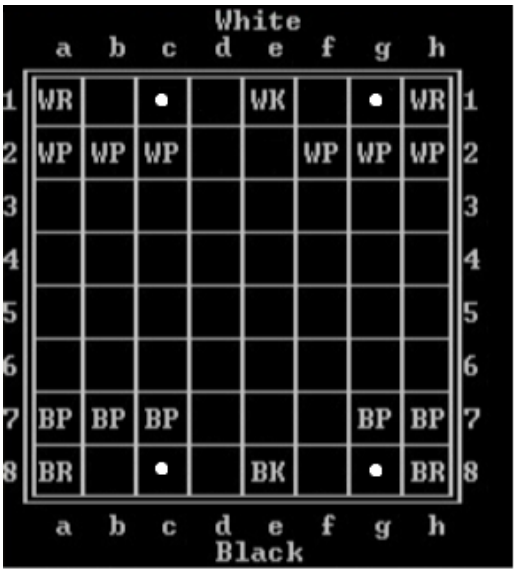
In this situation, the black team is checkmated because the king has no way to move without being captured. The black king can move to e7 or f8, but the white queen can capture the king. The king can also move to f7 to capture the white queen, but the white bishop from c4 can capture the king if it moves to f7.

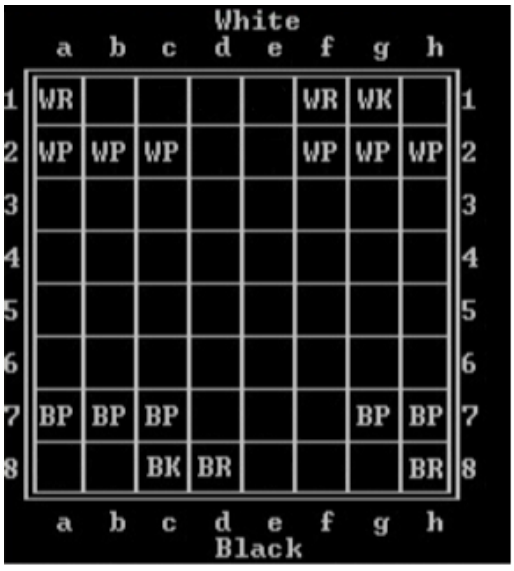
3.5 Chess Special moves included:

Castling, Pawn Promotion, En Passant Capture will also be included.

- Castling allows the players to move the rooks 2 blocks to the king and the king also 2 blocks towards the rook. The player can't castle if the king is in check or can be checked after the castle.
- Pawn Promotion allows the pawn, if it makes it to the other side of the chess board to "promote" to any chess piece except a king.
- En Passant Capture allows you to capture a pawn using a pawn horizontally to it, if the other pawn moved 2 blocks in the being previously

Example: Castling

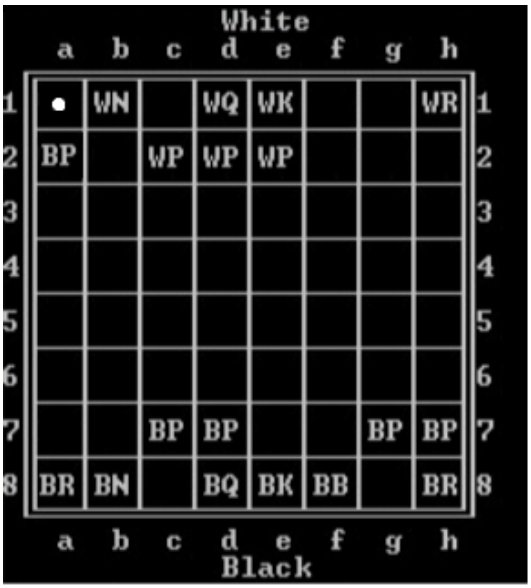


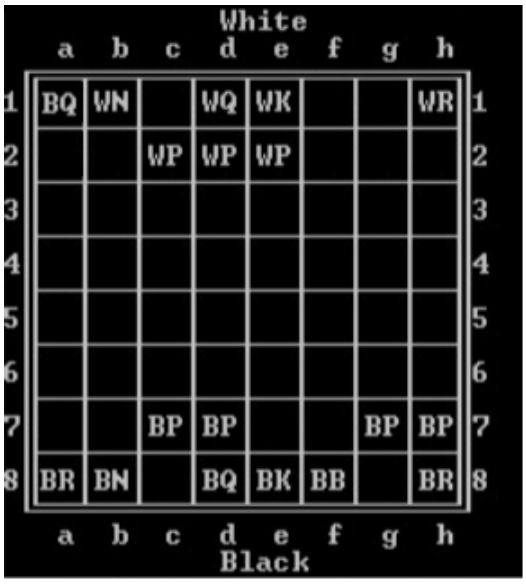


In this example we are going to make both players castle. For the white player, they can move their king to c1 or g1 to castle. For the black player, they can move their king to c8 or g8 to castle. For this example, we'll make the white king move to g1. We can see that the king moved two spaces to the right and the rook moved to the opposite side of the king. For the

black team, we'll make their king move two spaces to the left. Once the move was completed, the rook moved to the opposite side of the king.

Example: Pawn Promotion

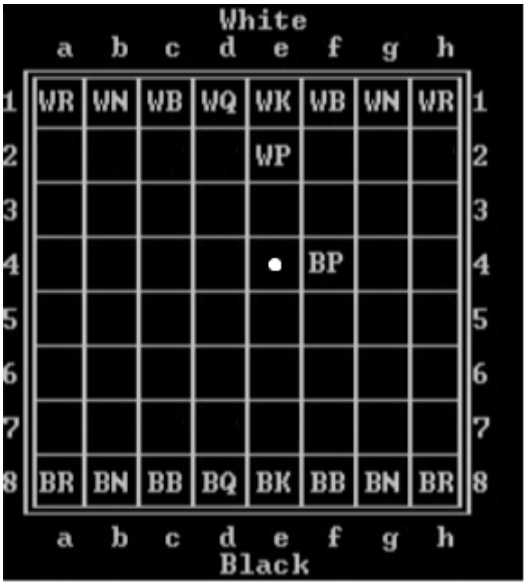


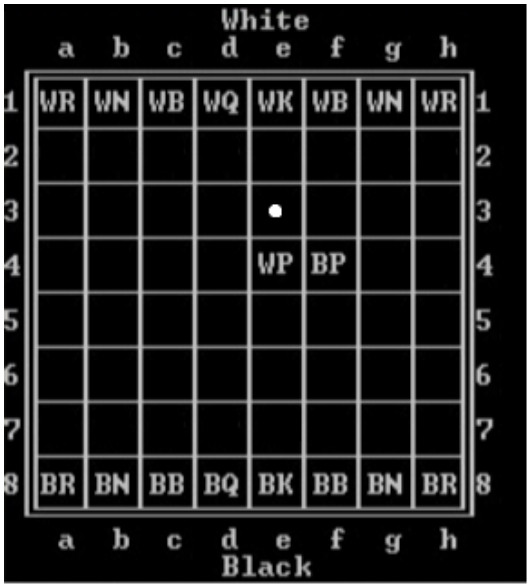


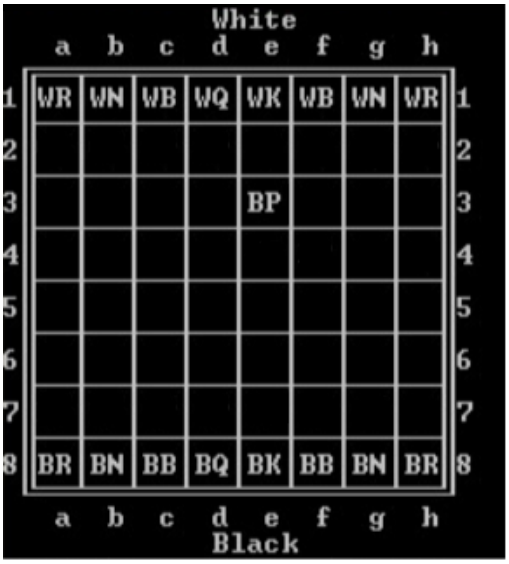

```
Black team enter your move: a2a1
Pawn promotion. Enter the piece you'd like your pawn to be: BQ
White team enter your move:
```

In this example, the black team is one move away from reaching a pawn promotion. The black team will first move the pawn so that they can reach the other side of the board, in this case they will move the pawn in a1 to a2. Since the pawn has reached the other side of the board, the black team will be prompted a pawn promotion. The black team is then asked to type what piece they want their pawn to be. They want another queen so they will type 'BQ'. The pawn has been promoted to a queen.

Example: En Passant





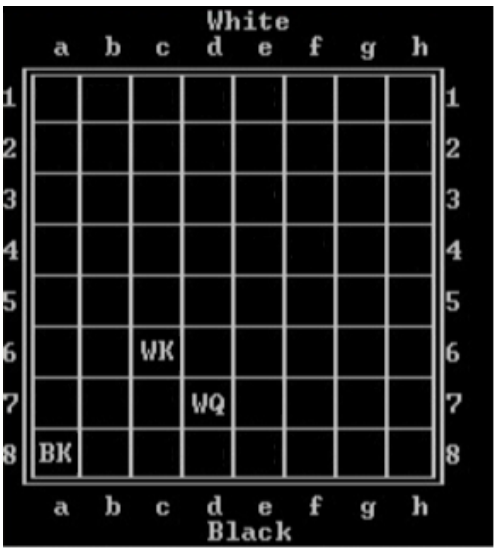


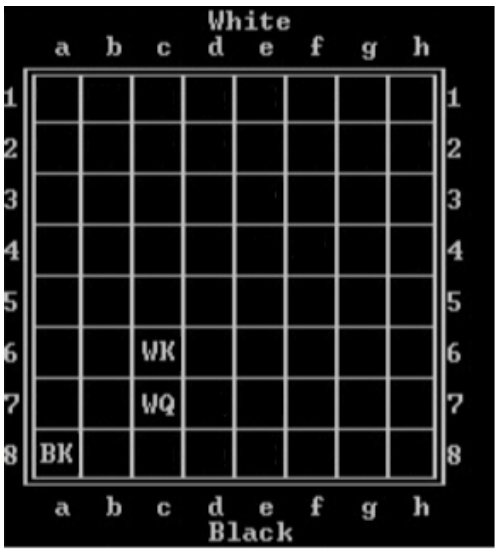
In this situation, the white pawn in e2 has not moved yet so it can move one or two spaces forward. We will move it two spaces to e4. Since the pawn moved two spaces and moved next to an opponent's pawn, the black pawn in f4 can move to e3 to capture the white pawn in e4. En passant can only happen if those two criterias are met.

3.6 Stalemate:

A stalemate occurs when there are no legal moves to make.

Example:





In this example, to win the game the white team can move the white queen in d7 to b7 to put the black king in checkmate, but we will move the white queen from d7 to c7 instead. This now created a stalemate because the black king is not in check and the only possible moves it can make is to put itself in check. Since moving the king into check is illegal, this will result in a draw.

Back Matter

Copyright

Error Messages

If the user experiences error messages from the PUTTY application, exit out of the application and try logging in again and follow the steps in the Installation module.

If the issues persist, please contact help@chessgpt.com.
Alpha Version April 2023

Program and Manual by Jeffrey Ching, Jayniel Gagui, Fabian Hernandez, Vanessa Lauridsen, Varvara Vorobieva, and Tangqin Zhu.

For any questions contact help@chessgpt.com.

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