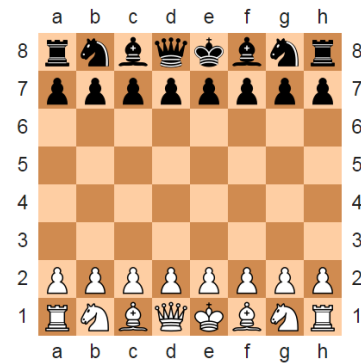**Code / Project** : CME1251 / 3

Year / Semester : 2020-2021 Fall Semester

Duration : 4 weeks

Project: DEU-CENG Chess

The aim of the project is to develop a two-player chess game, called DEU-CENG Chess.

General Information

The game is played on a 8 by 8 chessboard. The board is initially filled with chess pieces in the regular way that each piece should be placed, at their starting position. For example, the second row is filled with pawns. The rooks are placed in the corners, the knights next to them, followed by the bishops and finally the queen, and the king on the remaining spaces.

The rows on the chessboard are called *ranks* and the columns are called *files*. The ranks are labelled from 1 to 8 and the files are labelled from a to h. These numbers and letters are used as a coordinate system, in order to describe where the pieces are positioned on the chessboard. The letter always comes first and the number follows it. The aim is to beat the opponent by capturing opponent's King which ends the game.

Game Elements, Chess Pieces and Moves

- 8*8 game board
- 2 players. Players are represented by their pieces in white or black colors (Blue is used for white, red is used for black in examples below).
- 6 chess pieces and their special moves are as follows:
  - **King (K)** moves one square in any direction, so long as that square is not attacked by an enemy piece. When the king is captured, game is over.
  - **Queen (Q)** moves diagonally, horizontally, or vertically any number of squares. She is unable to jump over pieces.
  - **Rooks (R)** move horizontally or vertically any number of squares. They are unable to jump over pieces.
  - **Bishops (B)** move diagonally any number of squares. They are unable to jump over pieces.
  - **Knights (N)** move in an 'L' shape, e.g. two squares horizontally (or vertically), then one square vertically (or horizontally). They are the only pieces able to jump over other pieces.
  - **Pawns (P)** move vertically forward one square, with the option to move two squares if they have not yet moved. They capture other pieces diagonally in a one square forward direction. Pawns are unable to move backwards on captures or moves.

Special Chess Moves

- **Castling:** A player moves his/her king two squares over to one side and then move the rook to the square that the king crossed last. Castling on the kingside is called castling short (the rook moves a short distance, i.e. two squares) while castling on the queenside is called castling long (the rook moves a long distance, i.e. three squares).
  This special move can be done only if the king has never moved, the rook involved has never moved, the squares between the king and the rook involved are unoccupied, the king is not in check, and the king does not cross over or end on a square attacked by an enemy piece.

- **Promotion:** When a pawn reaches the other side of the board, the player must promote it to another piece (such as a queen). Then pawn moves like that piece.

- **En passant:** If a pawn moves out two squares on its first move, and by doing so lands to the side of an opponent's pawn, that other pawn has the option of capturing the first pawn as it passes by.

Game Playing Rules

The game starts with 8*8 chessboard filled with chess pieces in their starting positions. Every chess match starts with a white move.

There are two modes of the game as **Play Mode** and **Demo Mode**. In each turn of **Play Mode**, a player moves one of his/her pieces according to the game rules and the turn of play passes to the other player. Player selects the move position through cursor movements or by entering the move as a string of chess notation. The placement of the selected piece is allowed only when chess rules are not violated, otherwise an error message appears. After each move, a string showing the chess notation of the player's move is written on the right side of the chessboard. The moves are written in vertical columns if necessary.

In **Play Mode**, the game can be saved and quitted at any time. If a player presses "H" on the keyboard, it means that player asks for a hint. Game must show all the possibilities for the next move which captures the opponent's any piece.

In **Demo Mode**, a game in chess notation is read from a txt file. Demo mode shows each move of white and black by pressing space key. A player can switch to Play Mode at any time and continue from there.

In each mode, all the moves should be checked whether chess rules are violated or not.

Chess Notation Symbols

Symbol	Meaning	Symbol	Meaning
K	King	Q	Queen
R	Rook	B	Bishop
N	Knight	x	Captures
O-O	Kingside castling	O-O-O	Queenside castling
+	Check	e.p.	En passant

General Chess Notation Rules

Rule	Rule description	Example
1	Chess Notation Format: TurnNumber. WhiteMove BlackMove	`1. e4 e5`
2	A move, basically, is a target square. The symbol of the piece comes before the target, except from pawn pieces. Pawns have no symbols. Move=SymbolTarget	`f3` `Nf6`
3	Capture moves have an "x" between symbol and target. Pawn column is given firstly in pawn captures. CaptureMove=SymbolxTarget PawnCaptureMove=ColumnxTarget	`Qxd4` `exd4`

4	If more than one piece (of the same kind) have the ability to move to the same target, column (or row if necessary) must be written after the symbol in order to differentiate the piece.	`Nbd2`
		`Nbxd2`
		`N1xf3`

Sample Chess Moves

Moves	White move description	Black move description
`1. e4 e5`	pawn moves to e4	pawn moves to e5
`2. Nf3 Nf6`	knight moves to f3	knight moves to f6
`3. d4 exd4`	pawn moves to d4	pawn on e captures d4
`4. e5 Ne4`	pawn moves to e5	knight moves to e4
`5. Qxd4 d5`	queen captures d4	pawn moves to d5
`6. exd6e.p. Nxd6`	pawn captures d5/moves to d6 (**en passant**)	knight captures d6
`7. Bg5 Nc6`	bishop moves to g5	knight moves to d6
`8. Qe3+ Be7`	queen moves to e3 and **check**	bishop moves to e7
`9. Nbd2 0-0`	knight on b moves to d2	**kingside castling**
`10. 0-0-0 Re8`	**queenside castling**	rook moves to e8
`11. Kb1`	king moves to b1	
`d8Q`	pawn moves to d8 and **promoted** to queen	

Sample Game Screens

```
  +-----------------+
8 | R N B Q K B N R |
7 | P P P P P P P P |
6 | . . . . . . . . |
5 | . . . . . . . . |
4 | . . . . . . . . |
3 | . . . . . . . . |
2 | P P P P P P P P |
1 | R N B Q K B N R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B N R |       1. e4
7 | P P P P P P P P |
6 | . . . . . . . . |
5 | . . . . . . . . |
4 | . . . . P . . . |
3 | . . . . . . . . |
2 | P P P P . P P P |
1 | R N B Q K B N R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B N R |       1. e4 e5
7 | P P P P . P P P |
6 | . . . . . . . . |
5 | . . . . P . . . |
4 | . . . . P . . . |
3 | . . . . . . . . |
2 | P P P P . P P P |
1 | R N B Q K B N R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B N R |       1. e4 e5
7 | P P P P . P P P |       2. Nf3
6 | . . . . . . . . |
5 | . . . . P . . . |
4 | . . . . P . . . |
3 | . . . . . N . . |
2 | P P P P . P P P |
1 | R N B Q K B . R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B . R |       1. e4 e5
7 | P P P P . P P P |       2. Nf3 Nf6
6 | . . . . . N . . |
5 | . . . . P . . . |
4 | . . . . P . . . |
3 | . . . . . N . . |
2 | P P P P . P P P |
1 | R N B Q K B . R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B . R |       1. e4 e5
7 | P P P P . P P P |       2. Nf3 Nf6
6 | . . . . . N . . |       3. d4
5 | . . . . P . . . |
4 | . . . P P . . . |
3 | . . . . . N . . |
2 | P P P . . P P P |
1 | R N B Q K B . R |
  +-----------------+
    a b c d e f g h
```

```
  +-----------------+
8 | R N B Q K B . R |       1. e4 e5
7 | P P P P . P P P |       2. Nf3 Nf6
6 | . . . . . N . . |       3. d4
5 | . . . . P . . . |
4 | . . . P P . . . |
3 | . . . . . N . . |
2 | P P P . . P P P |
1 | R N B Q K B . R |
  +-----------------+
    a b c d e f g h
```

Pressed H!
Hint: exd4 or Nxe4

```
  +-----------------+
8 | R N B Q K B . R |       1. e4 e5
7 | P P P P . P P P |       2. Nf3 Nf6
6 | . . . . . N . . |       3. d4 exd4
5 | . . . . . . . . |
4 | . . . P P . . . |
3 | . . . . . N . . |
2 | P P P . . P P P |
1 | R N B Q K B . R |
  +-----------------+
    a b c d e f g h
```

Suggested Weekly Program

1. Discussing and designing solution alternatives. Creating the necessary variables, structures.
   Screen. Cursor movement.
2. Play mode. Cursor moves. Simple string moves (move/capture (no special moves)).
3. Checking a move with respect to chess rules.
   (First Evaluation: Knight and simple pawn controls (no special moves))
4. Demo mode. Reading chess file. Writing chess file. Hint. Special moves. Determine "check" (+) condition.
   Remaining parts of the game. Testing/Debugging.

First Evaluation: 18.1.2021 Report: 18.1.2021	Final Evaluation: 29.1.2021 (powerpoint + poster) Report: 29.1.2021