**Software Design  
Document**

for

Chess Game

Version 1.0 approved

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# Introduction

* 1. **Purpose**

The Chesstackle is intended to mimic a game of chess, following standard chess rules including piece movement.

## 1.2 System Overview

Each piece will be its own class, inheriting its functions from a ‘piece’ class. The board will be managed by a database which will be updated by a manager class. The board will update and redraw based on changes to the database.

## 1.3 Definitions, Acronyms and Abbreviations

* Castling – Castling consists of moving the King two squares towards a Rook on the player's first rank, then moving the Rook to the square over which the King crossed. Castling may only be done if the King and Rook involved have not moved this game, 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 in which it would be in check.
* Check – A state in which the King will be taken in the opponent’s next move. The side in check may not end their move with their King still in check.
* Mate – End of the game. The King is mated when check state cannot be removed via legal moves.
* Bishop – Each player starts the game with two Bishops. White having them start on squares c1 and f1, and black having them start on squares c8 and f8. The Bishop can only move diagonally and will always stay in squares of the same color it started the game in (a Bishop starting on a white square will never move into a black square).
* King – The King is the most important piece in the game, a mated King ends the game with the mated King’s side losing. Each player only has one King, white having it start on e1 and black having it start on e8. The King can only move one space horizontally, diagonally, or vertically. The King cannot move into a position that would cause it to be in check.
* Knight – Each player starts the game with two Knights. White having them start on squares b1 and g1, and black having them start on squares b8 and g8. The Knight moves by first moving 1 square horizontally or vertically, then 1 square diagonally in an outward direction. The Knight may also jump over pieces of either color to reach its destination.
* Pawn – The lowest value piece in a chess game that can move one square forward (or two on its first move) and can only capture another piece when moving one square diagonally. Each player starts with eight Pawns on the second rank of the board from each players perspective. If a Pawn reaches the opponent's end of the board it can be promoted to any other piece.
* Queen – Each player starts the game with only one Queen. White having it start on square d1 and black having it start on square d8. The Queen may move horizontally, vertically, and diagonally any number of squares but may not jump over pieces.
* Rook – Each player starts the game with two Rooks. White having them start on squares a1 and h1, and black having them start on squares a8 and h8. The Rook can only move horizontally or vertically across the chess board.
  + This portion will be updated as necessary as the document grows.

## 1.4 Supporting Materials

1. Bodlaender, Hans. “The Rules of Chess.” The Chess Variant Pages, [www.chessvariants.com/d.chess/chess.html](http://www.chessvariants.com/d.chess/chess.html)
2. “Chessboard.” Wikipedia, Wikimedia Foundation, 24 Jan. 2018, en.wikipedia.org/wiki/Chessboard.

This portion will be updated as necessary as the document grows.

## Document Overview

# Architecture

<The architecture provides the top level design view of a system and provides a basis for more detailed design work. This is the section where you should include your High-Level design Component Diagram.

**2.1 Class Diagram**

Figure 2.1 shows the class diagram for the chess software. The diagram is represented by the Unified Modeling Language.

* 1. **Templates**
     1. **Function Template**

Function details will be formatted in the following manner:

**Purpose:** Description of how the function is used in the software.

**Inputs:** Description of the parameters of the function.

**Outputs:** Description of the return values of the function.

**Calls:** Functions called by this function.

**Called:** Functions this function calls.

**Procedure:** Description of the procedure of the function.

**2.3 chessGame class**

The chessGame class shall contain methods responsible for creating various piece objects and placing them on the chess board.

**2.3.1 chessGame**

**Purpose:** The constructor of the chessGame class is responsible for the creation and placement of the various pieces upon the chess board. Additionally the chessGame constructor initializes the values of the turn and turnNumber variables.

**Inputs:** None

**Outputs:** None.

**Calls:**

* + - Piece.moveLocation(int) method.
    - Piece.Piece(int) method.
    - Knight.Knight(int) method.
    - Rook.Rook(int) method.
    - Bishop.Bishop(int) method.
    - Queen.Queen(int) method.
    - King.King(int) method.
    - Pawn.Pawn(int) method.

**Called:** Board Class as global variable.

**Procedure:**

* + - Instantiates the Piece class as an array of size 64.
    - Loops through the array to instantiate the various individual piece classes and assigns them to a location in the array. The array is used to place pieces on the Board.
      * Rook, King, Queen, Bishop, Knight, Pawn
    - Initializes the turn and turnNumber variables, responsible for:

1. Changing turns in the game (turn).
2. Keeping track of the number of turns in the game(turnNumber) .

**2.3.2 changeTurn**

**Purpose:** This function changes turns in the game.

**Inputs:** None.

**Outputs:** None

**Calls:** None

**Called:** TilePanel.TilePanel()

**Procedure:**

* + - If turn = 0, switch it to one, else turn = 0.

**2.3.3** turnUp

**Purpose:** The purpose of this function is to provide the framework for the user to quit the game before a winner is decided.

**Inputs:** Description of the parameters of the function.

**Outputs:** Description of the return values of the function.

**Calls:** None

**Called:** TilePanel.TilePanel()

**Procedure:**

* + - Increments turnNumber when called.

**2.4 Board Class**

The Board class is called by the strtGUI class (top-level). The Board class shall contain   
 methods to handle events dealing with the user interface, as well as provide the user with   
 game functionality.

**2.4.1 Board**

**Purpose:** Creates the various JFrames necessary for the GUI.

**Inputs:** None.

**Outputs:** None.

**Calls:**

* + - JFrame.setLayout()
    - JFrame.setSize()
    - JFrame.add()
    - JFrame.setDefaultCloseOperation()
    - JFrame.setVisible()

**Called:** strtGUI.main()

**Procedure:**

* Create new JFrame for the Chess Board.
* Initialize the Layout of the Board.
* Create new JFrame for the Grave.
* Add the Frames to the Game Frame.

**2.4.2 GravePanel Class**

The GravePanel class is responsible for providing the framework to add captured pieces to the graveyard.

**2.4.2.1 GravePanel**

**Purpose:** The constructor for the GravePanel class shall create a new Label and add it to the Grave Panel.

**Inputs:** None

**Outputs:** None

**Calls:**

* JPanel.add()
* JLabel.add()

**Called:**

* Board.Java()

**Procedure:**

* Gather a captured piece’s information.
* Add the piece to the graveyard via JLabel.

**2.4.3 BoardPanel class**

This class provides the framework for creating the individual panels on the chess board. The class is also responsible for adding the panels to the board.

**2.4.3.1 BoardPanel**

**Purpose:** The constructor for the BoardPanel shall add the individual tiles to the board.

**Inputs:** a GravePanel object is passed into the parameters.

**Outputs:** None

**Calls:**

* JFrame.add()
* JFrame.setSize()
* Validate()

**Called:** Board.java

**Procedure:**

* Loop to populate an ArrayList with TilePanels and assign the panels to  
  a position in the chess board.

**2.4.3.2 drawBoard**

**Purpose:** This function shall draw the chess board GUI.

**Inputs:** chessGame object responsible for game creation and initialization.

**Outputs:** None

**Calls:** TilePanel()

**Called:** TilePanel.run()

**Procedure:**

* Shall utilize a loop to construct game tiles and add them to the chess Game.

**2.4.4 TilePanel Class**

The TilePanel class shall create the functionality of the GUI as well as provide the system with general decision-making logic when it comes to piece movement. This class gives the user functionality.

**2.4.4.1 TilePanel**

**Purpose:** The constructor for the TilePanel class is responsible for providing the GUI with functionality as well as the user with ability to play the game.

**Inputs:** BoardPanel Object, GravePanel Object, and Integer tileID

**Outputs:** none

**Calls:**

* JPanel.setPreferredSize()
* GridBagLayout()
* assignTileColor()
* assignTileSprite()
* Piece.validMove()
* GravePanel.graveYardAdd()
* ChessGame.changeTurn()
* ChessGame.turnUp()

**Called:** BoardPanel.java

**Procedure:**

* Check if player selected a tile with a piece on it.
* Check if player selected a piece on the team who is taking their turn.
* If the player has selected a piece, call highlightTile() to highlight available path.
* If the path is valid, the system shall allow the piece to move or capture an enemy piece on the selected tile.
* Update piece positions, graveyard, the board GUI, and switch turns.

**2.4.5 drawTile**

**Purpose:** The purpose of this function is to provide the structure to create tiles.

**Inputs:** chessGame object

**Outputs:** None

**Calls:**

* removeAll()
* assignTileColor()
* assignTileSprite()
* validate()
* repaint()

**Called:** BoardPanel.drawBoard

**Procedure:**

* Assign color and necessary board pieces to specific tiles when called.

**2.4.6 assignTileSprite**

**Purpose:** The purpose of this function is place a piece on a specific tile.

**Inputs:** None

**Outputs:** None

**Calls:**

* JLabel.setText()
* Validate()

**Called:**

* drawTile()
* TilePanel.TilePanel()

**Procedure:**

* Create JLabel and set the text of the JLabel to the name of the piece.
* Add new Label with the piece name to the tile.

**2.4.7 assignTileColor**

**Purpose:** The purpose of this function is to assign different tiles colors to represent the accepted chess board.

**Inputs:** None

**Outputs:** None

**Calls:**

* Swing.setBackground

**Called:**

* drawTile()
* TilePanel.TilePanel()

**Procedure:**

**2.4.8 highlightTile()**

**Purpose:** The purpose of this function is to highlight the tiles that are a part of a valid move to the selected piece.

**Inputs:** Int selected; Describing the location of the tile selected

**Outputs:** None

**Calls:**

* Piece.validMove()

**Called:**

* TilePanel.TilePanel()

**Procedure:**

* If a tile is in the valid path of the selected piece, highlighted = true.

**2.11 Bishop Class**

This class provides the framework to give the bishop movement across the board.

**2.11.1 Move**

**Purpose:** The purpose of this function is to create the bishop’s ability to move generally.

**Inputs:** Description of the parameters of the function.

**Outputs:** Description of the return values of the function.

**Calls:** Functions called by this function.

**Called:** Functions this function calls.

**Procedure:**

# High-Level Design

<This section provides a high level overview of the structural and functional decomposition of the system. Focus on how and why the system was decomposed in a particular way rather than on details of the particular components. Include information on the major responsibilities and roles that the system (or portions of it) must play.

## View / Model Component 1..n

<Provide a description and diagrams of a system component or set of components that describes a clearly defined view or model of the entire system or a subset of the system.

# Component 1..n

<Describe an element (subsystem, component, etc...) from architecture in further detail. When appropriate, include information on how the element is further broken down and the interactions and relationships between these subcomponents.

# Overview