 **New Bulgarian University**

Bachelor Faculty

Bachelor programme Network Technologies

NETB 375 Programming Practice

AI Chess Game

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Project Description

Using the programming language C++ and programming framework Qt implement a computer program the famous chess game. The game must gave two modes of play: human against human (on the same computer), and human against CPU. The program must have the following features:

* fully functioning GUI that represents the chess board and all pieces;
* white piece can be moved if it is a white player's move, and the same for black pieces;
* each piece is allowed to perform only valid moves according to game rules;
* AI complexity is left to project developers, and it can be the simplest possible -- a random move.

Project Architecture Overview

The chess game is organized as a three-layer application. The three main layers are the presentation logic (GUI), the ‘chess-logic’ which contains the business logic of the game and the ‘chess-state’ which stores the current state of the game.

The presentation logic (the GUI) knows and communicates only with the ‘controller’ which is the main part of the chess-logic. This way the GUI is responsible only for visualization and interaction with the user. It does not contain any chess specific logic, it does not perform any direct changes the chess state.

The ‘chess-logic’ contains all of the logic specific to a chess game. It is formed by the Controller, CheckChecker, SpecialMovesHandler and AI classes. They are responsible for enforcing the rules of the game and changing the state.

The ‘chess-state’ represents the state of a chess game. It is formed by the State, Player, Cell, GameType and all Piece classes. They model the chess game and store all the necessary information to replicate the state of a chess game.

The chess state

As stated earlier, the ‘chess-state’ represents the state of a chess game. It is formed by the State, Player, Cell, GameType and all Piece classes. In this document the Piece classes will not be explained as they are written by Vasil Yoshev.

The ‘Cell’ class represents a cell from a chess board. It contains a reference to a piece object. If there is no object on the cell the reference is NULL reference. The class has a getter and a setter for the Piece reference as well as copy constructor.

The ‘GameType’ is an enum that lists the possible game types – Player vs CPU, Player vs Player and Not Selected. Not Selected is the initial value, Player vs Player is the game type when two players pay against each other, Player vs CPU is the game type when a player plays against the AI.

The ‘Player’ class represents a Player. A Player has a name and color. Also there are two flags – inCheck to indicate if the player is in check and inCheckmate to indicate if the player is in checkmate. There are setters and getters for each of the fields and a copy constructor as well.

The ‘State’ class represents the actual state of the chess game. It contains the board which is two-dimensional vector of Cell objects. There are no getters and setters for this field, instead there are setPiece() and getPiece() methods which return or place the piece on the desired cell. The class stores the two players in a static array of size 2 as well as the index and a reference to the current player. There is a getter for the current player and a method that changes the current player to the other player. Also there are setters for the two players. The ‘State’ also holds the game type as an enum value. There is a getter and a setter for it. It also holds track if there is a pawn in promotion state (A pawn is in promotion when it reaches 8th rank. Then it should be changed with either a queen, rook, bishop or knight). This is the reason there is a flag inPawnPromotion and Coordinate field which stores the coordinates of the pawn that is in promotion. There are setters and getters for these two fields. There are also three private methods that help the initialization of the board – initPieces() which calls setPawnPieces() which sets Pawn pieces on entire row and setMajorPieces() which sets the major pieces on entire row. Thera is also shortcut for checking the check status of the current player – getCheckStatusCurrentPlayer(). The class also has a copy constructor which is used to copy the current state of the chess game.

The chess logic