Cylindrical Connect 4 program description

Board Class

The board class's main purpose is to be used as an object. This object will be used by both the main thread and the AI thread. This Board class will provide all of the necessary utility functions for searching the board, as well as manipulating the board while always taking into consideration the adjacent side. Main thread will use this class/object for the purpose of initializing, the playing board, and being able to print the board after the human makes their move.

Game Thread

The game thread will run the function gameStart. The purpose of this thread is the ability to accept the moves of a human player, after the main thread communicates to this thread that a move has been made by a human player. Depending on the parameter where the thread is initialized, the thread will determine if the AI will move first, or the player will move first. After every time either the player or AI makes a move, the main thread will be informed. All of the moves made by the human and AI are stored in separate Queues, where the main thread will tally the new board based on when the game progresses. The game thread simulates a similar version of a human player, where it will constantly "think" about the next possible move it can take until the player has made a move. Once the player has made their move, the AI will make a final decision based on logical sequence of conditions to determine the move.

AI "thinking" function

This function was designed based on logical reasoning conditions to determine its move. The priorities of each column is stored in an array called "rankings" where each index is the column on the board. Each integer element will indicate how much of a priority that index is, with the highest element indicating highest priority, and lowest indicating lowest priority. These columns are ranked by dropping tokens into 2 Hypothetical boards, separate from our main playing board, and evaluating the result. The hypothetical boards will help predict what action to take if the human makes a certain move. These are solved with logical conditions based on the priority:

1. Will the AI win the game?
2. Will the human win the game?
3. Will the human win the game by placing in the column that the AI just placed in?
4. Make Aggressive moves to win the game.

Main Thread

The main thread/program is designed based on the states of the game. This main thread will first initialize the game thread based on who the player wants to go first. The main thread will provide all of the necessary dialogues with the main and game thread, while showing the state of the game in the console after tallying the human and the AI move. This thread is also responsible for asking player for input throughout the program, and informing the game thread that the move has been made.

Mutex

The mutex is used throughout the program to allow both threads to take turns using the resources, and keep concurrency consistent.

Instructions to Run

This program was written with Visual Studio 2015, so please use windows. Next, you are able to run it by:

1. Opening Visual Studio, and open the project by File->Open->Project/Solution then navigating to the folder and opening the Connect4.sln file.