

1. Introduction of the game

Gobang, also called Gomoku or Five in a Row, is an abstract strategy board game. It is traditionally played with Go pieces (black and white stones) on a Go board. It can be played using the 15×15 board or the 19×19 board. The game is known in several countries under different names.

Players alternate turns placing a stone of their color on an empty intersection. The winner is the first player to form an unbroken chain of five stones horizontally, vertically, or diagonally.

In my designed game, I changed white stones to yellow, which could be seen clearly. There are 2 game modes: 1P and 2P.

1P is player vs computer, and 2P is player (pick yellow) vs player (pick black).

2. Requirements and functions of the game

- 1) A simple JFrame interface with good layout, which includes:
 - a. A chessboard. The chessboard is square, set the initial length (both rows and columns) of the chessboard is 15.
 - b. Menu with buttons: start, 1P, 2P, repent, reset.
- 2) A two-dimensional array to record coordinate of each points on the chessboard.
- 3) Mouse listener and action listener to achieve the function of set piece. The pieces are drawn at the intersection of the checkerboard grid and the pieces of two colors appear alternately. Same position cannot be played repeatedly.
- 4) Judging win or lose, if one color piece consecutive set to 5, win.
- 5) 1P and 2P game modes
In 1P mode, player will versus computer, using hashmap(key, value) to achieve auto-play for computer.
- 6) Button functions
 - a. Start: start the game
 - b. 1P and 2P: Switching game mode
 - c. Repent: undo the last step
 - d. Reset: Clear the chessboard and restart the game

3. Class diagram

- 1) Chessboard Class: This is an interface which contains key features in chessboard, using lots of constants.
- 2) ChessUI Class: A JavaFX user interface to set the chessboard and menu. Override paint method to draw the chessboard and pieces.
- 3) CountScore Class: Count consecutive pieces through 8 directions: up, down, left, right, upper left, upper right, bottom left, bottom right.
- 4) Buttons Class: Achieve all button-functions by action listener, which includes these methods:
 - a. mousePressed method: Choose play mode, 1P or 2P

- b. actionPerformed method: Achieve each function of buttons by action listener
- c. reset method: Clear the chessboard and restart the game
- 5) Chess Class: Contain 2 game modes, set chessboard and draw piece, judge win or lose, this class includes these methods:
 - a. getWeight method: Traverse the board to get the weight of each position, which used in 1P mode.
 - b. maxWeight method: Find latest and biggest weight as next step for computer, which used in 1P mode.
 - c. drawPiece method: Draw piece (x_cross, y_cross) with alternate order, use 1 represent yellow piece, use 2 represent black piece.
 - d. win method: Judge win or lose according to columns, rows, diagonalLR and diagonalRL, 1 represent yellow piece win and 2 represent black piece win.

4. Testing

- 1) ButtonsTest Class
Test Buttons Class, makes sure all the buttons are work good, test reset() method works.
- 2) ChessTest Class
Test Chess Class, makes sure these functions are OK: set chessboard, draw piece, get weight and max value of weight, win() method to judge win or lose correctly.
- 3) CountScoreTest Class
Test CountScore Class, all 8 methods with different direction works good.