GOMOKU GAME DESIGN SUMMARY

INTRODUCTION

Gomoku is a board strategy game. It is played with Go pieces (black and white stones) on a Go board. The winner is the first player to form an unbroken chain of five stones horizontally, vertically, or diagonally ("Gomoku", 2019). We develop this game with two modes, One Player and Two Player mode. In One Player mode, the player will face against the AI that we built using heuristic functions.

FLOWCHART

The flowchart of this game is described in Figure 1 below.

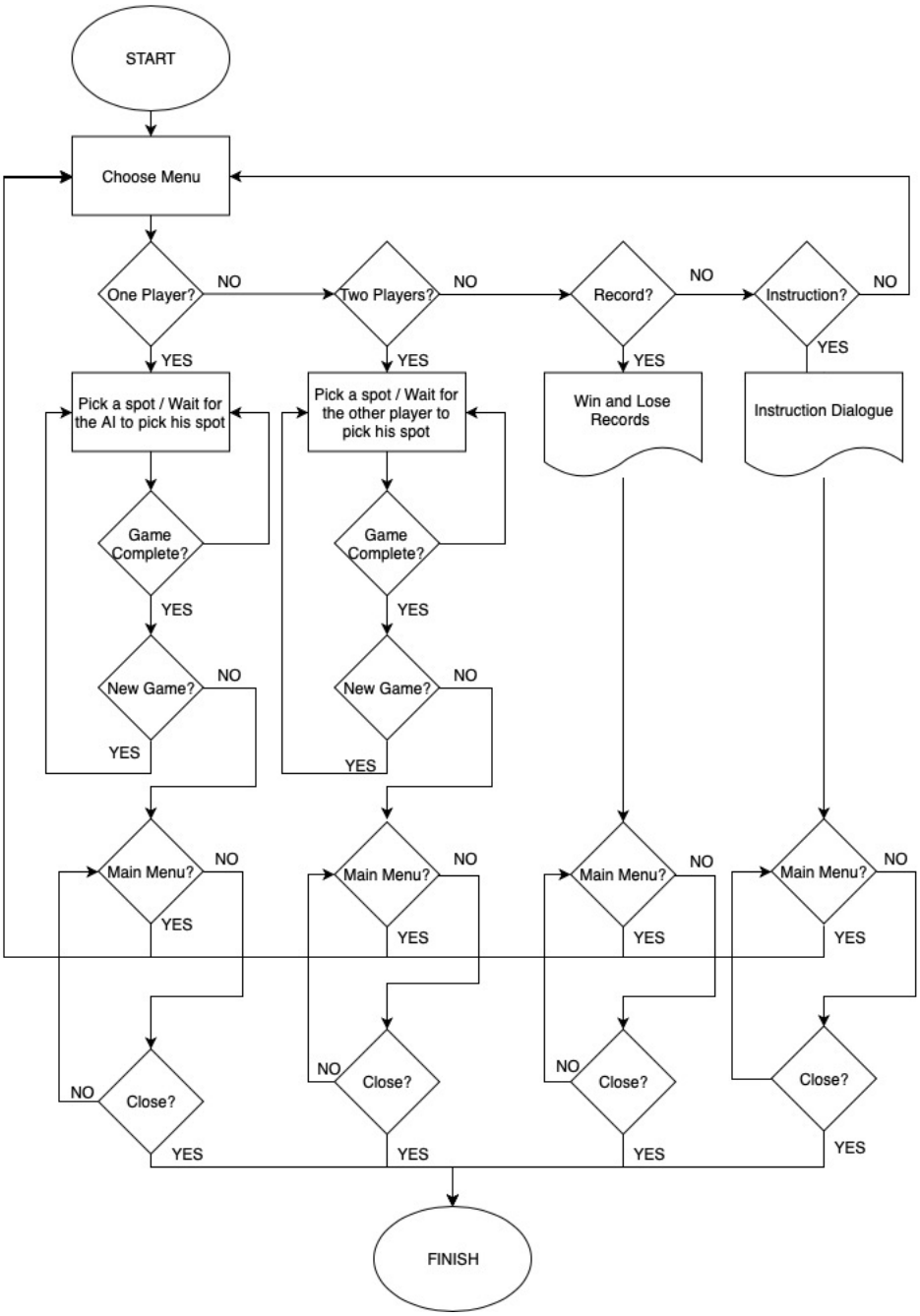

Figure 1 the game flow chart

INTERFACE DESIGN

For the interface of the game, we choose a bit "dark" theme because not only it is better for the eyes but also the limitation of our team who cannot provide dual theme (light and dark). We also add simple notifications such as "You Lost!", "Your Turn", "Bomb" and "You are out of bombs!" either as a title at the top of the apps or as a toast at the bottom of the apps to make the game more clearly. In the game interface, we put New Game and Main Menu button to immediately terminate the current game and start a new game or return to main menu in order to simplify the flow of the game.

GAME DESIGN

In the beginning, we load the game resources (pictures and music) and view the menu. If the player chose either One Player (play with AI) or Two Player mode then we start the game by initializing and drawing the board using image view. If the player plays with AI, we will generate a random number will tell who will be the first to play the stone. If it is two-player mode. The first player will get the black stone and the second player will get the white stone. For these two modes, we assign a Boolean variable named "isAImode" to manage the AI mode and two-player mode. We use arrays of valueCell to clarify the occupation of the cell whether the position is placed player-one or computer or player-two.

Just to make the game more fun to play, we add a "Bomb" feature in both one-player and two-player mode. When the bomb is placed on the board, the surrounding (8 neighbor stones) and the bomb will blow up with a sound effect. The bomb activation is identified by a Boolean variable named "isBomb" which can be assigned to true when the button bomb is pressed.

Beside the two modes of play, we also add two non-playable menu named "Record" and "Instructions". The Record menu will show the win and lose rate in the One Player mode. The Instruction menu will show a dialogue on how to play the game.

AI DESIGN

The Evaluation class is built for AI to play the game with three key features:

1. Update the information of the game board as the game is playing
2. Evaluate next possible status by the heuristic function.
3. Return the best next move to AI based on the heuristic function.

The procedures of the AI could be described into 3 steps as follow:

1. Create the instance of Evaluation, the positions will be added to the Set<String> availablePositions by default.
2. As player or AI place their pieces, Set<String> playerPositions and Set<String> aiPositions will add these positions and availablePositions will remove them correspondingly.
3. Evaluate next possible steps for AI by calling the method scoreCalculator(String position, Set me, Set other).

The heuristic will consider the benefits of attacks and defends at the same time. For example, String pattern_50000 represents the winning pattern for AI or Player. It will get 50000 points if AI place in this way so it will win the game, it will also gain 10000 points, which is the second highest score if player can win in next step by placing the piece in the certain position. Thus, winning is the first priority and deter the player from winning is the second priority.

REFERENCE

Gomoku. (2019). Retrieved from https://en.wikipedia.org/wiki/Gomoku