Status Report: Gin Rummy

Team Name: Noses Goes
Aaron Bu (acb256), Anya Harter (ash247), Cindy Wang (cw653), Annie Zhang (zz229)
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All edits from the original proposal are done in blue.

Introduction

Our project involves creating an interactive game playing program for a two player gin rummy game. One player will be a human user and one player will be an AI bot. Our project will then have two main components: a GUI for gameplay and an AI bot. In terms of AI, our system will specifically be exploring game tree search for a gin rummy game. A gin rummy game is played with an ordinary deck of 52 cards, and 10 cards are dealt to each player to begin with, so our game tree actually starts at the initial state *after* the cards are randomly dealt, which greatly simplifies our state space.

Evaluation

We will evaluate our system in two ways. We will first test it with human players, both to test our GUI/overall gameplay system and to test the functionality of our AI. After ensuring that our system works in all edge cases with a human player, we can then test it against other bots. There are websites online where human players can play against a similarly intelligent bot, and while we cannot ensure that the same set of cards are randomly dealt to each player, we can temporarily manually input the game from the website into our system, so the website's bot can play against our own via a human intermediate.

Our evaluations as the AI progresses will be based on playing against a bot. We will run 10 games and calculate the percentage of the rounds that our AI wins. This will give us a number to chart as it increases with the complexity of our AI.

Gin Rummy Explained

The following is a simplified explanation of the basis of the game.
A two-player game using a single deck of cards, where Ace is low and King is high.
The goal is to make your whole hand of 10 cards, sets of either 3 or 4 of a kind or a straight of 3 or more consecutive cards. You do this by either picking up the top card in the discard pile or the top card in the facedown deck. The players alternate turns until a player decides to "knock". They can do this as long as the value of their hand is less than 10. The "value" of a hand is the sum of the values of cards not belonging to a set where Ace is 1, 2 is 2 etc. and all face cards are 10. At this point, they lay their cards down and if the "knocker" has fewer points, their score is the point difference. If the "knocker" has more points, then the "knocker" has been undercut and the opponent scores 10 points plus the difference between the values. Rounds continue until one player's score reaches 100 points or more and they win.

Timeline and Workload Distribution

Week of	Previously Stated Goal	Status/Revised Goal
3/23	Begin planning in detail	Learn to play Gin Rummy.
3/30	Week of spring break, ideally no work :-)	---
4/6	Start developing the GUI, finish mapping general AI structure	Play Gin Rummy to familiarize with strategy more.
4/11	**Check in**	Set up Git repo, work on mockups for GUI and begin basic structure. We are also familiarizing ourselves with the Java GUI more.
4/13	Finish setting up game mechanics and our general AI structure	Same as previously stated.
4/20	Finish general GUI, continue AI coding	Same as previously stated.
4/27	Finish AI coding, put it all together	Same as previously stated.
5/4	Testing, touch-ups	Same as previously stated.
5/11	Finish writing final report, write personal reports	Same as previously stated.
5/14	**Team Final Report Due, Personal Final Report Due**	Same as previously stated.

For this project, we need to create a GUI in order for both humans and AI to play Gin Rummy. This GUI will be split up into the visual/UI/UX side and the actual mechanics of the game. We then need to create an AI to play against humans.

~~On the GUI side, by April 11th, we will have the game mechanics set up so that we can interactively test. The interface can be created in parallel, but does not necessarily need to be done in order to move on with the project. For the AI, the general structure should be completed by April 11th so that when the game mechanics are finished, the AI can begin to be implemented immediately.~~

On the GUI side, we currently have a simple working GUI for purposes of understanding the code structure for Java GUIs. Due to the limitations with Java GUIs, we will likely need to simplify our mockups and create a very simple but clean user interface. On the AI side, we currently have a solid grasp of gin rummy strategy and just need to translate that into code.

We can split the work between two teams of two for the GUI and the AI initially. For the GUI, one person will tackle game mechanics (Annie) and the other will handle mostly UI/UX (Cindy). The AI can be worked on by two (Aaron and Anya), with one's primary focus being implementation and the other testing. ~~However, since the GUI is meant to be finished halfway through the project, the focus of the~~ Once the GUI is finished, the GUI team's efforts can be redirected towards developing our AI for the latter half of our project.

External Resources

We will be using some existing resources to allow us to focus more on the AI part of the assignment. We will likely be using some GUI libraries to help our GUI development (AWT and Swing). However, we will be coding most of the AI and game state ourselves. We might use an online Gin Rummy player to help us get a better idea of the strategy and develop our own Gin Rummy skills so we can play against our AI. This is because in the end we want our AI to be able to play real people. However, we may also use the online player in testing as described above.

Relation to Other Work of Team Members

There is no relation of this project to anything else we are doing.

Citations

The rules for Gin Rummy described above are summarized from this website:

https://www.thespruce.com/gin-rummy-complete-card-game-rules-412366