CSC 466: Candidate Research/Programming Project #2

Title: What is the Heuristic Jeopardy! Player?

Jeopardy! is a popular trivia game show. In recent years, there has been an uptick in so-called Jeopardy! super champions – James Holzhauer, Amy Schneider, Matt Amodio, and Mattea Roach, to name a few – breaking game winnings and streaks records. When James Holzhauer made his run in 2019, there was a lot of buzz around his out-of-the-ordinary strategies pertaining to board selection and wagering. The unorthodox play styles of the super-champions make the basis for an interesting project exploring the heuristics of Jeopardy!

Jeopardy! features three rounds of gameplay with a total of sixty-one questions. The first round features a board of thirty questions with six categories each containing $200, $400, $600, $800, and $1000 boards. There is only one daily double in this round, where the player can wager money. The second round, Double Jeopardy, has the same setup as round one except with double the money and two daily doubles. The third round, Final Jeopardy, features a single question where players can wager their accumulated money. Three players compete in Jeopardy!

The focus of this project is not to create a mini IBM Watson. The goal is to create a simulator that can predict a winning play style based on player statistics, like buzz-in probability/speed, answer accuracy, and wagering confidence. All three Jeopardy! rounds will be simulated. Heuristic, traditional (playing the board from top-to-bottom, or easiest to hardest), and random play styles will be implemented. Each player will have configurable statistics.

The Jeopardy! Player

The Jeopardy! Player will feature several characteristics that affect gameplay:

1. ***Play Style*** – The player can either play heuristically, traditionally, or randomly.

2. ***Question Accuracy*** – The percentage of correct answers a contestant gives. Used to determine whether a player answers a question correctly.

3. ***Buzz-in Speed*** – The speed at which a player buzzes into a question. Used to see which player buzzes in first to a question. A player may or may not choose to buzz into a question.

4. ***Confidence*** – This is used to measure how confident a player is in buzzing into questions and making wagers. A more confident player will buzz into more questions and make riskier wagers. A less confident player will buzz into less questions and make safer wagers.

The three Jeopardy! players will be initialized by the user prior to gameplay.

Jeopardy! 1st and 2nd Round Simulation

The first two Jeopardy! rounds will need to be modeled with a simplified board of thirty questions. A visual representation is not necessary, but would be nice to have as proof of work. Neither categories nor questions need to be defined, as this is not a Q&A system. Daily doubles will need to be hidden on the boards. The following represents a textual representation of of a Jeopardy! board, with "*" for unplayed questions and "-" for played questions:

```
            1 2 3 4 5 6
$200    * * * * - *
$400    * - * * * *
$800    * * * - * *
$1000   * * * * * *
```

To start round one, the first player will pick a category and money amount. If the question is not a daily double, any player can buzz in. The player that buzzes in first will be determined via a calculation using confidence percentage and buzz-in speed. If that player answers correctly – determined by the accuracy percentage calculation – the money total is added to the player's score. Otherwise, the question goes to the next player that buzzes in, unless time runs out. The

player with the most recent correct answer gets control of the board. If the question is a daily double, the player whose turn it is only gets to answer the question.

Final Jeopardy Simulation

Final Jeopardy does not need a visual representation; instead, player wagers, correctness, and updated scores will be displayed. For Final Jeopardy, each player makes a wager based on their current scores. Player correctness will be determined by an accuracy percentage calculation. If a player gets the question correct, money is added to its score. Otherwise, money is subtracted from the total score. The game winner is determined by which player has the highest money score.

The Heuristic Player

The heuristic player follows the gameplay of the aforementioned Jeopardy! super champions. Heuristic gameplay occurs in three places:

1. **Board Selection** – The heuristic player will choose questions based on the daily double position probabilities found [here](). After the daily double(s) is found, the heuristic player chooses the highest money values on the board.

2. **Daily Double Wagering** – In the first round, the heuristic player wagers everything on the daily double. In Double Jeopardy, the heuristic player wagers based on personal score, how many questions remain, and opponent scores. Questions like "Can the player catch up to first place?", "Can the player catch back up if everything is lost?", and "If in first, can the player maintain a lead?" are considered.

3. **Final Jeopardy Wagering** – The heuristic player wagers based on player placement. If the player has a substantial lead, the heuristic player only bets enough to maintain that lead even if wrong. The heuristic player may wager more safely if a win can be obtained by the first place player missing a question.

The Traditional Player & The Random Player

The Traditional Player – The traditional player plays the board "in order," choosing the questions monetarily-valued from lowest to highest. Daily double wagers are safer. Unless in first place, the traditional player takes riskier bets in final jeopardy.

The Random Player – The random player plays the board randomly and bets random monetary amounts regardless of situational context.

Heuristic Analysis

Heuristic analysis will be performed by comparing the heuristic player to the traditional and random players. Other analyses can be performed on player characteristics to determine what effects they have on gameplay.