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COSC326 Etude 6 Report

BuyBot3002 is a bot designed to play the game For Sale. It implements various strategies to maximise the value of properties won at auction and maximise the amount received for selling properties. It was developed by continually iterating on a basic initial design and testing newer iterations of the bot against older ones over thousands of games. Iterations of BuyBot3002 also have modifiers to weight the importance of different decisions. The final weightings were chosen after extensive testing and tweaking. Overall, BuyBot3002 consistently has the largest number of wins and a higher average point value after 10,000 matches when playing against previous iterations of itself.

Bot Strategy:

Buying:

When choosing a property to buy, BuyBot3002 calculates a set of variables relevant to the decision.

- Calculated Auction Value is a combination of multiple variables:
    - Auction Value is the estimated value of the auction, based on the properties in the current auction. Higher values have more weight so that an auction with better properties will have an exponentially larger auction value.
    - Standard Deviation is the standard deviation of card values in the auction. A higher standard deviation means that there is a range of good properties and bad properties, so we should bid more to avoid getting a bad property. This applies to the other way too, if the properties are all similar in value, there isn't much point bidding high to get the top card when it isn't that much more valuable than the lower ones.
    - Highest Value is simply the highest value property in the auction.
    - Deck Heat is the average difference of properties remaining in the deck from the overall average property value (15). A higher value means that the deck has high value cards remaining in it.
- Cash Advantage is the difference between the average players' cash remaining and the bot's cash remaining.
- Rounds Remaining is the number of auction rounds remaining.

These numbers are then normalized to be between 0 and 1, added together and multiplied by modifiers. We tested different values for these modifiers by continually testing the bot's play over 10,000 games and tuning the modifier values to maximise average property value and wins over the 10,000 games.

Once we have a decision value (which is between 0 and 1), we then calculate a max bid, taking into account remaining cash and the number of rounds remaining. The bot continues to bid until it reaches its max bid.

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Selling:

Initially, we tried to make selling decisions in the same way as buying. However, we found that we weren't getting reliable results, and it was hard to translate a decision variable between 0 and 1 to a property card in BuyBot3002's possession.
Instead we decided to use a series of if statements to determine which property to sell.

BuyBot3002 first checks whether it holds the highest property remaining in the game. If so, it will wait for either a cheque with value 15, or until the estimated sale value is over 4. If the bot does not hold the highest property, it will instead check whether the sale value is over 0.5 and then sell its second highest property - in order to preserve its highest property for later use. If the sale value is under 0.5, the bot will simply throw away its worst property.
To determine the bot's decision values we continued with our use of automated testing to find the most optimal values.