REAL MONOPOLY RULES: http://www.hasbro.com/common/instruct/00009.pdf

Game Options

- Before starting any new game, users may select options such as:
    - Number of players (Any combination of human/computer players)
    - Game Mode (Fast play, Normal mode)
        - Fast play:
            - Each player gets randomly given 3 properties
            - No rolling to get out of jail (only pay $50)
            - Only 3 houses needed before hotel
            - When one player goes bankrupt, the game is over and the winner is decided by determining net worth of remaining players (properties, bank account, houses/hotels, etc.)
        - Normal:
            - Rules are normal (start with no properties, $1500 each, may choose to try to roll doubles to get out of jail, Auction time customizable but default 20 seconds, need 4 houses before hotel, game continues after one player goes bankrupt)
- Should be accessed from “Main Menu” section and will have a way to access “Customize Board” page.
- “Game Options” page will give the user these options: Player Names, Player type (Human/AI), Game Mode (Normal/Fast Play), and a way to choose a theme

Customize Properties

Colors: Each monopoly grouping will be listed together. There will be an area with color pickers where the user can change the colors of the monopoly groups. As the user changes the color, the color box next to the corresponding monopoly group will also update.

Names: The textboxes should have as a placeholder our default name for the board square and allow the user to type whatever they want within limit of certain number of characters so that GUI displays this new name properly.

User’s Turn

- The user will always have four options to choose from: Roll Dice, Manage Properties, Trade, and Pause
    - At each step, the user will always be prompted to confirm the action so that they have time to process the game, or pause the game
    - Roll Dice

        - If they choose to roll the dice, they will be told (or shown) what number they rolled, and their playing piece will be moved to that spot on the board
        - Property
            - Buying
                - if a user lands on a property that is not owned, they have the option to buy it or pass
                - If they choose to buy it and have enough money, they can affirm or cancel the purchase
                - If they choose to buy it and don't have enough money, they may still purchase the property, but will be prompted to mortgage immediately after.
                - The user should be able to view the properties they own as well as the properties their opponents own
            - Paying Rent
                - if a user lands on a property that is owned, they will be notified that they paid rent
        - Community Chest/Free Parking
            - The card will be displayed on the screen and the user will be prompted to confirm the action
        - Just Visiting
            - Nothing happens and the player's turn ends
        - Go
            - Player is given money and the player's turn ends
        - Free Parking
            - Player is given money and the player's turn ends
        - Luxury Tax/Income Tax
            - money is deducted from player's balance and their turn ends
        - Go to Jail
            - The player's piece moves to Jail and their turn ends
    - Manage Property
        - The player can see a list of their property and how much money they have
        - For each property, there is an option to mortgage it
        - For each monopoly, there is an option to build on it
        - The user presses a save changes button to save and exit
    - Trade
        - Player can choose a player to trade with
        - Player can view all of their properties, and current balance
        - Player can select which properties they want to give, which they want to receive, and how much cash they want to give/receive
    - Pause
        - Resume

                - go back to the board and continue the game
            - Help
                - User can read the rules of the game and see the rules they have set up
                - Guidelines for navigating the interface
            - Save
                - If the game hasn't been saved before, Save As is executed
                - If the game had been saved previously, a confirmation pops up prompting the user to enter whether or not they want to overwrite the file
            - Save As
                - Textbox pops up asking the user for a filename
                - Game is saved once the filename is given
                    - need to check to make sure filename is valid
            - Exit
                - This will abandon the game and take the player to the main menu
- End of Turn
    - The player will be be notified in the game feed that it's the next person's turn
    - The next player then takes their turn
- Special cases
    - Rolling Doubles
        - If the user rolled doubles, they get an extra turn
        - If the user rolls doubles three times, they are sent to Jail
            - their piece is moved to Jail and their turn ends
    - In Jail
        - They can use a get out of jail free card, pay $50 to get out of jail, or try to roll doubles to get out of jail.
        - If the player has been in Jail for three turns, they will be prompted to pay $50 at the start of their turn
            - Once they make this payment, they can take a normal turn

Artificial Intelligence

- AI makes about 7 decisions
    - What to do when in Jail
    - When to unmortgage properties
    - Accepting or Declining trades proposed to it
    - What trade proposals it itself wants to propose
    - When/how many houses it wants to build when it is able to
    - When forced to mortgage, what properties it wants to mortgage
    - When lands on unowned property, whether or not to buy
- The first type of choices were straight buying decisions

        - for these, we calculate an expected earnings and cost of the current board, calculate a deviant board cost based on some risk aversion level where the higher the risk aversion level, the more standard deviations of cost away from the mean our deviant board cost is. For example, the AI becomes less risk averse when faced with a property that would give it a monopoly, which decreases the deviant board cost, making it more likely to say it feels “safe” and purchase the property.
        - At the start of each turn, checks to unmortgage property, checks to build houses, checks to make a trade proposal.
    - The second type of choices were Trade decisions.
        - Basically, the proposal gets boiled down to a numerical value based on retail prices of the properties and if the AI is getting more than it’s losing it’ll accept.
        - However, the AI also takes into account how good each of the properties are for each player and applies multipliers to weigh the values accordingly.
        - Able to both make decisions about incoming proposals and propose trades to other players if the multiplier for receiving a certain property is greater than 1 (the default).