About the Game and its Rules

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The Big Picture

Monopoly is a popular board game wherein players travel around a board consisting mostly of properties, but also a few special spaces. Players can buy properties and improve those properties. Meanwhile, as players move around the board, they must pay rent to the owners of other properties. The object of the game is to bankrupt all other players (or, in a short form of the game, be the richest player when the game ends).

This project will involve modeling spaces on a Monopoly board. The major focus of the project will be creating and using classes with inheritance and polymorphism. The game is quite complicated, and in the spirit of focusing on the issues of inheritance and polymorphism, we'll won't implement all of the rules of the official game. We'll make the following simplifications for the required project (i.e., you do *not* have to implement these things as they are in the real game):

- We'll simplify Chance and Community Chest. Instead of dealing with all of the cards and messages, landing on one of these spaces will result in the player either gaining or losing some cash. The amount can be randomly generated between some bounds, like -$200 to $200.
- No "house rules." So, no money on Free Parking, no extra cash for landing exactly on Go, etc. (Idea: keep it simple.)
- No auctions. If a player elects not to buy a property, the game simply moves on.
- No jail. Landing on "Go to Jail" will result in nothing happening. There will be no limit to how many times a player may roll doubles. (The cards are already nullified.)
- Actions that require a monopoly do not need code to check for a monopoly. Only the documentation for these actions needs to note the monopoly requirement. This means that you don't need to check if a player owns all of the properties of a color group before buying houses and you don't need to implement the rule that rent is doubled for unimproved lots in a color group of which a player owns all lots. (Do *not* try to support monopolies outside of an individual feature.)
- No limit to the number of houses or hotels sold.
- No mortgages.
- No selling or trading properties.
- We won't worry about announcing a winner by the official rules or removing players from the game. In other words, you only have to handle "normal" game play; when a player goes bankrupt, you can end the game manually.

While it may seem we're cutting out several rules here to make this problem easier (and, yes, these are all important elements of the original game design), we still have quite an interesting programming endeavor certainly worthy of a project and which will allow us to focus on practicing the OOP concepts we've been studying.

The required rules of the game you must support will be defined in this document.

Technical specifications will be provided. In short, you must:

- Implement a class to model a player.
- Implement a class hierarchy using inheritance and polymorphism to model the locations on the board.
- Implement a class to model a Monopoly game and include interactions with users, i.e. players.

Game Information

Here are a few links:

- A picture of the standard Monopoly board
- Official, complete Monopoly rules
- This text file contains all information found on title deeds and the order of spaces on the board.

Edited Rules

You do not need to implement all rules in the official rules. Below is a copy of the rules noting exactly what you do and do not need to support. (Everything below is edited from the official Monopoly rules found at http://www.hasbro.com/common/instruct/monins.pdf.)

Game Rules:

- **Object:** The object of the game is to become the wealthiest player through buying and renting property.
- **Equipment:** The equipment consists of a board, 2 dice, tokens, houses, and hotels. There is a Title Deed card for each property and play money. [No Chance and Community Chest cards.]
- **Preparation:** Set up the game board. Each player chooses one token to represent him/her while traveling around the board. Each player is given $1500. All remaining money and equipment go to the Bank.
- **Banker:** That's the computer in our version.
- **The Bank:** Besides the Bank's money, the bank owns properties and houses and hotels prior to purchase and use by players. The Bank...
  - ...pays salaries.
  - ...sells properties, houses, and hotels.
  - ...collects all taxes and interest and the price of all properties it sells.
  - ...never "goes broke." [Thus, you don't need to keep track of how much money the bank has.]
  - [...is *not* a player or anything to be modeled with a class or object, but rather an abstract concept.]
- **The Play:** A player is randomly chosen to go first.
  - The player starts at "GO," throws the dice, and moves in the direction of the arrow the number of spaces indicated by the dice. After you have completed your play, the turn passes to the left. The tokens remain on the spaces occupied and proceed from that point on the player's next turn. Two or more tokens may rest on the same space at the same time.
  - According to the space your token reaches, you may be entitled to buy properties or be obliged to pay rent, taxes, draw cards, etc.
  - If you throw doubles, you move your token as usual, and are subject to any privileges or penalties pertaining to the space on which you land. Retaining the dice, throw again and move your token as before.
- **"GO":** Each time a player's token lands on or passes over GO, the Bank pays him/her a $200 salary.
- **Buying Property:** Whenever you land on an unowned property, you may buy that property from the Bank at its printed price. You may otherwise pass. [No auctions in this project.]
- **Paying Rent:** When you land on property owned by another player, the owner collects rent from you in accordance with the rents on the Title Deed. [No mortgages.] Rents are higher when properties have

houses and hotels.

- **"Chance" and "Community Chest":** [When you land on these spaces in our form of the game, you will win or lose up to $200, randomly-generated at each turn with a uniform distribution.]
- **"Income Tax":** If you land here, you pay $200 to the bank. [Just one option here.]
- **"Luxury Tax":** If you land here, you pay $75 to the bank.
- **"Jail":** [Not implemented.]
- **"Free Parking":** A player landing on this place does not receive any money, property, or reward of any kind. This is just a "free" resting place.
- **Houses:** When you own all the properties in a color-group, you may buy houses from the Bank and erect them on these properties. You must build *evenly*, i.e. you may not build more than one house on any property of a color group until you have built a house on every property in that color group. You must also break down evenly in selling property back to the Bank. [These rules must be documented but do not need to be enforced via code.]
- **Hotels:** When a player has four houses on each property of a complete color-group, he/she may buy a hotel and erect it on any property of the color-group. He/she returns the four houses from that property to the Bank and pays the same price for the hotel as he/she would otherwise pay to build a fifth house. Only one hotel may be placed on any one property.
- **Building Shortages:** [Not enforced here.]
- **Selling Property:** Houses and hotels may be sold back to the bank at *one-half* the price paid for them. [No other selling here.]
- **Mortgages**: [No mortgages.]
- **Bankruptcy:** You are declared bankrupt if you owe more than you can pay either to another player or to the bank. [More omitted.]
- **Misc.:** No player may borrow from or lend money to another player.

Here is how rents work (information normally kept on the Title Deed cards):

- **Railroads:** If the player who owns the railroad only owns that railroad, the rent is $25. If the player owns two railroads, the rent is $50. If the player owns three railroads, the rent is $100. If the player owns all four railroads, the rent is $200.
- **Utilities:** If the player who owns the utility owns one utility, the rent is 4 times the amount shown on the dice. If the player who owns the utility owns both utilities, the rent is 10 times the amount shown on the dice.
- **Lots:** There is a rent for unimproved lots; a separate rent for having 1 house, 2 houses, etc.; and a separate rent for having a house. Rents vary based on properties.