PROJECT REPORT
CS-154

MONOPOLEE

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DESCRIPTION

We wish to implement the famous game Monopoly for our project using DrRacket. We have developed a two-player monopoly board game which consists most of the features of classic monopoly such as buy, sell, mortgage,bankruptcy , chance elements , community chests , jail etc. We constructed a optimal strategy to play the game using two game simulations. **We have extensively used syntactical abstractions (like while loops), states , structures , object oriented programming and graphics.**

What is monopoly ?
Monopoly is a real-estate board game for two to eight players, in which the player's goal is to remain financially solvent while forcing opponents into bankruptcy by buying and developing pieces of property. In the game, players roll two dice to move around the game board, buying and trading properties, and developing them with houses and hotels.

DESIGN OF OUR PROGRAM

We have represented the different properties in the board by a list of 40 boxes each of which is an object of a property class and the each of the two players are also the objects of a game player class.To move the tokens around the board we have used co-ordinates of the different boxes.
The overall design of our project contains 4 files :

1. ourproject.rkt :- It is the main file consisting all definitions, initializations for global variables that form our world using big-bang featureprovided in racket.

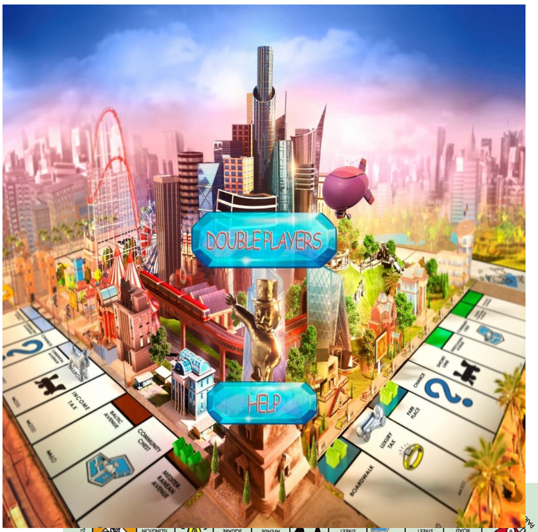
2. classes.rkt :- This contains all the classes and objects of players and properties and actions (purchase , upgrade , mortgage ,bankruptcy etc.) , and their heavy detailing.

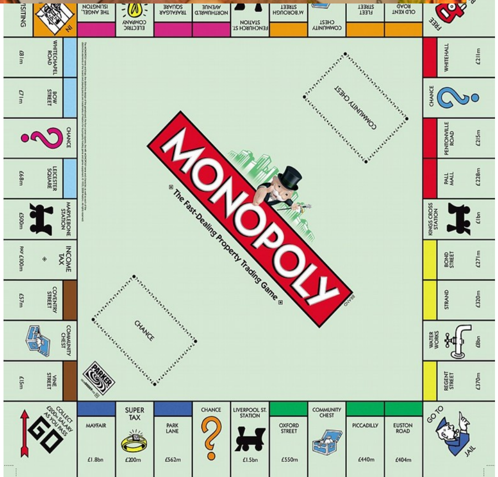
3. probability-simulation.rkt :- This was challenging part of our project. It runs a monopoly game simulator in which one player playes one million games of one thousand rounds each. It helps us to find which properties are more probable to be landed upon in the game and can helps us make decision related to purchase etc.which is a major part of strategy.

4. color-based-simulation.rkt :- This was the most challenging part of our project. It runs a whole two player monopoly simulation game in which all actions such as buy , mortgage , upgrade , chance etc. are considered. It then finds the winner and then calculates the frequencies of coloured properties owned by the winner of the game which lead to victory by running the simulation one million times. The top three colors which are most favourable should be the preference of player in a strategy to win the game.

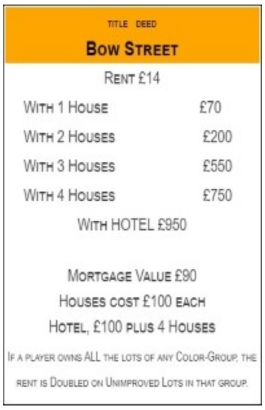
5. utility-color-sim.rkt :- this is just a helper file to the color simulator

The game will start with a menu window in which there will be two buttons Help and Double player.
Clicking on help will give you basic rules of the game. Pressing spacebar will return you to the main menu.
Once you start the game , press spacebar or enter key to roll dice. Then using mouse click choose the options you want in the pop up box.
The popup screen will be based on the state of player , if he had already bought the property a different popup will be shown (upgrade and mortgage) otherwise a popup with buy will appear.
Clicking on declare bankruptcy will end the game.





All the actions and features are displayed in the racket run window.



TITLE DEED

BOW STREET

RENT £14

WITH 1 HOUSE	£70
WITH 2 HOUSES	£200
WITH 3 HOUSES	£550
WITH 4 HOUSES	£750

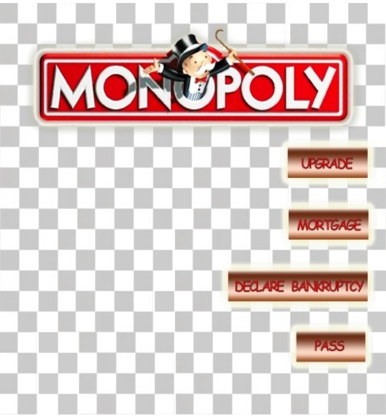
WITH HOTEL £950

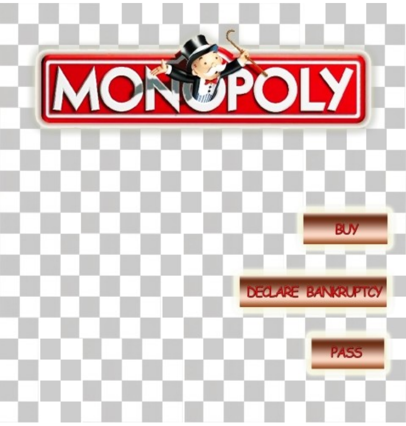
MORTGAGE VALUE £90

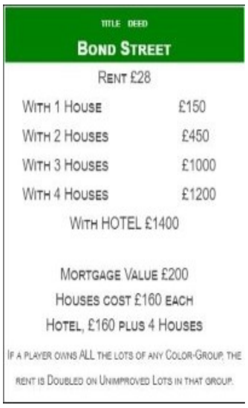
HOUSES COST £100 EACH

HOTEL, £100 PLUS 4 HOUSES

IF A PLAYER OWNS ALL THE LOTS OF ANY COLOR-GROUP, THE RENT IS DOUBLED ON UNIMPROVED LOTS IN THAT GROUP.







TITLE DEED

BOND STREET

RENT £28

WITH 1 HOUSE	£150
WITH 2 HOUSES	£450
WITH 3 HOUSES	£1000
WITH 4 HOUSES	£1200

WITH HOTEL £1400

MORTGAGE VALUE £200

HOUSES COST £160 EACH

HOTEL, £160 PLUS 4 HOUSES

IF A PLAYER OWNS ALL THE LOTS OF ANY COLOR-GROUP, THE RENT IS DOUBLED ON UNIMPROVED LOTS IN THAT GROUP.

SAMPLE INPUT OUTPUT

- The input will be key presses (spacebar and return key) for rolling dice and mouse clicks for buying and selling a property and other actions to perform in the game.
- The output will be the updated world according to the corresponding input.

LIMITATIONS AND BUGS

The limitation in our project is that we have not implemented some of the advanced rules of the games in our monopoly. Since there are hundreds of rules exisiting for it , it was not possible to implement all of them.

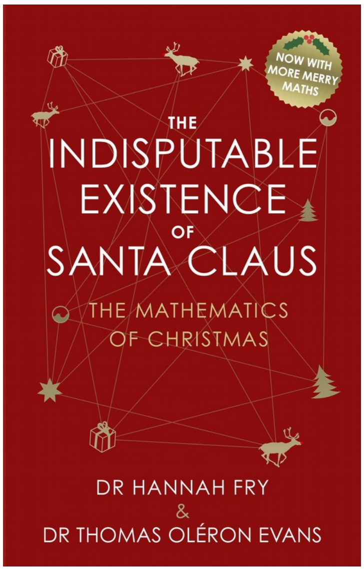
There are also some bugs in our project which is that the actions should be done by user in sequence. For example , if a pop-up for player1 appears and you roll the dice instead of choosing action it will take the world to next turn without doing the action for curent player.

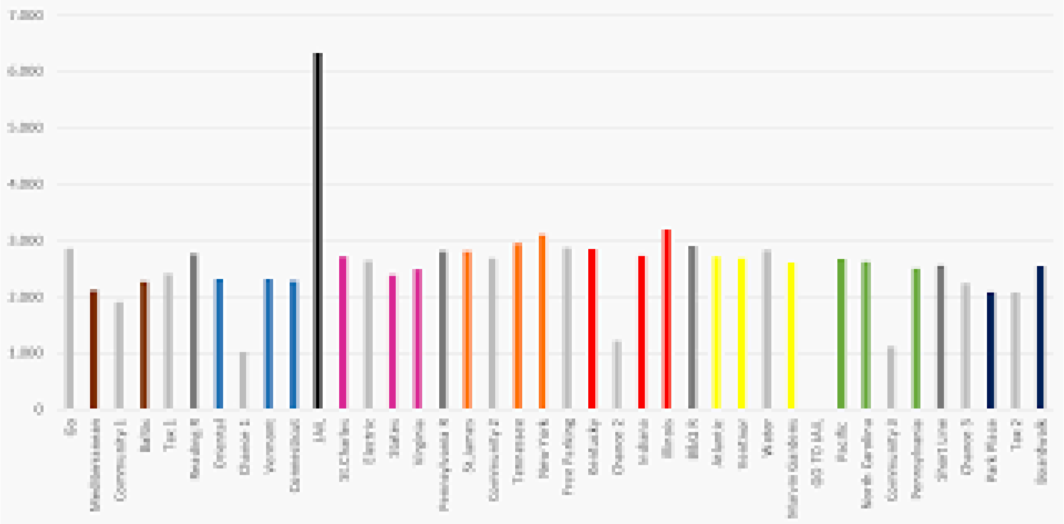
OTHER POINTS OF INTEREST

We have done some research to test the validity of our simulations. There is a book called“The Indisputable existence of Santa Claus” written by Dr. Hannah Fry in which she had calculated the probabilities using theoritacal mathematical analysis and markov chains (We don’t know how the method works).

The main point is that there is a **striking similarity** between the probabilities founded theoretically and those found by our simulation. Images below show the same.

This somewhat proves that our simulations produces correct results but these are not highly accurate as we have not implemented some complicated rules.




Go
Mediterranean
Community 1
Baltic
Tax 1
Reading R
Oriental
Chance 1
Vermont
Connecticut
Jail
St.Charles
Electric
States
Virginia
Pennsylvania R
St.James
Community 2
Tennessee
New York
Free Parking
Kentucky
Chance 2
Indiana
Illinois
B&O R
Atlantic
Ventnor
Water
Marvin Gardens
GO TO JAIL
Pacific
North Carolina
Community 3
Pennsylvania
Short Line
Chance 3
Park Place
Tax 2
Boardwalk