

Design and Analysis of a Game of Monopoly

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Abstract

The aim of this project is to design a game of monopoly using an Object-Oriented approach and following the Agile Scrum framework. This paper will outline the research required for the design of monopoly and will begin with an analysis of the requirements, classes and use cases needed for the design of the game. The product will be designed with the use of object diagrams and user interface mockups as well as state machines. Classes will be modelled using a collection of diagrams to portray the structure of the project, these will include collaboration and sequence diagrams. Finally, the source code will be written and provided to the reader based on the designs.

Introduction

This paper will seek to analyse, design and structure a game of monopoly with an Object Oriented Approach. The project is split into stages which include Analysis, Product Design, Class Design and finally the implementation. Source code for the game of monopoly will be provided and this will incorporate the designs and structure as outlined in the different stages.

Analysis

The first stage of this project is the Analysis Stage. Here, the requirements will be defined, the scenarios will be described, a primary class list determined, class diagrams and use case diagrams will be created and the results of a structured walkthrough will be provided.

Requirements

These requirements outline what the game will and will not do. They will highlight the scope of the project and give light to how the game will be developed. Below is the requirements specification of the game of monopoly.

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Requirements Specification

1. Allowing 2-8 players to join a game session.
2. Permitting each player to pick a game piece from a choice of 8.
3. Allocating money to players at the start of the game.
4. Enabling the player to navigate around the board by rolling two dice and moving the game piece.
5. Giving €200 to a player when the pass 'Go'.
6. Allowing player to take another go if a double is rolled.
7. Permitting player to purchase property if unowned.
8. Validating the property is unowned.
9. Giving out Title Deed Cards to players who have purchased a property.
10. Requiring the player to pay rent to another player who owns a property they landed on based on the rent price specified in the Title Deed Card if the owner of the property asks for it before the renter's turn ends.
11. Doubling the rent price for a set of properties once the complete set of properties is owned by one player.
12. Raising the rent price for a property when the property is improved with houses or hotels.
13. Auctioning a property if the property landed on is unwanted and unowned.
14. Permitting players to mortgage property according property's worth as specified on the Title Deed Card.
15. Enforcing that a property has no improvements before being mortgaged.
16. Receive payment for a mortgaged property with 10% interest when a player wishes to unmortgage it.
17. Preventing the player from collecting rent on a mortgaged property.
18. Allowing players to purchase up to four houses on a property when they own the full set of streets of the same colour.
19. Validating that the houses a player is building on a grouping is being built evenly.
20. Allowing the player to purchase hotels once four houses have been purchased on a property.
21. Enforcing that only one hotel may be built on a given site.
22. Preventing players to build improvements on a site if any of the sites in the grouping are mortgaged.
23. Auctioning buildings in the case of a building shortage and more than one player wishes to purchase the same building.
24. Allowing the player to pick up a chance or community chest card when landing on the relevant space and permitting to user to follow the instruction given.

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25. Allowing a player to go to jail when the player lands on 'Go To Jail', rolls three doubles or receives a card instructing them to do so.
26. Enforcing a player in jail to stay in jail unless 50€ paid, player waits three turns and pays 50€, rolls a double on one of their three turns or the player has a 'Get Out Of Jail Free' card and wishes to use it.
27. Collecting taxes and fines from players.
28. Buying properties and buildings back from the user when the player wishes to sell.
29. Validating that a player's buildings are sold back evenly.
30. Allowing players to make deals with each other which can include trading money, property, or 'Get Out Of Jail Free' cards.
31. Eliminating the player from the game when they can no longer pay what they owe and declare bankruptcy.
32. Enforcing a bankrupt player to give their mortgaged properties and 'Get Out Of Jail Free' cards to the other player that they are in debt to.
33. Requiring that the player who receives assets from a bankrupt player to pay 10% interest on any received mortgaged properties at time of receiving.
34. Auctioning a player's mortgaged properties at full (unmortgaged price) and returning 'Get Out Of Jail Free' cards to the relevant decks when that user is bankrupt and in debt to the bank.
35. Allowing last player left in the game to win.

Scenarios

Blah blah blah...

Primary Class List

Blah blah blah...

Class Diagrams

Blah blah blah...

Use Case Diagrams

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Use Case 1		
Goal In Context		
Scope and Level		
Preconditions		
Success End Condition		
Failed End Condition		
Primary, Secondary Actors		
Trigger		
Description	Step 1 2 3 4 5 6 7	Action
Extensions	Step 1a 2a 3a 4a 7a	Branching Action
Variations		Branching Action
	1	
	3	
	5	

Result Of Structured Walkthrough

Blah blah blah...

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Product Design

Object Diagrams

Blah blah blah...

Refined Class Diagrams

Blah blah blah...

User Interface MockUps

Blah blah blah...

State Machines

Blah blah blah...

Class Design

Collaboration Diagrams

Blah blah blah...

Sequence Diagrams

Blah blah blah...

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Object Diagrams

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Refined Class Diagrams

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Class Skeletons

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Implementation (Provisional)

Source Code

Blah blah blah...

Final Implementation

Summary of changes and Additions

Blah blah blah...

Source Code (Final)

Blah blah blah...

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Appendix

Notes of Team Meetings

Meeting 1

Blah blah blah...

References

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