Ho Chi Minh City International University

School of Computer Science and Engineering

Object-Oriented Programming

IT069IU

Monopoly Game

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GitHub Link Here

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CHAPTER I. INTRODUCTION

1. Abstract

This project presents the development of a Monopoly Game as part of the Object-Oriented Programming curriculum using Java. The project encompasses fundamental tasks set by the instructor, including reading, and presenting the Monopoly game rules, designing classes, implementing the game with basic rules, and writing a comprehensive report that covers game rules and class diagrams. Additionally, the project includes a live demonstration to showcase the developed Monopoly Game.

The development process adhered to mandatory requirements, such as utilizing Git for version control with a detailed commits history and implementing a graphical user interface (GUI) to enhance user interaction. As an extra feature, the project introduces dynamic sound effects, adding a multi-sensory dimension to the gaming experience.

The report provides thorough documentation of the project, offering insights into the game rules, class structures, and the decision-making process during development. The live demonstration serves as a platform to exhibit the successful integration of theoretical concepts and practical implementation, emphasizing the project's adherence to the specified requirements.

2. Key feature

In the realm of game development, creating an engaging and immersive experience is paramount. Our Monopoly Game project not only fulfills the academic requirements but also excels in delivering key features that enhance gameplay, aesthetics, and overall user satisfaction. Let's delve into the standout features that set our project apart:

i. Logical Gameplay:

One of the primaries focuses of our Monopoly Game is to provide players with a logical and intuitive gameplay experience. Every move, transaction, and interaction within the game adheres to the fundamental principles of the Monopoly board game. From the player turns to property management, the game's logical flow ensures that players can easily understand and navigate the virtual world of Monopoly.

ii. Quality Game Rules:

Our Monopoly Game preserves the essence of the classic board game while introducing strategic tweaks for a modern digital experience. Thoughtful adjustments enhance gameplay dynamics, ensuring a seamless transition from the traditional to the digital realm. It's a faithful adaptation that offers a fresh and engaging twist while staying true to the timeless joy of Monopoly.

iii. Manage Commits by GitHub:

Recognizing the importance of version control and collaborative development, our project utilizes GitHub to manage commits. A detailed commit history not only showcases the evolution of the project but also reflects the collaborative effort invested by the development team. This transparency in version control ensures efficient team coordination, allowing for a smooth and organized development process.

iv. Animated Sound:

To further enrich the gaming experience, our Monopoly Game incorporates animated sound elements. The inclusion of dynamic sound effects synchronized with in-game actions enhances immersion, providing auditory cues that complement the visual feedback. From the roll of the dice to property acquisitions, the animated sound contributes to a multi-sensory experience, elevating the overall enjoyment of the game.

v. Good-Looking GUI:

The graphical user interface (GUI) is the player's gateway to the virtual world of Monopoly, and our project places a premium on creating a visually appealing and user-friendly interface. The GUI is thoughtfully designed, featuring intuitive navigation, aesthetically pleasing graphics, and a layout that enhances overall user experience. The combination of functionality and visual appeal ensures that players are not only engaged but also delighted by the interface

3. Achievement

- Logical Game Rules
- Well-Designed Class Structure
- User-Friendly Gameplay Implementation
- GitHub Commits Management
- Well-Looking and Smooth GUI
- Animated Sound Effects

4. Techniques and Tools

- Java Programming Language: Leveraged the robust capabilities of the Java programming language to develop a versatile and platform-independent Monopoly Game application.
- GitHub for Version Control: GitHub served as a central hub for collaborative development. Using Git, we maintained a detailed commit history, ensuring a streamlined collaboration process, code management, and issue tracking.
- Canva for Sprite Design: Canva played a key role in crafting visually captivating sprites for the game. Its user-friendly interface and versatile design features facilitated the creation of engaging visual elements in the Monopoly Game application.

CHAPTER II. CONTRIBUTION

1. Contribution

Table 1: Group Contribution

Name	Responsibility	Contribution
Ưng Huỳnh Phúc	Project Manager, Front-end	35%
Trần Thiện	Back-end	32%
Nguyễn Khoa Minh Toàn	GUI and Support	28%
Mai Đức Thiện	Support	5%

2. Task Division

Table 2: Task Division

PHASE	ACTIVITY	MEMBER
Game Rules Research and Documentation	Thoroughly research and understand the rules of the classic Monopoly board game.	Ưng Huỳnh Phúc Trần Thiện Nguyễn Khoa Minh Toàn
	Document the rules and highlight any modifications or additions for the digital adaptation.	
Class Design and UML Diagrams	Responsible for designing the classes that will represent the game entities, players, properties, etc.	Ưng Huỳnh Phúc Trần Thiện Nguyễn Khoa Minh Toàn
	Create UML diagrams to illustrate the relationships and interactions between different classes.	Ưng Huỳnh Phúc Nguyễn Khoa Minh Toàn
Basic Game Implementation	Work on the initial implementation of the Monopoly Game, focusing on essential functionalities such as player movement, property transactions, and turn-based mechanics.	Trần Thiện Nguyễn Khoa Minh Toàn
Graphical User Interface (GUI) Design and Implementation	Responsible for designing an aesthetically pleasing and user-friendly GUI.	Ưng Huỳnh Phúc Nguyễn Khoa Minh Toàn
	Implement the GUI to enhance the overall user experience during gameplay.	
Animated Sound Integration	Incorporate animated sound elements into the game, synchronizing them with in-game actions to enhance immersion.	Ưng Huỳnh Phúc Trần Thiện
Report Writing	Responsible for documenting the project in a report. Include sections on game rules, class diagrams, development process, challenges faced, and solutions implemented.	Trần Thiện
Testing and Quality Assurance	Conduct thorough testing of the game, ensuring that all functionalities work as intended and identifying and resolving any bugs or issues	Ưng Huỳnh Phúc Trần Thiện Nguyễn Khoa Minh Toàn

Demonstration Preparation	Prepare the slide for the demonstration	Ưng Huỳnh Phúc
	Showcase the game during the demonstration. Ensure that the presentation covers key aspects of the project, emphasizing unique features and addressing any challenges faced during development.	All members

CHAPTER III. GAME RULES & FEATURES

1. The Rule of the Game

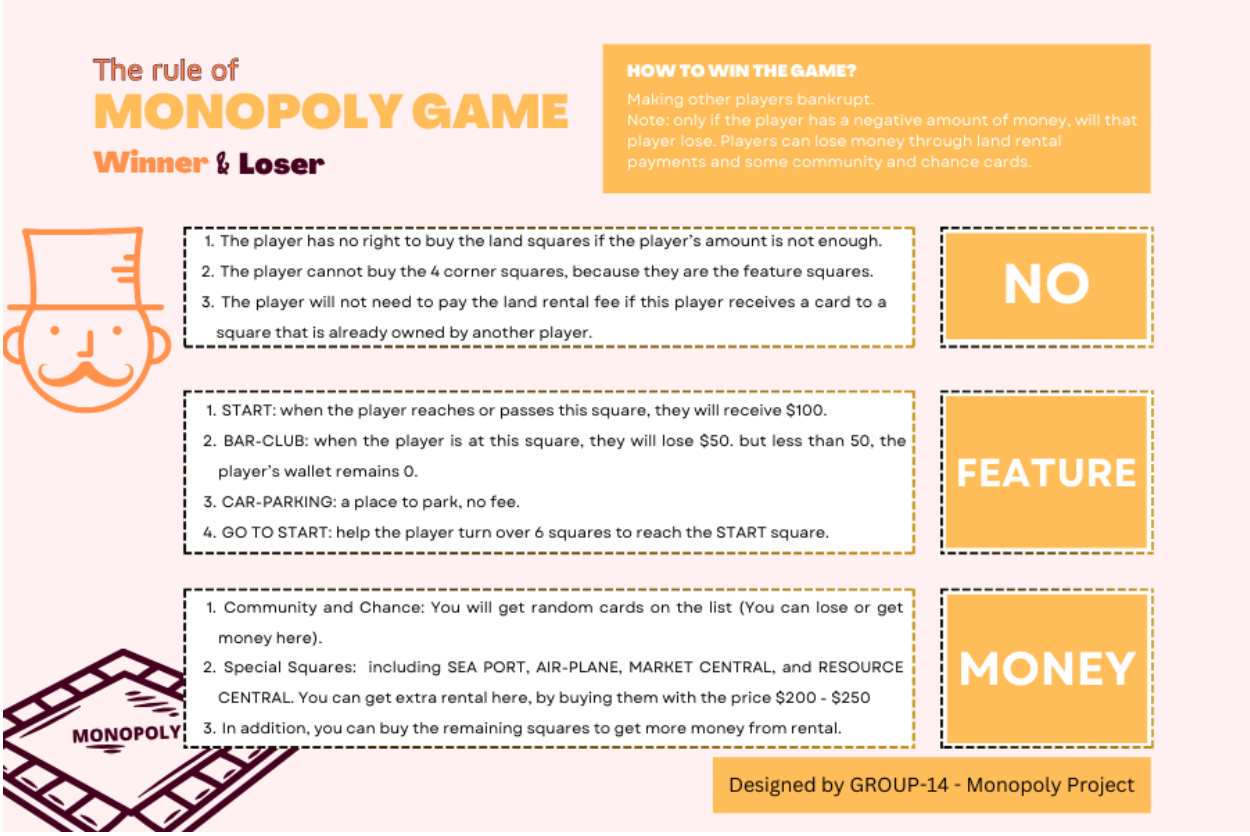

Figure 3.1 – The Game Board

2. Game Features

2.1 Enriching Gameplay with Traditional Monopoly Elements

- *Property Transactions:* Emulating the core feature of Monopoly, players can engage in buying and selling properties. The project ensures a seamless and interactive property transaction system, allowing players to strategically build their real estate portfolios.

- *Rent Payments:* The concept of paying rent has been faithfully integrated into the digital adaptation. As players land on owned properties, the project prompts the payment of rent, introducing a dynamic financial element that mirrors the competitive nature of the traditional game.
- *Complex Movement:* To mirror the intricacies of moving across various destinations on the Monopoly board, the project features a complex movement system. Players navigate through the virtual landscape, encountering different properties and challenges, contributing to the strategic depth of the gameplay.
- *Diverse Destinations:* The project introduces a diverse array of destinations, each with its unique characteristics and strategic implications. This diversity ensures that players encounter a rich and engaging game world, reminiscent of the varied spaces on the traditional Monopoly board.

2.2 Enhanced Gameplay with Community and Chance Cards

In the Monopoly Game project, an additional layer of excitement and unpredictability has been introduced through the incorporation of two distinct types of cards: Community and Chance. These cards serve as pivotal elements in enhancing the overall gameplay experience, aligning with the traditional Monopoly board game.

Community Cards: A specific set of Community Cards has been integrated, designed to introduce various events, challenges, or rewards into the gameplay. These cards aim to simulate community interactions within the game, adding an element of surprise and strategic decision-making for the players. There are 8 types of Community Chest Cards:

- Income: Collect $20
- Xmas: Collect $100
- Hospital Fee: Pay $50
- Services: Receives $25
- School Tax: Pay $150
- Doctor Fee: Pay $50
- Stock: Get $45 from the sale of stock
- Life Insurance matures: Collect $100

Chance Cards: Complementing the Community Cards are the Chance Cards, which bring an additional dimension of uncertainty to the game. These cards present players with unforeseen events, creating an atmosphere of suspense and ensuring that each turn holds the potential for unexpected twists. There are 8 types of Chance Cards:

- Dividend: Bank pays you dividend of $50
- Loan: Loan mature return. Collect $150
- Poor: Pay poor tax of $15
- Beauty: You have won second prize in a beauty contest! Collect $10
- NgheAn: Take a ride to Nghe An province.
- HCM: Travel to HCM City
- Community: Travel to Community square
- Go: Move to START square

2.3 Diverse Soundscapes for Monopoly Game

- Menu Theme Sound: The Menu Theme Sound sets the tone for the Monopoly Game right from the start.
- Game Theme Sound: The Game Theme Sound is designed to accompany players throughout their Monopoly journey.
- Button Sounds: Interactivity is key, and our Button Sounds add a satisfying layer to in-game actions. Button Sounds contribute to a responsive and engaging user interface, ensuring that every click is met with a corresponding and satisfying sound effect.

CHAPTER IV. GAME DETAILS

1. Game Structure and UML Diagram

1.1 Game Structure

i. General Purpose

The overarching goal in crafting the sophisticated structure of the Monopoly Game application is to create a digital adaptation that seamlessly encapsulates the essence of the classic Monopoly board game. This structure aims to provide a solid foundation for an engaging, user-friendly, and adaptable gaming experience, while leveraging the capabilities of a digital platform.

ii. Ideas to Design the Structure

We totally have eight classes for the application:

- *Board.java:* Purpose: Central to the game's environment, Board.java facilitates dynamic modifications to the game board. It manages squares, stores their locations, and sets board prices for a customizable and evolving game landscape.
- *Card.java:* Purpose: A multifunctional class responsible for creating versatile Community and Chance cards. These cards add unpredictability and strategic depth to player interactions, aligning with the traditional mechanics of the Monopoly game.
- *Dice.java:* Purpose: Generating random dice values, Dice.java introduces chance-based movement to the game. This aligns with the traditional Monopoly mechanic of rolling dice to determine player movement.
- *Square.java:* Purpose: Square.java plays a crucial role in storing information about each square, such as rent and buy prices. Its Get() and Set() methods provide a structured approach to managing square properties, contributing to a well-defined game structure.
- *Player.java*: Purpose: The Player class serves as a comprehensive repository for all player-related information during the game. It captures assets, properties, and current positions, forming an essential player profile.
- *Sound.java:* Purpose: Sound.java is designed to enhance user-friendliness by introducing sound effects. These auditory cues add an immersive layer to the gaming experience, providing feedback and engagement during various in-game actions.
- *MonopolyExe.java:* Purpose: Acting as the game's orchestrator, MonopolyExe.java executes the game and establishes the connection between the backend structure and frontend design. This ensures a seamless gaming experience and efficient flow of game logic.
- *GUI.java*: Purpose: Provide a visual and interactive way for users to interact with the program by buttons. And hold the role of compiling the whole application.

iii. Meaning of Designing the Game Structure

Designing the game structure is a strategic endeavor aimed at creating an organized, modular, and scalable framework that seamlessly integrates the core features of the Monopoly board game into a digital format. This structured approach ensures efficient management of game elements,

enhances code readability, and allows for future expansions. The chosen design is not merely a technical blueprint; it symbolizes a commitment to delivering an immersive, adaptable, and enjoyable gaming experience to users. Through meticulous design, the game structure becomes a vessel for tradition, innovation, and the seamless convergence of the classic Monopoly experience with the digital era.

1.2 UML Diagram

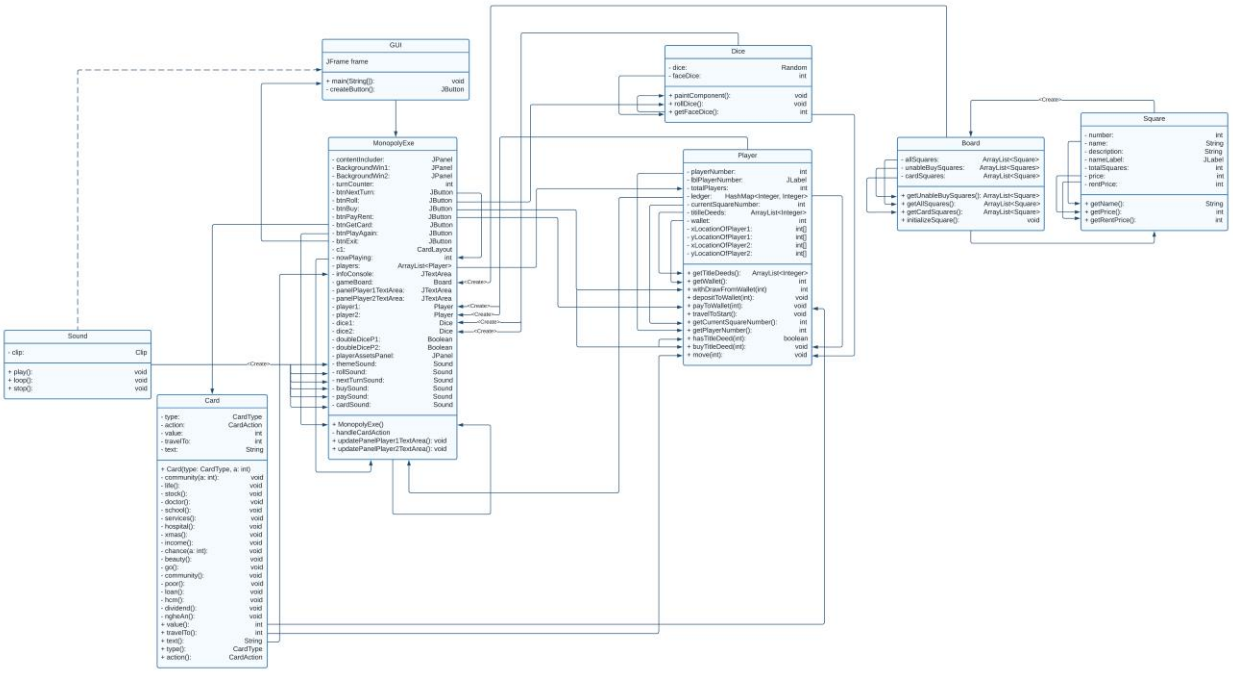

Figure 4.1: Game's UML Diagram

2. Game Design

i. General Purpose of Front-end Design

The front-end of a game refers to the user interface (UI) and the visual elements that players interact with. It is an essential component of MONOPOLY game and any other game for several reasons as follow:

- *User Experience:* The front-end is what the player sees and interacts with directly. A well-designed front-end enhances the overall user experience, making the game more fun and engaging. Elements like menus, buttons, and graphics contribute to the way players perceive and navigate the game much more easily than without a front end or a front end that doesn't meet user requirements.

- *Aesthetics and Immersion:* The visual elements of the front-end, including graphics, animations, and sound effects, contribute to the game's aesthetic appeal. A visually pleasing front-end helps create a more immersive and enjoyable gaming environment, enhancing the overall gaming experience.
- *Gameplay information:* Important information about the game, such as score, goal... in our monopoly game has something like amount of money, player position, etc. is often displayed through the user interface. Clearly presenting this information is important for players to understand the progression and dynamics of the game.
- *Accessibility:* An accessible front-end design ensures that players with different abilities can enjoy the game. This includes considerations for color contrast, text size, and other elements that make the game usable for a broader audience.

ii. Ideas to Design the Front-end

Outline the Ideas:

We have referenced many types of Monopoly games, the core thing we have learned is how to control the game, and display user information such as price, rent, amount, squares that the player has owned. As for controlling the game, we have 3 buttons to manipulate the land such as "Buy", "Pay Rent", "Get Card", and 2 buttons to manipulate the player "Roll", and "Next Turn".

The first thing, we want to create a fixed frame and its size is 1100px and 720px (Due to a problem of our team that adjusting the size of the frame can lead to the frame not working perfectly) Then separate it into 2 parts, one for the game board and it lies on the left of the screen, and the other is called the control part to make the player can control the game by the buttons, and show the information of the player.

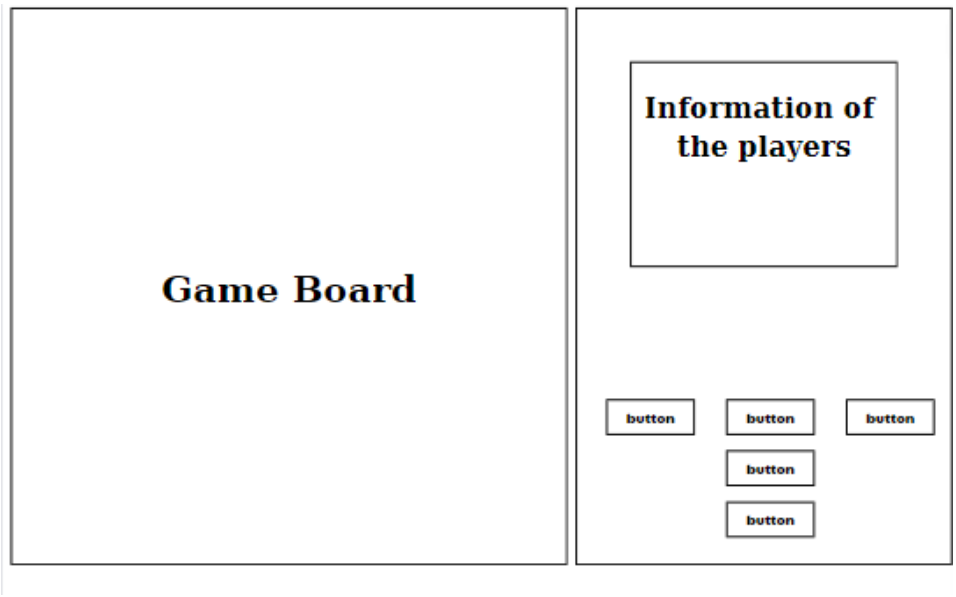

Figure 4.2 - The Original Design for the Game MONOPOLY

When the player wins the game, we want to design another panel to display the player has win the game, (Congratulation).

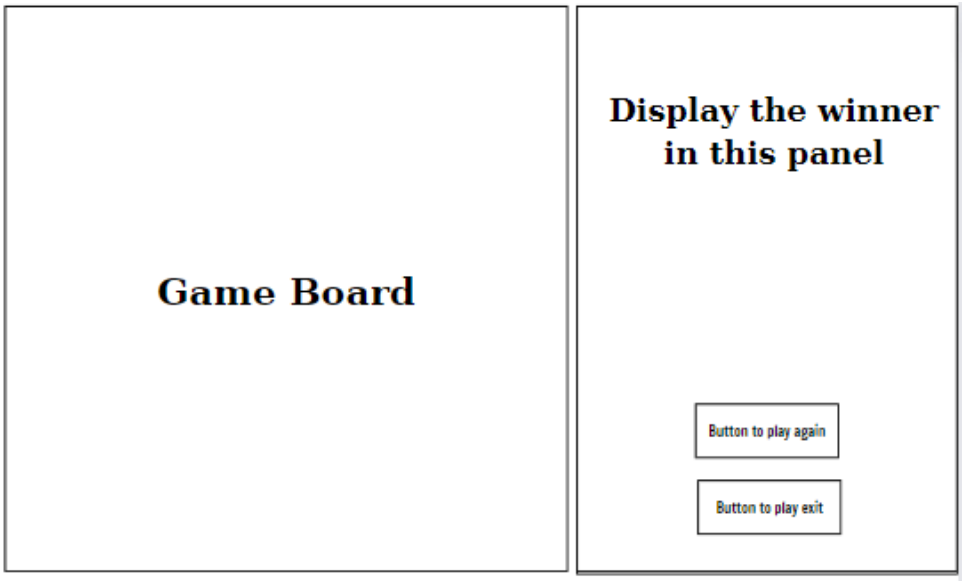

Figure 4.3 - The Design Frame for the Winner, When the Game is End

We use the photos for the Game Board and the Winner Panel. All of them are designed on canva.com by our team.

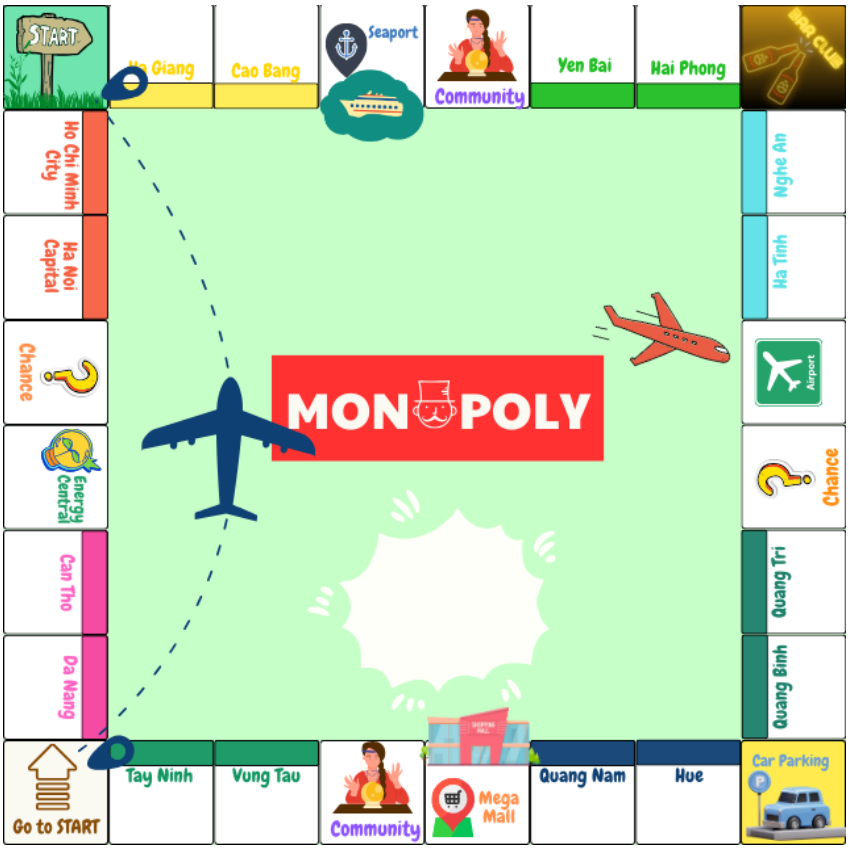

Figure 4.4 - The Monopoly Game Board Design

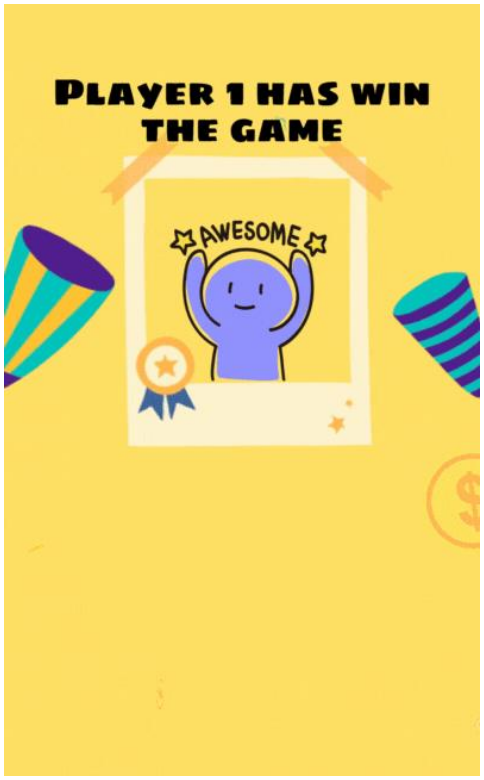

Figure 4.5 - Display Player 1 has Won the Game

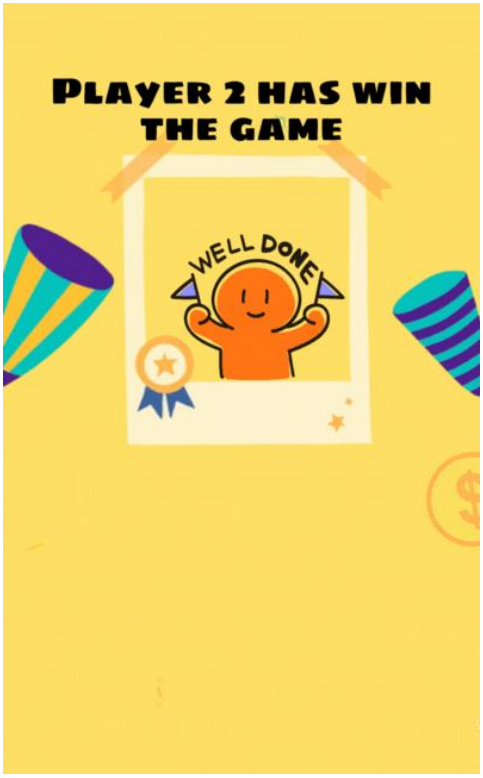

Figure 4.6 - Display Player 2 has Won the Game

Create a front-end friendly for the user as much as possible.

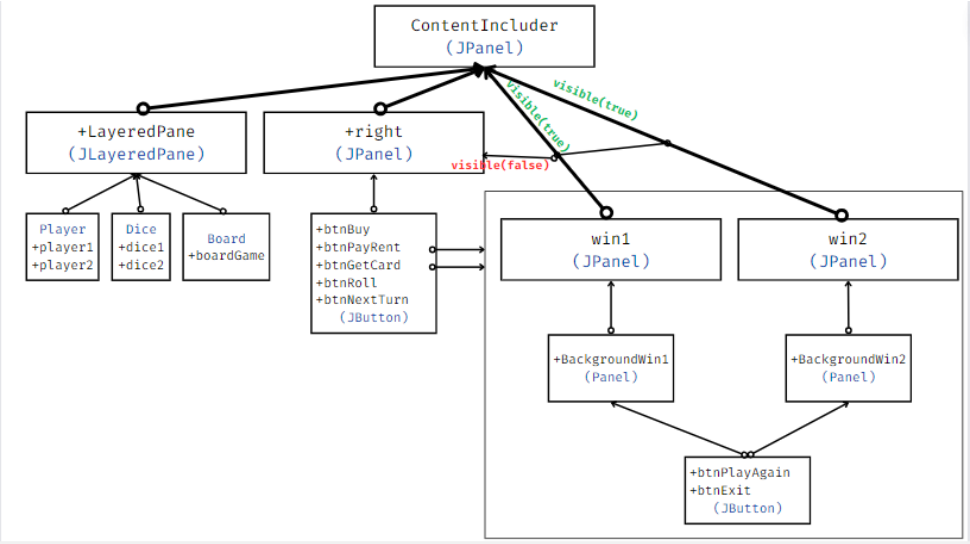

Figure 4.7 - Model for Design the Front-end

Design the frame that contains a game board and the control panel:

- As the figure above, we refer to create the private JPanel ContentIncluder then add the LayeredPane (in JLayeredPane), the purpose of the layeredPane to make sure that the players, dice, and board can exit perfectly at the same time. By set the boardGame is behind the player, and the dice.
- Creating 5 buttons to help the player can easily control the game.

 *Figure 4.8- Buy Button*	 *Figure 4.9- Pay Rent Button*	 *Figure 4.10 – Get Cart Button*	 *Figure 4.11 – Roll Button*	 *Figure 4.12- Next Turn Button*

- We add the image into button, and add the sound when click the button by class Sound (more details in Sound class)

Design additional panel to display the winner:

- In the model we provided, the btnGetCard and btnPayRent can lead to the win1 or win2 panel (According to the condition)
- In the win1 and win2 Panel, we add 2 buttons to make the options for the player (Play again or exit into the Menu).
- Set visible of the panel win1 or win2 depends on the condition of the player.

iii. The meaning of design the front-end

Designing the front-end of a game involves creating a visually appealing and user-friendly interface. Key considerations include planning the layout, maintaining consistency, implementing responsive controls, using animations for feedback, ensuring accessibility, conducting user testing, and optimizing performance. The goal is to provide an immersive and enjoyable experience for players.

3. GUI Design

In the development of the Monopoly game, the implementation of a Graphical User Interface (GUI) is paramount to ensure an engaging and user-friendly experience. The GUI design incorporates the following key elements:

- Library Utilization: A dedicated library is utilized to craft an immersive GUI for the Monopoly game, enhancing the overall visual experience.
- Navigation Buttons: The application features essential navigation buttons, including "START," "RULE," "EXIT," and "BACK," enabling users to seamlessly move through different states of the application.
- Wallpaper Image: An aesthetic image is employed as the wallpaper, providing a visually appealing background for the Monopoly game.

i. Ideals and Implementation

The realization of the GUI design involves the following principles and implementation strategies:

- JFrame Construction: The application window is constructed using JFrame, ensuring a sturdy and user-friendly interface for players.
- JPanel for Layout and Button Placement: JPanel is employed to structure the application's layout, creating an organized background, and strategically positioning navigation buttons.
- ImageIcon Integration: ImageIcon is utilized to associate images with navigation buttons, enhancing the visual aesthetics and overall appeal of the user interface.
- ActionListener Implementation: ActionListener is incorporated to manage button-press events, allowing for smooth transitions between different states of the application.
- Dynamic GUI Element Control: The GUI design includes the capability to dynamically show or hide specific elements based on predetermined conditions, optimizing user interface management.

ii. Significance and Purpose

- Visual Enhancement: The primary goal is to provide the Monopoly game with a visually captivating and user-friendly interface, elevating the overall gaming experience.
- Rule Representation: Upon selecting the "RULE" option, a dedicated image representing the game rules is displayed, enhancing the player's understanding through the use of JPanel.
- User-Friendly Navigation: The inclusion of buttons for starting the game, viewing rules, and exiting the application simplifies user navigation, promoting ease of use.
- Dynamic Interface Management: Components are dynamically shown or hidden based on different application states, ensuring a streamlined and intuitive user interface.

iii. The Meaning for Creating this GUI

- Enhanced Enjoyment: The addition of a GUI aims to make the Monopoly game more interesting and enjoyable for players, elevating the overall gaming experience.
- Intuitive Interaction: Users can interact with the game in an intuitive manner through the use of buttons and graphical elements, fostering a more engaging gameplay experience.
- User-Friendly Rule Display: The graphical representation of rules using JPanel not only enhances user-friendliness but also simplifies the code, ensuring a more efficient and maintainable application.

CHAPTER V. APPLICATION DEMO

Figure 5.1 – The Menu Screen

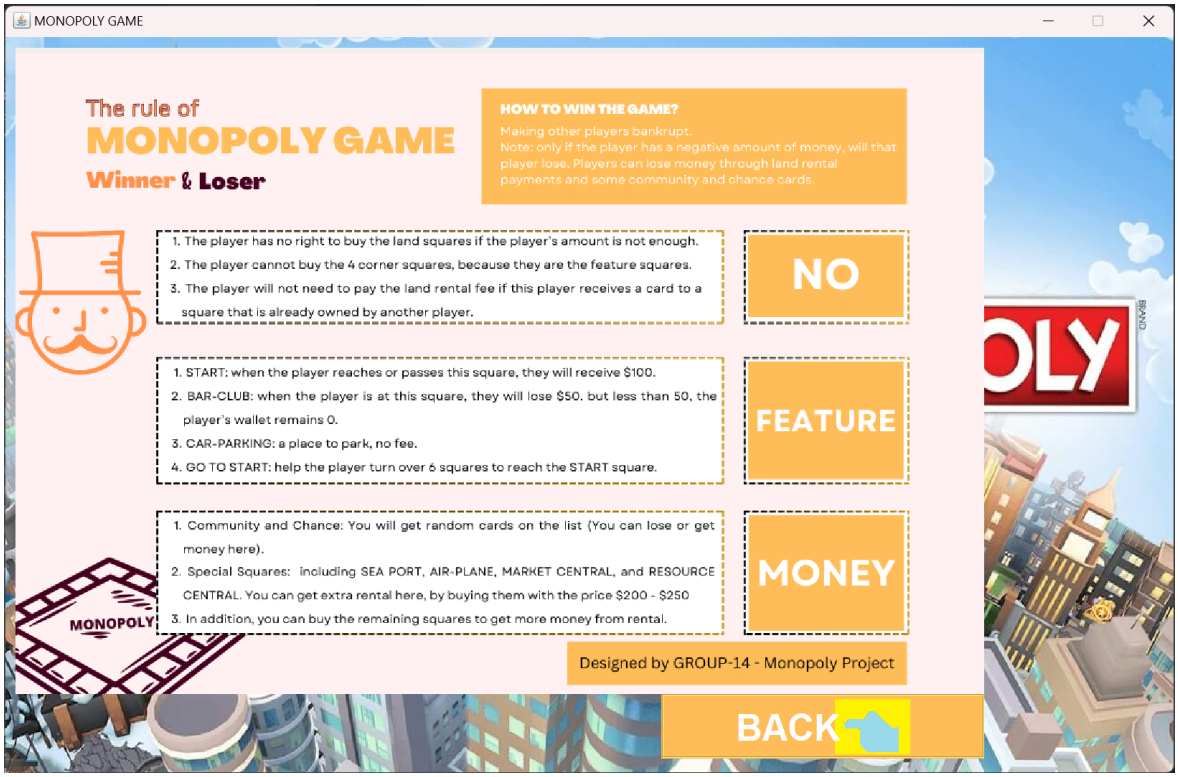

Figure 5.2 – Game Rule Screen

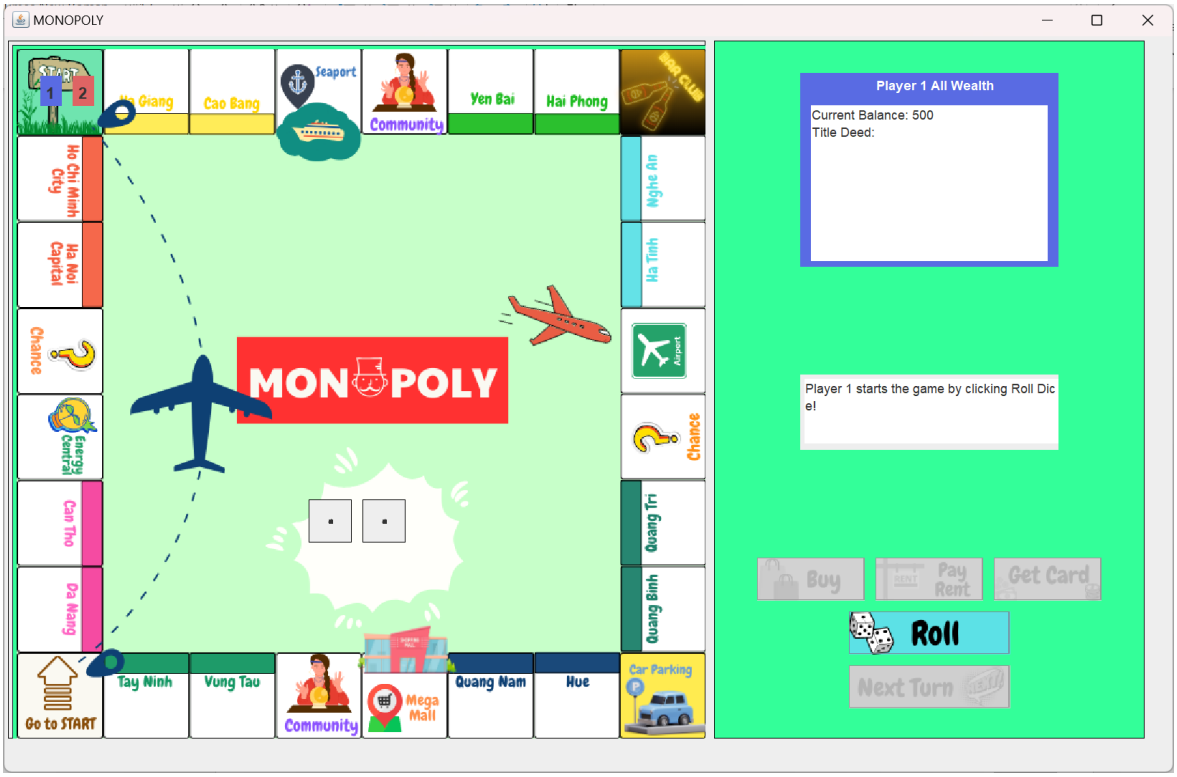

Figure 5.3 – Game Screen while Playing

Figure 5.4 – Game Screen when Player 1 Wins

Figure 5.5 - Game Screen when Player 2 Wins

CHAPTER VI. FUTURE DEVELOPMENT

Future Development Features for Monopoly Game:

- Expanded Property Portfolio: Introduce a rich array of additional properties, neighborhoods, and districts, including famous landmarks, iconic cities, and fictional realms. This expansion provides players with a diverse and strategic range of choices. Additionally, implement a Jail function that captures players, adding a competitive edge to the game as they strategize to avoid or navigate imprisonment.
- Evolving Economy Mechanism: Implement a dynamic economy system where property values, rent prices, and overall game dynamics evolve over time. Introduce the ability for players to sell their properties when facing bankruptcy, adding a layer of unpredictability. This evolving economic landscape challenges players to adapt and refine their strategies throughout the game.
- Cross-Platform Compatibility: Enable seamless cross-platform compatibility, allowing players to transition effortlessly between devices and platforms. The game can be downloaded from a publication version with an executable (.exe) file, ensuring accessibility across various devices such as computers, tablets, and smartphones.

- Expanded Character Customization: Provide players with the flexibility to choose the number of players in a game, allowing for a tailored gaming experience. Enhance character customization options with a variety of choices, including different avatars, outfits, and accessories. This feature adds a personal touch, allowing players to create unique and diverse characters.

These future development features aim to enrich the Monopoly Game experience by expanding the game world, introducing dynamic economic elements, ensuring accessibility across platforms, and providing enhanced options for character customization. These additions contribute to a more immersive and engaging gameplay, catering to the evolving preferences and expectations of players.

CHAPTER VII. CONCLUSION

In this Monopoly Game project, we have successfully navigated the complexities of object-oriented programming using Java, delivering a comprehensive and engaging digital adaptation of the classic board game. The project, guided by the core principles outlined by our instructor, has not only met but exceeded the specified requirements, showcasing a blend of traditional and innovative elements.

The logical implementation of game rules serves as the backbone of the project, providing players with a familiar yet dynamic gaming experience. The well-designed class structure lays the groundwork for a scalable and maintainable codebase, ensuring the longevity and adaptability of the Monopoly Game application.

The commitment to user-friendly gameplay implementation is evident in the thoughtful design choices that prioritize player interaction and enjoyment. The use of Git for version control has not only ensured a collaborative and organized development process but also left a detailed trail of the project's evolution.

The aesthetically pleasing and smooth graphical user interface (GUI) enriches the visual experience, creating an immersive environment for players. The incorporation of animated sound effects further elevates the gaming experience, engaging players on multiple sensory levels.

As we reflect on the project journey, it is evident that the combination of Java programming language, AWT, and Swing libraries has been instrumental in realizing our vision. The techniques and tools employed have empowered us to seamlessly translate the intricacies of the classic Monopoly board game into a captivating digital format.

In conclusion, the Monopoly Game project stands as a testament to our proficiency in object-oriented programming, collaborative development, and creative problem-solving. Through meticulous planning, execution, and innovation, we have not only met the academic requirements but have crafted a digital experience that pays homage to tradition while embracing the opportunities presented by modern technology. The project's success is a testament to the dedication and collaborative spirit of our team, and we look forward to future opportunities to apply and expand upon the skills honed during this endeavor.

CHAPTER VII. REFERENCES

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