The Art Dealer Game: Kindergartners through Eight Grade

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Graduate Degree

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1.0 Introduction

1.1 Purpose

This document outlines the design and development of The Art Dealer Game, a game designed to teach K-8 students computational thinking, patterns, and logic through engaging gameplay. This game is part of a broader educational initiative to introduce students to core concepts in math and patterns. The project adheres to principles, focusing on an iterative development process where feedback from testing phases and users (teachers and students) is integrated to refine gameplay mechanics.

1.2 The Art Dealer Game

In The Art Dealer Game, students play the role of a guesser who attempts to uncover patterns in a deck of cards based on clues provided by the "Art Dealer." The game is divided into difficulty levels that correspond to different grade ranges (K-2, 3-5, and 6-8). The initial implementation focuses on pattern recognition, while future iterations may include more advanced patterns, such Three of a Kind and A Pair in poker hands.

2.0 Process Model

The development of the game follows an evolutionary process model, blending agile and spiral methodologies. Each version of the game will undergo rapid prototyping, testing, and iteration, ensuring that educational objectives and fun gameplay are well balanced.

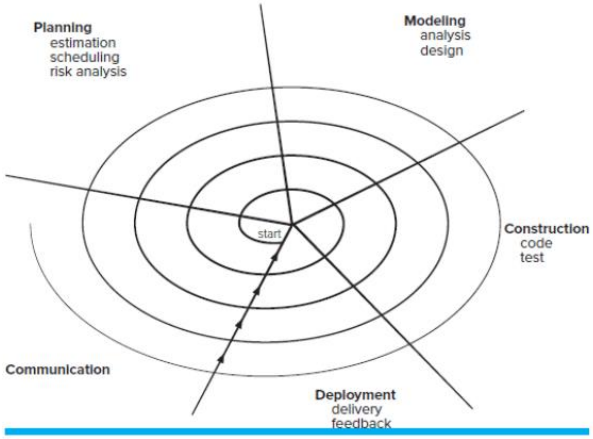

Figure 1. The evolutionary process model (Software Engineering, Pg 135)

3.0 Use Cases

The following six uses cases were defined by the team and the client as the core system requirements for the delivery of working prototype. Note, this baseline functionality can be easily extended through the inclusion of more use cases as the project progresses. Each use case lists the name of the use case, primary actors, preconditions, description, and acceptance criteria.

3.1 Start a New Game

Primary Actor:	Player
Preconditions:	The game application is running
Description:	The player starts a new game, selects a grade level (K-2, 3-5, or 6-8), and proceeds to the game interface where they will attempt to guess the card pattern set by the dealer.
Acceptance Criteria:	The player can successfully choose a grade level and begin gameplay. Ensure the appropriate level patterns are applicable

3.2 Use Case 3: Observe Dealer Pattern Outcome

Primary Actor:	Player
Preconditions:	Four cards must be selected and confirmed by user
Description:	The four cards selected by the user and submitted to the dealer. The dealer will then notify the player of the cards he has chosen to buy (if any of the four cards matches the pattern).
Acceptance Criteria:	Any card that matches the dealer's pattern is shown as purchased. If zero cards are purchased, display outcome None.

3.3 Use Case 3: Make a Guess

Primary Actor:	Player
Preconditions:	Dealer notifies player if any of the cards have been purchased.
Description:	The player is prompted to guess the dealer's pattern, regardless if any cards were purchased by the dealer. Members have three chances to guess the pattern correctly.
Acceptance Criteria:	The player receives notification on whether their guess was correct, with a window that contains animated balloons and cheering sounds. If

incorrect, the player is notified the guess was incorrect and reminded how many chances remain.

3.4 Use Case 5: Ballon Animation and Sound Upon Successful Guess

Primary Actor:	Player
Preconditions:	Player has guessed the Art Dealer's pattern correctly
Description:	Animated balloons will appear on a new screen, with cheering sounds congratulating the member on a successful guess.
Acceptance Criteria:	Balloons fly and cheerful sound.

3.5 Use case 6: Replay Options

Primary Actor:	Player
Preconditions:	Successful victory or unsuccessful three attempts at guessing the pattern
Description:	Upon completion of the game, the player is prompted with a play again notification.
Acceptance Criteria:	Yes, resets the game and attempt count. No, sends the player back to main screen.

4.0 UML Model

4.1 Use Case Diagram

The player interacts with the game system through the core use cases of starting a new game, making guesses, and revealing the dealer's pattern. The diagram shows how these use cases relate to winning

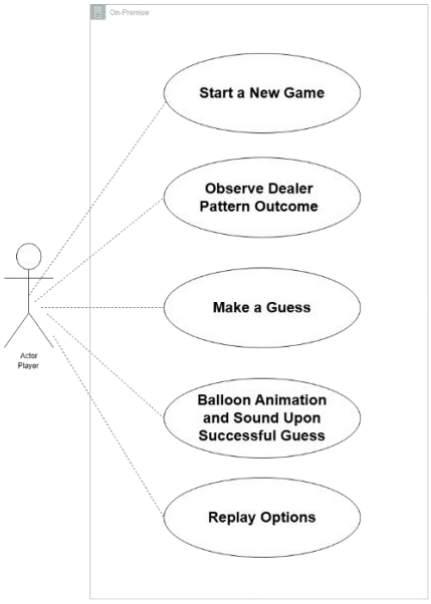

Figure 2. Use Case Diagram for the Art Dealer Game showing five use cases for the project

4.2 Class Diagram

- **ArtDealerGameBase:** Manages the game state, including game start, pattern setting, and guesses.
- **Player:** Represents the player, storing guesses, attempts, and guessed cards.
- **Dealer:** Defines the pattern that the player must guess.
- **Card:** Represents individual cards in the deck, including suit, value, color, and associated methods to check patterns.

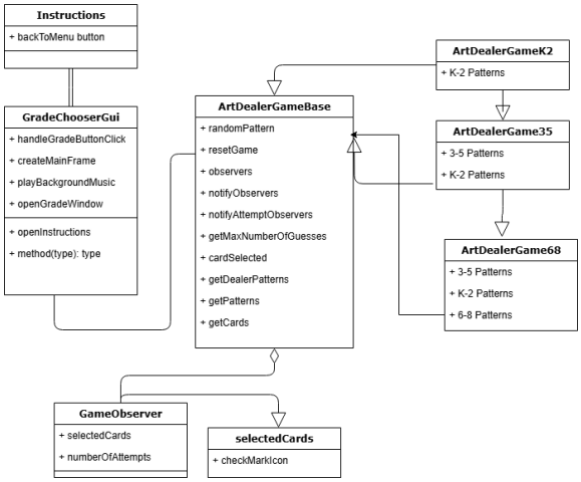

Figure 3. class Diagram for the Art Dealer Game

5.0 Testing Strategy

5.1 Unit Testing

Each method (e.g., setting a card's properties, comparing guesses) will be tested for correctness. For example, the isRed() method in the Card class will be tested to ensure it correctly identifies red cards.

5.2 Integrated Testing

This will ensure that components like the card deck, player, and dealer interact correctly. For example, after the dealer sets a pattern, the game must correctly compare the player's guess to the pattern.

5.3 Usability Testing

We will conduct playtesting sessions with students to observe how well they can understand and play the game. Testing will focus on the clarity of instructions and feedback after each guess.