Memory Game - Flipping Tiles

1. Introduction

1.1 Purpose

The purpose of this document is to provide a detailed description of the requirements for the Memory Game - Flipping Tiles application. This application aims to create an engaging and visually appealing Java-based memory game using Swing, designed to test and improve the user's memory skills through tile-matching gameplay.

1.2 Scope

This game challenges players to recall and match tile pairs within a time limit, featuring smooth animations, scoring, and difficulty levels. Key objectives include enhancing memory skills and offering an interactive, visually appealing gaming experience.

1.3 Product Overview

The Memory Game provides:

- Randomized tiles with matching pairs.
- Flip-based tile-matching mechanics with animations.
- Levels of difficulty, scoring, high-score tracking, and interactive hints.

2. Functional Requirements

2.1 Game Setup

- **Tile Setup**: The game board is initialized with an even number of tiles, each assigned a matching pair.
- **Randomization**: Tile positions are randomized at the start of each game using Java's ArrayList data structure.

2.2 Gameplay Mechanics

- **Tile Interaction**: Users click a tile to reveal its content (number).
- **Matching Logic**:
    - If two consecutively flipped tiles match, they remain face-up.
    - If they do not match, they revert to a face-down position after a brief delay.

- **Animation**: Smooth animations for tile flips and matches.

2.3 Game Completion and Scoring

- **Score Calculation**:
  - Scoring is based on time taken and moves made.
  - Bonus points are awarded for quicker matches to encourage efficient memory use.
- **End-of-Game Notification**: Displays a congratulatory message or animation when all tiles are successfully matched.

2.4 Additional Game Features

- **Timer**: A countdown timer adds urgency. Players can restart the game at any time.
- **Difficulty Levels**:
  - Multiple difficulty levels are available, adjusting tile count for increased challenge.
- **Leaderboard**: Tracks and displays high scores, adding replayability.
- **Hints**: Players have limited hints, which briefly reveal all tiles to aid memory.
- **Sound Effects**: Subtle sounds for tile flips, matches, and mismatches enhance interactivity.

3. Non-Functional Requirements

3.1 Usability

- The UI should be intuitive, with clear and responsive tile interactions and smooth transitions.
- All game controls and status indicators (e.g., timer, score) should be easy to access and understand.

3.2 Performance

- The game must load and initialize in under 5 seconds.
- Flip and match animations should be smooth, with minimal delay.

3.3 Reliability

- The game should handle edge cases like double-clicks on a tile without freezing or crashing.
- It should be playable without error on any system meeting Java Swing compatibility.

3.4 Portability

- The game will be developed in Java, compatible with any system supporting Java JDK and Swing.

4. System Requirements

4.1 Hardware Requirements

- Minimal hardware requirements as the game is light-weight.
- Memory: 512MB RAM (for basic execution).

4.2 Software Requirements

- Java JDK version 8 or later.
- Java Swing (part of standard JDK).
- Compatible on any OS supporting Java (Windows, macOS, Linux).

5. User Interface Design

5.1 Game Board

- A grid layout displays tiles face-down initially. Tile pairs will reveal numbers when flipped.

5.2 Visual and Interaction Features

- **Tile Flip Animation**: Provides smooth visual feedback when a tile is flipped.
- **Matched Pairs Highlighting**: Matched tiles are visually highlighted to signify pairing.
- **Timer and Score Display**: Displayed at the top, with scoring updates after each move.
- **Buttons**: Reset game, difficulty selection, and hint buttons positioned intuitively.

6. Testing Requirements

6.1 Unit Testing

- Test tile flipping and match checking logic.
- Verify randomization and pairing assignment.

6.2 Integration Testing

- Test the interaction of GUI components with game logic.
- Ensure all buttons and features respond correctly.

6.3 User Testing

- Gather feedback on usability, visual appeal, and difficulty.

7. Future Enhancements

- **Themed Tiles**: Allow players to choose tile themes.
- **Multiplayer Mode**: Incorporate turn-based multiplayer gameplay.
- **Additional Hint Types**: Different hint styles for strategic gameplay options.