

# Memory Card Matching Game

## Technical & Feature Documentation

### 1. Game Overview

This is a **Memory Card Matching Game** built in **Unity (UI-based)** where players flip cards to find matching pairs.

The game supports:

- Multiple difficulty modes
- Animated card flipping
- Match / mismatch effects
- Audio system with persistence
- Settings with volume control
- Proper game reset & replay flow

### 2. Game Modes

Mode	Cards	Grid Layout	Pairs
Easy	6	3 × 2	3
Normal	12	4 × 3	6
Hard	16	4 × 4	8

The selected mode:

- Is saved using **PlayerPrefs**
- Automatically restored on app restart
- Controls grid layout, card count, and sprite usage

### 3. Core Systems Overview

#### Main Systems Used

- **GridManager** → Grid layout & card spawning
- **CardManager** → Pair & sprite assignment
- **Card** → Individual card behavior
- **GameManager** → Game logic & flow
- **AudioManager** → Music & SFX (persistent)
- **Settings** → Volume sliders & save/load
- **LevelSelector** → Difficulty selection UI
- **DOTween** → Animations (flip, pop, shake)

## 4. Grid & Card Spawning (GridManager)

### Responsibilities

- Apply layout preset based on difficulty
- Spawn correct number of card prefabs
- Clear old cards safely (runtime & editor)
- Trigger pair assignment
- Initialize game state

Initialize(mode)

- └ Clear old cards
- └ Apply grid preset
- └ Spawn cards
- └ Assign pairs (CardManager)
- └ Initialize GameManager

## 5. Pair & Sprite Assignment (CardManager)

### Core Rule (IMPORTANT)

Only use **EXACTLY** the number of sprites needed for the current mode

### Final Working Logic

1. Calculate required pairs
2. Shuffle sprite pool
3. Pick only `pairsCount` sprites
4. Duplicate pair IDs (1,1,2,2...)
5. Shuffle IDs
6. Assign to cards

## 6. Card System (Card.cs)

### Card States

- `PairIndex`
- `IsFaceUp`
- `IsMatched`
- `isAnimating`

### Card Features

- DOTween flip animation
- Front / Back faces

- Click handling via `IPointerClickHandler`
- Safe input blocking during animation
- Reset support for replay

## 7. Game Logic (GameManager)

### Responsibilities

- Handle card selection
- Match / mismatch checking
- Preview phase at game start
- Track matches & flips
- Win detection
- Reset game for replay

### ResetGame()

- ✓ Stops all coroutines
- ✓ Resets counters
- ✓ Resets all cards
- ✓ Locks input until new start

## 8. Animations & Effects

### Flip Animation

- Y-axis rotation using DOTween
- Mid-flip face swap

### Match Effect (PopAndShrinkEffect)

- Shrink → Pop → Scale to 0
- Singleton utility
- Reusable on any UI element

### Mismatch Effect

- Shake / vibration animation
- Then hide cards

## 9. Audio System (AudioManager)

### Audio Channels

- Background Music
- Card Tap
- Match
- Mismatch

- Win

## Features

- Singleton
- PlayerPrefs-based volume saving
- Independent Music & SFX sliders
- Auto-resume on app restart

## 10. Settings System

### Settings Screen

- Music volume slider
- SFX volume slider
- Values saved instantly using PlayerPrefs

### Persistence

- ✓ Settings remembered across sessions
- ✓ Linked directly to AudioManager

## 11. Level Selection System

### LevelSelector Responsibilities

- Difficulty buttons
- Selection box animation
- Save selected mode
- Restore last selected mode on start