Introduction:

This document outlines the level design principles and structure for the AMAZE prototype. The game utilizes a procedural level generation system to create diverse and engaging puzzles dynamically. The goal is to ensure scalability, increasing complexity, and engaging player challenges without requiring manual intervention for each level.

Level Design Goals:

The level design for AMAZE follows these principles:

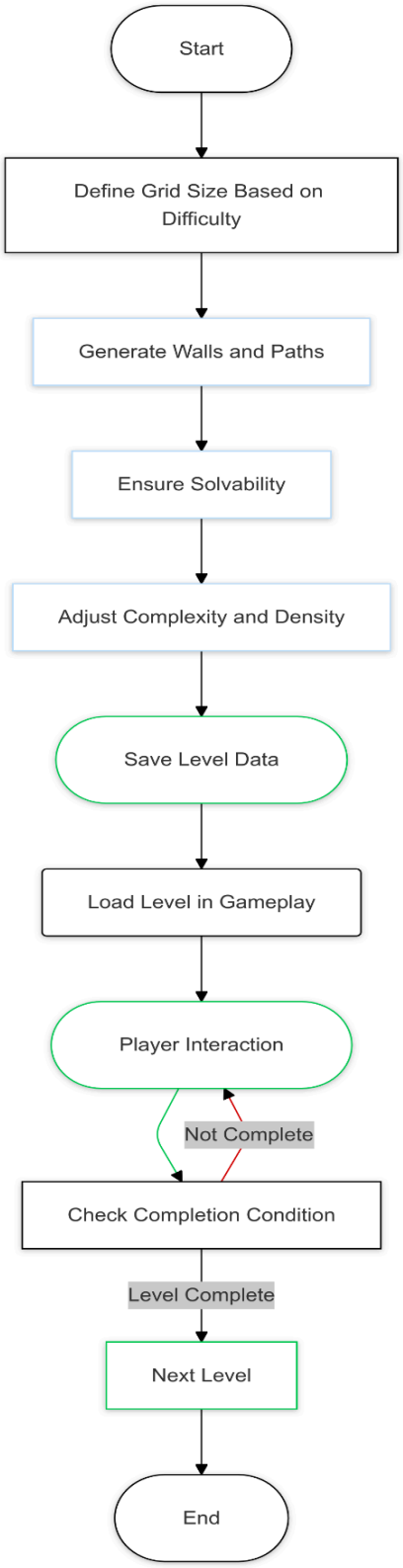
- Progressive Complexity: Levels gradually increase in size and complexity.
- Varied Challenges: Different tile arrangements create unique movement puzzles.
- Replayability: No two levels are exactly the same due to procedural generation.
- Minimalist Aesthetic: Clean and readable layouts with intuitive difficulty scaling.

Level Structure:

Grid-Based Layout:

- Each level is structured as a 2D grid of variable size.
- The grid consists of:
    - Walls (1)**:** Block player movement.
    - Tiles (0)**:** Must be painted to complete the level.
    - Start Position (2)**:** Player spawn point.

Flowchart:


Start
Define Grid Size Based on Difficulty
Generate Walls and Paths
Ensure Solvability
Adjust Complexity and Density
Save Level Data
Load Level in Gameplay
Player Interaction
Not Complete
Check Completion Condition
Level Complete
Next Level
End

Level Progression:

Levels are categorized into four difficulty levels, controlled by the StageCreationSettings script:

Difficulty	Grid Size	Obstacles	Moves Required	Bifurcation Chance
Easy	4x4 to 6x6	Few	10-15	5%
Moderate	6x6 to 8x8	Moderate	18-22	15%
Hard	8x8 to 10x10	Many	20-25	20%
Very Hard	10x10 to 12x12	Complex paths	23-28	20%

- Larger grids introduce more obstacles, requiring strategic movement**.**
- Bifurcation Chance**:** Determines the probability of multiple possible movement paths.

Procedural Level Generation Flow:

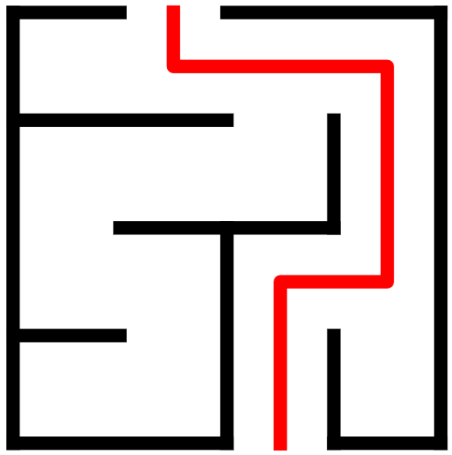
- **Step 1:** Generate a grid with random size within the difficulty constraints.
- **Step 2:** Assign the player's starting position randomly within an open space.
- **Step 3:** Place walls to create movement constraints.
- **Step 4:** Ensure that all tiles can be reached with a solvable path.
- **Step 5:** Adjust difficulty by tweaking movement limitations and tile placements.

Sample Level Designs:

Easy Level Layout:

- Small, beginner-friendly grid with minimal walls.

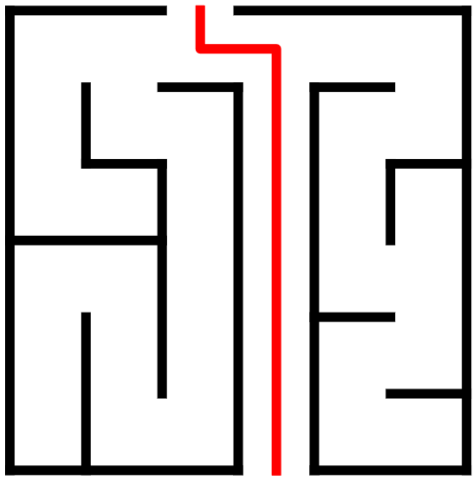
Image:



Moderate Level Layout:

- Increased obstacles requiring strategic movement.

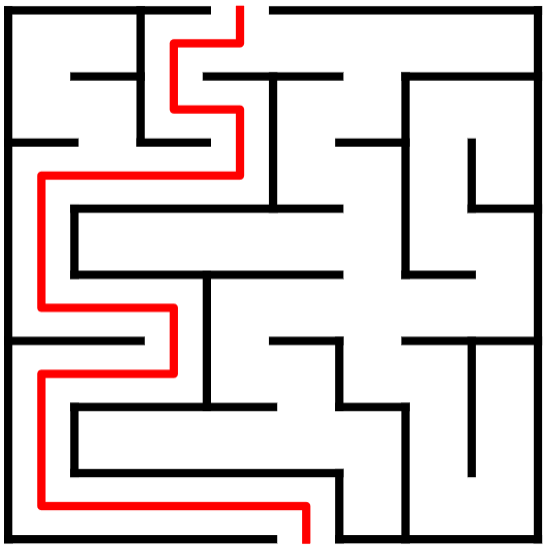
Image:



Hard Level Layout:

- Large grid with multiple dead ends.

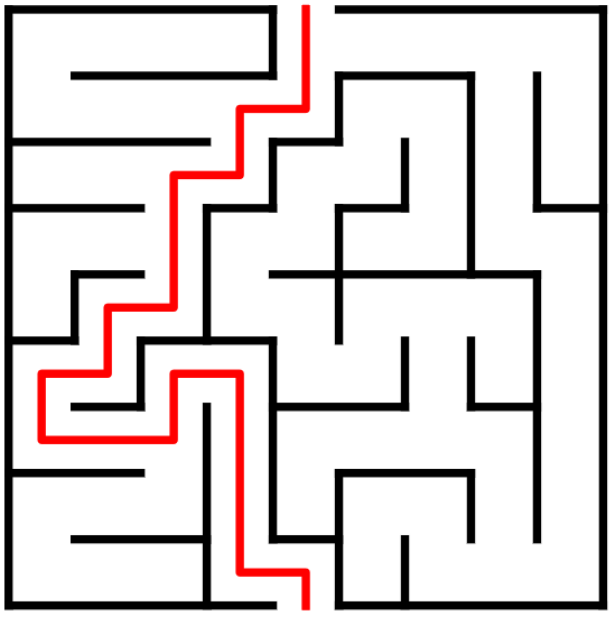
Image:



Very Hard Level Layout:

- Complex paths with minimal solutions.

Image:



Conclusion:

The procedural level generation system in AMAZE ensures dynamic and scalable puzzle design. By adjusting difficulty parameters, the game can generate infinite levels that maintain engagement without manual level creation. Future iterations will introduce adaptive difficulty based on player performance.

References:

Mage images generated for references using: https://mazegenerator.net/