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Report - Conway's Game of Life

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Abstract

This report explores an imaginative and strategic extension of Conway's classic Game of Life by introducing elements of fantasy, such as goblins and magicians, into a dynamic grid-based simulation. The project enhances the original cellular automaton by incorporating narrative-driven mechanics, including factional combat, territory control, and behavior that changes depending on the environment. These additions allow for a more complex and visually engaging simulation where emergent behaviors such as dominance, peaceful coexistence, and extinction naturally evolve over time. By placing opposing factions in a world shaped by simple, rule-based interactions, this study demonstrates how narrative and simulation can intersect to model realistic conflict scenarios in an abstract way. Ultimately, this work aims to deepen the understanding of cellular automata and highlight the potential of simulation-based storytelling as a tool for both education and entertainment (1).

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0.1 Introduction

Procedural simulations like Conway’s Game of Life offer fascinating insights into emergent behavior from simple rules (2). This project extends that model with narrative-driven mechanics to simulate a fantasy world at war. The goal is to explore how environmental conditions and faction dynamics can be modeled using grid-based automata.

0.2 Game Synopsis

Long ago, the goblins of Deepwood and the magicians of the Ivory Spires lived in harmony. But peace shattered with the discovery of a powerful artifact. Now, trapped in a cursed cycle, they battle endlessly—reborn again and again in a broken world shaped by magic, steel, and lost memories. (3)

The land is divided into four key zones, each influencing survival, reproduction, and combat in unique ways.

0.3 Cell Types and Behaviors

Our grid simulation is inspired by Conway’s Game of Life, using three types of cells:

- **Empty cell:** Can be populated. Displayed as green grass.
- **Goblin cell:** Lives with 2–3 goblin neighbors. Spawns with exactly 3.
- **Magician cell:** Lives with 2–3 magician neighbors. Spawns with exactly 3.

Combat Rules

- If goblins and magicians try to populate the same cell, neither succeeds.
- If rival cells are adjacent, the one with more allies survives.
- If ally numbers are equal, no changes occur.

0.4 Map and Special Zones

Zone	Effect
Goblin Stronghold	Goblins reproduce with 2 neighbors; magicians need 3+ to survive.
Magician Base	Magicians survive overcrowding up to 5; goblins need 4 to reproduce.
Valley of Eternal Peace	No combat; random births and deaths based on alive neighbors.
Cemetery of Ash	Cells die if they have fewer than 3 neighbors.

Table 0.4.1 - Special Zones and Their Effects

0.5 Simulation Observations

0.5.1 General Behavior

In standard zones, both goblins and magicians follow basic Game of Life patterns. Clusters, gliders, and oscillators emerge. Combat rules suppress random spread and shape predictable borders.

0.5.2 Goblin Stronghold

Goblins rapidly expand even from sparse beginnings. Magicians struggle to maintain any lasting presence. Goblin "floods" dominate open space.

0.5.3 Magician Base

Magicians form stable and dense networks due to extended overcrowding tolerance. Goblins rarely thrive unless tightly packed.

0.5.4 Valley of Eternal Peace

Random mob births and deaths create chaotic but balanced regions. No single species dominates, and symmetry sometimes emerges.

0.5.5 Cemetery of Ash

Most cells die quickly unless in large, protected clusters. The zone becomes sparse and desolate after a few iterations.

0.6 Emergent Behaviors

- Zones significantly alter the balance of power.
- Goblin territories behave like viral outbreaks.
- Peaceful zones act as buffers that slow expansion.
- Cemetery acts like a "death fog" that resets nearby areas.
- Borders show frequent stalemates due to combat suppression.

0.7 Visualizations

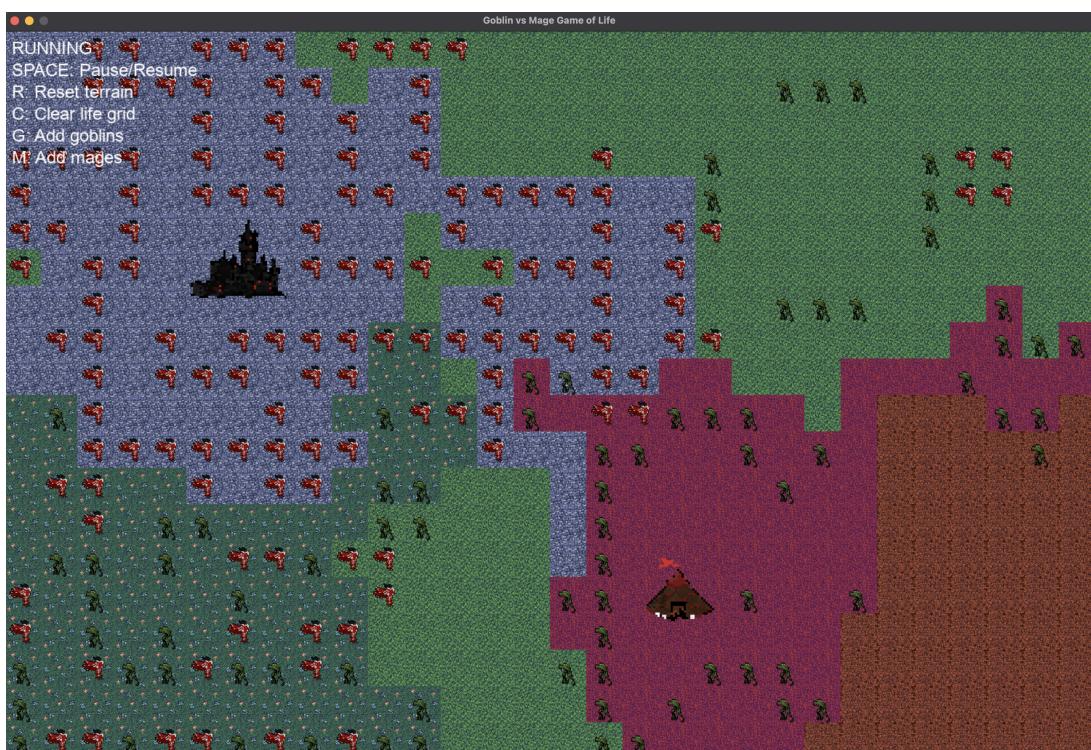


Figure 0.7.1 - Map with all kind of zones

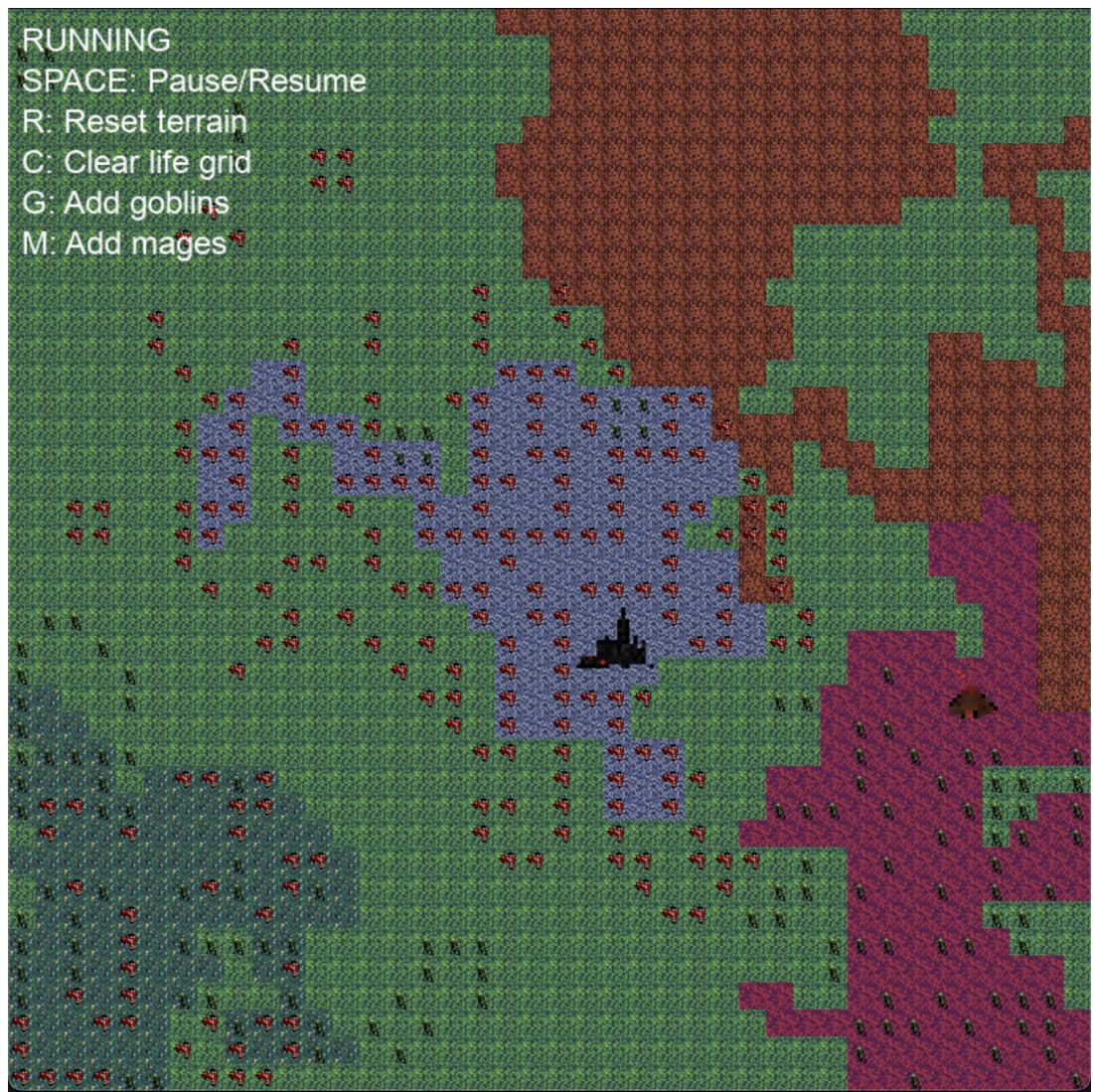


Figure 0.7.2 - Different arrangement of zones within map

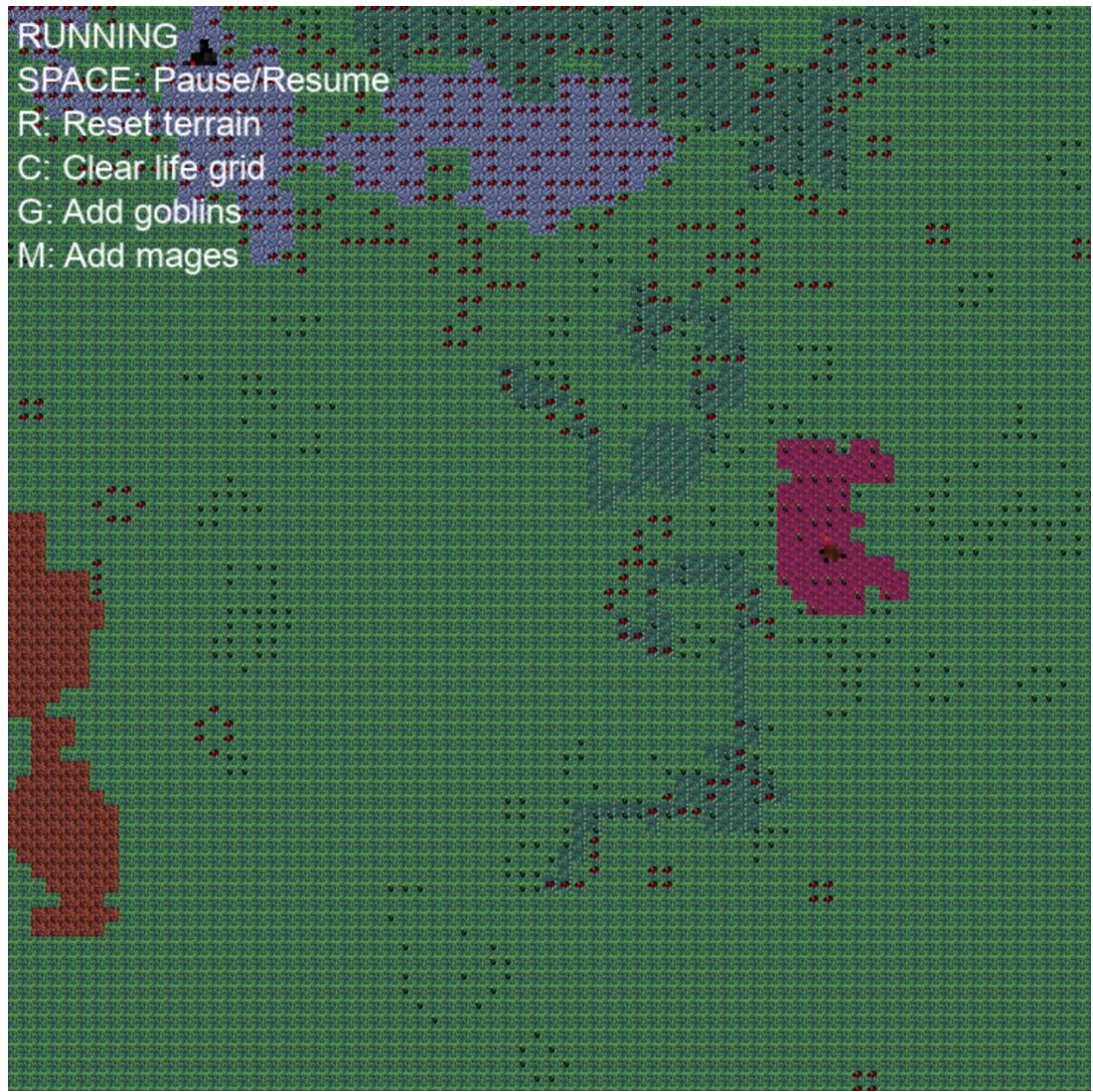


Figure 0.7.3 - Larger map with randomly positioned zones

0.8 Conclusion

Our modified Conway simulation adds narrative depth through strategic zones and rule alterations. Unique reproduction and combat mechanics offer fresh emergent behaviors. As the war rages in Eldoria, we observe cycles of dominance, collapse, and rebirth—reflecting the game's theme of endless struggle.

Bibliography

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