Mystere: The Integration of Detective Elements in a First-Person 3D Puzzle Survival Game

Information Technologies
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Motivation and Vision

282.30 Bn USD

In 2024, the Video Games market is projected to reach a revenue of US$282.30bn (statista.com)

Different Genres

I desire to blend various genres, like first-person shooter, detective, and puzzle, into a singular game and evaluate the result.

Graphics & Code

Can a solo developer build a computer game of AAA-quality, including stunning visuals, sounds, animations, and 3D models?

The purpose of this work was to create a professional game that encompasses different genres in addition to having many different systems in place, like economy, AI, animations, and story.

Analytical process

Games examined

Aspects analyzed

Gameplay

Story

Puzzle

Economy & Resource Management

3D Environment

Analysis methods

Playing video games

Watching video walkthroughs

Going behind the scenes

Analysis results

Large teams made up of several departments create high-quality games.

More than half of the games incorporate puzzle components alongside a linear or semi-linear narrative. Resource management takes priority over the economy.

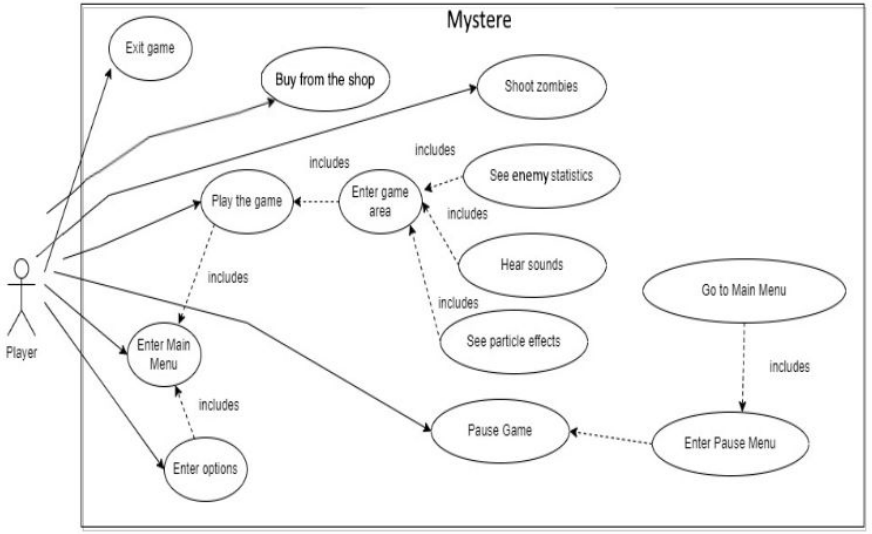
All of the analyzed games use their own, custom game engine.

Most of the games try to focus on 1-3 core game mechanics, such as shooting, immersion, and resource management. **I work with 4**.

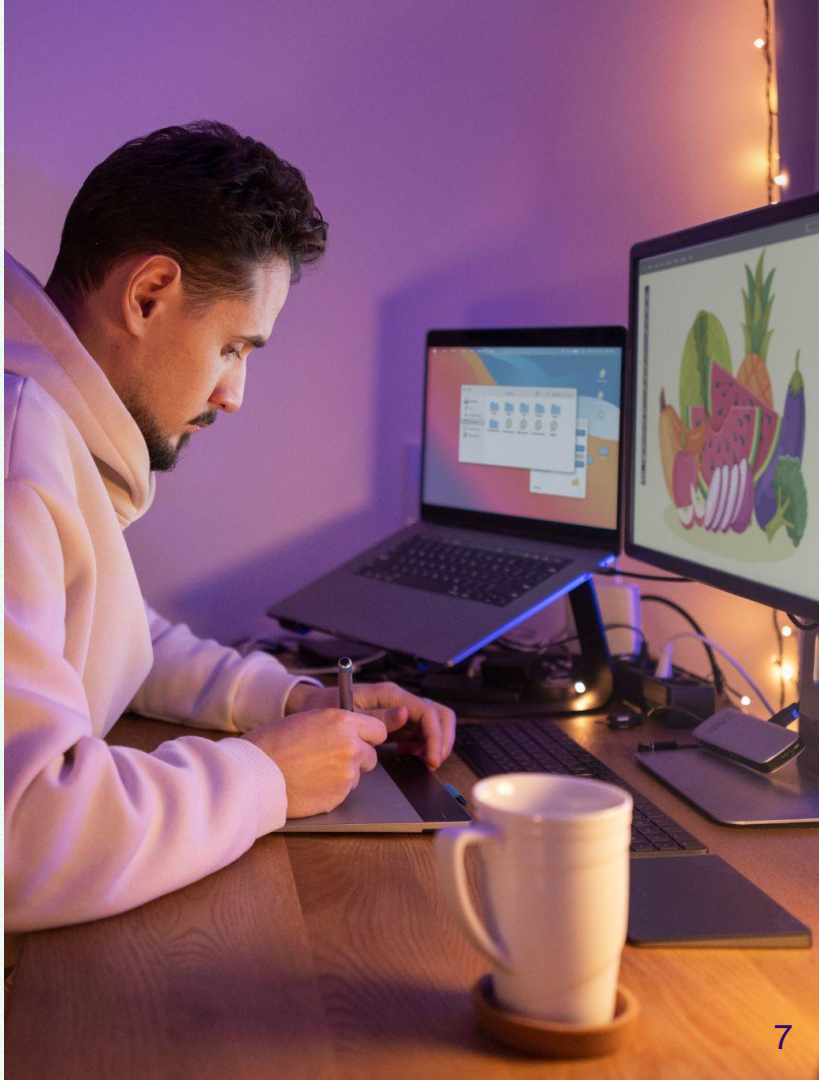
System Requirements

- Adaptability
- Security
- Usability
- Maintainability
- Performance

Figure 1. Use case diagram



Mystere Implementation



Technologies

unity

HDRP

Dialogue System
for unity

thefuntastic/**Unity3d-Finite-State-Machine**

There are a lot of systems in Mystere:

But only those marked in **red** are going to be touched in this presentation.

Passive Income
Game State
Enemy Spawn
Enemy Round
Player Spawn
Economy
Stuck Enemies
Dialogue
Audio
User Interface
Options
Player
Enemies
Moving Vehicles
Enemy Agents (AI)
...

Enemy Agents

1. There are 4 distinct enemy types.
2. The enemy's goal is to find and eliminate the player.
3. To achieve player elimination, AI agents use state machine and the A* Search algorithm.

A* Search Algorithm

Table 4. A short description about A* search algorithm

A* search algorithm	
Run time complexity (Big O)	
Best Case	O(1) to O(b)
Average Case	$O(b^d)$
Worst Case	$O(b^d)$
Space complexity (Big O)	
Worst Case	$O(b^d)$
where b is the branching factor and d is the depth of the optimal solution in the search tree.	

$$f(n) = g(n) + h(n)$$

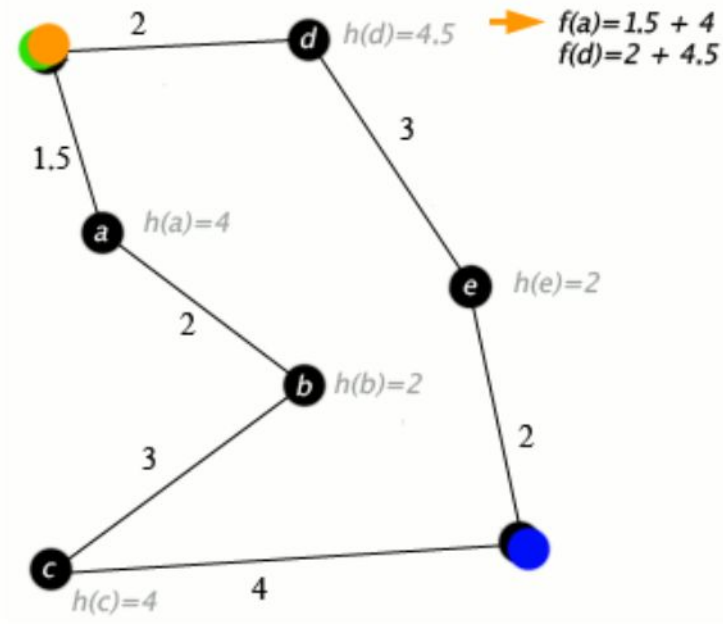
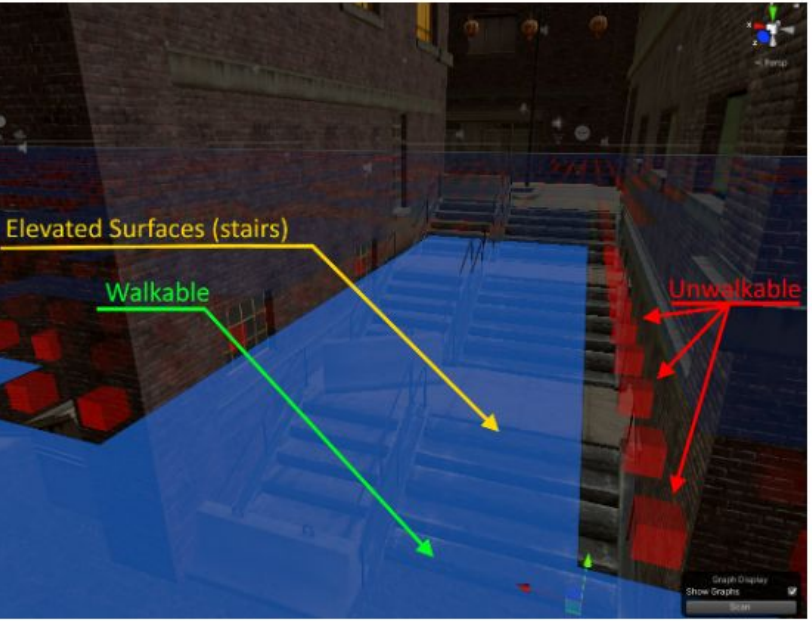
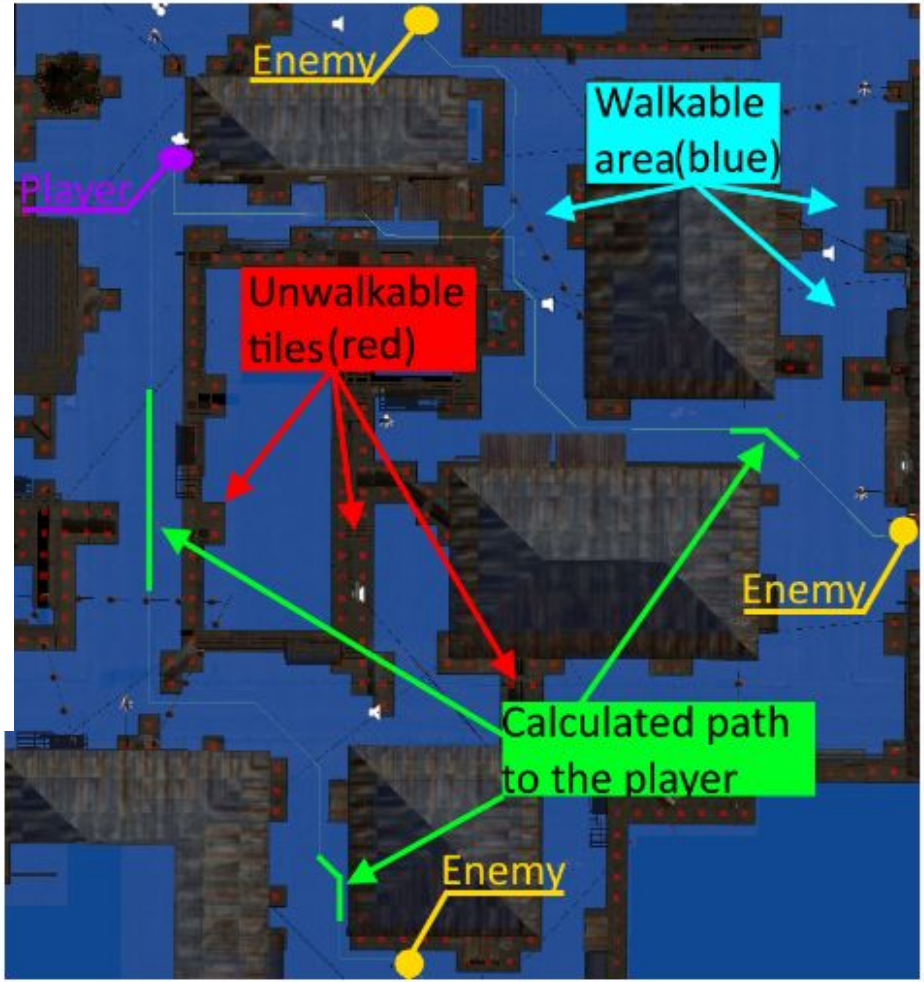


Figure 14. An aerial perspective illustrates the process of path calculation for the

gure 11. A set of stairs (elevated surface) together with the graph model.





Economy

Passive Income Generation

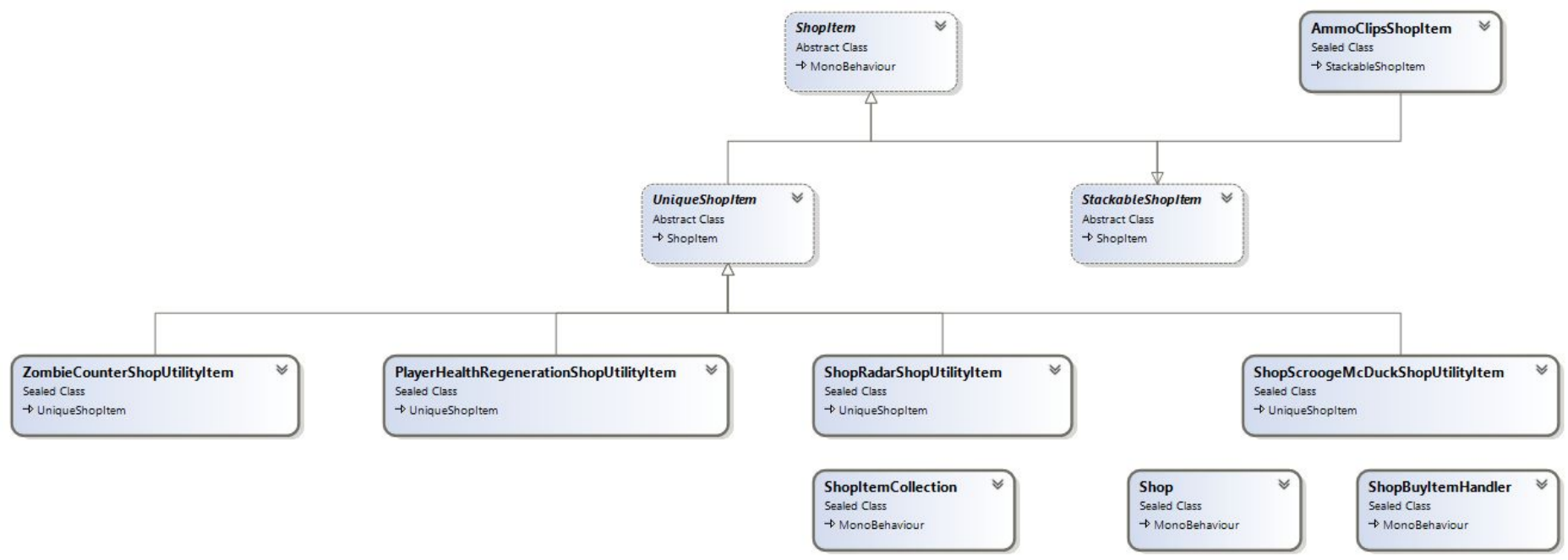
Calculating income for the player using complex math equations and random number generation.

$$\mathrm{P}_{\mathrm{money}} = \left(B_{\mathrm{money}} + \frac{R_{\mathrm{multiplier}} \times R_{\mathrm{number}}}{T_{\mathrm{multiplier}} \times T + 1} \right) \times (1 + B_{\mathrm{multiplier}} \times \sin(T_{\mathrm{factor}} \times T))$$

Shop System

Allowing the player to spend the in-game currency via shop systems.

Shop system (economy)



Round system

Enemy Composition

Every game and every round, the player will meet unique enemy sets, mixed from all 4 enemy types, using an innovative system.

Maximum enemies subsystem

Each round, a complex mathematical calculation is done to calculate the maximum number of enemies.

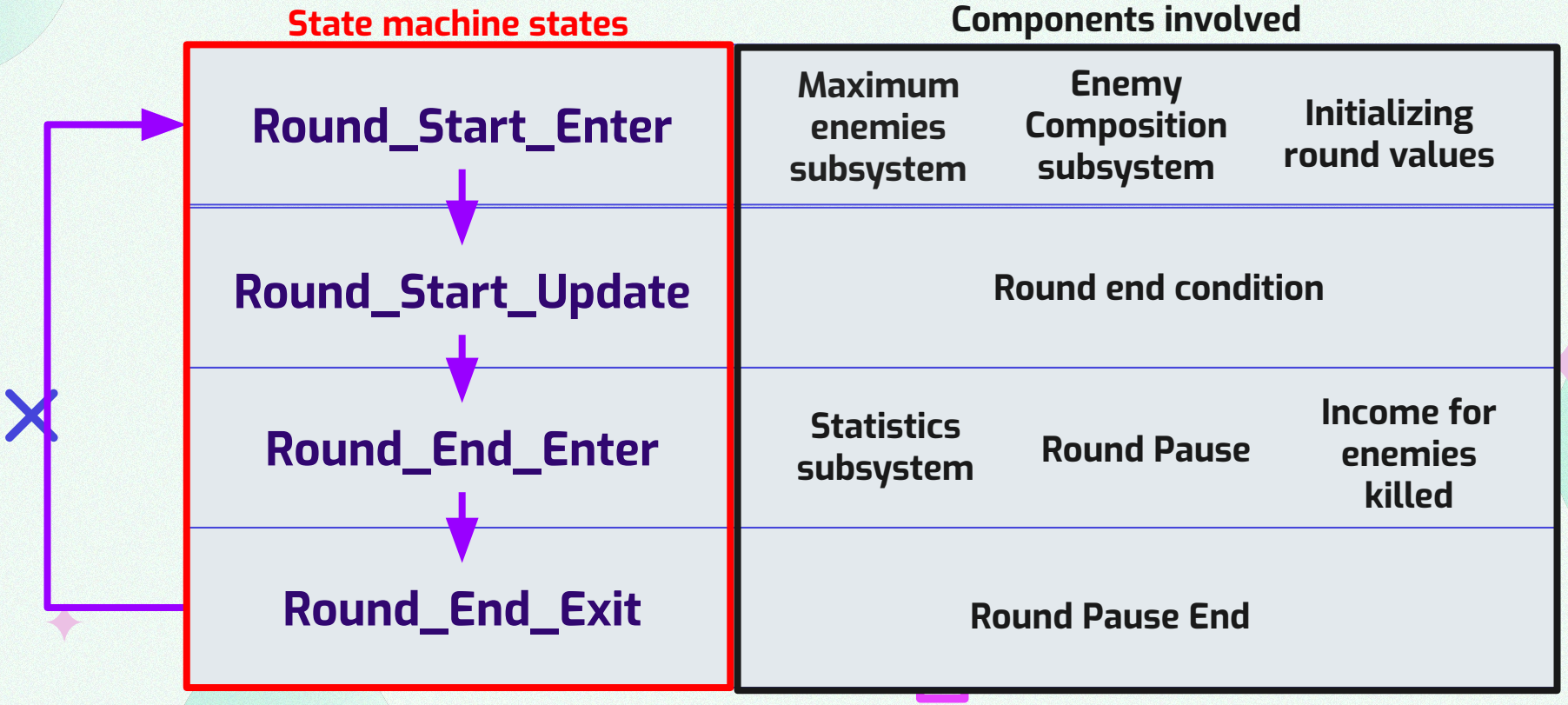
$$E_{\min} = X_{\min} + Y_{\min} \cdot R + Z_{\min} \cdot \sin\left(\frac{\pi}{2} \cdot \log(R)\right) \quad (3.1)$$

$$E_{\max} = X_{\max} \cdot \cos\left(\frac{\pi}{2} + \log(R)\right) + Y_{\max} \cdot R + \frac{Z_{\max}}{\sqrt{R}} \quad (3.2)$$

State machine

The round has several states that are performing various tasks using a state machine.

Enemy Round System



Conclusions and Future Work

Implementing a more robust utilization of the Object-Oriented Programming (OOP) aspects

Prioritizing basic game concepts over level design is a must.

Having specialized team members for graphics would be beneficial.

Utilizing the Chat GPT to offer unique dialogue lines would allow unique detective stories to be played out.

Potential to evolve the game into a robust educational tool.

Adding a multiplayer mode to the game would expand the replayability aspect.

Weapon customization, flying enemy types, and environmental hazards are planned.