Bunny is on farm Project

1. Project Overview

This project is a farming and completing the dungeon game having a little bunny as the main character. The game combines elements of farming simulation, resource management, and dungeon exploration with maze-like levels and battles against animated objects. Inspired by Stardew Valley, the game will have an engaging day-night cycle where players can grow crops, and go into dungeons to collect resources and defeat enemies. The primary goal is to enjoy expanding the farm.

2. Project Review

A relevant project for comparison is Stardew Valley, a farming simulation RPG with combat mechanics. While Stardew Valley focuses primarily on farming with some dungeon exploration, this game aims to enhance the dungeon experience by introducing unique enemy behaviors, procedurally generated maze dungeons, and interactive battle mechanics involving animated objects. Additionally, this game will feature a bunny with unique abilities, such as burrowing underground to avoid danger or using special farming skills to interact with the environment creatively

3. Programming Development

3.1 Game Concept

The game consists of two primary mechanics:

- Farming: Players can plant crops, water them, harvest, and sell for profit. Crops will have growth cycles and require proper maintenance.
- Dungeon Completing: Players will explore randomly generated dungeons, solve maze-like puzzles, and battle against objects (e.g., possessed tools, animated rocks). Each dungeon will have different themes and hazards.

Key Features:

- A farming system with crop cycles and soil mechanics.
- A dungeon that includes randomized mazes and fights with animated object enemies.
- A pet system where the bunny can befriend and interact with other animals.
- A resource management system to collect and utilize dungeon loot for farming upgrades.

3.2 Object-Oriented Programming Implementation

The game will include these following classes and etc.:

1. User System

UserAccount

- Attributes: username: string ,passwordHash: string ,sessionID: string, lastLogin: datetime
- Methods: login(username: string, password: string) ⟶ bool, logout() ⟶ void, saveProgress() ⟶ void, loadProgress() ⟶ void

2. Player System

Player (Main bunny character)

- Attributes: health ,stamina ,inventory: Inventory ,position ,homePosition ,account: UserAccount
- Methods: move(direction: string), attack(target: Enemy), interact(target: GameObject) ,farm(crop: Crop) ,rest() ,takeDamage(amount) ,teleportHome() ,saveGame()

Inventory

- Attributes: items: List ,capacity: int
- Methods: addItem(item), removeItem(item), useItem(item)

3. Game Systems

GameConfig

- Attributes: themeColor: string, screenWidth: int ,screenHeight: int , autoSaveEnabled: bool
- Methods: loadConfig() ,saveConfig() ,enableAutoSave()

DayNightCycle

- Attributes: currentTime ,isDay: bool

- Methods: updateTime() ,toggleDayNight()

4. UI System

UIManager

- Methods: displaySaveButton() ,handleSaveButtonClick()

5. Farming System

Crop

- Attributes: type: string ,growthStage: int waterLevel: int ,yield: int
- Methods: grow() ,water() ,harvest()

FarmSpace (Manages farming area)

- Attributes: crops: List<Crop>
- Methods: plantCrop(crop: Crop) , harvestCrops() ⟶ List<Crop>

6. Dungeon System

Dungeon (Randomly selects between Maze or PvPSpace)

- Attributes: currentArea: Maze or PvPSpace
- Methods: enterDungeon(), selectArea(), exitDungeon()

Maze (Non-combat puzzle-based dungeon)

- Attributes: directions, rows, cols, grid
- Methods: generateMaze(), addLoops(), draw()

PvESpace (Enemy combat area)

- Attributes: enemies
- Methods: spawnEnemies(), startBattle(), endBattle()

7. Enemy System

Enemy (Base class for all enemies in PvPSpace)

- Attributes: health, attackPower, movementPattern
- Methods: move(), attack(), takeDamage()

Enemy Subclasses:

- BossEnemy (Stronger enemies)
- RareEnemy (Special skills)
- StandardEnemy (Basic combat enemies)

8. Animal NPC System

AnimalFriend (Friendly animals that interact with the player)

- Attributes: health, movementPattern, type
- Methods: move(), takeDamage(), interact()

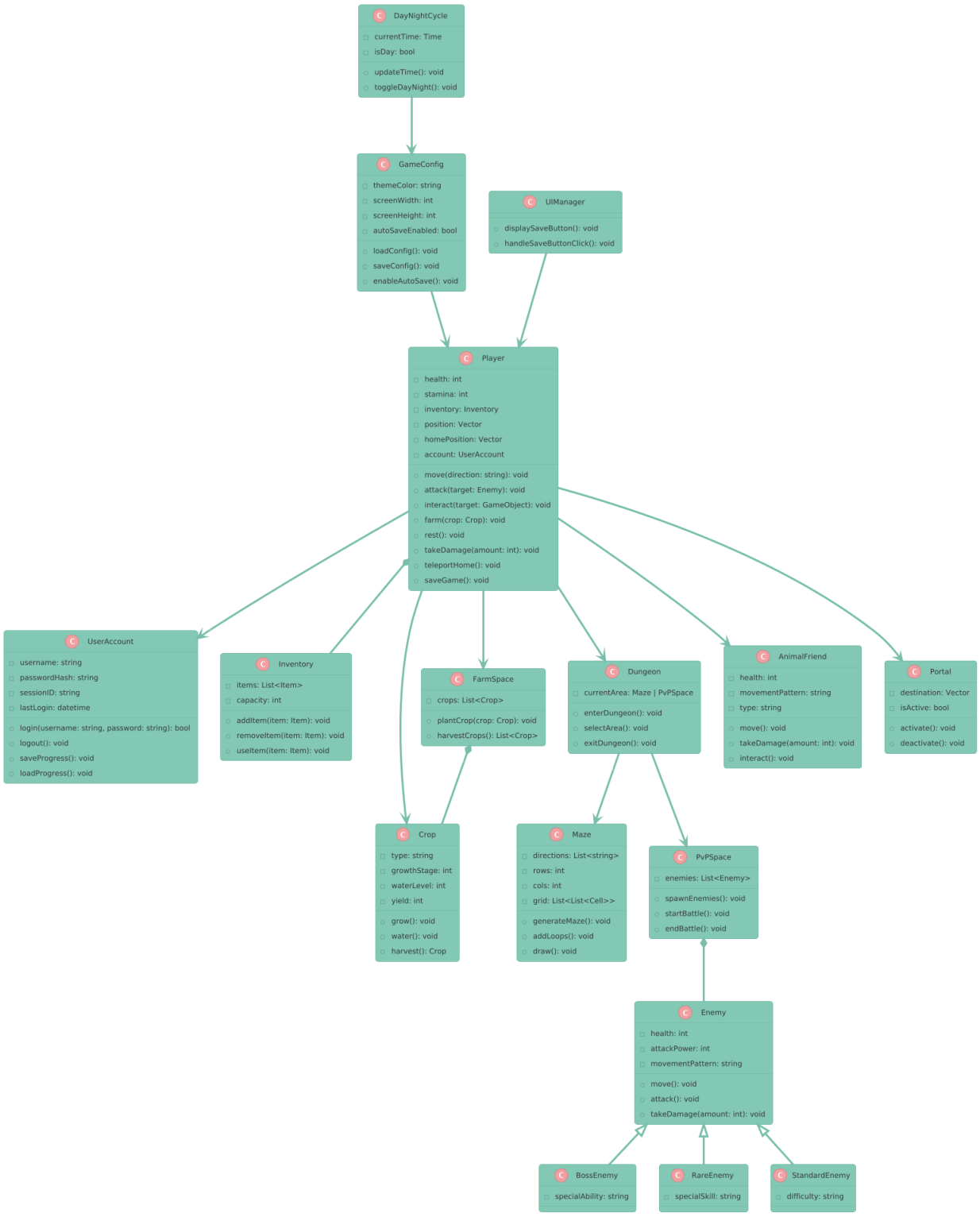
9. Portal System

Portal (Allows teleportation)

- Attributes: destination, isActive
- Methods: activate(), deactivate()

And more due to being essential for the project.

UML diagram:



3.3 Algorithms Involved

- Pathfinding Algorithm: An algorithm for enemy movement and maze navigation.

- Random Dungeon Generation: A procedural maze generation algorithm to create unique dungeons for each playthrough.
- AI Behavior: Rule-based decision-making for enemy movements and attacks.
- Sorting Algorithm: Inventory sorting using a simple sorting algorithm.
- Event-Driven Mechanics: Triggers for farming growth cycles, dungeon interactions, and enemy attacks.

4. Statistical Data (Prop Stats)

4.1 Data Features

The game will track the following features:

1. Player Movement (pixels moved per session)
2. Enemies Defeated
3. Crops Harvested (total crops collected and sold)
4. Time Spent in Dungeon (minutes spent exploring per session)
5. Accuracy Rate (hit percentage during combat)

Each dataset will contain at least 50 rows of data, which can be used to analyze player performance and balance the game mechanics.

Feature	Why?	How to Obtain 50 Values	Source	Display Method
Player Movement	Track player exploration patterns, identify stuck points, optimize map design	Record position changes every 10 seconds during gameplay	Player.position	Line chart (movement over time) + Average
Deaths vs Kills	Balance combat difficulty, measure player progression	Count each enemy defeat event and count the death by this enemy to see if it balance	PvESpace.enemies (count removal)	Bar graph (by enemy type) + Total count
Crops Harvested	Evaluate farming system usage, economy	Record each harvest action	FarmSpace.harvestCrops() return value	Pie chart (crop types) + Sum

	balance			
Combat Accuracy	Adjust enemy AI and hitboxes, balance weapons	Calculate (hits landed/total attacks)*100	Player.attack()success rate	Scatter plot (over time) + Mean & SD
Inventory Usage	Understand item preferences, balance resource economy	Log each useItem() call	Inventory.useItem()method	Heatmap (item frequency) + Mode

Feature	Statistical Value	reason
Player movement	Average (pixels)	*Shows typical exploration range per session.*
Deaths vs Kills	KDR (by type)	Balance combat difficulty, measure player progression
Crops Harvested	Sum (by type)	Evaluate *farming preferences and economic impact.*
Combat Accuracy	Mean & SD (%)	Helps adjust enemy AI difficulty based on player skill.

**KDR (Kill/Death Ratio)*

Graph#	*Objective*	*Graph type*	*X-Axis*	*Y-Axis*
Graph 1	Enemy difficulty (KDR per type)	Boxplot (Distribution)	Enemy type	KDR Value
Graph 2	Crop type preference	Stacked Bar (Proportion)	Session Week	Crop Count (stacked by type)
Graph 3	Player movement heatmap	Correlation Heatmap (Relation)	Map Grid(X)	Map Grid(Y)

**In graph 3, darker the color more time spend at that point*

3.2 Data Recording Method

The game will store statistical data in a CSV file format for easy analysis and visualization. Each session's data will be appended to the file at the end of gameplay.

3.3 Data Analysis Report

Recorded data will be analyzed using the following statistical measures:

- Average values(e.g., average movement distance, average dungeon time)
- Standard deviation(to determine player behavior variation)
- Graphs & Charts (bar graphs for enemy defeat count, line charts for movement trends, etc.)

A Python-based data analysis script will generate reports, helping developers refine difficulty balance, optimize gameplay flow, and enhance the player experience.

4. Project Timeline

Period	Task
10 March	Proposal submission / Project initiation
17 March	Full proposal submission
26 Mar- 2 Apr	Game login system with interface. Also the data saving logic.
3-9 Apr	Game algorithm and Interface
17-23 Apr	Project revise
24 Apr - 11 May	Project revise & Submission

5. Document version

Version: *4.0*

Date: *31 March 2025*

Date	Name	Description of Revision, Feedback, Comments
14/3	Pattapon	Good job. :)
16/3	Phiranath	Don't forget to remove the template and change the section number, other than that good job!
29/3	Phiranath	Some of the text is green, but some is black, which is strange. Choose one of the colors. 👍I am not sure about PvPSpace, is this game a single player or multiplayer because PvP stands for Player Versus Player, PvE might make more sense here. Overall pretty good proposal. Good job! 👍