CSCI441_VC_Software Engineering

Penultimate Adventure

Team: G

Team Members

Fernando Duffoo	**Management & Organization**
Isaac Howard	**Programming**
Johnathan Bennett	**Design**

Project URL: http://github.com/PenultimateAdventure

Part 1 Statement of Work and Requirements

Customer Statement of Requirements

In the contemporary gaming environment, numerous video games place a high emphasis on cutting-edge graphics, frequently utilizing 2D or 3D visuals to craft captivating and visually impressive universes. While these games unquestionably provide a wide array of experiences, they also bring about a series of socio-technological hurdles that may hinder inclusiveness and accessibility within the gaming community.

This project attempts to move away from the high graphics model and provide story based and engaging content. This allows for easier use of assisting tools such as screen readers. This additionally permits more lenient hardware requirements.

The application aims to have a fun and creative gaming experience that appeals to a large audience. The application will be able to challenge decision making skills while navigating through a dangerous new world.

The user will be able to access the menu to start game, save game, load game, view status bar, and quit the game.

The user interface will display the menu as well as the main functional portion of the application.

In summary, the central socio-technological issue addressed by this project pertains to the exclusionary aspects found in contemporary gaming, stemming from demanding system specifications and insufficient accessibility for those with disabilities. Our mission is to advocate for inclusivity, aiming to enhance accessibility and enjoyment in gaming for a wider audience, thereby tackling the critical socio-technological challenges within the gaming industry.

Glossary of Terms

User- a person who intends to use the application for entertainment or educational purposes.

User interface- the means by which the user and a computer system interact, in particular the use of input devices and software.

System Requirements

Functional Requirements:

Identifier	PW	Requirement
REQ1	5	The system's interface shall allow the user to start game, save, load, view status, and exit game.
REQ2	5	The systems interface shall allow for text commands to control their progress through the game.
REQ3	4	The system will allow for shortcuts for common commands.

Non-Functional Requirements:

Identifier	PW	Requirement
REQ4	3	The system shall provide a non-cluttered, user friendly, easy to understand interface.
REQ5	3	The system shall have preferences for font and display styles.

On-Screen Appearance Requirements:

Identifier	PW	Requirement
REQ6	5	The system shall use a display containing the menu and the functional portion of the game application.

Gantt Chart

	Start Date	End Date	Status
Text Adventure Game	08-28-2023	12-04-2023	Incomplete
Design Discussion	09-01-2023	09-04-2023	Complete
Initial Design	09-04-2023	09-11-2023	Complete
Detailed Design	09-11-2023	09-18-2023	Incomplete
Analysis of Implementable Tools	09-18-2023	10-08-2023	Incomplete
Perform System Testing	10-08-2023	10-09-2023	Incomplete
Document Bugs Found	10-09-2023	10-10-2023	Incomplete
Debug	10-10-2023	10-29-2023	Incomplete
First Demo	10-29-2023	10-30-2023	Incomplete
Review Feedback	10-31-2023	11-01-2023	Incomplete
Redesign	11-01-2023	11-13-2023	Incomplete
Develop & Integrate	11-13-2023	11-15-2023	Incomplete
System Testing	11-15-2023	11-20-2023	Incomplete
Document Bugs Found	11-20-2023	11-23-2023	Incomplete
Debug	11-23-2023	11-25-2023	Incomplete
Deployment	11-25-2023	11-26-2023	Incomplete
Second Demo	11-26-2023	12-04-2023	Incomplete

Stakeholders

Our primary stakeholders are users who will be directly using the system for their entertainment experience.

Actors and Goals:

Actors	Goals	Use Cases
Player/User	Immerse themselves in the game world, explore and progress through the storyline.	UC1, UC2, UC3, UC4, UC5, UC6, UC7
NPC	Interact with the player and advance storyline through player choices.	UC3
Save/Load	To allow players to save or load their progress.	UC2
Enemies	To challenge the player through combat encounters.	UC4
Scoring System	To provide a measurement of the players' performance.	UC6

Use Cases:

UC1: Start Game – Player starts a new game.

UC2: Save/Load – Player saves their game progress or loads a previous saved game.

UC3: NPC Interaction – Player engages in conversation with an NPC.

UC4: Combat Encounter – Player engages in combat with one or more enemies.

UC5: Game Over – The game ends and the player must start over or quit.

UC6: Score – The game tracks the player's score.

UC7: Settings – The player preferences such as font, font color, and background color.

Traceability Matrix

Requirements	PW	UC1	UC2	UC3	UC4	UC5	UC6	UC7
REQ1	5	**x**	**x**					
REQ2	5		**x**	**x**	**x**	**x**		
REQ3	4		**x**			**x**		
REQ4	3	**x**	**x**	**x**	**x**	**x**	**x**	**x**
REQ5	3							**x**
REQ6	5	**x**	**x**				**x**	
Max PW	5							
Total PW		13	22	8	8	12	8	6

Fully Dressed Description

Use Case UC1:

Related Requirements: REQ1, REQ 4, REQ 6.

Actor's Goal: Immerse themselves in the game world, explore and progress through the storyline.

Initiating Actor: The Player.

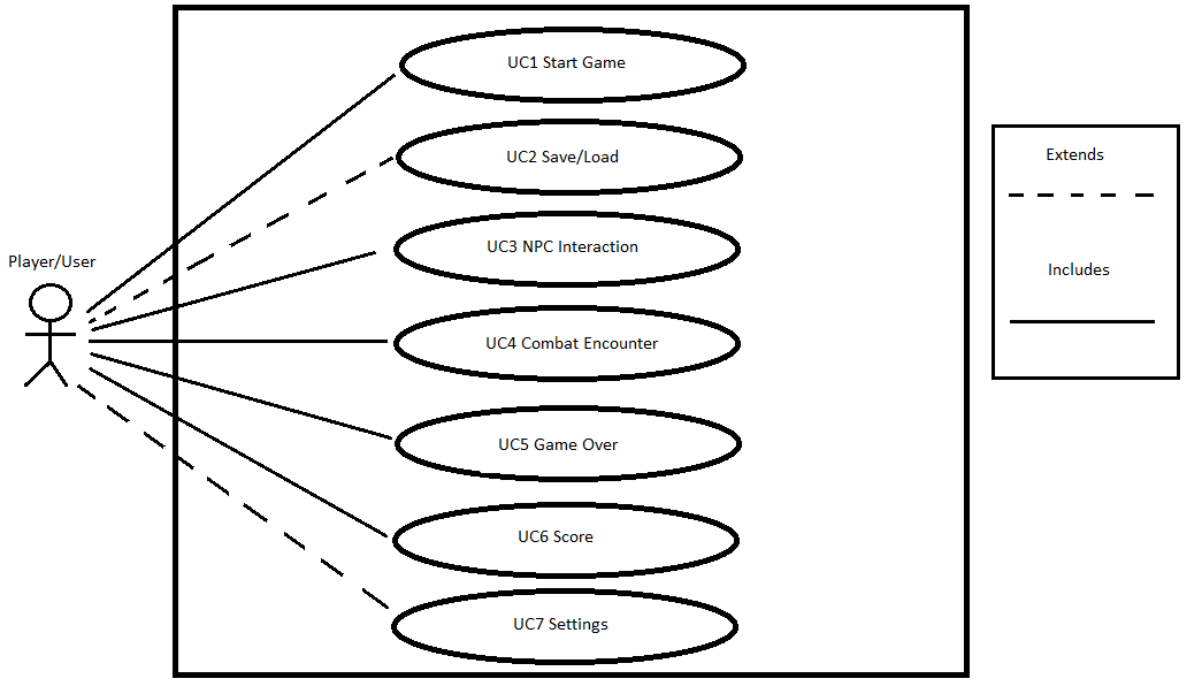
Participating Actor: NPC, Enemies, and the Scoring System.

Preconditions: The player starts the application.

Postconditions: The player can save the game and quit.

Flow of Events for Main Success Scenario:

- ➔ 1. System displays the game's menu.
- ➔ 2. Player selects start or load game.
- ➔ 3. System starts the game and displays GUI.
- ➔ 4. Player progresses through game until they save, quit, or there is a game over.
- ➔ 5. System displays main menu.



Use Case UC3:

Related Requirements: REQ2, REQ4.

Actor's Goal: Interact with the player and advance storyline through player choices.

Initiating Actor: The Player.

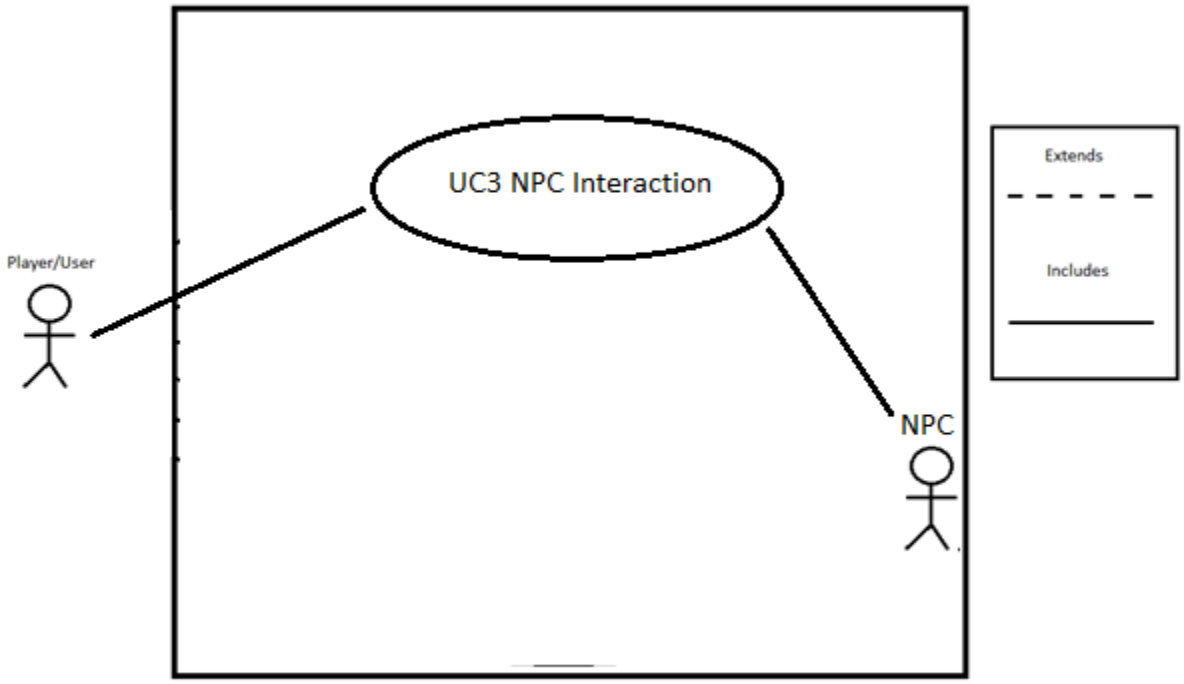
Participating Actor: NPC and Player.

Preconditions: The Player approaches NPC.

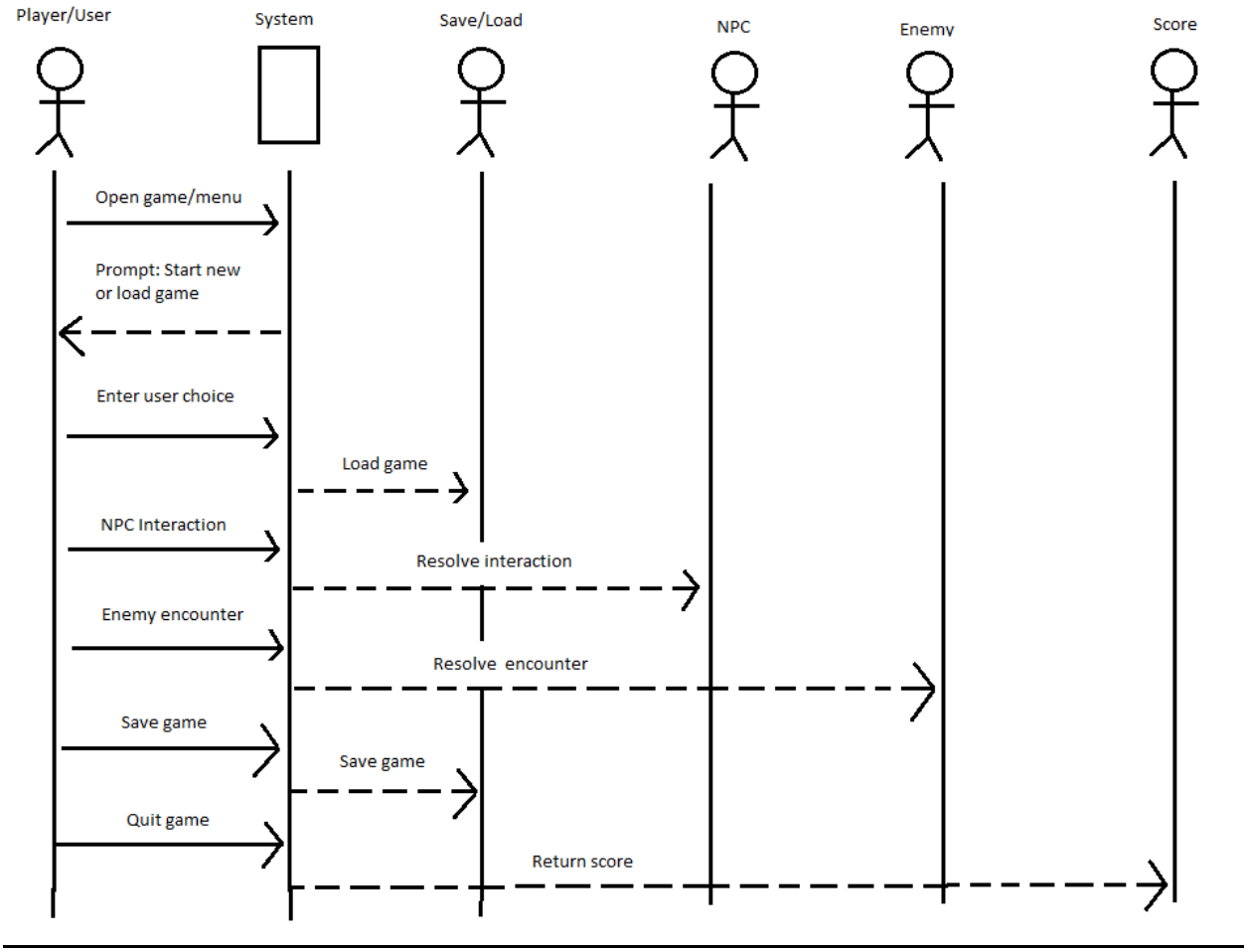
Postconditions: The Player gains information, an item, or completes a quest.

Flow of Events for Main Success Scenario:

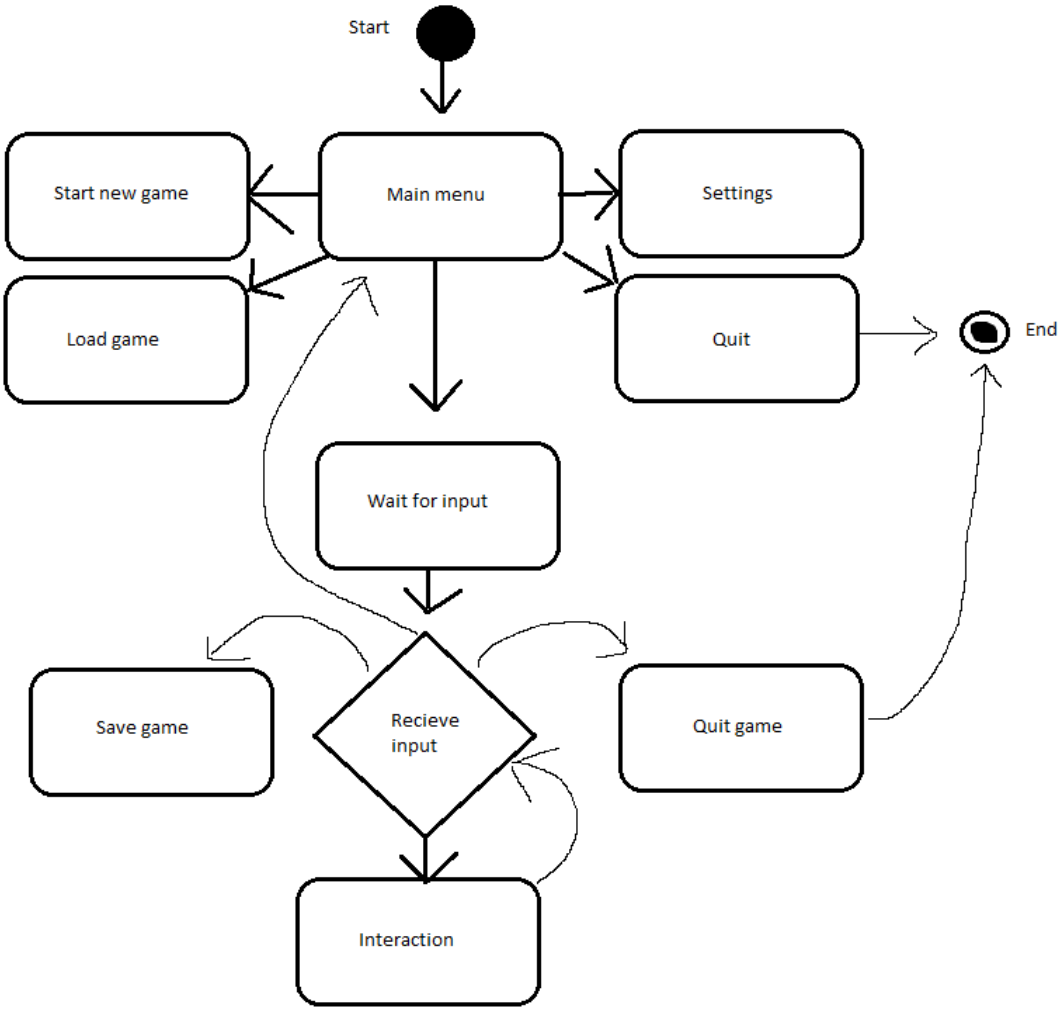
- ➔ 1. Player initiates interaction with NPC.
- ➔ 2. NPC provides varying options for the Player.
- ➔ 3. The Player chooses their option.
- ➔ 4. The NPC provides an item, quest, story completion, or information.
- ➔ 5. The player leaves the NPC.



System Sequence Diagram



Activity Diagram



Architecture Style

The text-based adventure game follows a software architectural style known as Entity Component system (ECS). ECS is typically used in game development. This allows for efficient management of complex interactions and dynamic play. In this pattern there are entities, representing objects, and components representing things such as inventory, health, and location. The game system processes entities with specific components. This allows for modularity and scalability, allowing for expansion of the narrative.

Global Control Flow

Time Dependency:

The game does not rely on real-time constraints. It is not a real time system. Instead, it operates in a turn-based system. Where time doesn't play a role. This allows players to make decisions and progress through the game at their own pace.

Execution Order:

The text-based adventure game operates as an event-driven system, reacting to actions initiated by the user, including selecting dialogue options, making in-game decisions, and initiating interactions with non-playable characters (NPCs). The game's underlying logic relies on these events, shaping the narrative in response to the player's choices. The game does not adhere to real-time constraints or follow periodic actions; instead, it dynamically adjusts to the player's decisions, advancing the storyline accordingly.

Hardware Requirements:

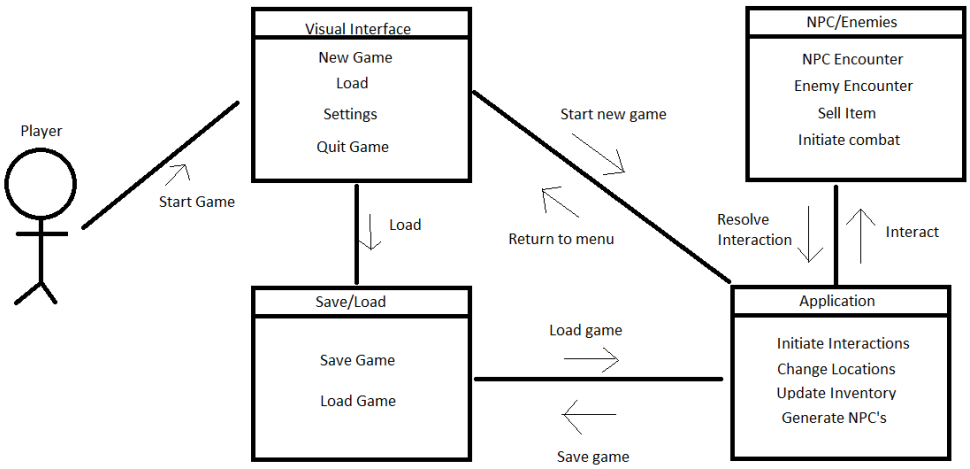
Memory: 8GB

Graphics card: minimum of GeForce 700 for Intel or Radeon 400 series for AMD

Monitor: basic LED monitor

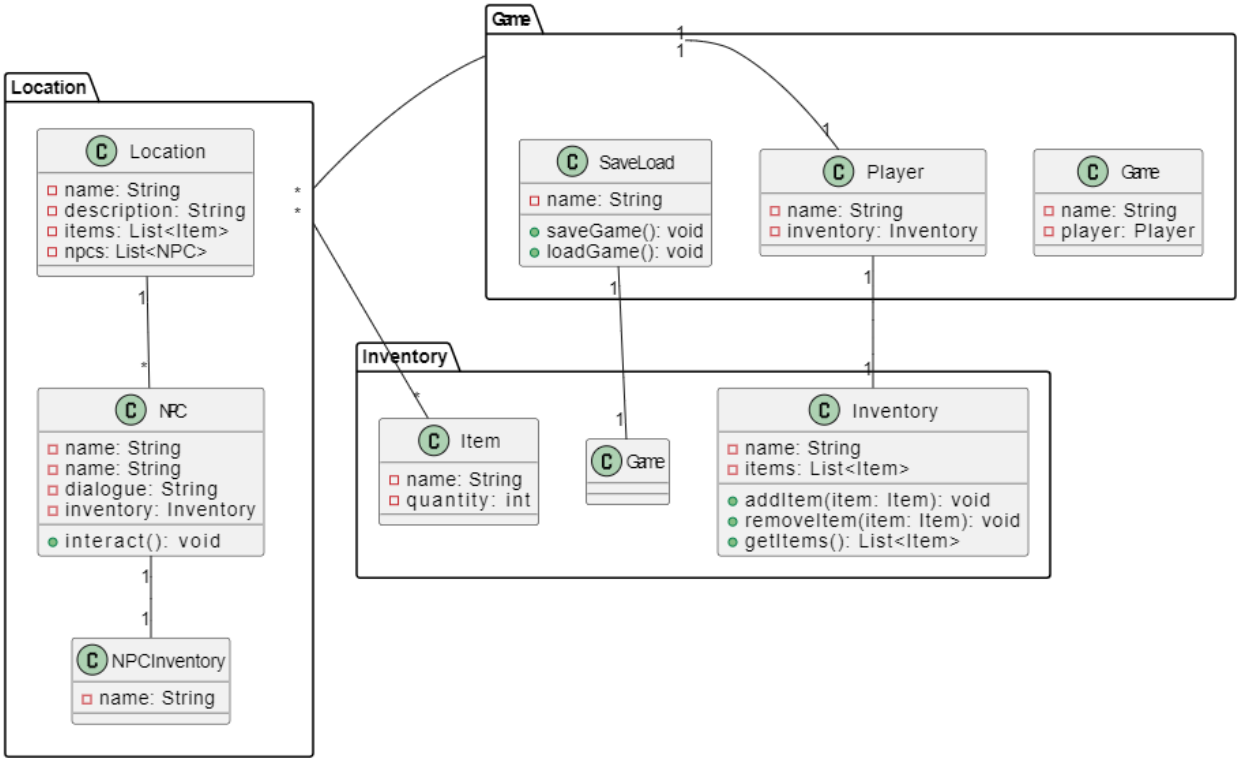
Hard drive: at least 1GB of space

Interaction Diagram



By looking at the use cases and requirements of the application, we were able to create our domain model. Internal concepts include the NPC's and the application. When the user opens the application, they may start a new or load an existing game. The user has direct access to the application at any time.

Domain Model



Concept Definitions

Name	Definition	Category
Game	The central entity that represents the game itself. It contains information about the game state, progress, and overall management.	Knowing (K)
Player	The entity representing the game's player character. It stores information about the player's progress, inventory, and interactions.	Doing (D)
SaveLoad	Functionality responsible for saving	Doing (D)

	and loading the game's state, allowing players to resume their progress.	
Inventory	A container for storing items collected by the player character.	Doing (D)
Item	Represents objects or items that players can collect and use in the game.	Knowing (K)
Location	Represents different places or scenes within the game world where player actions and interactions occur.	Doing (D)
NPC	Non-Player Characters within the game world with whom players can interact.	Doing (D)
NPCInventory	Represents the inventory or possessions of an NPC.	Doing (D)

Association Definitions

Concept Pair	Association Description	Association Name
Game-Player	Tracks players progression and actions, provides environment	Tracking progression
Player-Inventory	Inventory Provides an inventory for the player to manage and interact with items	Checking inventory
Game-Save/Load	Save and loads game states	Saving and loading
Location-Item	Item allows for specific locations to have items	Updating location

Location-NPC	Stores NPC, ensures interactions happen at right locations and points in the game	Updating NPC location
NPC-NPCInventory	Allows NPC to have and manage inventory	Checking inventory

Attribute Definitions

Concept	Attribute	Attribute Description
Game	Name	Name of the player
	Player	The user
Player	Name	Name of the player
	Inventory	Items in player possession
Save/Load	Name	Name of the player
Inventory	Name	Name of selected item
	Items	List of items in inventory
Item	Name	Name of the item
	Quantity	Amount of the item
NPC	Name	Name of the NPC
	Dialogue	Output of NPC interaction
	Inventory	Items NPC has available
NPCInventory	Name	Name of NPC's items in inventory
Location	Name	Name of current location
	Description	Describes the location for player
	Items	What items are in this location
	NPC's	What NPC's are in this location

System Operation Contracts

Operation Name: StartNewGame

Description: The system allows the player to initiate a new game session, resetting game progress and initializing game resources.

Preconditions:

The game application is running.

Player chooses to start a new game session.

Postconditions:

Game progress is reset.

Game resources are initialized.

Cross-Reference to Use Case: UC1: Start Game

System Operation Contract: Save/Load Game

Operation Name: SaveGame

Description: The system allows the player to save their current game progress for future retrieval.

Preconditions:

The game application is running.

Player chooses to save their game progress.

Postconditions:

Current game progress is saved for future retrieval.

Cross-Reference to Use Case: UC2: Save/Load

System Operation Contract: Save/Load Game (Load)

Operation Name: LoadGame

Description: The system allows the player to load a previously saved game session.

Preconditions:

The game application is running.

Player chooses to load a saved game session.

Postconditions:

The game state is restored to the state of the previously saved game.

Cross-Reference to Use Case: UC2: Save/Load

System Operation Contract: NPC Interaction

Operation Name: InteractWithNPC

Description: The system allows the player to engage in conversation or interaction with a non-player character (NPC) within the game world.

Preconditions:

The game application is running.

Player initiates interaction with an NPC.

Postconditions:

The conversation or interaction with the NPC proceeds as per the game's logic.

Cross-Reference to Use Case: UC3: NPC Interaction

Traceability Matrix

	Visual Interface	NPC/Enemy	Save/Load	Application
UC1	x		x	x
UC2	x		x	x
UC3	x	x		x

Our data model has been thoughtfully designed with user convenience in mind. It takes the form of a JSON model, chosen for its simplicity, making it easy to read and edit. This intuitive design empowers users to seamlessly pick up their game right where they left off.

Within this model, we focus on persisting key elements that enhance the gaming experience. These include the user's current location, essential statistics, and their inventory. These vital aspects are effortlessly captured in our flat file format.

What sets our approach apart is the absence of any cumbersome databases, streamlining the user experience. In this project, we prioritize user-friendly functionality over complex mathematical models, ensuring a smooth and enjoyable gaming journey.

Interaction Diagram

Use Case UC1:

Related Requirements: REQ1, REQ 4, REQ 6.

Actor's Goal: Immerse themselves in the game world, explore and progress through the storyline.

Initiating Actor: The Player.

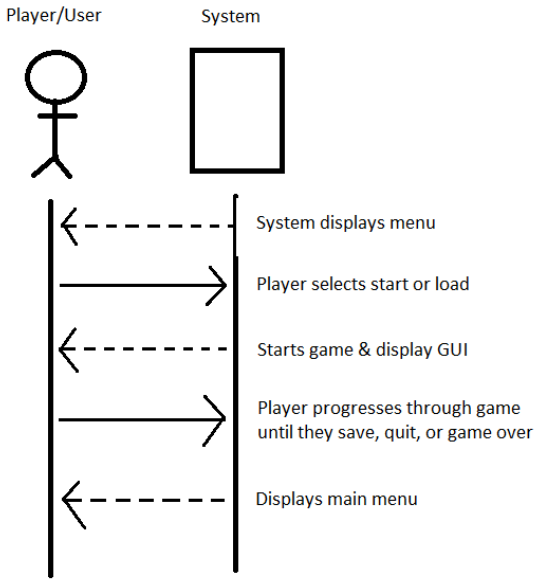
Participating Actor: NPC, Enemies, and the Scoring System.

Preconditions: The player starts the application.

Postconditions: The player can save the game and quit.

Flow of Events for Main Success Scenario:

- ➔ 1. System displays the game's menu.
- ➔ 2. Player selects start or load game.
- ➔ 3. System starts the game and displays GUI.
- ➔ 4. Player progresses through game until they save, quit, or there is a game over.
- ➔ 5. System displays main menu.



We have chosen to entrust the pivotal responsibility of orchestrating the presentation of the main menu and graphical user interface (GUI) to the capable hands of the system itself. Within this design framework, the system bears the pivotal role of facilitating the player's interaction with an array of essential options, encompassing actions such as save/load and the

commencement of a new game. This strategic allocation of responsibilities ensures a seamless and user-friendly gaming experience, allowing the player to navigate effortlessly through the diverse facets of our gaming environment.

Use Case UC3:

Related Requirements: REQ2, REQ4.

Actor's Goal: Interact with the player and advance storyline through player choices.

Initiating Actor: The Player.

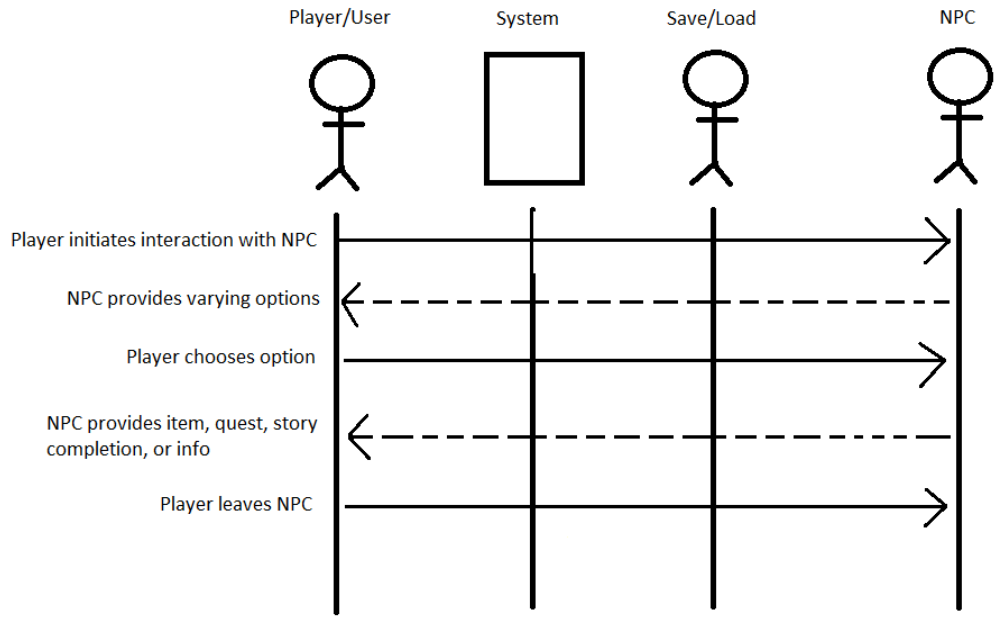
Participating Actor: NPC and Player.

Preconditions: The Player approaches NPC.

Postconditions: The Player gains information, an item, or completes a quest.

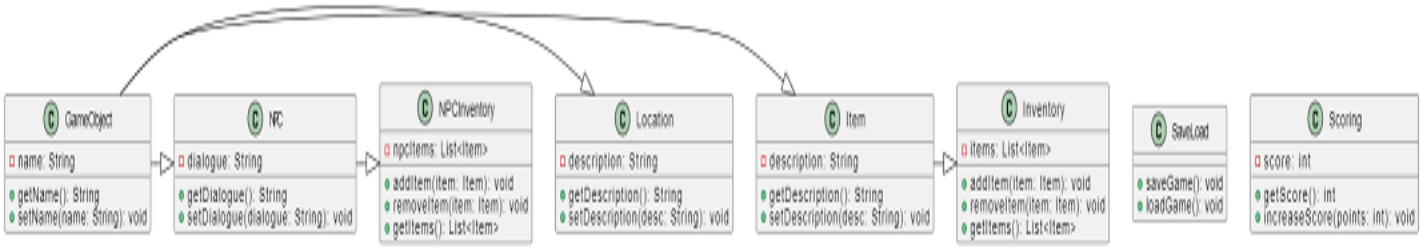
Flow of Events for Main Success Scenario:

- ➔ 1. Player initiates interaction with NPC.
- ➔ 2. NPC provides varying options for the Player.
- ➔ 3. The Player chooses their option.
- ➔ 4. The NPC provides an item, quest, story completion, or information.
- ➔ 5. The player leaves the NPC.



The responsibility for providing the options to the player, including information, quests, items, and story completion is assigned to the NPC. The player will interact with the NPC and choose the available options.

Class Diagram



Data Types and Operation Signatures:

Class GameObject:

Purpose: This class represents the base object for all game objects.

Attributes:

name: String - The name of the game object.

Class Item:

Purpose: This class represents an in-game item.

Attributes:

description: String - A description of the item.

Class Inventory:

Purpose: This class represents an inventory that can hold items.

Attributes:

items: List<Item> - A list of items in the inventory.

Operations:

addItem(item: Item): void - Adds an item to the inventory.

removeItem(item: Item): void - Removes an item from the inventory.

getItems(): List<Item> - Retrieves the list of items in the inventory.

Class Location:

Purpose: This class represents a location within the game.

Attributes:

description: String - A description of the location.

Class NPC:

Purpose: This class represents a Non-Player Character (NPC) within the game.

Attributes:

dialogue: String - The dialogue or text associated with the NPC.

Operations:

getDialogue(): String - Retrieves the dialogue of the NPC.

setDialogue(dialogue: String): void - Sets or updates the dialogue of the NPC.

Class NPCInventory:

Purpose: This class represents the inventory of an NPC.

Attributes:

npcItems: List<Item> - A list of items in the NPC's inventory.

Operations:

addItem(item: Item): void - Adds an item to the NPC's inventory.

removeItem(item: Item): void - Removes an item from the NPC's inventory.

getItems(): List<Item> - Retrieves the list of items in the NPC's inventory.

Traceability Matrix

Requirements	GameObject	Item	Inventory	Location	NPC	NPCInventory
Start game	X					
Save game	X					
Load game	X					
NPC Interaction	X	X	X	X	X	X
Combat Encounter	X	X	X	X	X	X
Game Over	X					
Score	X			X		
Settings	X					

Data Structures and Algorithms

Algorithms

Our project will not require any intricate algorithms.

Concurrency

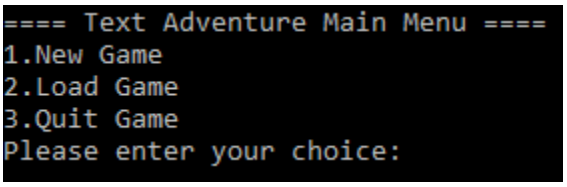
Our system will not use multiple threads at this time.

Data Structures

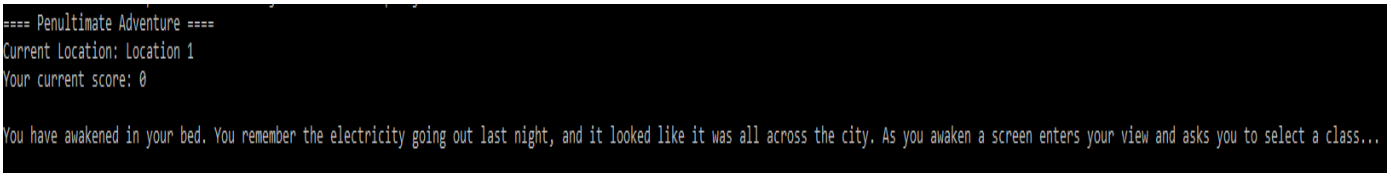
Our system we will employ various data structures, including arrays and lists, to manage player inventory and monster encounters. We will use lists to model the players' inventory to allow for the change in size as the users obtain more items. A list is dynamic and allows for storing and managing a collection of elements. The list can grow and shrink in size based upon need, which allows for management of variable sized data such as inventories. For monster encounters, we will use arrays to select the monster using a random number to associate with the index, since the number of monsters in the system will not be dynamic but fixed this will serve our purposes. Arrays allow storing of multiple elements of the same data type in a single block of memory that is contiguous. This provides an organized way to access data in a systematic way.

User Interface and Implementation

Overall, our UI design has changed a small bit since the first design. We are no longer implementing a settings menu, as the changing of background color, and font size/color is not possible within the current system.



Main Menu



Starting Location

Design of Tests

For this demonstration, we want to test out multiple cases including new game, inventory management, location transition, and input validation. These are very important functions for our application. We want to complete these functions before working on other aspects as the system will not function without these use cases.

Unit tests

New Game Test:

Description: To verify that starting a new game initialized the game with the correct state.

Test input: Start a new game.

Expected output: The game is initialized with the default character attributes, inventory and location. The score is reset to zero and the game begins at the starting location.

Inventory Management Test:

Description: Ensure that adding, removing, and accessing items in the game inventory works as intended.

Test Input: Add an item, remove an item, check the inventory.

Expected Output: Inventory reflects the correct state after each operation.

Location Transition Test:

Description: Test if the player can move between locations within the game world.

Test Input: Attempt to move the character from one location to another.

Expected Output: The character's location is updated.

Integration Testing

We will be incorporating a combination of approaches, instead of a top down or bottom up. This will incorporate elements of both, and additional strategies to ensure comprehensive testing. Component interaction: This will involve testing how specific components interact with each other, such as inventory management and location transition as well as input validation.

Error Handling and input validation: This part tests the integration between the error handling and input validation. This will examine how these components interact and respond to valid inputs.

Performance and Stress Testing: Evaluate the game's performance as a whole. This includes testing how the game behaves when the player explores various locations, interacts with numerous characters, accumulates items, and plays for extended periods.

Game Logic and Item Interaction: Verify that the game's logic, such as combat or puzzle-solving, integrates smoothly with item interactions. For instance, using a specific item should affect game mechanics appropriately.