Garden of Loom

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1 Introduction

Garden of Loom is a story-driven puzzle and exploration game set in a mysterious, magical garden where weaving and gardening intertwine. Conversation and narrative generation AI techniques were used to create an immersive and interactive experience. By leveraging OpenAI's GPT-3.5-turbo, the game features dynamic conversations with NPCs, allowing players to ask questions, explore backstories, and delve deeper into the mysteries of the garden. GPT was also used for narrative generation in various scenes, which unfolded a rich and compelling story that adapted to players' choices and discoveries. One of the high points of the project was the finally achieving the successful integration of AI-generated content into the game's narrative. The ability to produce context-aware, coherent, and relevant conversations between Lyra and the NPCs greatly contributed to the game's immersive atmosphere. However, there were challenges in fine-tuning the AI to generate content that consistently aligned with the game's theme and tone. A solution to this was repeatedly testing out different input prompts in order to come up with the best generated content.

2 Gameplay Goals

The objective was to create an immersive and linear story-driven game, which blends exploration, puzzle-solving, and NPC interaction in a fantasy environment. The individual goals are outlined as follows:

1. Linear interactive storyline enhanced by narrative generation AI
2. NPC interactions enhanced by conversation generation AI
3. Puzzle solving

Players assume the role of a young apprentice weaver named Lyra, who discovers a hidden garden where the plants and creatures are made of delicate, living threads. As Lyra collects magical materials and crafts garments, she encounters NPCs that guide her journey and unravel the mysteries of the garden through AI-generated narratives and conversations. Once she is done exploring and gathering, she solves weaving-based puzzles using the plants and natural materials found in the magical garden. As Lyra solves each puzzle, she creates a new garment, and a unique creature in the garden reveals the stories and histories behind it.

3 Game AI and Features

3.1 Conversation Generation with OpenAI's API

OpenAI and ChatGPT was integrated into the game for conversation generation with NPCs like Wovenwitch and Florathread. First, OpenAI's API was incorporated into the game's codebase, allowing the game to communicate directly with the GPT model. Next, tailored prompts were created for each NPC, providing the AI with the necessary context to generate character-specific responses. These prompts also included a set of instructions to guide the AI's behavior and maintain consistency with the game's narrative.

In the game, each time a player interacts with an NPC like Wovenwitch or Florathread, the conversation is processed through the API, which generates a contextually relevant response from the AI model. To ensure a smooth and dynamic conversation flow, the game maintains a record of the ongoing dialogue, allowing the AI to reference previous messages when generating new responses.

The GPT final prompts for conversation generation fed to the NPCs are as follows:

1. Florathread NPC Interaction: "You are Florathread, a wise and ancient tree-like creature in a magical garden filled with living plants and animals made of threads. Answer the questions and reveal the secret origins of the garden and why its living creatures possess magical properties. Don't ever mention that you are an AI model."

2. Wovenwitch NPC Interaction: "You are Wovenwitch, a wise and mystical character who wears garments made of living, magical threads. You possess the knowledge of the secret mysteries and histories behind the garments created from the materials of the Garden of Loom. Be prepared for answers to Lyra's questions about her first completed garment,and reveal its hidden secrets and significance. Share your knowledge of the history and secrets of the Garden, as well as teach Lyra advanced weaving techniques to help her harness the full potential of the magical materials. Remember, you are a mysterious and enigmatic character, so maintain an air of mystique in your responses. Don't ever mention that you are an AI model."

3.2 Narrative Generation With OpenAI's API

The use of OpenAI and ChatGPT with not only conversation generation but also narrative generation significantly enhanced the playability of the game. Since the story would be slightly different each time, the game could more easily be played through multiple iterations. As Lyra explored the garden and gathered materials such as carrots, tomatoes, acorns, threads, and flowers and by integrating OpenAI's GPT technology through its API, the game was able to generate contextually relevant and engaging storylines.

The linear storyline of the game, organized by scene with their respective GPT prompts (if used), is as follows :

1. Introduction: A paragraph of text types onto the screen that gives a pre-written introduction to the protagonist, Lyra, and the Garden of Loom.

2. Meet Creatures: The player can click on various animated creatures from the garden in order to be given a brief pre-written blurb about them. This serves to provide context for how all living creatures in the garden have magical properties related to weaving.

3. Begin Exploration and Gathering: A short pre-written text lets the player know that Lyra will begin exploring the garden in order to gather materials for her first project. A button that says "Walk" appears to continue onto the next scene.

4. Gather Acorns: From this point on, all of the narrative text is generated through a connection to Open AI's API. The GPT prompt given was: "Generate a narrative text of around 30 words or tokens for a scene in which an apprentice weaver named Lyra is exploring a magical garden where weaving and gardening intertwine. She has decided to walk around to find materials and in this particular scene she has discovered an acorn forest. These acorns can be used as beads or charms that can enhance or strengthen garments. Come up with a history behind them as well as a special property of them."

5. Gather Tomatoes: The GPT prompt given was, "Generate a narrative text of around 35 words or tokens for a scene in which an apprentice weaver named Lyra has been exploring a magical garden full of materials with magical properties. In this particular scene she just discovered a tomato field. These tomatoes can be used as bobbins that can be used to organize and store Lyra's threads. Come up with an eerie secret about them as well as a special property of them. Do not say the words: Legend has it."

6. Gather Carrots: The GPT prompt given was, "Generate a narrative text of around 30 words or tokens for a scene in which an apprentice weaver named Lyra has been exploring a magical garden where weaving and gardening combine. She has been exploring to find materials and

in this particular scene she just discovered a carrot field. The carrots can be used as spindles. Come up with a mysterious story behind them as well as a special property of them. Do not say the words: Legend has it."

7. Gather Vines: The GPT prompt given was, "Generate a narrative text of around 30 words or tokens for a scene in which an apprentice weaver named Lyra is exploring a magical garden. Previously, she was in a tomato field. She has continued her search for materials and in this particular scene she just discovered a tower of multi-colored vines. These vines can be used as threads. Come up with a history behind them as well as a special property of them. Do not say the words: Legend has it."

8. Gather Flowers: The GPT prompt given was: "Generate a narrative text of around 40 words or tokens for a scene in which a young weaver is deep into her exploration of a magical garden full of materials with magical properties. She has been searching for materials for a garment and in this particular scene she just discovered a forest full of flowers. These flowers can be used in her embroidery. Come up with a dark history behind them as well as a secret property of them that can be useful for garment making. Do not say the words: Legend has it."

9. Florathread NPC Interaction: See section 3.1

10. Garment Making Puzzle: See section 3.3

11. Wovenwitch NPC Interaction: See section 3.1

12. Ending Scene: The GPT prompt given was: "Generate a narrative text of around 70 words or tokens for an ending scene in which an apprentice weaver named Lyra has explored a magical garden, called the Garden of Loom. She has collected acorns, carrots, flowers, tomatoes, and vines with special properties for weaving. She has met a wise tree named Florathread and a spider like creature named Wovenwitch who has provided guidance. She has learned a lot about the mysteries and secrets behind the garden."

3.3 Puzzles

The garment-making puzzle serves as a central component of the Garden of Loom gameplay, offering an engaging and interactive challenge for players to overcome. As Lyra collects magical materials throughout her exploration, she must use these resources to craft unique garments by solving weaving-based puzzles. In the puzzle implemented in the current version of the game, the player simply clicks all of the materials they have gathered in order to place them onto the "blank slate," represented by a white dress. Once all materials have been clicked, the finished garment appears.

For future edits of the game, the puzzles are meant to increase in complexity as players progress. Each successfully crafted garment not only signifies the completion of a puzzle but also unlocks new interactions with NPCs, revealing fascinating stories and insights about the magical world of the Garden of Loom.

4 Discussion

The most challenging part of building the game was successfully integrating ChatGPT using OpenAI's API in order to implement the conversation generation and narrative generation. Since the API has been fairly recently released, it was difficult to find external tutorials outside of OpenAI's documentation. As this was my first time using Unity, I also struggled initially figuring out the basics of connecting scripts to game objects, as well as creating successful game object hierarchies.

It was rewarding once the connection was successful and I became more comfortable with Unity's interface. It was especially interesting to observe the creative capabilities of the LLM–Figures 1 through 4 provide an example of how the narrative text would be different each time. The next challenge, however, was figuring out the most optimal way to feed the proper GPT prompts to each scene in order to ensure consistency and prevent issues, such as repetitiveness. For instance, when I initially copy and pasted a few situations that were common for different scenes, the model would tend to repeat phrases, such as "Legend has it." I ended up having to tell the model to not say specific

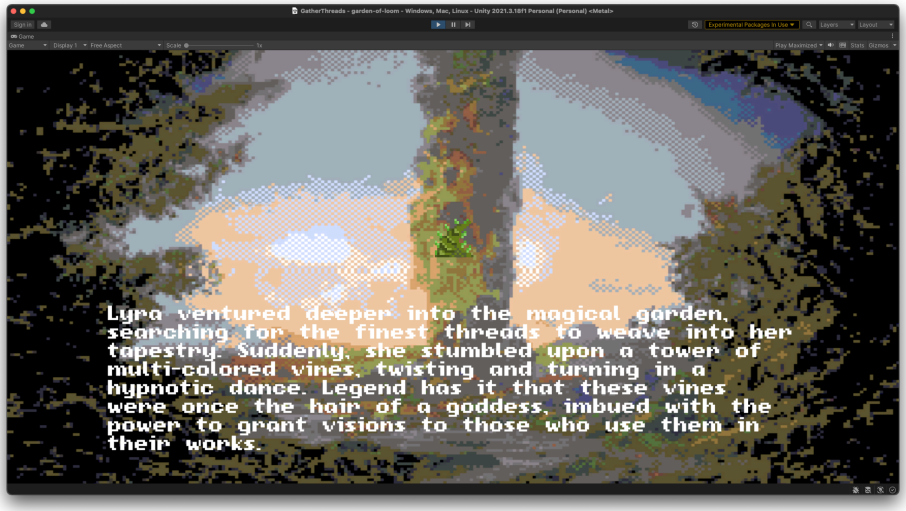

Figure 1: AI generated narrative text.

phrases or words. Providing different specifics for each plot, such as "provide a dark history behind the tomato bobbins" and "come up with a healing property of the flowers" instead of "provide a special property" for all of the materials made the storyline more interesting and less likely to repeat itself. If I were to rewrite the prompts, I would try to also simply word parts of prompts differently despite needing to feed the same information because I discovered that this creates more variability in the generated texts. For instance, instead of copy and pasting phrases like "an apprentice weaver named Lyra has been exploring a magical garden full of materials with magical properties" I would change the wording to describe the same situation for each scene. The issue with the way that I implemented the narrative generation is that unlike with the NPC conversation generation AI, each scene has no concrete record of the text that was generated at each scene – the flow of the story could be improved if each scene could build upon the next by somehow both using the LLM and an ongoing record of generated text for each scene.

For future progressions of the game, I would like to explore how I could connect to Dalle-2 with OpenAI's API as well. I played around with the idea of having a final scene in which Lyra leaves the garden and is asked by an NPC to describe the garden to them–the player would then input their description of the garden, which would be used to generate an image with Dalle-2. The idea was to have Lyra eventually add images to a "scrapbook" for her to keep a record of her weaving lessons and journey through the Garden of Loom. Other future AI implementation ideas include dynamic music generation and dynamic background generation. Additional features to improve upon include more complex and interesting puzzle designs, a resource management system for gathering materials, and moving the game to an open world format as opposed to an interactive fiction game with a linear storyline.

5 Sources

1. https://platform.openai.com/docs/api-reference
2. https://github.com/srcnault/OpenAI-Unity
3. https://github.com/openai/openai-cookbook
4. https://opengameart.org
5. https://itch.io/game-assets

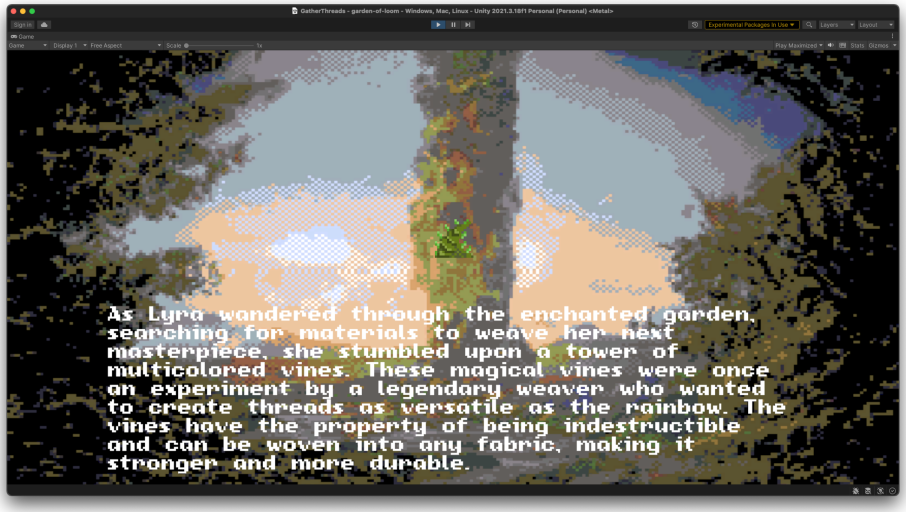

Figure 2: AI generated narrative text.

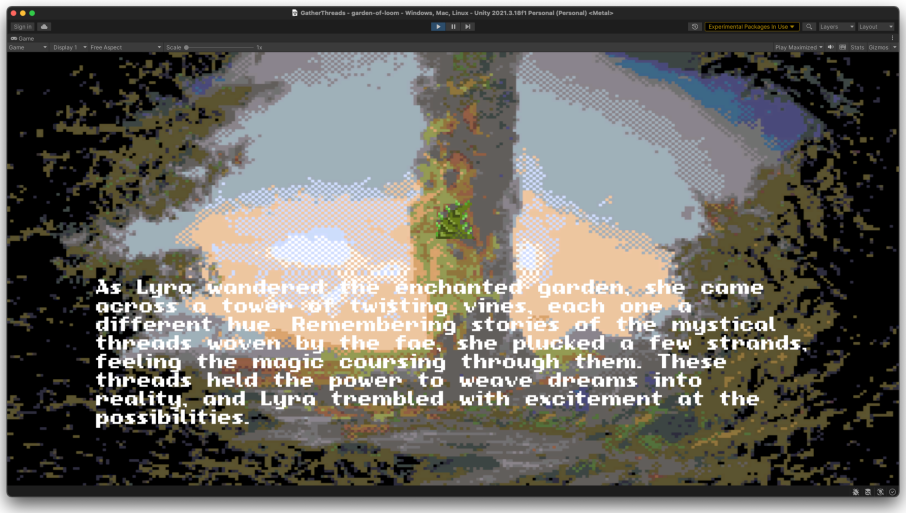

Figure 3: AI generated narrative text.

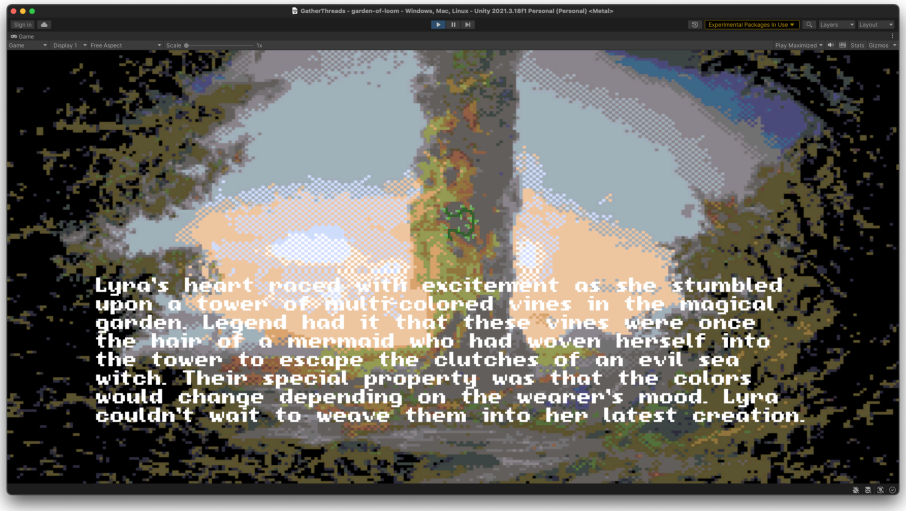

Figure 4: AI generated narrative text.