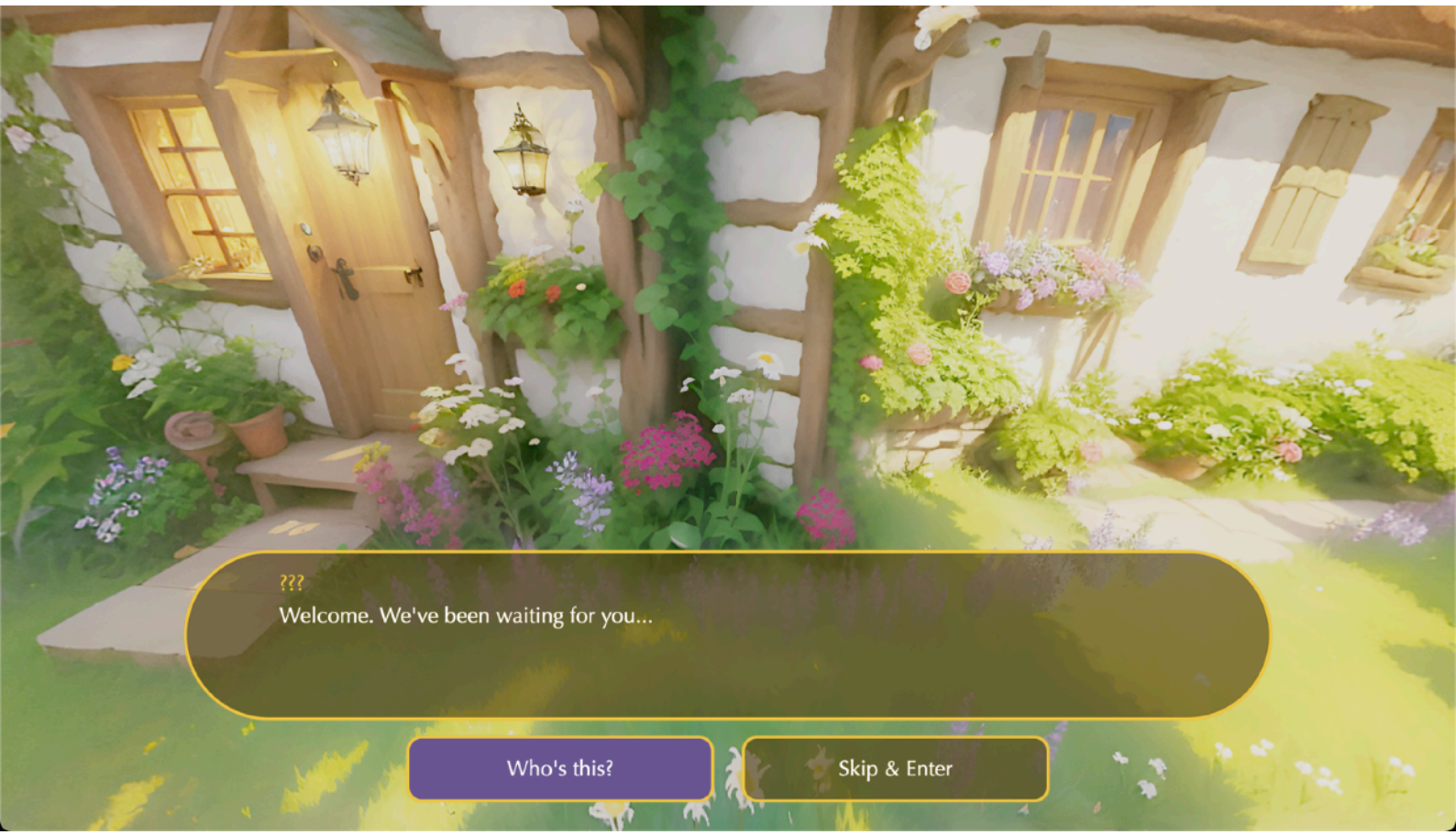

Programming Usable Interface Final Project Write-up

Mindfulness Alchemy: Interactive RPG

Peiwen Huang (peiwenh)

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Part 1- Introduction

My final project– Mindfulness Alchemy, is a web-based interactive 3D role-playing game to induce calmness and introduce mindfulness techniques that are interwoven in the content of the game. Targeting at young people (typically aged between 16~26) who are commonly under academic pressure, this web game infuses welcoming, inclusive conversations to navigate users through the process of making a potion paired with a self-affirmation.

The user first lands on the outside of a cottage where they are instructed to enter the cottage to interact with the "alchemist" who is the facilitator of the mindfulness practice. During the process, the user goes through the following modules:

1. **Meditation practice**:
   Before making the potion, the user first calms themselves with the "box breathing" stress-relieving technique; they will be guided through a 1-minute practice.
2. **Potion base picking**:
   The user will pick a herb as the base of their potion in the alchemist's garden, in which they will learn about medical benefits of some herbs.
3. **Potion energizer matching**:
   After picking a base for the potion, the user will be guided to the alchemist's desk to do a tarot card drawing. The tarot card provides words of encouragement and self-affirmation to boost users' self-esteem.
4. **Potion obtaining**:
   The alchemist will make a potion based on the ingredients selected and provide it to the user with a self-affirmation note.

The game leverages an animal character playing the role of the alchemist, interactive dialogues and draggable 3D environments to make it highly engaging, along with the background music setting a calming atmosphere.

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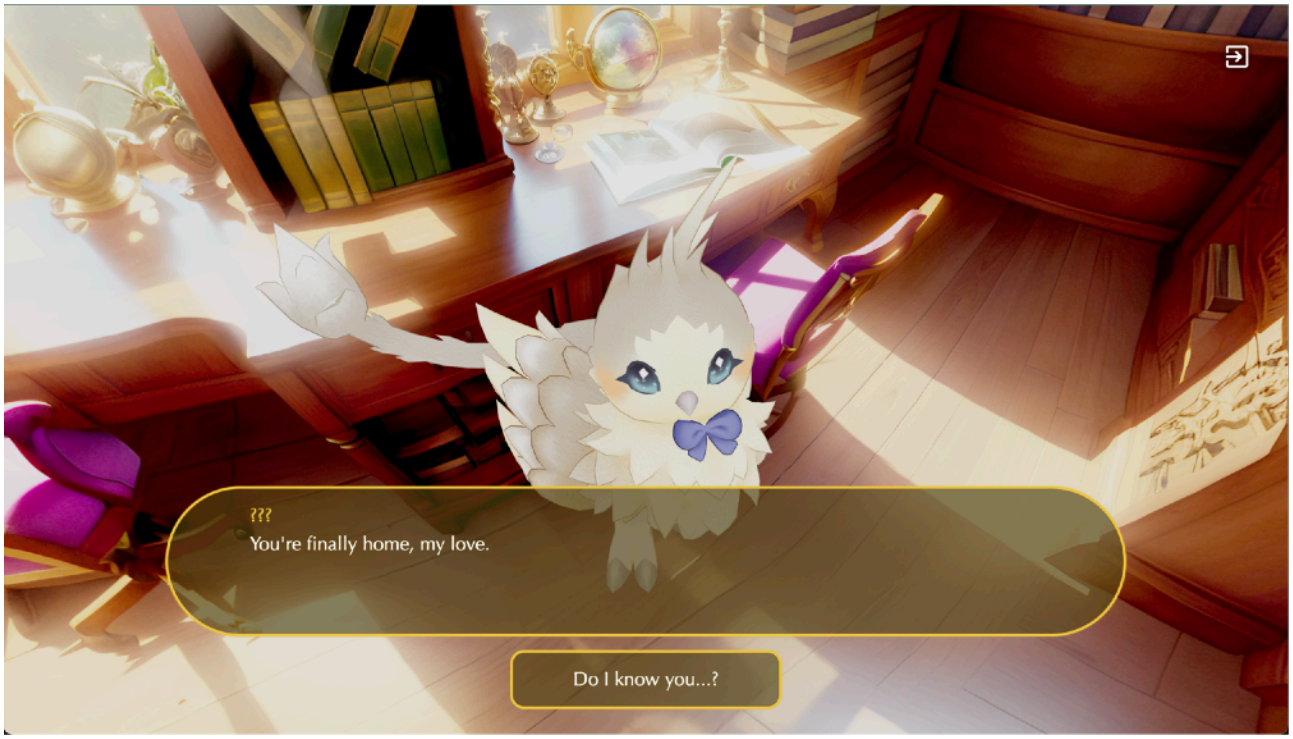
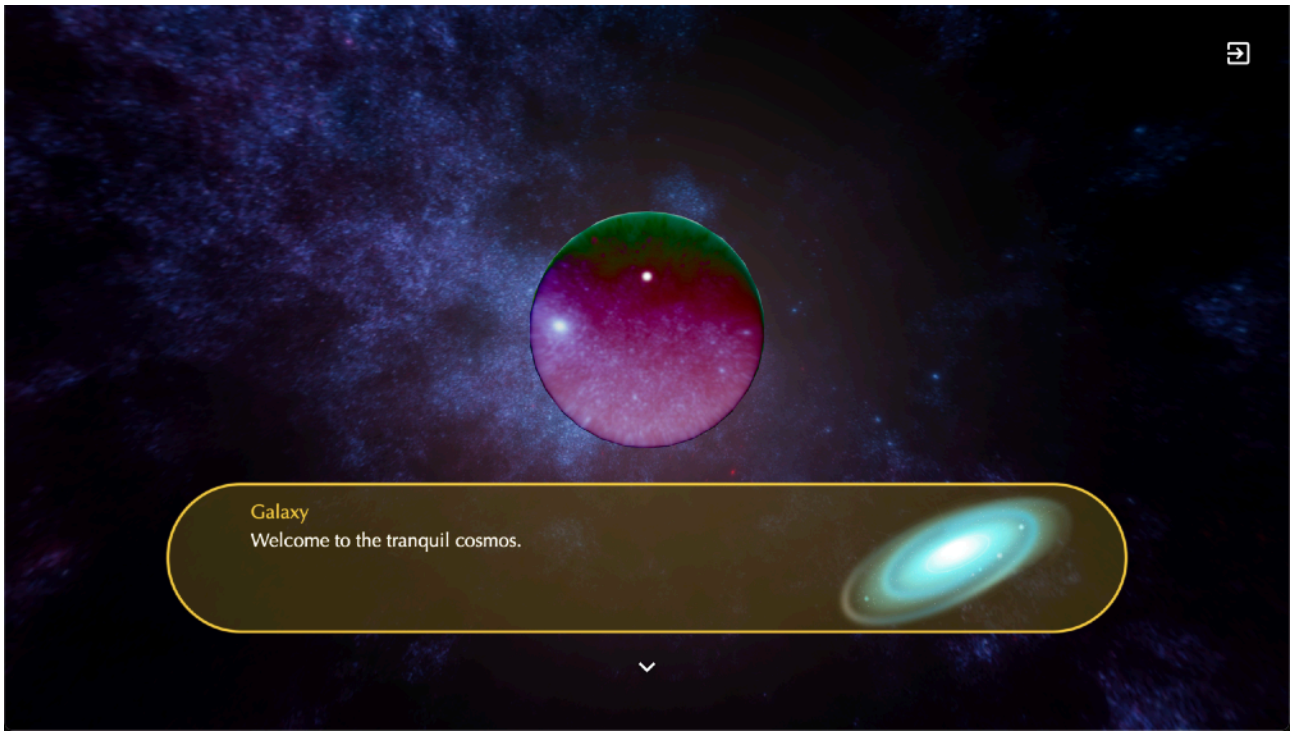
Part 2- Interaction

1. ***Forest*** (landing page)
   - Drag around the 3D forest environment in the landing page
   - Click on "Who's this..." to continue the dialogue in the landing page (Alternatively: click on "- Skip & Enter -" to directly enter ***Cottage***)
   - Continue clicking the user dialogues until clicking on "- Enter -" to enter ***Cottage***



2. ***Cottage***
   - Drag around the 3D cottage environment to explore
   - Click on "Do I know you…?" dialogue to continue conversing with Alchemist character
   - Click on Down Arrow icon to see more of Alchemist's messages
   - Continue clicking on the dialogue buttons until clicking on "- Start -" to enter ***The Space***



3. ***The Space***
   - Click on Down Arrow icon to see Galaxy's messages introducing the "box breathing" technique
   - Continue clicking on the dialogue buttons until clicking on "- OK -" to focus on the sphere and start practicing box breathing
   - After the practice, click on "- Go back to cottage -" to go back to ***Cottage***

4. ***Cottage***
   - Click on Down Arrow icon to see Alchemist's messages
   - Click on "- Lead me to your garden then! -" to enter ***Garden***

5. ***Garden***
   - Drag around the 3D garden environment to explore
   - Hover around any of the 3 floating plants– plants enlarge in size while hovered
   - Click on any of the 3 floating plants to see the herb's medical effects

- Click "- Pick xxx as base -" to pick the herb as potion base and go back to ***Cottage*** (Alternatively, click on "Cancel" to pick other herbs)

6. ***Cottage***
   - Click on Down Arrow icon to see Alchemist's messages
   - Click on "- Sure, let's pick a card! -" to enter ***Desk***

7. ***Desk***
   - Hover around any of the 3 tarot cards– cards enlarge in size while hovered

- Click on any of the 3 tarot cards to choose a fortune telling– card floats to center, flips to reveal its tarot element
- Click on Down Arrow icon to see more of the tarot reading
- Click on "- Next -" to finish tarot reading and go back to ***Cottage***

8. ***Cottage***
   - Click on Down Arrow icon to see Alchemist's messages
   - Click on "- OK -" to see an animated potion object move to center
   - Click on "- Take a look -" to see the self-affirmation note accompanying the potion
   - Click on "- Go back -" to go back and complete the game
   - Click on "- Finish -" to see credits and ***Ending screen***
     (Alternatively, click on "- Remake Potion -" to restart the game)

9. ***Ending screen***
    1. Click on "- Play again -" to restart the game
10. **Other interaction**
    - Upon entering ***Cottage***, click on Exit icon on the upper right corner anytime to leave Cottage and restart
      (User would be prompted with a confirmation window to notify user the page is about to restart)
    - Entering ***Cottage*** after ***The Space***, a progress bar shows up on the upper left to indicate user progress in the potion making progress. If in mobile view, the user will see a List icon which they can click on to see a pop-up window showing the progress bar

Part 3- Implementation

1. **Name of tool**:
   React.js + React Three Fiber (Three.js variant)
2. **Why**:
   React Three Fiber (R3F) makes 3D modeling easy to implement in React framework without needing to use Blender to build models. Its scalability also enables fast responsiveness of the models upon cursor/keyboard interactions. R3F is crucial in Mindfulness Alchemy in order to make the game visually aesthetic and engaging.
3. **How**:
   Creating `<Canvas>` elements imported from R3F to wrap 3D models inside the React.js environment so that 3D environments are simulated with a large sphere

geometry and an equirectangular JPG map applied onto its inner side (so the user stands inside the sphere and sees the environment backdrop). 3D animated assets are loaded and wrapped in `<mesh>` elements within `<Canvas>`. Other objects, such as tarot cards, are implemented by creating box geometries and applying image textures. User dragging input is enabled with `<OrbitControls>` to explore the environment in different angles.

4. **Added value**:
   The visuals of the game are significantly enhanced with the simulated 3D environment built with R3F, and user being able to explore their surroundings by dragging also makes the environment more realistic.

Part 4- Iteration

When making the prototype, I first created screens using Figma with a initial idea of how components should look like (e.g. dialog boxes, buttons, progress bar). Based on the mock-up, I started working with R3F to simulate the 3D environment using JPG images and creating 3D objects within the simulation. During the check-in session, some feedback mentioned that there was a mismatch in visual consistency among certain environments (because some environments used highly refined AI-generated environment equirectangular map, while some others only had basic geometries simulating a room) Thus I decided to use AI-generated maps for almost all environments except for Desk (because it has a close-up scene which is inappropriate for use of equirectangular maps) to ensure consistency.

Furthermore, originally the transition between scenes was awkward, so I added an opacity transition animation such that it simulates a “curtain falling down, light dimming” type of theatrical effect. Another important addition to the page after feedback was the exit button allowing user to restart the game at any time to give user control.

Part 5- Challenges

One of the biggest challenges I experienced when implementing the website was in fact how some state changes in the parent components not triggering their child components to re-render. It involved some asynchronicity that required using some timeouts to prevent certain actions firing before state changes.

Another challenge was that the simulated environment using AI-generated map was difficult to integrate with 3D models; because the map is rendered with a sphere while model objects need to be situated in a box-like 3-dimensional space, so some objects would look like they are floating rather than sitting in the environment. I therefore only used minimum 3D objects in the environment other than necessary (e.g. tarot cards, floating plants, floating alchemist).

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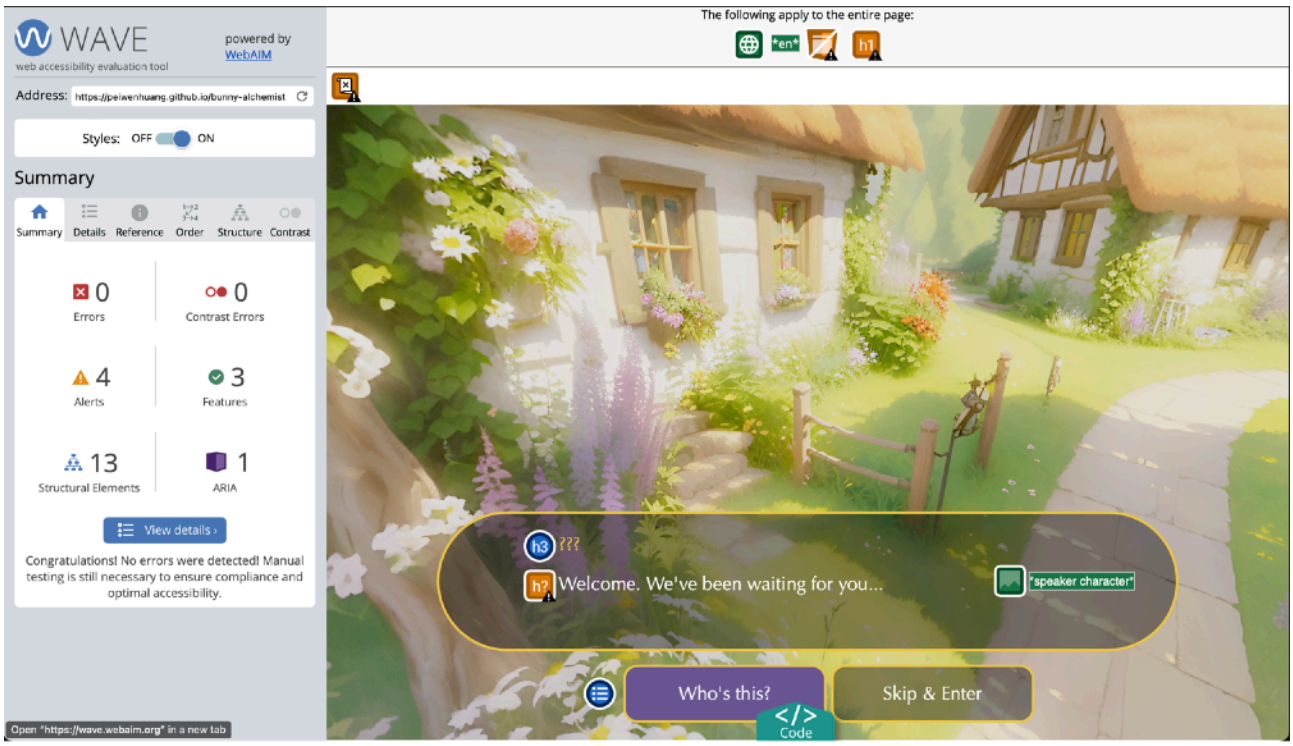
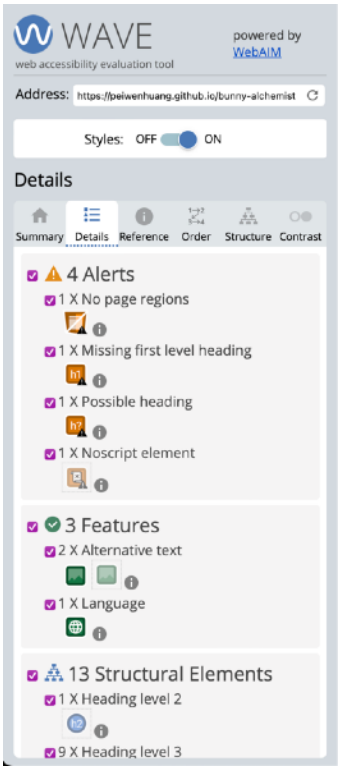
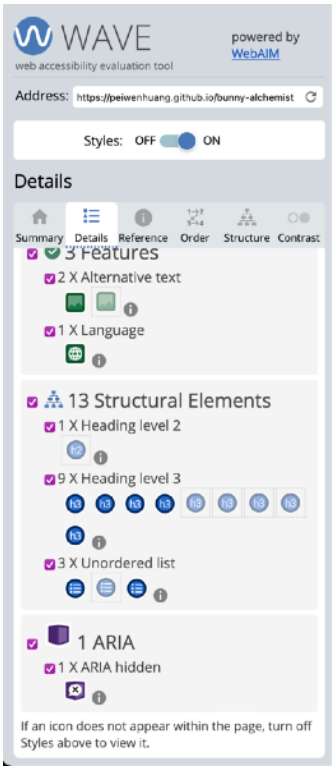
Part 6- Responsive Web Design

Available screen sizes:

1. Desktop: 1440x1024
2. Tablet: 768x1024
3. Mobile: 390x844

Part 7- Accessibility