

John Choi Pre-Interview Task Deliverables - Written Summary

The scope of the project was to "Build a simple environment (e.g., a room or outdoor area) using Unity's built-in assets or free assets from the Unity Asset Store, that uses one interactive element (e.g., a button to trigger an event, object movement, or animation)." and then document the result.

This was a short 1-week project, but exhilarating nonetheless. So many possibilities and so little time!

My creative process works as follows:

Step 1: Get an idea. I wanted to do something that was more interesting than simply modifying the basic starter VR templates, but also result in a project that was highly relevant to the goal of the Askwith Kenner Immersive Technology Room for Language and Culture, while remaining greatly expandable should we decide to continue with my short exploration project. What better way to combine novel AI techniques, mixed reality, and demonstrate the potential for cross-cultural capabilities than to create a **multilingual LLM AI chatbot avatar NPC character, complete with expressive behaviours, speech recognition and text to speech?**

Step 2: Create the functional base framework: what are the core tech components, and can we build a working MVP that compiles and runs correctly with all the key parts and pieces playing nicely together? This was by far the longest step, estimating almost 50% of my development time for this project. I spent a whole two days researching ALL the biggest providers for VR interaction frameworks, Text-To-Speech, Speech recognition, Chatbot LLM AI providers, and humanoid body controllers animation systems; the key things I was looking for in the specs sheets being clean compatibility with Unity's backend C# scripting AND ultimately playing nice with final 64-bit Android compilation, as I was targeting the Meta Quest 3 headset. Errors I've encountered through this process include, but are not limited to: random crashes, failing to compile, having missing connections, poor documentation, black screens, mysterious errorless black screens, and more. (Meta also has a particularly bad habit of requiring random updates to things every couple of months that break previously working systems, take hours to install, and fail randomly without any indication of failure. Configuring everything correctly for optimal Meta Quest development in Unity literally took half a day, as I hadn't built for Quest 3 since last year for a VR class.) I ended up using the Meta XR All-in-One SDK to build for Quest 3, and Convai (powered by a variant of ChatGPT) to handle the NPC LLM AI and the multilingual Text-to-Speech backend. Fortunately, Meta headsets have a built-in speech recognition provider called Wit.ai, which was a breeze to implement once the Meta All-In-One SDK finally installed. Since this took so long to do, I turned this effort into a clonable template project in Github so that I wouldn't have to do this again, now that all the parts and pieces are finally stable without any errors and compile nicely (in theory).

Step 3: adapt my template project into something that actually looks nice! This also took a decent chunk of time, roughly 25% of development efforts. A good analogy to this would be cooking: If I were the king's chef cooking a novel stew to impress a visiting royal family, the first thing I'd do is study ALL my available ingredients very carefully, before beginning any meal preparations. So I scrolled through hundreds of pages of assets on multiple asset stores (Turbosquid, CGTrader, Sketchfab, Unity Asset Store, etc.) to find the highest quality free assets in the world. Picking and choosing from an infinite buffet of free assets, I ultimately opted to create a fantasy themed VR world with an elf wizard character as the Chatbot AI LLM NPC. (Of course, assets outside of the Unity Asset Store don't magically work in a plug-and-play fashion with Unity, so I had to spend a bit of time in modeling software to clean things up to import nicely into Unity.) I also spent a bit of time creating an imaginative backstory for this character to give the LLM some behavioral and knowledge pointers: *"Faelyn Cardithas, the young elf-wizard, is an interdimensional cosmopolitan traveler, having mastered a form of portal magic to seep into our world and learn about the vibrant diversity of human culture. Faelyn is an eager, multilingual polyglot who knows the basics of speaking English, French, German and Japanese."*

Step 4: wrap-up, polishing, and presentation. As an engineer, I understand we have to “meet-the-spec,” and so I spent the last 25% of my development time making sure I hit all of the deliverable checkboxes: uploading everything to Github, creating a short demonstration video, and a writing a written summary of 300 words or less (admittedly, I kind of cheated here by exceeding the word count as I had so much to say about my process, but I hope you will forgive me on this point 😊) So here is a synopsis of everything in under 300 words below if this is absolutely required:

SYNOPSIS OF EVERYTHING (300 WORDS OR LESS)

[Task Instructions:]

1. Create a Unity Scene:
 - a. Simple Environment: Elf-wizard in a fantasy world using free assets.
 - b. One interactive element: Speech recognition to talk to the elf-wizard NPC.
2. Showcase VR compatibility:
 - a. Scene demonstrated in both mixed reality passthrough and fully-enclosed virtual reality on Meta Quest 3.
3. Document your process:
 - a. Short video recorded and uploaded into Google Drive for both MR and VR modes.
 - b. Tools used:
 - i. Unity 2022.3.54f1: <https://unity.com/releases/editor/whats-new/2022.3.54>
 - ii. Meta All-in-One SDK: <https://assetstore.unity.com/packages/tools/integration/meta-xr-all-in-one-sdk-269657>
 - iii. NPC AI Engine - Dialog, actions, voice and lipsync - Convai: <https://assetstore.unity.com/packages/tools/behavior-ai/npc-ai-engine-dialog-actions-voice-and-lipsync-convai-235621>
 - iv. Convai: <https://convai.com/>
 - v. Wit.ai: <https://wit.ai/>
 - vi. Elevenlabs: <https://elevenlabs.io/> *(I tested this, but I did not include it in the final build as there was no free tier to integrate with Unity+Convai. However, I am including this link here as it is simply the BEST text-to-speech system on the market.)*
 - c. Assets used:
 - i. See Appendix.
 - d. How the interaction works:
 - i. Hold “A” on the right Quest 3 controller to talk to the agent.
 - ii. Press “X” on the left Quest 3 controller to access settings.
 - e. Challenges I faced and my solutions:
 - i. See “Step 2.”

[Deliverable Links:]

- Github Template Project (Public): <https://github.com/johnchoi313/Unity-URP-XR-NPC-AI>
- Github Final Project (Public): <https://github.com/johnchoi313/Pre-Interview-Task-John-Choi>
- Google Drive (Public): https://drive.google.com/drive/folders/1VUFaKRKfDibNEoITp-h0blkqx_XJ7YHN?usp=sharing

APPENDIX: FULL LIST OF ASSETS USED

[Animations]

Basic Motions FREE: <https://assetstore.unity.com/packages/3d/animations/basic-motions-free-154271>

[Characters]

Elf Wizard: <https://sketchfab.com/3d-models/elf-wizard-ca5564a738174feca82c9d89610c017d>

[Effects]

Falling Cherry Blossom Effect:

<https://assetstore.unity.com/packages/vfx/shaders/falling-cherry-blossom-effect-288938>

Firefly Flare Effect: <https://assetstore.unity.com/packages/vfx/shaders/firefly-flare-effect-288941>

[Environment]

Autumnal Nature Level Set:

<https://assetstore.unity.com/packages/3d/environments/fantasy/autumnal-nature-level-set-69314>

[Materials]

Fantasy Skybox FREE:

<https://assetstore.unity.com/packages/2d/textures-materials/sky/fantasy-skybox-free-18353>

[Props]

Witch's House: <https://assetstore.unity.com/packages/3d/environments/fantasy/witch-s-house-125519>

Books: <https://assetstore.unity.com/packages/3d/props/interior/books-3356>

Chests Fantasy PBR - Mobile:

<https://assetstore.unity.com/packages/3d/props/furniture/chests-fantasy-pbr-mobile-89904>

Lowpoly Wells: <https://assetstore.unity.com/packages/3d/props/exterior/lowpoly-wells-68437>

Stylized Rocks FREE Sample:

<https://assetstore.unity.com/packages/3d/environments/stylized-rocks-free-sample-283215>

Mushroom House: <https://assetstore.unity.com/packages/3d/environments/fantasy/mushroom-house-61027>

PKS_Laptop_Low: <https://assetstore.unity.com/packages/3d/props/pks-laptop-low-264665>

Vintage Style Radio: <https://assetstore.unity.com/packages/3d/props/electronics/vintage-style-radio-158856>

School Globe: <https://assetstore.unity.com/packages/3d/props/interior/school-globe-152072>