NDSU

CSCI 488 Project Design

Team Members:

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Tasks

- Select Notebook
- Deselect Notebook
- Interact with Grabbable Objects
- Text Input
- Move Text Cursor

User Interaction

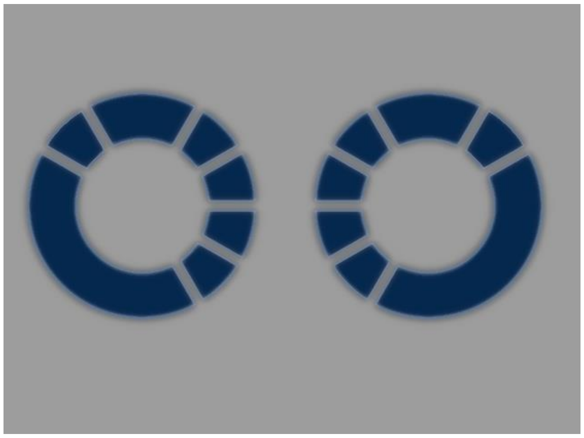
The Room:

Our project will place the user in a simple virtual room. In the room, there will be a notebook atop a table as well as other simple furniture and grabbable objects such as virtual fruit. The notebook is where the majority of our project will be centered. It serves as an example application of where our new text entry interface may be implemented. To begin text entry, users will point at the notebook and “click” (press the trigger button). A blank document will then be displayed on the user’s screen where they can begin text entry. To leave the document and return to the room, the user can simply point and click outside the document. The grabbable objects in the room serve to demonstrate how our text entry interface can be seamlessly integrated into any virtual world. Users can switch between entering text on the notebook and interacting with other objects as they would in any other VR application. Grabbable objects can be picked up with the grip button and moved mirroring the user's arm and wrist movements.

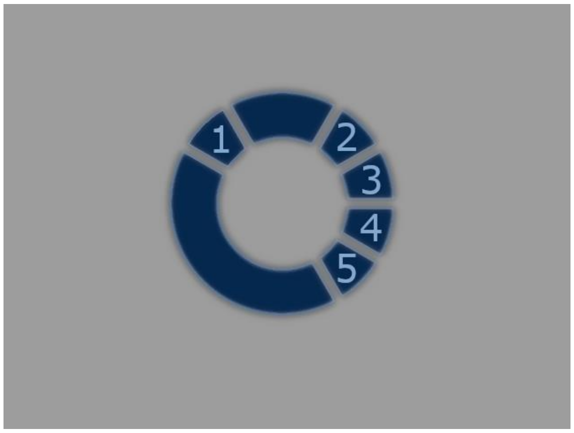
The Notebook

After selecting the notebook on the table, a user will enter text entry mode. In this mode, a text document will be displayed as a flat plane in space in front of the user, approximately 3 feet away. Instead of an onscreen keyboard, the user will gain access to two “Keydials”, one on each hand. Like a safe dial, users turn their wrists left and right to move a cursor around a wheel of characters. First, users will use the left or right thumbsticks to select a qwerty-style “row” of characters (e.g. holding “up” on the right thumb stick will select the characters ‘6’, ‘7’, ‘8’, ‘9’, and ‘0’). The row of characters will then appear in the Keydial on the hand corresponding to their thumbstick input. Next, users will rotate their wrists to select a character. Finally, users will release the thumbstick to input the selected character. To delete characters, we will have a backspace button on the controllers. If the user wishes to enter text at a different location in the document, they can point and click on the document to move their cursor. Also to note, text is saved to the document for the course of the application session. Users can exit and re-enter text entry mode and pick up where they left off.

Prototypes:

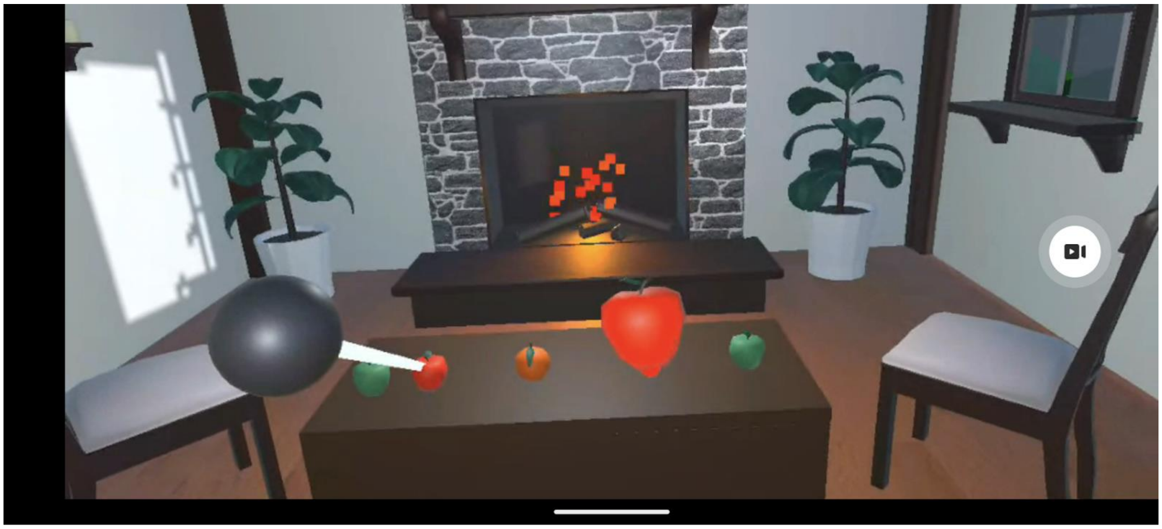


Above: Keydials (Left and Right Hand)

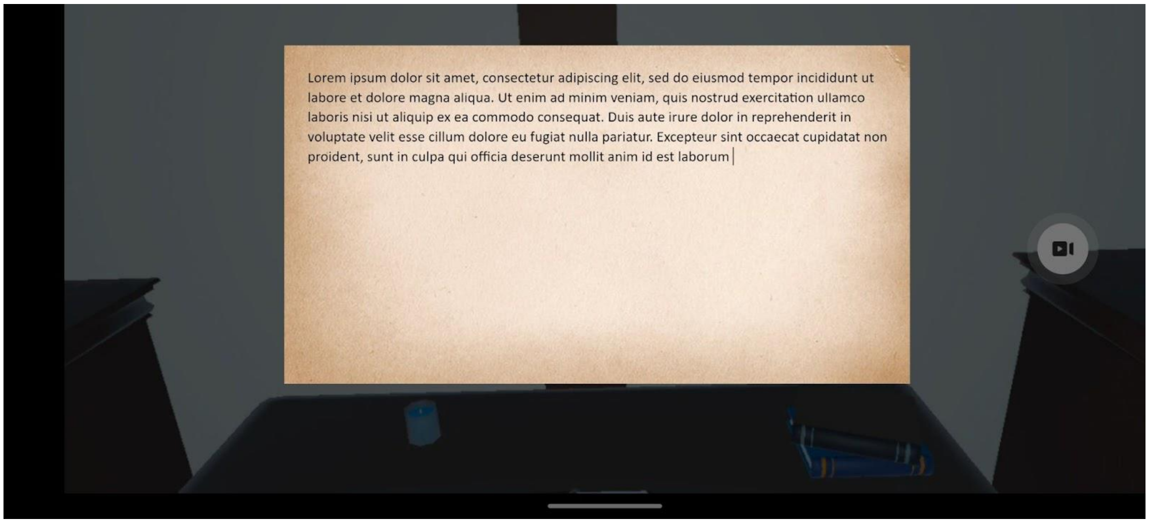


Above: Keydial with Selected Row

Above: Virtual Environment



Above: Interaction with Grabbable Objects



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Above: Text Entry Interface

Eight Golden Rules

1. *Strive for consistency*: Virtual reality in general has many aspects that attempt to be consistent with the real world. For example, a user can turn their head or move their arms in the real world and see these actions mirrored in the virtual world. Because of the many immediate parallels to the real world, a VR experience can quickly become disorienting if interacting with the virtual world strays too far from interactions in the real world. As a result, we hope to make

input actions such as looking around the room, picking up objects, and moving one's avatar as consistent with the real world as possible. Some examples of this effort include making it so users cannot walk through furniture and giving grabbable objects Earth-like gravity.

2. *Cater to universal usability*: We understand that many users are new to virtual reality experiences. Quest, the platform for which we are building our project, provides many tutorials for new users entering VR for the first time. In order not to isolate expert VR users and limit the amount of repeated instruction, we recommend any user unfamiliar with VR to check out Meta’s own Quest tutorials for basic interaction with a virtual environment. However, there are many aspects of interacting with our virtual world (i.e. using the Keydials) that are new to all users. For this reason, we will be including a short tutorial for users to play when they first enter our virtual world. The tutorial – which can be accessed later at any time – will show the user everything they need to know about controlling their avatar in our virtual world that might not be applicable to other VR environments. The other aspect of universal usability we would love to explore is customization for expert users: custom character layouts, multi-language support, etc. These are all features that could be expanded upon in a future version of the project.

3. *Offer informative feedback*: Just as with striving for consistency, VR environments in general must offer a level of informative feedback to the user by nature of the platform. A user needs real-time feedback when moving around the virtual world in order not to become disoriented. Imagine, for example, a virtual environment with a half-second delay between user input and displayed feedback. Users would immediately have trouble interacting with their environment. This real-time feedback is only further important when considering that we are developing a text input system. If text appears on the screen incorrectly or too slowly, the system becomes unusable. Another way we plan to offer informative feedback can be found on the Keydials themselves. Once a “row” has been selected using the thumbstick, each of the available characters

will appear on the Keydial in their respective position. This allows the user to quickly see where they must rotate to in order to select their desired character.

4. *Design dialogs to yield closure*: Our project will not present much for dialog besides the tutorial. This is because most of our project has the user interact with the world in a way that does not involve any need for dialog. As far as the tutorial, we plan to design a simple and intuitive experience to teach the user how to use our Keydials. The tutorial will involve a basic overview of the Keydial concept, graphics on how to operate Keydials, etc. The hope is that users can go through the tutorial and feel confident in their ability to operate the Keydials.

5. *Prevent errors*: A common error we foresee with the Keydials would happen when a user accidentally selects the wrong “row” of characters. To mitigate this error, we will design the dials with a blank space at the top of each dial that acts as a “cancel” selection. For example, imagine a user moved their left thumbstick to the “up” position; characters ‘1’,’2’,’3’,’4’, and ‘5’ would appear for selection. If the user instead wished to select a different row, they can simply let go of the thumbstick without rotating their wrist to return to row selection.

6. *Permit easy reversal of actions*: Just as with traditional keyboards, our Keydials will include a backspace option. The backspace button will be found on the handheld controllers and can be pressed to quickly and easily delete the last character typed.

7. *Support internal locus of control*: Making a user feel like they are fully in control of their virtual avatar is a cornerstone of virtual reality experiences, and our project is no different. Actions that the user makes in the real world correspond nearly one-to-one with actions in the virtual world; changes seen in the virtual world will almost always be a result of an action the user themself made. For example, text appears in the virtual world only when the user inputs characters. There are no random changes in the world that happen without user input.

8. *Reduce short term memory*: The greatest volume of information a user will have to remember in our program is how to operate the Keydials. To reduce the amount of information a user must remember, our Keydials will display everything they need to know at any given time. When a user selects a row, the Keydial will show them exactly what characters can be selected, eliminating the need for memory of selectable characters. Furthermore, our tutorial can be accessed at any time to remind the user of any information they may have forgotten. Over time, we hope knowledge of Keydial operation moves from short term to long term memory.

Group Project Logistics

Because both group members are relatively new to coding in Unity, we will be working closely together on nearly every aspect of the project. This means it is difficult to assign specific responsibilities at this stage of the project. Generally, Alex expects to take the lead on Keydial creation and implementation. This would cover the largest of our tasks, namely text entry and moving the text cursor. Jean expects to lead virtual world design. Tasks such as selecting or deselecting the notebook and interacting with grabbable objects fall under this domain. Again, no one member should handle any task individually; we believe the breakdown above provides the best path for project management.