Virtual Keyboard

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Content

Introduction

We have created a Virtual Reality Keyboard application, using ManusVR gloves for typing texts. The application may be added to several VR games in order to be used as a chat interface between players, or may be used for getting input from the user.

Generally, in VR applications players use controllers in order to interact with objects. But, in our project we chose to use ManusVR gloves so the player/user can feel the process of typing as much as real and comfortable.

So, our main object is to explore and examine the capabilities of the ManusVR gloves, especially in trying to integrate it in building the VR keyboard.

Technologies & Platforms

The application developed using Unity 2018.3.0 game engine, and the following equipment:

- HTC Vive
- Vive Trackers
- Pair of ManusVR gloves
- ManusVR dongle

Features

The application contains several features that gives the user a real and interesting experience.

Screen Features

The screen has an ON/OFF Button that turns it on and off. The application starts with an off screen and the user can't start typing until touching the on button and turning the screen on. He can turn it off/on at any time; and it will keep its content.

In addition, the screen shows the number of the current page of all pages so the user will know in witch page he is typing, and how much pages he has typed.

Off Screen

On Screen

Keyboard Features

The Keyboard includes the following keys:

- English letters, a -z and A - Z.
- Numbers, 0 - 9.
- Some cool emojis.
- Special characters like [` ; ' . / , \ ]
- Enter key, Space, Tab, Caps Lock and Backspace.
- Previous and Next keys for pagination.

When clicking a key, its color changes as well its height so the user easily detects which key he actually clicked.

Gloves Features

The typing process is done using ManusVR Gloves.

The user can type by both hands gloves; left and right, and by all the fingers in each glove.

Also when a key is typed, the appropriate glove vibrates so the user would know if the required key was clicked.

Typing with index finger in left glove

Typing with middle finger in right glove

Implementation

Interaction with ManusVR gloves

Manus-VR provides a SDK written in C# that we used to deep dive into the code in order to understand it's features, and integrate them in our project.
Manus keeps the data in the following structure:

1. each finger is defined as the two joints that constituent it.
2. each joint gets a value from [0,1] which 0 means closed and 1 means open
3. all these data is stored in the object "manus_hand_t" in the array "raw.finger_sensor"
    a. 0, 1 refer the pinky.
    b. 2, 3 refer the ring finger.
    c. 4, 5 refer the middle finger.
    d. 6, 7 refer the index.
4. each hand has 4 states
    a. Fist
    b. Small
    c. Tiny
    d. Open
5. the state is calculated as an average of all its fingers close value.

Interaction with the keyboard

As our project is eventually building a VR keyboard, the main method is clicking on the different keys.
Our main goal was introducing the best clicking experience as if it is a real keyboard.
In order to approach our goal, first we focused on the design; that is, the size of the keys, the distance between the keys and the shape on the keyboard.
Then, we wanted the click to feel real; that is, smooth and accurate clicks, distinguishing between touching and clicking a key:

- When only touching a key, nothing happens.
- When clicking a key, its color changes as well its height.

In order to achieve these, for every key we defined a Collider object and placed it in med height of the key, also we added colliders to each finger in the glove and we used the **OnTriggerEnter(Collider other)** function which is called when
the collider other enters the trigger. In this function, we print the key character on the screen, change the color and height of the key.

Besides when clicking, an acknowledgement accepted in a form of vibration of the gloves.

Another effort to make the experience natural is designing the output.
We chose not to restrict the typing, so we designed the screen to support moving between multiple pages so the user can keep writing, and can view his input. This feature implemented using the TextMeshPro page overflow tab.
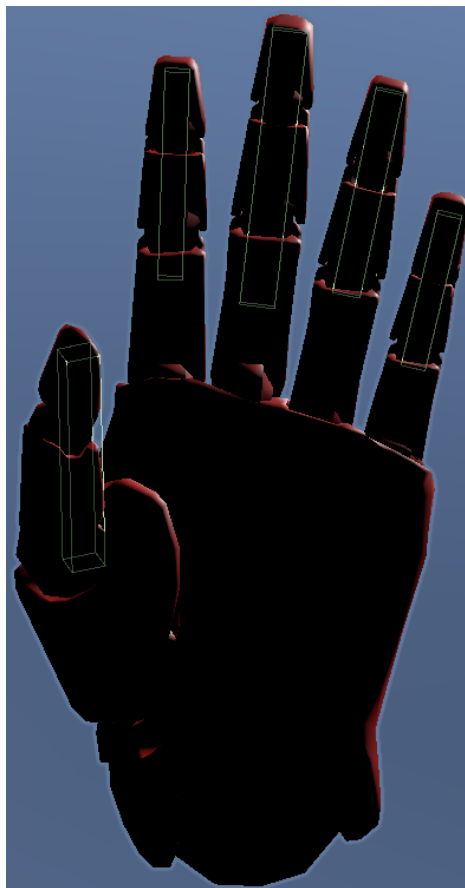
Fingers Colliders

Conclusions

In this project, we tried to make the experience feels natural as much as possible. We succeeded to make the typing process accurate and fast, but still not comfortable as natural.

The Manus gloves product is brand new, so we couldn't reach the ideal situation due to bounded capability of the gloves. It would be much better if it is possible to adjust the size of the glove to user hand; so his experience will be better and more comfortable.

Useful Links

Project Website - https://sabah92saloty.wixsite.com/vr-keyboard

Project Video - https://www.youtube.com/watch?v=yqHSL1bfeUQ

Unity Documentation - https://docs.unity3d.com

ManusVR Developer - https://developer.manus-vr.com

SteamVR - https://store.steampowered.com/about/setup