Cubic Keyboard for Virtual Reality

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ABSTRACT

We developed a cubic keyboard to exploit the three-dimensional (3D) space of virtual reality (VR) environments. The user enters a word by drawing a stroke with the controller. The keyboard consists of 27 keys arranged in a $3 \times 3 \times 3$ (vertical, horizontal, and depth) 3D array; all 26 letters of the alphabet are assigned to 26 keys; the center key is blank. The user moves the controller to the key of a letter of the word and then selects that key by slowing movement.

CCS CONCEPTS

• **Human-centered computing** → **Virtual reality**; *Text input*; Gestural input;

KEYWORDS

3D user interface; text entry; WPM; soft keyboard

ACM Reference Format:
Naoki Yanagihara and Buntarou Shizuki. 2018. Cubic Keyboard for Virtual Reality. In *Symposium on Spatial User Interaction (SUI '18), October 13–14, 2018, Berlin, Germany.* ACM, New York, NY, USA, 1 page. https://doi.org/10.1145/3267782.3274687

1 INTRODUCTION

In contrast to planar keyboards, whose performance in virtual reality (VR) has been explored in detail (e.g., [1]), we developed a cubic keyboard (Figure 1) to exploit the three-dimensional (3D) space of VR environments. The keyboard consists of 27 keys arranged in a $3 \times 3 \times 3$ (vertical, horizontal, and depth) 3D array; all 26 letters of the alphabet are assigned to 26 keys; the center key is blank.

2 TEXT ENTRY

The user enters a word by drawing a stroke with the controller. Initially, the keyboard follows the controller; the pointer is placed on the center of the keyboard. A word is entered as follows. 1) Pressing the trigger button fixes the keyboard in its current position. 2) The user moves the controller to the key of a letter of the word and selects that key by slowing the controller movement to below a threshold. 3) Button release enters the word. After Step 3, the user can enter a special character (i.e., DELETE, ENTER ['.'], ',', '?', and '!') by simply moving the pointer into a corresponding box. The entered phrase floats in front of the user (the user has entered "where are you?" in Figure 1).

SUI '18, October 13–14, 2018, Berlin, Germany

ACM ISBN 978-1-4503-5708-1/18/10.
https://doi.org/10.1145/3267782.3274687

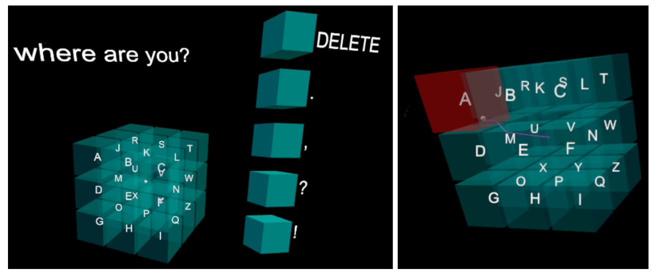

Figure 1: Our cubic keyboard (left). The user is entering 'A' (right).

Note that Step 2 allows the user to select a key by simply pausing the controller on that key; this greatly enhances text entry performance.

3 PERFORMANCE TEST AND FUTURE WORK

We tested our keyboard to measure its performance. The first author transcribed 30 phrases randomly chosen from 100 memorable phrases from the Enron corpus [2]; each had 10–28 characters. The entry speed averaged 21.59 words per minute (WPM) for all phrases. The averages were 19.04 WPM for the first five phrases and 23.00 WPM for the last five phrases.

During the above test, we felt key selection by slowing movement is fast while it also has room for improvement. As an approach, we will modify the keyboard to use both angle and direction (in addition to speed) for key selection. We will also perform a formal study to evaluate speed, accuracy, and user experience.

REFERENCES

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