RotateEntry: Controller-rolling-style Text Entry for 3 Degrees of Freedom Virtual Reality Devices

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***Keywords*—Virtual reality, text entry method, three degrees of freedom, controller, QWERTY keyboard layout**

Our work proposes RotateEntry, a controller-rolling-style method for text entry on three degrees of freedom virtual reality devices. To move the key-selecting cursor in two dimensions on a QWERTY layout virtual keyboard, we developed three variants of RotateEntry: Rotate Column Rotate, Rotate Key, and Rotate Column Point.

We conducted a comparative empirical evaluation of the four text input methods, including three proposed controller-rolling-style text input methods and the standard raycasting-style one. Text entry performance, accuracy, workload, usability, and user experience were tested and evaluated.

I. INTRODUCTION

The controller-based raycasting keyboard is a popular built-in text entry solution for three degrees of freedom (3DoF) virtual reality (VR) devices. It provides an intuitive and precise way for text entry on VR devices. However, while using the raycasting input, the user has to hold a controller, keep raising his/her arm in use, and frequently move the arm in space to aim at a key. After long term use, this using posture could cause arm muscle fatigue (Grubert et al. 2018), resulting in reducing text input performance, accuracy, and user experience. Also, the aim-and-shoot style interaction implemented by the raycasting input would be challenging for those who cannot keep their arms in mid-air for a long time.

This paper proposes RotateEntry, a "controller-rolling-style" text entry method for 3DoF VR devices. RotateEntry moves a key-selecting cursor through the virtual keyboard using the controller's rolling angle and relative pitching angle. In this way, it frees the VR user from the need to enter text with a fixed posture, and instead, the user can put his/her hand holding the controller in any spatial position. Hence, it could be a potentially more efficient and effort-saving way for VR text entry than the raycasting solution.

This study focused on the interaction comparison between RotateEntry and the standard raycasting method. Since the typical raycasting-style text input technique uses a QWERTY keyboard layout (Dube and Arif 2019), RotateEntry implemented the same keyboard layout, aiming to eliminate the potential effect of the keyboard layout. We developed three interaction methods named Rotate Column Rotate, Rotate Key, and Rotate Column Point. They were using the RotateEntry concepts that look at how to move the cursor across the standard virtual QWERTY keyboard. Next, we evaluated these three methods and the traditional raycasting method in a comparative empirical study. The knowledge obtained from this study might help us identify a proper interaction for RotateEntry and provide us insights to improve it further.

II. CONCLUSION

By analyzing the comparative empirical evaluation results, we identified that Rotate Key interaction method had an outstanding text input speed, higher overall user experience scores, and excellent overall workload performance than the other two variants of RotateEntry. However, no evidence was identified to support that RotateEntry had better performance and experience compared to Raycasting.

III. REFERENCES

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