Bottomless Joystick 2

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ABSTRACT

Bottomless Joystick is a mid-air interaction device which produces the maneuvering feeling of a joystick without the need for a table. By utilizing a motor-powered gimbal mechanism, a counterweight, and IMU, our interface makes a virtual anchoring point in midair, and it provides a haptic sensation similar to that of a conventional joystick. In this paper, we propose new usages, especially when using multiple Bottomless Joysticks.

CCS CONCEPTS

• Hardware → Haptic Devices

KEYWORDS

VR/AR, mid-air interaction, gaming

1 INTRODUCTION

The computer was invented as a tool to assist intellectual production, so-called desk work. Therefore, the computer needs a work surface such as a desktop, laptop, or palmtop. However, computing that does not use a "top" (e.g. Augmented Reality, Ubiquitous Computing, and Tangible User Interface) has been proposed since the last century. Recently, these researches are rapidly penetrating our society due to the spread of smartphones and the VR HMD boom.

For computing without a "top", an interface that can be used in midair and that does not require a "bottom" for mounting on the top of a working surface will be needed. Therefore, we developed Bottomless Joystick [Katsumoto 2016] which provides the same kinetic sensation in midair as a usual joystick.

After several public demos, we developed two improved Bottomless Joysticks. As a result, this device can be used beyond conventional joysticks as follows.

2 IMPROVEMENTS

2.1 Multiple and Simultaneous Use

We created another Bottomless Joystick. As a result, it is able to use for more than one person. Also, it is now possible for one user to use two joysticks. The user can use it as two handguns for the First-Person Shooter game, and the device enables to represent the feedback from skiing poles (Fig. 1a) and oars for a boat (Fig. 1b). Also, if the user combines two joysticks, they can experience the feedback from a shooting arrow (Fig. 1c) and the paddling of a kayak.
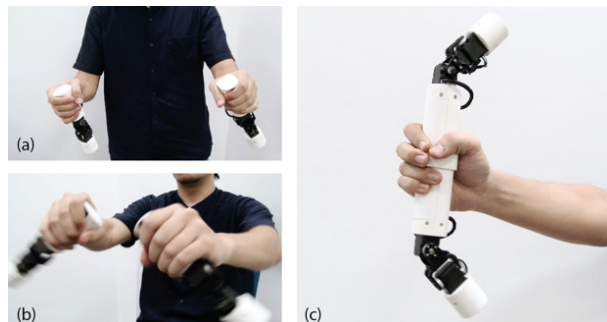

Figure 1: Multiple and simultaneous use. (a) Haptic Representation of Skiing by two prototypes; (b) Rowing a boat; (c) Archery-shape controller by combining two prototypes.

2.2 Variable Anchor Point

The previous Bottomless Joystick could only set the anchor point in the vertical-down direction. So, we made it possible to change the anchor point. In other words, the user can now set the direction of the counterweight so that it faces the ceiling or the side wall at all times. With this, it became possible to get a feeling of handshakes, rowing a boat, etc.

2.3 Others

Bottomless Joystick enabled the operation of a robot arm and a camera crane. It is possible that our device could be used in the future to operate heavy machinery from outside the operator's seat.

We also changed the shape of the grip and the position of the function button to improve usability. This eliminates the need to grasp the grip, and the load of operation could be reduced.

REFERENCES

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