Demonstrating Motionless Movement: Towards Vibrotactile Kinesthetic Displays

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Abstract. We demonstrate how vibration can be used to provide a sense of limb-motion, even when the users limbs are in a fixed position. The illusion of isotonic motion is induced through grain-based vibrotactile feedback, coupled to isometric user input [1]. Participants will be seated in front of a static knob, while wearing a VR headset. When they push against the knob, participants will feel a tactile experience of motion in their fingers, while seeing their hand move in VR. Participants will also be able to explore stimulation parameters (frequency and density of grains) of the tactile illusion. The demo will take around five minutes per participant.

Keywords: grain-based vibrotactile feedback · motion illusion.

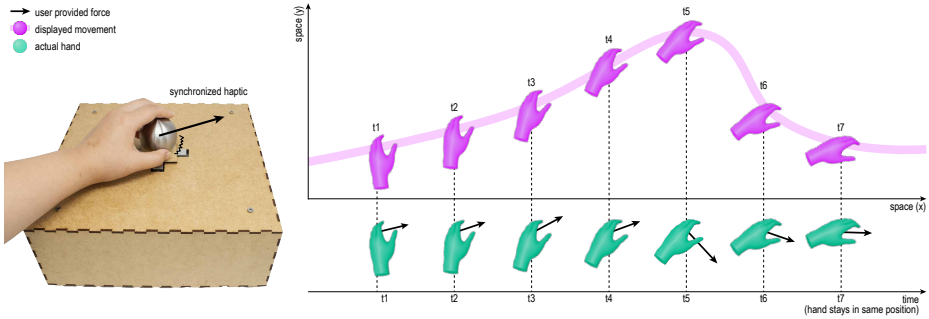

Fig. 1. Our demo showcases a vibrotactile kinesthetic display that offers users the experience of movement when there is none. On the left is our prototype: as the user pushes the handle, their force is sensed by load cells. Grain-based vibrotactile feedback corresponding to the force applied by the user provides an embodied movement experience. On the right, the graph shows the induced movement experience in pink and forces applied in green. Note that the actual physical location of the handle and the user's hand stays stationary.

Fig. 2. The participant will be wearing a VR headset while feeling the motion illusion in VR. The kinesthetic display is connected to the computer.

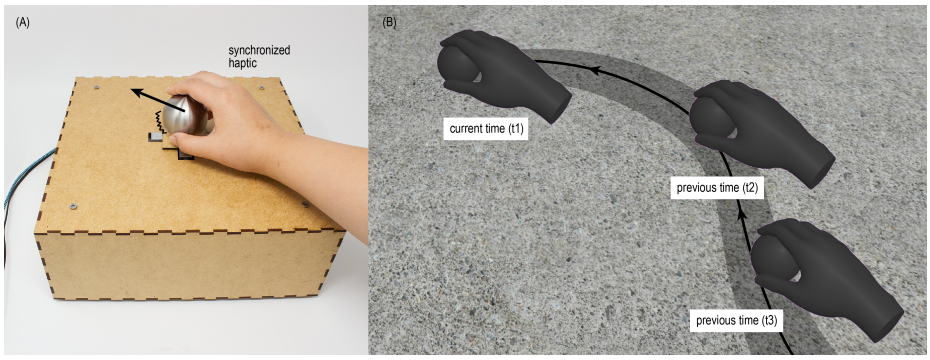

Fig. 3. Setup when a user intents to push the sphere forward. (A) shows the physical setup of the kinesthetic display. The kinesthetic display provides synchronized haptic feedback together with the VR visual renderings. (B) shows the VR renderings of the path of movement.

1 Hands-on demonstration setup

The entire setup with an organizer and a participant trying out the demo is shown in Figure3 and 2. The participant will be pushing the metal sphere handle on the kinesthetic display and wearing a head-mounted display for VR (Figure 2). The demo showcases a synchronized grain-based vibrotactile illusion that makes participants feel that their hand is moving, even when they are not. The synchronized haptic feedback is paired with VR renderings of movement, corresponding to the force direction in which the participant is applying on the metal handle, giving the embodied material experience of them moving an object (Figure 3).

1.1 Technical requirements

- single table, with 2 chairs for the visitor and the organizer of the demo
- 3 power outlets
- Monitor to visualize what people see in Unity.
- Space for poster

References

1. Yuran Ding, Nihar Sabnis, and Paul Strohmeier. Motionless movement: Towards vibrotactile kinesthetic displays. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*, 2024.