

XGlove: A Multi-Point Vibrotactile Glove and Its Application in the Spatiotemporal Consistent Texture Experience System of the MPEG Standard

Kehan Zhang, Junming Chen, Qian Liu
School of Computer Science and Technology
Dalian University of Technology
Dalian, China
{kehan_zhang, 32409126}@mail.dlut.edu.cn,
qianliu@dlut.edu.cn

Huan Wang, Zhuoyi Lv
vivo Mobile Communication Co., Ltd,
Beijing, China
{huan.wang, zhuoyi.lv}@vivo.com

The XGlove is a multi-point vibrotactile feedback glove designed to validate and assess the effectiveness of vibrotactile codec standardized in the MPEG-I Haptic standard. The hardware of the XGlove comprises three voice coil actuators that provide vibrational feedback to the user. XGlove communicates with the computer through a radio frequency (RF) station (attached to the computer) and RF terminal (attached to the glove).

A distinctive feature of the XGlove is its ability to deliver different vibrotactile feedback at different contact points on a single finger. To test and verify this characteristic, we conduct synchronized spatiotemporal data acquisition, resulting in the acquisition of two-dimensional tactile textures. Subsequently, we construct a VR system in Unity platform, where users can control a virtual hand to interact with two-dimensional tactile textures with aligned spatiotemporal visual-haptic perception.

Hardware

The XGlove contains a glove with 3 voice coil actuators, an RF (Radio Frequency) terminal connected to the glove and

an RF station connected to the computer. These components are shown in Fig. 1(a). In addition to these components, the MPEG reference hardware WeArt glove is attached to the device for pose inputs. The demonstration of XGlove on the MPEG148 meeting is presented in Fig. 1(b).

Software

The scene of texture experience system is shown in Fig. 1(c). The user can move and operate the virtual hand through the WeArt or the keyboard (i.e. the user can move the virtual hand by operating the up, down, left, and right arrow keys on the keyboard).

With different contact locations on the textured object, the system can provide visual-tactile consistent feedback to the user. This is in strong contrast to existing texture experience systems, which can generally provide homogenous textural perceptions to the users. In order to visualize the vibrotactile feedback on the actuators, we illustrate the corresponding waveforms on the lower left corner.

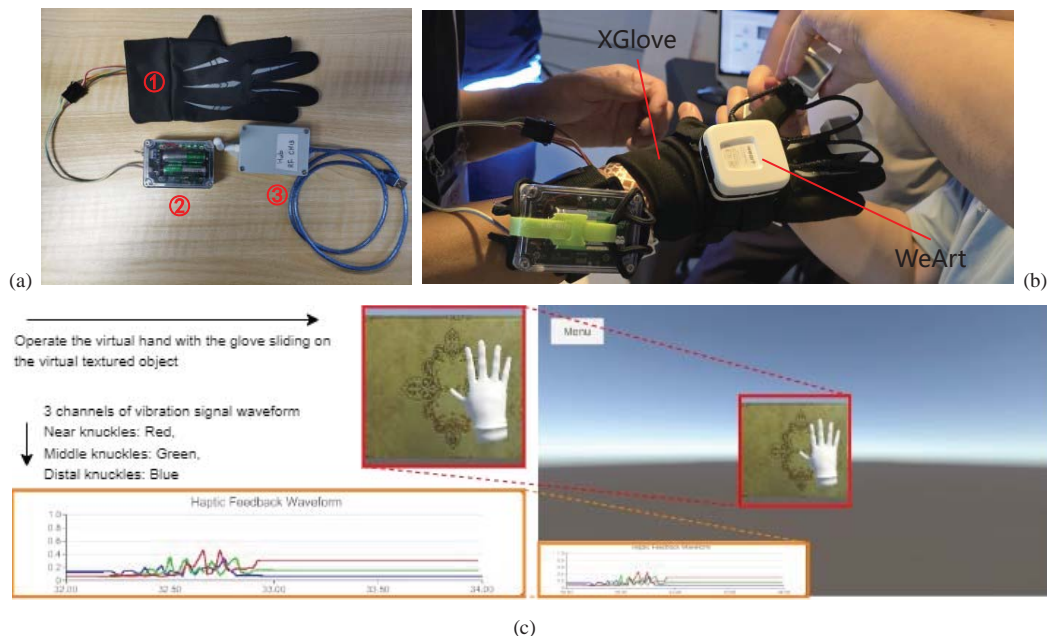


Fig. 1. (a) XGlove with 3 voice coil actuators and RF communication stations. (b) Integration of XGlove and WeArt device. (c) Texture experience system with spatiotemporal consistency