Format

Wearable tactile display applying textile-based 2-D communication

Project Leader
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1. Objective
This project is aimed at:
Development of a densely distributed actuator array in the form of a flexible wearable tactile display. The actuator array consists of actuator elements attached to clothing made of conductive textiles. A conductive textile-based communication method, which enables both power supply and communication to arbitrary points on a conductive fabric, has been proposed by the project leader [1]-[3]. In this project, we will construct a wearable tactile display system embedded into an item of clothing. The actuators are not wired individually nor are they loaded with batteries or WiFi/Bluetooth modules. This approach will enable the creation of a very densely distributed actuator array that can achieve high-fidelity tactile representation. In virtual reality, while mature technologies exist for visual and auditory representation, tactile sensation work is still in its infancy. In this project, we will develop a method that could become one of the standard forms implemented in wearable tactile displays in the future.

2. Project Outline
To that end, the project will consist of the following phases:
(a) mathematical analyses of the signal transfer in dense tactile actuator arrays;
(b) development of electronic circuits for the actuator nodes and the controller device; and
(c) implementation of application software, e.g., a simple VR game, for demonstration of the rich tactile representation that can be achieved via the wearable actuator array.

3. Expected Performance
In this project, the successful candidate would be expected to:
(a) work independently;
(b) think logically; and
(c) enjoy tough challenges.

4. Required Skills and Knowledge
The successful candidate for this project will have the following knowledge and skills:
(a) knowledge of the fundamentals of electronic circuits, skill in soldering/handcrafting the circuits under testing;
(b) knowledge of the fundamentals of wireless communications; and
(c) skill in programming with microcontrollers (e.g., Arduino) and 3-D game engine (e.g., Unity).

References
[1] NODA, Akihito. Multi-channel FM transmission of vibrotactile signals on 2-D communication textile. *IEICE Communications Express*, 2022, 11.5: 195-201.
[2] NODA, Akihito; SHINODA, Hiroyuki. Simplex inter-IC for wearables and its applications. *IEEE Access*, 2021, 9: 69654-69662.
[3] FURUKAWA, Taichi, et al. Synesthesia Wear: Full-body haptic clothing interface based on two-dimensional

signal transmission. In: *SIGGRAPH Asia 2019 Emerging Technologies*. 2019. p. 48-50.

See my webpage:

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