Docket #: S17-433

Haptic Device to Simulate a Stroking Sensation

Researchers in the Collaborative Haptics and Robotics in Medicine Lab at Stanford University have patented a haptic device that simulates a stroking sensation. Prior work used vibrations to create the sensation of a long lateral motion, but people can become accustomed to vibrations over long periods of use, and these vibrations were not designed to mimic human touch, making the interaction feel less natural. Stanford's sleeve-like apparatus consists of a series of small actuators that are activated for a specified length of time to indent the users' skin with specific delays relative to each other to give the natural impression of stroking – an important sensation in social touch. This simple, wearable device can aide navigation for the visually impaired or provide directional guidance cues, and simulate human touch in gaming, and virtual and augmented reality applications.

Stage of Development- Prototype
Prototype testing is ongoing in a human-subject study at Stanford University.



Figure 1 Device for creating the sensation of a long lateral motion

Applications

- **Virtual reality and augmented reality** – especially for gaming and social touch interactions.

- **Assistive Technology** - pedestrian signals and navigation aids for visually impaired.

Advantages

- **Wearable**
- **Natural sensation**

Publications

- Culbertson, H., Okamura, A. M., Nunez, C. M., & Williams, S. R. (2021). *U.S. Patent No. 11,205,329*. Washington, DC: U.S. Patent and Trademark Office.
- Salvato, M., Williams, S. R., Nunez, C. M., Zhu, X., Israr, A., Lau, F., ... & Culbertson, H. M. (2021). Data-driven sparse skin stimulation can convey social touch information to humans. *IEEE Transactions on Haptics*.
- Nunez, C. M., Huerta, B. N., Okamura, A. M., & Culbertson, H. (2020, March). Investigating social haptic illusions for tactile stroking (SHIFTS). In *2020 IEEE Haptics Symposium (HAPTICS)* (pp. 629-636). IEEE.
- Nunez, C. M., Williams, S. R., Okamura, A. M., & Culbertson, H. (2019). Understanding continuous and pleasant linear sensations on the forearm from a sequential discrete lateral skin-slip haptic device. *IEEE Transactions on Haptics, 12*(4), 414-427.
- Culbertson, H., Nunez, C. M., Israr, A., Lau, F., Abnousi, F., & Okamura, A. M. (2018, March). A social haptic device to create continuous lateral motion using sequential normal indentation. In *2018 IEEE Haptics Symposium (HAPTICS)* (pp. 32-39). IEEE.

Patents

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Innovators

- Heather Culbertson
- Allison Okamura
- Cara Nunez
- Sophia Williams

Licensing Contact

Michael Spaid

Technology Licensing Associate 2

Email