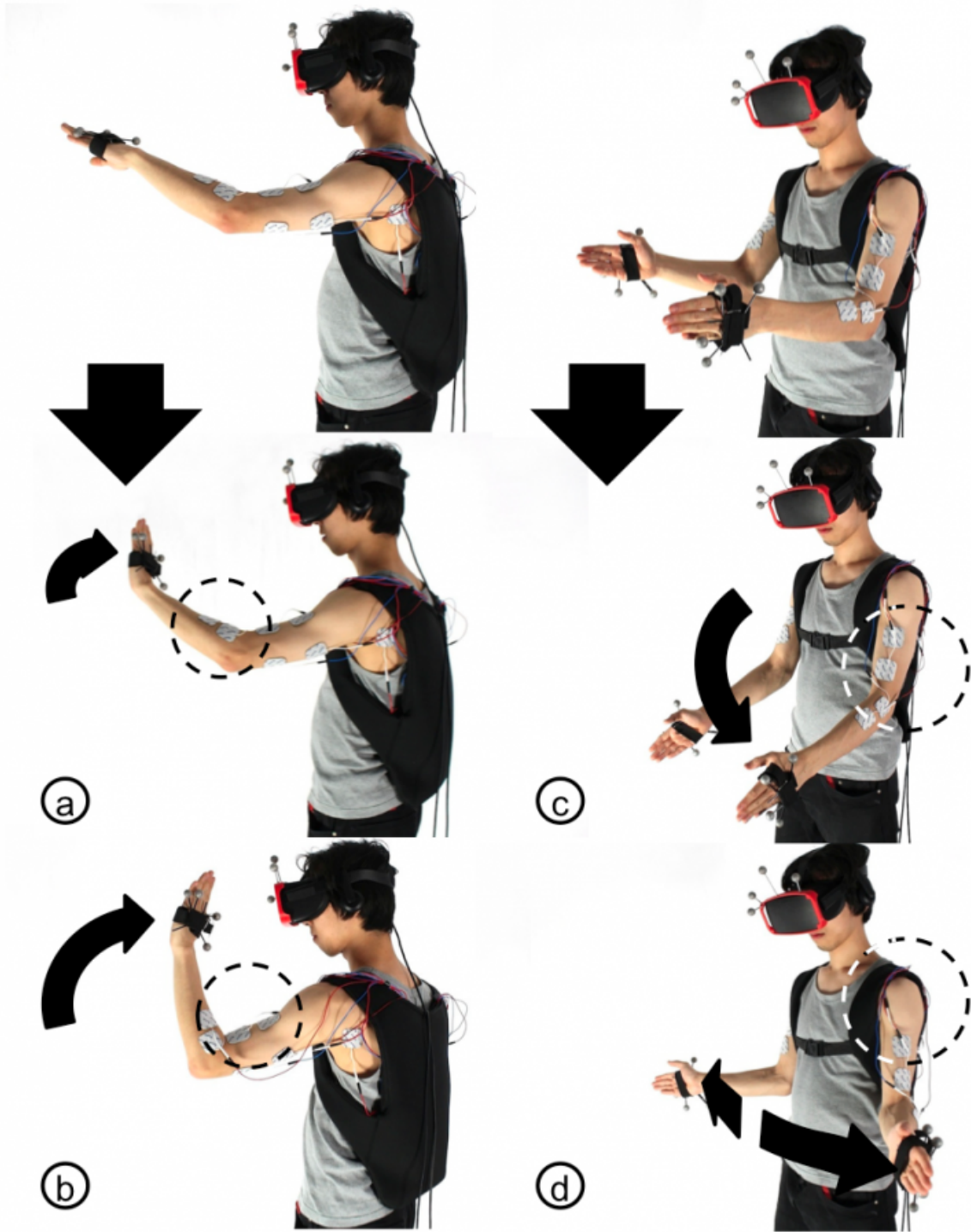


# Virtual reality: Do you feel that wall?

April 19 2017, by Nancy Owano

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Credit: Hasso-Plattner-Institut

(Tech Xplore)—Researchers are thinking on the lines of raising the bar on the virtual reality experience— by adding haptics to virtual reality walls and other heavy objects. Instead of your fingers passing right through every virtual wall you encounter in a game, you would feel barriers.

Via controlled [muscle](#) responses as part of their system, the idea is that you feel objects that really are not there.

The Hasso Plattner Institute HCI posted a video earlier this month about the work of a team providing haptics to walls and other heavy objects in [virtual reality](#) using electrical muscle stimulation. Their paper was prepared for ACM CHI 2017.

These are tiny bursts of electrical stimulation that help users feel walls and spaces in VR. "We render virtual objects such as walls by pushing the user's hands with an invisible counter-force." They do this by via electrical muscle stimulation. The laptop running the VR experience and muscle stimulator are in a backpack.

Katharine Schwab in *Co.Design* described the system components. The wearable setup includes up to eight electrodes stuck to the forearm, bicep, triceps and shoulder. The electrodes are hooked up to a medical eight-channel [muscle stimulator](#), controlled by the VR simulator.

The video shows the various moves.

There were two studies done. In their first user study, participants wearing a head-mounted display interacted with objects provided with different types of EMS effects.

The repulsion design, visualized as an electrical field, and the soft design, visualized as a magnetic field, received high scores on

"prevented me from passing through" as well as "realistic."

In a second study, they allowed participants to explore a virtual world in which all objects provided haptic EMS effects, including walls, gates, sliders, boxes, and projectiles.

This kind of system could eventually be a welcomed link in the VR experience. "There's a need for physicality in VR," Pedro Lopes, one of the study authors, said in *Co.Design*. "The next step is bigger [force](#), more physical sensations. I think electrical muscle stimulation can do that."

"As adoption of AR and VR becomes more pervasive, being able to walk through walls won't seem like a neat trick—it'll be a significant limit to user experience," said Katharine Schwab in *Co.Design*, "jarring you out of a world that may otherwise seem realistic."

The team themselves stated, "Our main idea is to prevent the user's hands from penetrating [virtual objects](#) by means of electrical muscle stimulation (EMS)."

As illustrated in a user lifting a virtual cube, the system can let the person feel weight and resistance of the [object](#). "The heavier the cube and the harder the user presses the cube, the [stronger](#) a counterforce the system generates." The system actuates a user's opposing muscles with EMS.

The wearable is giving the person small electric shocks. These, said Schwab, are like the ones used in physical therapy. "Electrical muscle stimulation has been used in physical therapy and strength training for decades," she said.

The backpack is connected to sensors attached to the person's arms in order to monitor and stimulate the muscles, said Luke Johnson in

*TechRadar.*

"It's also not yet the most seamless [technology](#), with the necessary electronic slotted into a small backpack that must be worn alongside a traditional VR headset."

All the same, though "fiddly," he added, "the possibilities for such technology are vast."

Moving forward, a more streamlined design for a commercial version is envisioned, said Schwab.

**More information:** — Providing Haptics to Walls & Heavy Objects in Virtual Reality by Means of Electrical Muscle Stimulation:

[hpi.de/baudisch/projects/vr-walls.html](http://hpi.de/baudisch/projects/vr-walls.html)

— Publication: Lopes, P., Young, S., Cheng, L., Marwecki, S., and Baudisch, P. Providing Haptics to Walls and Other Heavy Objects in Virtual Reality by Means of Electrical Muscle Stimulation.

In [Proceedings of CHI'17](#).

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