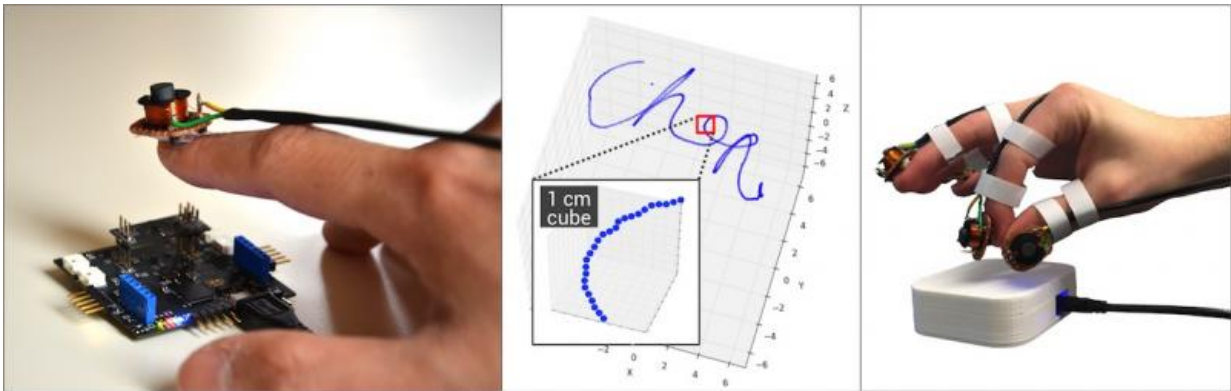


Electromagnets and sensors track the motions of fingers

December 23 2015, by Nancy Owano



Credit: Ke-Yu Chen

A university's ubiquitous computing lab has teamed up with virtual reality company Oculus to work on a system capable of precisely tracking finger movements. You and your VR game in the future could be thriving on magnets tracking all your fingers.

A look at their work appeared in *MIT Technology Review* on Tuesday. "Finexus tracks individual fingers in three dimensions using electromagnets and [magnetic sensors](#)," said the article author, Rachel Metz. She said the project employs four magnetic sensors to track fingernail-sized electromagnets placed on each of the user's fingertips.

Finexus is described by its team as an input device tracking multiple fingertips, where electromagnets are operating at different frequencies to differentiate movements. "Finexus is a multipoint tracking system using magnetic field sensing ...By instrumenting the fingertips with electromagnets, the system is able to track fine fingertip movements in real time using only four magnetometers," they said.

"To keep the system robust to noise, we operate each electromagnet at a different frequency and leverage bandpass filters in order to distinguish signals attributed to individual sensing points for localization," according to the research team.

They said, "We develop a novel algorithm to efficiently calculate multiple electromagnets' 3D positions from corresponding field strengths."

Their work will be presented in a research paper at the ACM CHI 2016 conference on computer-human interaction in May. This is a key conference event for relevant research communities focused on human-computer interactions.

The title of their paper: Finexus: Tracking Precise Motions of Multiple Fingertips Using Magnetic Sensing, by Keyu Chen, Shwetak Patel and Sean Keller.

Chen has done work at the University of Washington at the Ubiquitous Computing (UbiComp) Lab under Prof. Shwetak Patel.

Engadget's Jon Fingas pointed out that this is not like camera tracking; with Finexus, you do not need a direct line of sight to the sensors. So "you could tie your virtual [shoelaces](#) if you wanted."

Gaming is one obvious application conduit; another would be "tasks that

require a variety of [delicate](#) finger motions, like playing a virtual piano, painting, or writing in the air," said Metz.

MIT Technology Review discussed how their system works: "Finexus works kind of like a GPS system: the distances between an electromagnet and the four magnetic sensors is calculated, then the intersection of each of those four distances is determined and used to figure out the electromagnet's position in space. Each electromagnet operates on a different frequency, which Chen says makes it easier to identify them [individually](#)."

Their attention to finger movement [tracking](#) is a timely move. They wrote, "With the resurgence of head-mounted displays for virtual reality, users need new input devices that can accurately track their hands and fingers in motion."

Now what? Chen said his next step will be to miniaturize the hardware. Metz quoted him: "'I do not know if [Oculus is] going to put this in a future product, but that is one possibility."

Metz also said that "Chen envisions Finexus eventually being built into a glove and wristband or smartwatch; the glove would house the electromagnets, while the wrist-worn device would hold the sensors." The maximum distance between sensors and [electromagnets](#) is 12 centimeters. Chen thinks it could be as great as 25 centimeters.

More information: www.keyuc.com/research/Finexus/

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