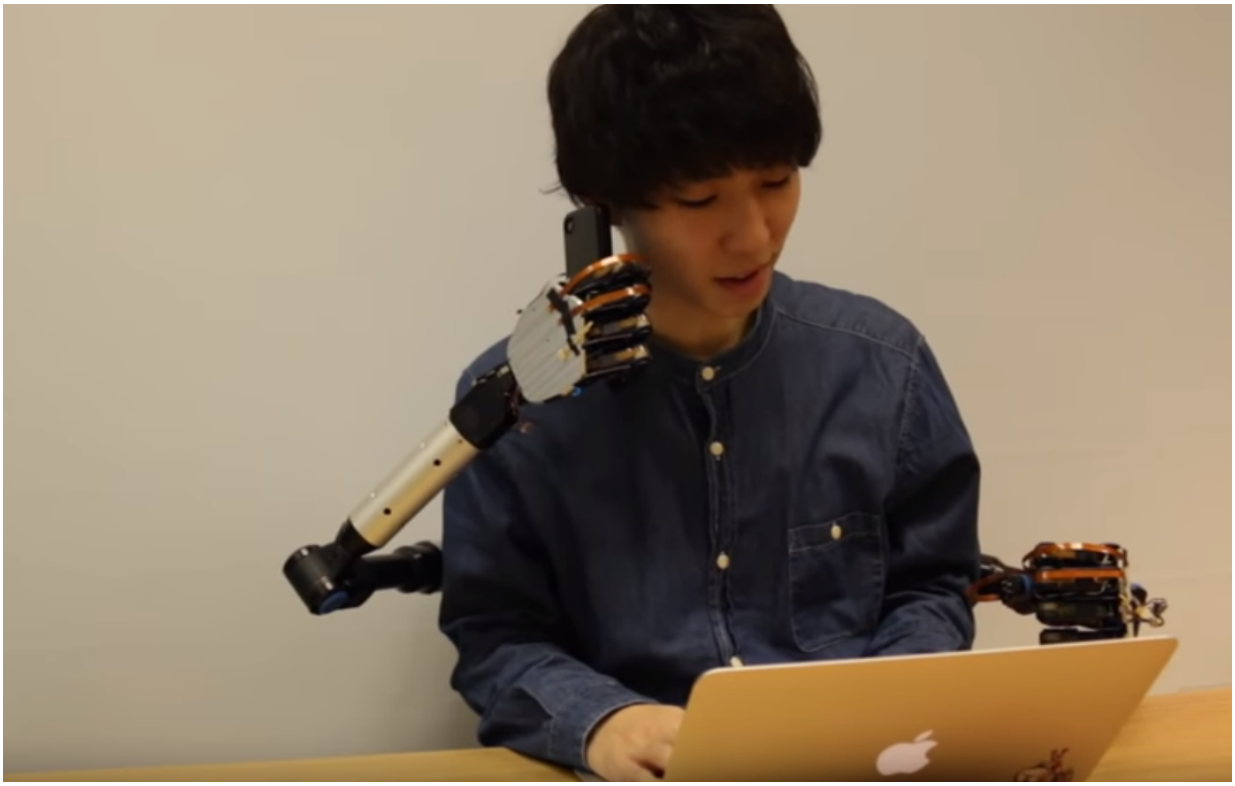
Extra arms, manipulated by feet, designed for performing tasks

May 31 2017, by Nancy Owano



(Tech Xplore)—A team from Japan has been developing an interesting project called "MetaLimbs: Multiple Arms Interaction Metamorphism." They posted a video recently showing their work. This is set of artificial arms, designed to reached under your own arms, and they are controlled

by sensors that are attached to your legs.

They propose this concept where the arm is manipulated by the motion of your feet. The system has two parts, then, a mounted robotic system and a positional tracking system.

The latter has a knee tracker and a foot tracker. Optical tracking markers are attached to toes and knee. This is to measure position and rotation.

And now for the interesting component, the user's sock device: This detects the position of the toes, said Anika Salam, *The Technews*. "This sock device comes with two bending sensors that measure the movement of the toes. The combination of these components can manipulate the robotic arms; means squeezing toes lets your robotic hands make fists."

Rich Haridy in *New Atlas* said it's this sock device that allows the movement of your toes to control the grasp the robot hands. "There are even haptic sensors on the robot hands that generate force feedback on your feet." As *The Verge* put it, there is limited force feedback; if something touches a "hand," it triggers a squeeze band on your foot.

The team, from the University of Tokyo Inami Hiyama Laboratory and Keio University, KMD Embodied Media Project, posted a video on May 24 which shows their work in action.

The MetaLimbs project will be showcased at the Siggraph 2017 Emerging Technologies Showcase. The event is from July 30 to August 3 in Los Angeles. The gathering sets its focus on emerging technologies.

Descriptions of what's to come during the event include that of the MetaLimbs team. "MetaLimbs proposes a novel approach to body-schema alternation and artificial-limb interaction. It adds two robotic arms to the user's body and maps the global motion of legs and feet

relative to the torso. It also maps local motion of the toes. Then it maps these data to arm and hand motion, and to fingers gripping the artificial limbs, adds force feedback to the feet, and maps the feedback to the manipulator's touch sensors."

How would their MetaLimbs be used in real world applications? Is it looking too much like a circus clown act to be practical in daily life? Would people looking for convenience, like trying to open doors when hands are already occupied with food or other items, find this something they would own?

Anika Salam *The Technews*, said, "It's so frustrating when you have to open the door while both of your hands are blocked. What if you can have a pair of robotic arms, which you can control by your feet?

Matthew Loffhagen in *Outer Places* made a case for its broader use in the real world. He said, "this emerging technology definitely has potential, and could revolutionize work for many engineers, creators, and scientists around the world. If you've ever wished you had an extra pair of hands to help you get everything done over the course of the day, it's worth keeping an eye on what Inami Hiyama Laboratory does with these MetaLimbs in the near future."

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