

SEED Solutions Expands Research Possibilities for Industry-Government-Academia Innovation Programs

The Research Promotion Institution for COI (Center of Innovation) Site at Kyoto University is developing the Orthobot® (a wearable mobility assistive device) for the rehabilitation of people with disabilities, helping them regain the ability to walk naturally after suffering paralysis from a stroke or spinal cord injury. With a focus on attaining a “flexible and comfortable society,” we at Kyoto University, “the Last 5X innovation R&D Center for a Smart, Happy, and Resilient Society,” pursue various research projects, and our Orthobot® research is one COI program that advanced through the industry-government-academia collaboration sponsored by JST (Japan Science and Technology Agency) and the Ministry of Education, Culture, Sports, Science and Technology.

With this mobility assistive device, we are endeavoring to create a robotic walking aid that can be installed to the KAFO (knee-ankle-foot orthosis) devices that most patients are already comfortably using.

Kyoto University’s role is to plan the overall design and collect measurements and data from the patients who wear the Orthobot®. The specific movements necessary for walking assistance are different for each person, so we need to collect basic information about the way each individual patient walks.

When regular robotic walking aids are used to collect data, the force used to move a unique individual’s leg with a machine naturally generates an opposing force. Only the force that tries to move the leg back gets stronger, forming a lingering habit that exacerbates the symptoms. In contrast, the Orthobot® assists the bending and extending of the knee in a way that matches the movement of the leg while walking. It calculates the timing best suited to the wearer’s walking speed and stride length to create a natural gait. Therefore, the timing of the driving motors sent by our robot is crucial. THK’s **SEED Solutions** units are used in this critical function,



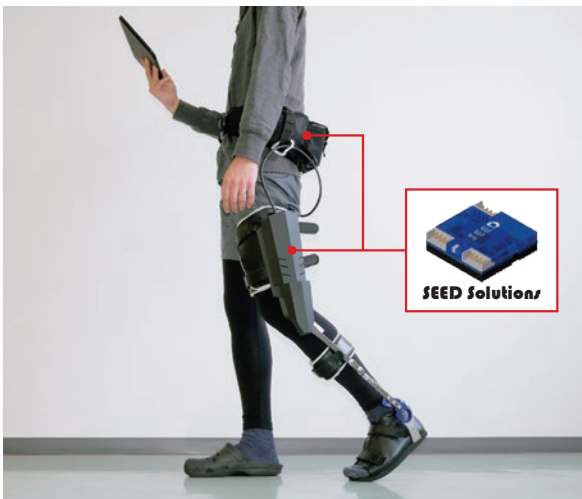
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receiving information from the sensors that detect how the individual is walking, and then operating the actuator motors that determine the amount of force used to move the leg up and down.

The data collection is currently done through wiring, but a single **SEED Solutions** unit has the capability of communicating wirelessly, so we will consider using wireless communications in our future research. One application would be for patients requiring control for not just one, but both legs. If the pace of the left and right legs do not match, the patient will experience difficulty walking. To control the timing of both legs, the sensors in the robots on the left and right legs need to be able to communicate. This is a situation where the wireless communication function of **SEED Solutions** would prove useful.

We are currently in the development phase of rehabilitation robots primarily for use at medical institutions, but we will also broaden our scope in the future to research robots that support independent living, which can be worn by private individuals to make their everyday lives easier. By wearing the Orthobot®, we hope that people with bad hips or knees and those whose return to their community has been limited by lingering symptoms from a serious illness will be able to go to work and live their lives like those without such disabilities.



The Orthobot® is equipped with two **SEED Solutions** units