Safer, lighter robot-assisted gait training with THK Seed Solutions

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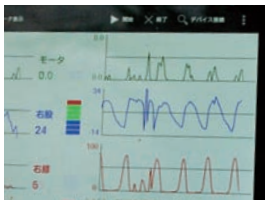
More and more people are undergoing surgery to have knees or hips replaced with an artificial joint. After the operation the new knee or hip works fine, but because many patients have already developed an idiosyncratic gait while walking with deteriorated joints, walking with the new joint is painful, so they're susceptible to falling. We want to help them walk properly again. The most common method has been to have them practice walking while a physical therapist provides verbal instruction, but this often doesn't produce the desired results.

To enable these patients to regain the ability to walk properly, Yamanashi University is collaborating with Kofu Municipal Hospital and private businesses to conduct a robot-assisted gait-training program and related clinical research. The robots used in the program employ THK's **Seed Solutions**, a product line consisting of compact motor drivers, controllers, and actuators designed for use in next-generation robots.

Seed Solutions products built into knee and hip joint components.



Gait-related data transmitted by **Seed Solutions** products.

Before the assisted-gait robots were equipped with **Seed Solutions**, the robot had to be connected to a computer by a cable in order to transmit data such as joint angle and heel height. This was a problem, since the patient could trip over the cable and training distance was limited by the length of the cable. We tried to develop multiple central-processing boards but couldn't make much progress. During the trial-and-error process, we discovered THK's **Seed Solutions** and realized we'd finally found what we were looking for. The craftsmanship is outstanding, and the fact that students can use them right away without a lot of detailed instruction was very attractive.

A **Seed Solutions** product has been incorporated into the knee-joint apparatus on the assisted-gait robots to control the knee-drive motor. Using sensors, it collects data on various types of motion, heel contact, and other aspects of the patient's gait, and transmits it wirelessly. This enables those involved to check the patient's gait pattern and review rehabilitation progress in real time, which is expected to help improve treatment more quickly than would otherwise be the case. I think wireless transmission is very important in making the patients more at ease, and I think we can expect further efforts to integrate and reduce the size of control boards, to address the forthcoming demand for lighter products.

»Viewpoints from Kofu Municipal Hospital

Before wireless control became available, we had to maintain physical contact with patients training with the assisted-gait robot to make sure they didn't trip over the cable and fall. This problem was resolved through the adoption of **Seed Solutions** technology.

Due to governmental guidelines and other factors, there are usually limits on the duration of in-patient treatment. To ensure that the patient can reacquire the ability to perform normal daily activities within the limited time we have to work with, we really needed viable access to rehabilitation methods using assisted-gait robots. Many patients who work with the robots have given them very positive reviews, saying they make it easier to take that first step and lift their feet. Some patients, however, have said the robot's weight causes them to tire quickly.

If the assisted-gait robots can be made lighter, most patients will be able to do five laps around the training course instead of only three, which will provide more effective rehabilitation. We're hoping to see these kinds of improvements in the future.

Members of the Kofu Municipal Hospital staff (from left): Hidenori Omori, physical therapist; Yoshinobu Hanagata, physical therapist, Dept. of Rehabilitation; and Masahiro Nakamura, physician, Dept. of Orthopaedic Surgery.