Intelligent building technology enhances energy efficiency
智能大廈技術提升能源效益

Hand robot — a revolution of stroke therapy
機械手 — 中風治療的新突破

Prof. Wang receiving the Innovation Award at the China International Industry Fair

Hand robot attaching to a human hand

Jointly developed by Dr Raymond Tang Kai-kyu, Associate Professor of the Department of Health Technology and Informatics, and the Industrial Centre, this Exoskeleton Hand Robotic Training Device works to recover the hand functions of stroke patients. It is made up of an embedded controller and a robotic hand module, which provide patients with assistive power to perform hand movements and gradually boost learning in the brains of stroke patients.

Once the compact, wearable robotic hand is attached to the patient’s fingers and hand, it begins to detect his or her intention to move through signals from the hemispheric side measured by surface electromyography. A nervous response then sets the robotic hand in motion to move the patient’s stiff hand at his or her own will. The device allows substantial flexibility, as each finger assembly can be adjusted to fit different finger lengths.

Unlike the case with conventional rehabilitation treatment, the assistive power from the robotic hand helps to overcome muscle and joint stiffness, thus allowing the patient to open/close a paralysed hand or pick items up according to his or her own intention. Through repetitive exercises, the hand motions send feedback to the patient’s brain, helping it to revolve itself in response to new experiences.

The device has been licensed to the Dellassion Medical Group, and clinical trials are well underway at the Shinan Hospital and Kwokloon Hospital. It also won a Gold Medal at the 62nd International Trade Fair Ideas — Inventions — New Products in Nuremberg, Germany.

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Energy efficiency is becoming increasingly critical to sustainable urban development, and this advanced technology and software can be applied to diagnosis and optimization at various stages of the entire building life cycle, from design and construction to commissioning and operation. Central air-conditioning systems normally account for 50% or more of a building’s total operating energy. Energy consumption could be reduced by 20 to 30% through the better diagnosis, commissioning, and optimization of energy systems and their control systems.

The technology is currently in use in one of Hong Kong’s landmark buildings, the International Commerce Centre (ICC), and a few others. It has helped the ICC to save 7 million kWh of energy annually, which is equivalent to about 18% of its air-conditioning system energy consumption.

This PolyU invention won an Innovation Award in the China International Industry Fair 2010, and a related research study entitled “Enhancing Accuracy of Air-Conditioning Load Measurement Using the Data Fusion Technique” was granted an Outstanding Paper Award in the 2010 National Conference on HVAC and Refrigeration.

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