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

Intelligent Building Laboratory
智能大廈實驗室

Prof. Wang receiving the Innovation Award at the China International Industry Fair
王教授於中國國際工業博覽會中榮獲創新獎

Prof. Wang Shengwei, Chair Professor of Building Services Engineering, and his research team recently developed an Intelligent Building Life-cycle Diagnosis and Optimization technology that enhances the energy efficiency of buildings through the effective diagnosis and optimization of their central air-conditioning systems and control systems.

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 testing/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.

由屋宇設備工程學系王盛衛教授及其團隊研發的「建築全生命週期智能化診斷及優化技術」能診斷及優化中央空調系統及其控制系統，有效地節省用電量及避免浪費用電。

能源效益對城市的可持續發展至為關鍵。此先進技術及各種軟件工具，可應用於大廈的全生命週期，包括設計、施工、調試和運行階段，以進行診斷及優化。中央空調在大型建築中的耗電量通常佔建築運行的總耗電量百分之五十或以上，而透過診斷及優化能源系統及其控制系統，可節省其中百分之二十至三十的耗電量。

該技術現應用於香港的地標建築物—環球貿易廣場及其它幾座建築物，每年為環球貿易廣場節省七百萬度電力，約佔建築空調總耗電量的百分之十八。

此嶄新技術於二零一零年中國國際工業博覽會中獲得創新獎。同時，相關研究項目「應用數據融合技術提高空調製冷負荷測量準確度」於二零一零年全國暖通空調製冷學術年會上獲優秀論文獎。🔰

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

Hand robot attaching to a human hand
機械手托配戴於人手上

Dr Raymond Tong (second from left) and his research team members
湯啟宇博士（左二）與研究小組成員

Jointly developed by Dr Raymond Tong Kai-yu, 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 relearning 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 hemiplegic 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 affords

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 rewire itself in response to new experiences.

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

由醫療科技及資訊學系湯啟宇博士及工業中心聯合開發的「肌動機械手」，可幫助中風病人重拾手部的活動能力。它是由內置的調節器及機械手組成，為病人提供輔助動力來控制手部活動，以及逐漸提升中風病人腦部的再學習能力。

當病人把精密的機械手套在手指和手掌之後，它就能透過肌電圖監測到病人想活動手部的意欲，神經反應就會使機械手活動起來，令僵硬的手隨著病人的指令而伸縮。這裝置可靈活地因應病人不同的手指長度來調校及裝嵌。

機械手有別於傳統的復康治療方法，其釋放的輔助動力可幫助病人克服僵硬的肌肉和關節，讓病人根據個人意欲開合癱瘓的手或撿起東西。通過重複的練習，病人手部動作的反應傳致腦部，這樣有助腦部面對新經驗時自我重新調校。

理大已把機械手的技術授權予得信醫療集團，而其臨床實驗現於沙田醫院及九龍醫院中進行。該項發明於德國紐倫堡市舉行的第六十二屆「國際創意、發明及新產品展」中奪得金獎。🔰