THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學
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# Technology Frontier

News Bite on PolyU's Innovation

## iWheelchair

### Independence, comfort and safety for wheelchair users

Wheelchairs give the disabled some degree of mobility. Yet, wheelchair users still encounter countless challenges in daily life and their caregivers are subject to much stress. For this reason, researchers from PolyU came up with iWheelchair, an integrated platform that puts seven PolyU inventions under one roof, to make life more independent, comfortable and safe for wheelchair users while giving caregivers the ultimate peace of mind.

Ir Dr Eric W.C. Tam

iWheelchair

Many sufferers of temporary or permanent disabilities rely on wheelchairs for mobility, and the aging population seems to be fuelling the global wheelchair demand[1]. A recent study shows that by 2034, 30% of Hong Kong's population will be 65 or older[2]. Smart homes with remotely controlled appliances and health monitoring systems are the game changer for the disabled, young and old. In light of this, PolyU researchers developed an award-winning smart platform tailor-made to the specific needs of wheelchair users known as iWheelchair. From now on, one can carry on with daily activities safely and independently even on a wheelchair while caregivers having the ultimate peace of mind.

**An integrated platform encompassing seven PolyU technologies**

It's not easy for others to understand the daily frustrations one must overcome being disabled. Even a simple task like turning the lights on could be lots of work. "On the outset, we considered thoroughly what wheelchair users need and find solutions from existing technologies developed by Interdisciplinary Division of Biomedical Engineering (BME) and Institute of Textiles and Clothing (ITC). Then we came up with iWheelchair, the platform that connects all of such technologies seamlessly via Bluetooth, complete with an intuitive interface on a tablet computer," said Dr Eric C.W. Tam, Assistant Professor of BME and Coordinator of the Project.

User interface of iWheelchair's tablet PC


iWheelchair won a bronze medal in the Seoul International Invention Fair 2015.

First off, the system gives users access to environmental control, such as opening and closing curtains, turning TV and lighting on and off, scrolling projector screen up and down, tilting and adjusting the height of motorized electric bed, all done at the touch of an icon on a tablet. As users' health condition and safety are of utmost concern, their heart rate can be monitored and a fall alert system detects any possible fall of the user or the wheelchair via a sensor on the user's belt and on the back of the wheelchair seat. Besides, users may suffer from bed sores if they sit still for too long. Prolonged period without any motion may also be a sign of life-threatening event. A fabric sensor developed by ITC reminds them to move from time to time, with an option to alert caregivers via SMS or email.

When a wheelchair is used daily, it's hard to wash the cover regularly. The ITC-developed self-cleaning nano fabric finish ensures the seat cover repels stains, water and bacterial growth. Diaper users will find the smart diaper, another ITC invention, with humidity sensor and alert system connected to the iWheelchair platform extremely handy. Finally, users suffering from muscular dystrophy may have problems operating the touchscreen of a tablet, but this is also taken care of with an optional fabric electronic switch – a thumb sleeve that controls the tablet. With iWheelchair, life sure is a lot more independent, comfortable and safe for wheelchair users.

A demo system of iWheelchair is now in use at Jockey Club Activity Center of Hong Kong Federation of Handicapped Youth (HKFHY). iWheelchair won a bronze medal in the Seoul International Invention Fair 2015.

**The PolyU technologies deployed in the system include:**

| Technology | Principal Investigator (Department) |
|---|---|
| Tablet PC Based Integrated Control System | Ir Dr Eric W.C. Tam (BME) |
| Vital Sign Monitoring System | Ir Prof. Yongping Zheng (BME) |
| Elderly Fall Monitoring System | Ir Prof. Yongping Zheng (BME) |
| Fabric Sensor | Prof. Xiao-ming Tao (ITC) |
| Fabric Electronic Switch | Prof. Xiao-ming Tao and Dr Frency Ng (ITC) |
| Nano Functional Fabric Finishing Technology | Prof. John H. Xin (ITC) |
| Smart Diaper | Dr Patrick C. L. Hui and Dr Frency Ng (ITC) |

[1] Global Industry Analysts, Inc., "Aging population and rising disability incidence drive the global wheelchairs market," PR Web, 2 March 2016. http://www.prweb.com/releases/wheelchairs_market/assistive_mobility_aids/prweb11170610.htm.

[2] Jennifer Ngo. "Hong Kong's population to decline after 2043, first 50-year projection indicates," South China Morning Post, 26 September 2015. http://www.scmp.com/news/hong-kong/education-community/article/1861546/hong-kongs-population-decline-after-2043-first-50.