ITF funding boosts textiles and apparel researches

Two PolyU research projects focusing on the applications of nanotechnology and the development of smart textile have received a total of $22.7 million from the Innovation and Technology Fund (ITF) of the Hong Kong Government for further development.

Nanotechnology Centre for Functional and Intelligent Textiles and Apparel

Awarded an ITF fund of $14.7 million for a period of three years, the "Nanotechnology Centre" project aims to set up a dedicated centre to consolidate research efforts in the applications of nanotechnology. Three research areas have been identified: development of a nano-structured surface polymerization system for multi-functional finishing, textile sensors and electrical apparel, and nano-structured photonic fabrics.

Jointly managed by the Institute of Textiles and Clothing, the departments of Applied Physics, Applied Biology and Chemical Technology, and Electronic and Information Engineering, the Centre is run under the directorship of Prof. Philip Yeung, Vice President (Academic Development).

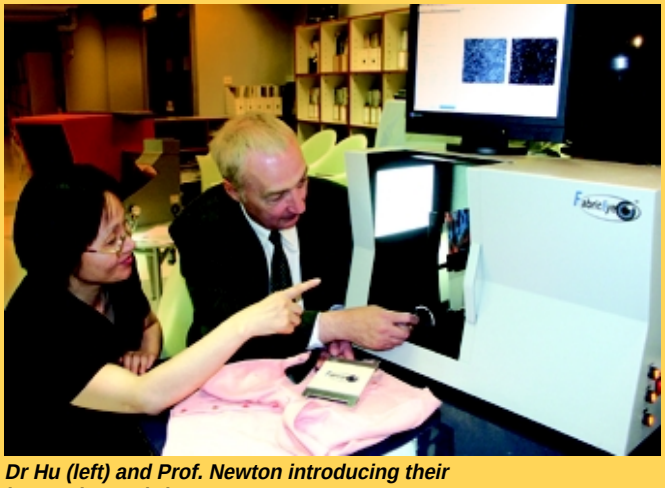
Smart Textile Development: Shape Memory Fabrics/ Garment

Awarded an ITF fund of $8 million for a period of two years, the "Smart Textile" project aims to develop a smart textile which has shape memory ability through foam, spray and other finishing processes.

Such shape memory ability allows the smart textile to stand high pressure creases and be able to return to the original shape at certain hot setting. The project will also impart additional benefits to the textile, such as wrinkle-free, shrinkage resistance, colourfastness, high strength and chemical resistance.

The project is led by Dr Hu Jinlian, Associate Professor of the Institute of Textiles and Clothing. She is also the recipient of the Award for Distinguished Achievement in Fiber Science from the US-based Fiber Society in 2001.

First 'Eye' for fabrics in the world



Dr Hu (left) and Prof. Newton introducing their innovation, FabricEye.

Known as "FabricEye", the world's first Artificial Intelligence-enabled fabric evaluation machine brings reform to quality assurance in the textile industry. Instead of traditional manual inspection, fabrics can now be analysed and graded by this innovative machine in a more accurate, efficient and cost-effective way.

The inventors Prof. Edward Newton and Dr Hu Jinlian, Chair Professor and Associate Professor of the Institute of Textiles and Clothing, have already registered two US patents and a trade mark for FabricEye.

Making use of a three-dimensional image processing technique, FabricEye uses a high-resolution scanner and camera to capture and enlarge the surface of the fabric. In less than a minute, the quality of the fabric will be automatically evaluated and graded on a five-point scale – in accordance with the international ASTM (American Society for Testing and Materials) standard. Captured images can be used to build up database for further analysis and production improvements for the textile industry.

The successful development of FabricEye helps raise the industry standards in developing and sourcing quality fabrics. It can also be applied to a wide range of settings, from factories to laundries, testing laboratories and customs.

New systems to enhance home intelligence

Headed by Dr Keith Chan, a research team of the Department of Computing has recently developed a home-based diagnosis system and a local positioning system which can help enhance the healthcare and safety standards at home.

With the home-based diagnosis system, people can perform body checks and receive diagnosis from doctors without leaving home. By putting a finger on the sensor of the system, patients can have their blood pressure, blood oxygen, heartbeat and temperature measured. The medical data will automatically be sent via the Internet to the designated doctors for a preliminary diagnosis. Doctors can also download the patients' data with their mobile phones or PDAs at anytime, anywhere.

The same team has also developed a local positioning system which can provide home monitoring without the use of Web cameras. Only with a radio transmitter and a receiver, together with the software developed by the research team, the system can help check positions of targeted parties. This can be applied to infants, the elderly or patients who require close monitoring. The system can alert users by sending SMS to their mobile phones or PDAs.

According to Dr Chan, the local positioning system can be customized with different configurations to meet needs of individual consumers.

Demonstrating the home-based diagnosis system.

Dr Keith Chan wears the tracking device on his wrist to introduce the local positioning system.

More HIV education urged for pregnant women

A recent university study showed that many pregnant women in Hong Kong underestimated the risk of HIV. Better education was thus urged to increase their awareness.

The study was carried out by Miss Ho Choi-fung, a Masters' degree graduate in nursing and Dr Alice Loke Yuen, Associate Professor of the School of Nursing. It was based on a survey interviewing 191 women from an antenatal clinic in Hong Kong between December 2000 and January 2001.

Recently published in the *Journal of Advanced Nursing*, a British medical journal, the study showed that only 37 per cent of pregnant women in Hong Kong were aware of the risk of contracting HIV and only 38 per cent would take measures to protect themselves and the unborn from infections even if they suspected their partners were HIV positive. Twenty-four per cent would have abortions if HIV infection was confirmed. More than 70 per cent of women said that HIV testing should be performed before marriage or pregnancy.

The findings also showed that Chinese immigrants were less knowledgeable about HIV than women born in Hong Kong, and women with higher education levels knew more about HIV than those with lower education levels.

The researchers urged that better education should be provided to enhance women's knowledge about mother-to-baby HIV transmission and promote the awareness of safe sex.

Improved GPS technology to detect landslides

Research team members pictured near the test slope.

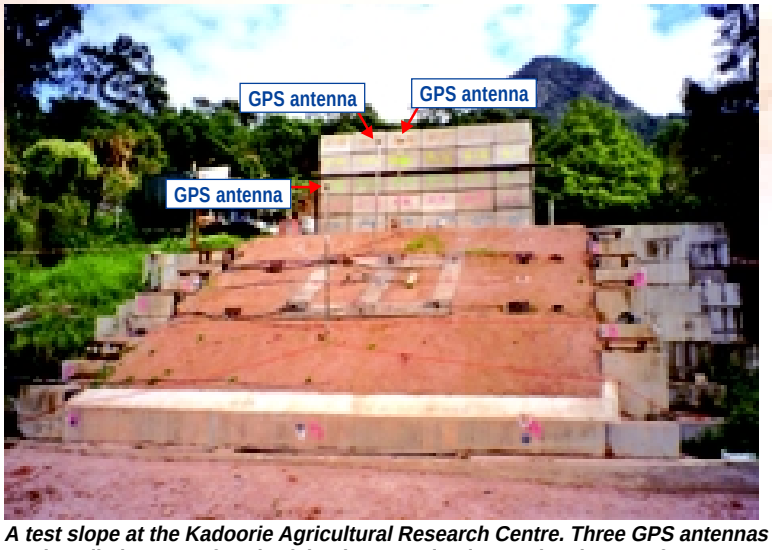
Researchers from the Department of Land Surveying and Geo-Informatics and the Department of Civil and Structural Engineering have successfully developed new satellite-based technology to monitor landslides. Known as the multi-antenna Global Positioning System (GPS), the new technology enables tiny movement of slopes to be monitored precisely for detecting signs of potential landslides.

GPS has been extensively used all over the world for precise navigation and positioning. It relies on a GPS receiver to pick up signals continually transmitted from GPS satellites orbiting the earth for calculating geographical locations. However, the high cost of a standard GPS receiver has limited the use of the technology.

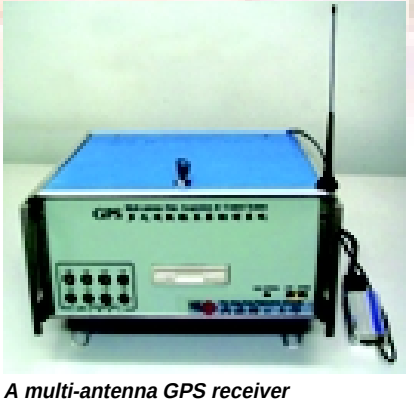
In view of this, PolyU researchers have developed the multi-antenna GPS which enables one GPS receiver to monitor a number of points that are equipped with GPS antennas. This new approach has largely reduced the cost of using GPS technology. For example, it costs only 20 per cent of the conventional GPS if eight points of movements are monitored. Due to the much reduced cost, the new technology has opened up opportunities for wider GPS applications in areas such as landslides and structures monitoring.

The multi-antenna GPS was used to monitor movements of a test slope at the Kadoorie Agricultural Research Centre in Tai Po for eight months last year. It measured the acceleration of the downslope movements during different stages including installation of soil nails, artificial raining and loading on the crest of the slope. The results showed that the new technology was able to measure precisely the deformations of the slope prior to a landslide.

Over $2 million has been funded by the Research Grants Council for this research project entitled “Centre for Ground Engineering and Technology”. Support has also been sought from Fong On Construction and Engineering Co. Ltd. and the University of Hong Kong.



A test slope at the Kadoorie Agricultural Research Centre. Three GPS antennas are installed on top of each of the three steel poles on the slope surface.



A multi-antenna GPS receiver

Making nano-machining a hit technology

Led by Prof. Lee Wing-bun, Cheng Yick Chi Chair Professor of Manufacturing Engineering and Head of the Department of Industrial and Systems Engineering, a team of PolyU researchers have developed a computer-aided simulation model in support of industries involved in the ultra-precision machining of materials.

The model, being the first of its kind, is able to achieve super smooth surface – a surface roughness of less than 10 nanometers. It is particularly useful in producing optical microstructures such as lenses in a camera or telescope. Such smoothness of the lens surface can enhance the accuracy, quality and effectiveness of optical products.

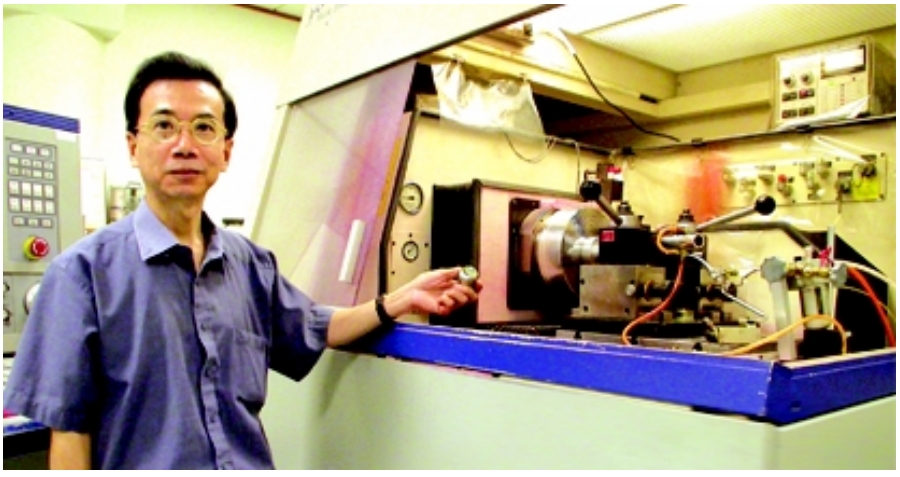
Lenses are usually produced by a manual process of machining, grinding and polishing. The simulation model is able to predict the three-dimensional surface topography of the machined material with great accuracy at nanometer level. It can also forecast results of ultra-precision machining after analysing detailed data such as the physics and crystal structure of the materials, geometry of the cutting tool and cutting speed.

By applying this model, users can optimize the cutting conditions before the actual cutting. The model not only enhances understanding of the mechanics of nano-machining, but also greatly increases efficiency and helps improve the cutting process. It can also be used in training engineers.

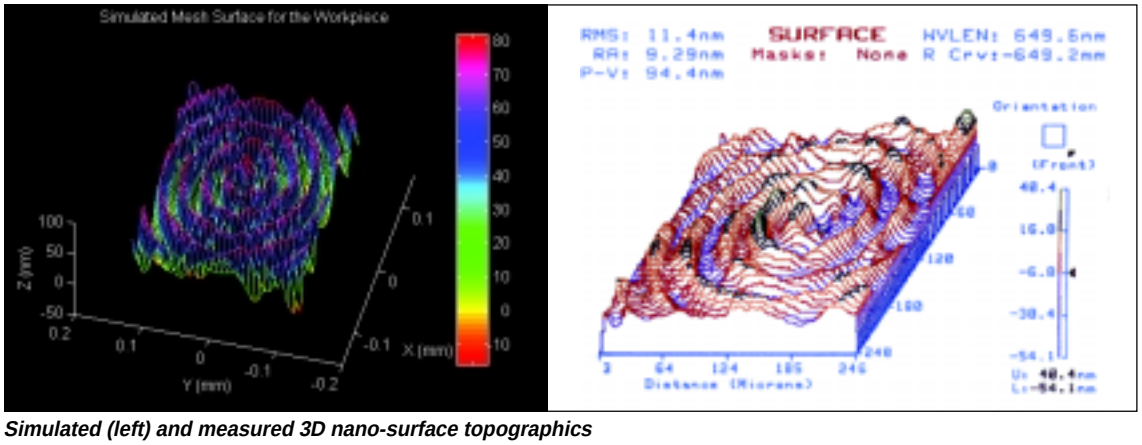
Prof. Lee's fundamental research on nano-machining has been applied to industries through PolyU's Ultra-precision Machining Centre. Being the most advanced facilities of its kind in the region, the Centre has helped over 100 companies with their industrial applications. Furthermore, Prof. Lee is now extending the Centre's research to cover freeform shapes.

Recently, the research team has been awarded a grant of $8 million from the Government's Innovation and Technology Fund for the development of design and manufacturing capability of freeform optical elements and optical microstructures. They are critical components used in products such as laser printers and hand-held scanners. The fabrication of those novel optical surfaces is based on the ultra-precision multi-axis freeform machining technology which is not yet available in Hong Kong.

The successful development of the technology will advance photonics research in Hong Kong and create a great demand for precision tooling and moulding industry.



Prof. Lee pioneers the research of nano-machining technology.



Simulated (left) and measured 3D nano-surface topographics