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Renewable energy and Hong Kong

Plus:
Manga computation
Graphene-based DNA sensors

CU develops surgical simulation and manga computation technologies

Two technologies, a vascular intervention simulation system (VISS) for training doctors in vascular and interventional radiology (VIR) operations, and a computational manga system (CMS) for improving the efficiency of manga production, was showcased by the Chinese University of Hong Kong (CU) at the International ICT Expo 2009 in April.

The development of VIR has allowed doctors to perform image-guided and minimally-invasive therapeutic operations through tiny pin-hole punctures on patients' bodies by using medical imaging devices and high-technology medical equipment.

VIR operations have become an indispensable standard component in the modern medical arsenal and the demand in Hong Kong has increased rapidly in recent years. However, safe and effective performance of precise VIR procedures requires highly skilled doctors with specialised training. The restrictions of the traditional training mode through hands-on practice on animals and real cases call for the development of a comprehensive computerised training system.

Simulation systems for VIR training currently available in the West have been developed from the data of local clients, focusing on the treatment of diseases common in the West, and thus may not be applicable to the Asian region.

Since the end of 2006, Prof Heng Pheng-Ann of CU's Department of Computer Science & Engineering, Faculty of Engineering; and Prof Simon C H Yu of the Department of Diagnostic Radiology & Organ Imaging, Faculty of Medicine, have jointly developed a VISS for treating common diseases in Asia. The system makes use of patients' data to reconstruct the 3D anatomic model of organs and vascular network, and simulate the whole VIR procedures and patients' bodily responses, including the slight resistance to the leading wires and micro-catheter, and patients' respiration and blood flow. The system can greatly enhance the effectiveness of VIR training and can also be used for education and evaluation of medical personnel.

Prof Heng is also involved in the development of CMS.

The production of manga (Japanese comics) is highly complicated, time-consuming and labour-intensive. Coloured and black/white (b/w) mangas are usually produced separately, leading to inconsistency in styles between the two versions. Prof Heng and Prof Wong Tien-tsin of the same department have developed the CMS to enhance the efficiency, consistency and cost-effectiveness of manga production.

The CMS comes with two functions: manga colourisation and manga screening, which facilitates easy colourisation and de-colourisation.

Using existing software to colourise regions without enclosed boundaries create leakage as computers cannot identify the specific perimeter for colourisation. The manga colourisation function automatically identifies and simulates hand-drawn hatching and printed screening patterns and fill up different regions with the right colours quickly.

The manga screening function mimicks the way a cartoonist lays screens with different patterns to transform coloured images into b/w manga, with a much more promising result than the traditional halftone technique. The new technology helps cartoonists substantially reduce time spent on preparing the background and focus more on the design of characters. More on the CMS can be obtained from http://www.cse.cuhk.edu.hk/~ttwong/papers/manga/manga.html.

Prof Wong Tien-tsin introduces the computational manga system