CMC MICROSYSTEMS IMPACT

World First: Charting New Territory in the War on Cancer

Toronto hospitals first to acquire 3D images with MEMS-based system

"By using MEMS technology to miniaturize the scanner, we were able to miniaturize the endoscopic tip, making it possible to image minute cavities which were difficult or even impossible to image before."

Dr. John Yeow
Professor
Systems Design Engineering
University of Waterloo

Dr. John Yeow, former researcher at University of Toronto and current Professor, University of Waterloo.

Princess Margaret Hospital and a former engineer at the University of Toronto have developed a new MEMS (microelectromechanical systems)-based microscope that will help doctors better detect and diagnose cancer. Toronto's Princess Margaret, along with Saint Michael's Hospital and the University Health Network, are among the first in the world to test a prototype that is considered to be the most advanced optical microscope of its kind.

"Micromachining technology has enabled the production of a higher resolution image, which gives a physician more information to work with," says Dr. John (Tze-Wei) Yeow, a PhD graduate in mechanical and industrial engineering at the University of Toronto. Dr. Yeow recently won the 2003 Micralyne Microsystems Design Award at CMC's annual symposium for his work on the Endoscopic Coherent Optical Microscope (ECOM) under the supervision of Dr. Brian Wilson.

Developed using MEMS Pro software design tools provided through CMC, the ECOM is about 1.4 x 1.7 mm and includes an Optical Coherence Tomography (OCT) microscope and a microscanner. It can provide a 3D image of microstructres as small as 10-20 microns just beneath the skin. The ECOM represents a significant advance over existing scanners that only provide a 2D image.

Dr. Yeow has used the device to image the central nervous system of a fruit fly—the first ever 3D OCT images acquired with MEMS technology. "The software that CMC made available was instrumental in helping us to realize the design of the optical scanner," says Dr. Yeow. "We also hope to work with CMC on fabrication of the device in the future." The device should be ready for human clinical trials within two years. *cmc*

MEMS or microelectromechanical systems are small devices manufactured with dimensions of less than one millimetre (1000 microns), and with parts as small as one micron. For comparison, a human hair is 100 microns thick and a bacteria is 1-2 microns long. Common MEMS applications include medical sensors, airbags in automobiles, aerospace navigation systems, and even ink jet printers.