

**Sector Focus:** Medical training

**Advanced Applications**

**Project:** Hapto-Audio-Visual Environments for Collaborative Tele-Surgery Training over Photonic Networking

**Goal:** To develop a 3D collaborative training environment where medical students can perform virtual cataract operations on virtual eyes using virtual surgical instruments.

**Project Leader:** University of Ottawa

**Participating Regions:** Ottawa, Edmonton

**Duration:** December 2004 – March 2006

**CANARIE Investment:** \$500,000

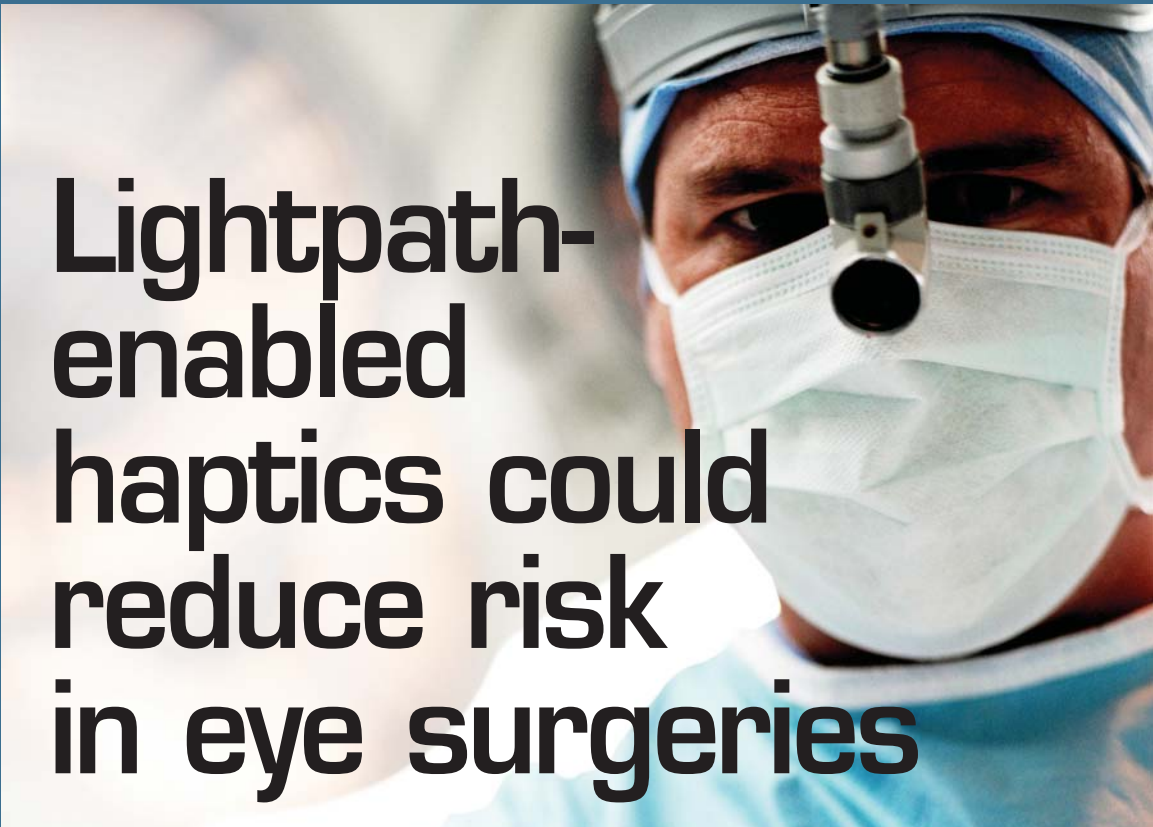
[www.photonics.uottawa.ca/CANARIE/](http://www.photonics.uottawa.ca/CANARIE/)

**The  Advantage**

More effective and less expensive medical training that results in improved patient care.

“Haptics and audio-visual collaborative environments are ideally suited to an advanced economy that’s geographically dispersed. It will allow experts on one side of the country to guide people on the other side.”

Dr. Trevor Hall  
University of Ottawa



# Lightpath-enabled haptics could reduce risk in eye surgeries

Mistakes made during eye surgery can have devastating consequences for a patient. To minimize that risk, the University of Ottawa Eye Institute is working with networking and photonics experts from Ottawa and Edmonton to build a 3D simulation where students can perform virtual operations on virtual eyes using virtual surgical instruments.

With strategic funding from CANARIE and access to end-to-end lightpaths and UCLP software, the project advances the yardstick in the emerging field of haptics – a Greek working meaning “the science of touch.”

Haptics makes it possible to simulate real tissue resistance and elasticity in a virtual environment. This project goes even further by creating a shared space where medical students in multiple locations can train simultaneously, using virtual tools and high-speed networks.

As part of the project, Dr. Rejean Munger from the University of Ottawa Eye Institute is working with clinicians to develop a virtual eye and cataract surgery training application. Cataract removals are an extremely delicate procedure in which a doctor removes the opaque lens from the interior of the eye and a plastic lens is inserted. Using a virtual platform, trainees will be able to experiment with various operating procedures that would be impossible to do with real patients.

“We hope to develop the application in such a way that a trainee can actually feel an eye distorting under a scalpel. Clinicians want something that is as realistic as possible,” says Dr. Trevor Hall, Project Manager and Canada Research Chair in Photonic Network Technology at the University of Ottawa.

The training application will be tested and evaluated over a CA\*net 4 lightpath.

The speed and reliability of lightpaths will help overcome a major hurdle in haptics: latency. “You do not want delay variations between the time you initiate an action and feel the response back,” says Dr. Hall.

Other potential applications for haptics include modeling and animation, geophysical analysis, virtual museums, assembly planning, mine design, control of scientific instruments and robotic simulation. ■

*Participants: University of Ottawa (School of Information Technology & Engineering, Faculty of Medicine); University of Ottawa Eye Institute/Ottawa Health Research Institute; University of Alberta (Dept. of Computing Science); Communications Research Centre; BigBangwidth*