Quanser recognized for cutting-edge, real-time control technology solutions, is leading advancements in the realm of medical applications of robotic and haptic technology. Quanser-developed state-of-the-art haptic and robotic devices that simulate realistic and accurate sense of touch are currently used for research and surgical training. Founded in 1990 and headquartered in Markham, Canada, Quanser’s innovative control technology is applied worldwide in areas of medical assistive devices, aerospace and robotics. Quanser’s ability to take medical technological advancement from concept to prototype is summarized below. Their work in haptics has far-reaching implications for the future of robot-assisted surgery, such as brain microsurgery, minimal invasive surgery and telesurgery (long distance surgery). Quanser is also a founding member of the Intelligent Computational Assistive Science and Technology Network (ICAST), a group of top researchers and industry partners developing intelligent assistive technology and devices.

**ROBOT-ASSISTED SURGERY**

Robots, along with cameras and visual effects, are a hallmark of contemporary surgical advancements. Robot-assisted surgery allows precision robotic tools to act as a surgeon’s arms, hands and fingers, reaching places the human hand simply can’t reach without the need for large incisions. The transition from traditional ‘open-surgery’ to minimal invasive surgery (MIS) techniques is a direct result of advanced robotic technologies. MIS allows physicians to perform major surgery with tiny incisions through which highly sophisticated robots operate under a surgeon’s direction. The robotic tools take surgery beyond the level of human hand with greater reach, accuracy and effectiveness. As a result, patients experience less trauma, pain and blood loss, fewer complications, minimal scarring, fast recovery times and shorter hospital stays. With so many benefits over traditional techniques, robotic surgery tools are effective for both surgeons and patients, while reducing strain and costs on overburdened healthcare systems.

**SENSE OF TOUCH IN TELEOPERATION**

Quanser, with its haptic expertise and tools adds another dimension to the robotically assisted surgery - a realistic sense of touch. In essence, the haptic technology gives robot’s hands the ability to translate a sense of touch back to the surgeon through special hand controllers under development by Quanser. While allowing the surgeon to ‘feel’ what’s going on in the operation, the highly sensitive real-time controllers also eliminate natural tremors and prevent accidental movements from being transmitted to the robotic tools by applying corrective forces.

**MEDICAL SIMULATORS**

In addition to advancing research in the area of robotically-assisted surgery, Quanser’s robotic and haptic technology is also being used for surgical training. The powerful simulations built around state-of-the-art robotic tools allow students and researchers to learn more about the structure, functions and manipulations of the anatomy than traditional techniques. Surgeons can practice virtual operations before the actual procedure. In the future, the telesurgery techniques can facilitate surgical training with surgeons learning under the guidance of leading specialists over distances.

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LAPAROSCOPIC SIMULATOR
Quanser’s multi-disciplinary Laparoscopic surgery simulator enables simultaneous hands-on practice for a single trainee or a team. The system offers training opportunities to new and experienced surgeons for everything from perfecting basic laparoscopic skills to performing complete laparoscopic surgical procedures. The improved haptic interface on the platform offers enhanced tactile feedback, performance and reliability. The Laparoscopic Simulator provides realistic surgical simulations by incorporation of tactile sensations in the use of laparoscopic instruments that imitate real-life.

NEEDLE INSERTION SIMULATOR
The Veress needle is an instrument used at the beginning of a laparoscopic surgical procedure to insufflate the abdominal cavity with gas. The surgeon inserts the needle blindly and cannot see the tip of the needle as it penetrates the tissues. As such, experienced surgeons rely on the “feel” of the tissues as the needle travels through the various layers of the abdominal wall. The virtual reality haptic Needle Insertion Simulator provides a much needed training tool which allows trainees to practice this procedure in a safe environment with no risk of injury to patients. This simulator also helps to expedite the learning curve of the procedure while at the same time provides a quantitative measure of the trainee’s abilities. Trainees can practice until a certain proficiency level is achieved before performing the procedure on real patients. The simulator also accounts for various patient types (muscular, obese, etc.) to allow the trainees to practice different surgical scenarios.

INTELLIGENT REHABILITATION ROBOT
Another exciting example of Quanser’s ability to take medical technological advancements from concept to prototype, is the Autonomous Upper-Limb Stroke Rehabilitation Device, developed in partnership with the Toronto Rehabilitation Institute and the University of Toronto. The revolutionary device utilizes Quanser’s robotic and haptic technologies in combination with an intelligent graphical computer interface to treat post-stroke patients in need of limb rehabilitation. The rehab robot is accurately replicating traditional rehabilitation exercises to help improve coordination and strengthen the affected limb. The system provides the realistic sensory feedback for the patient, while allowing the robot to sense how to accurately react and respond to the patient. As the patient’s mobility improves, the device detects the progress and adjusts the level of resistance.

Current limb rehabilitation requires the patient to visit a clinic many times for repeated manual therapy. Quanser’s Rehabilitation Robot allows patients to conduct the same exercises in the comfort of their homes. The effective, user-friendly and enjoyable treatment can therefore be delivered more quickly and provide faster rehabilitation and better long-term results.