Robotic Surgery
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LapaRobot for Remote Operation
The LapaRobot System is a 5 DoF Master-Slave pair of robot manipulators that allows 2 users at different physical locations to perform interactive teaching and learning in laparoscopic procedures, as well as cooperative telesurgery. In other words, the LapaRobot System allows less experienced or new surgeons to be taught and/or guided through laparoscopic procedures via a more experienced master surgeon.

LapaRobot Capabilities:
• Functions as a Fundamentals of Laparoscopic Surgery Evaluation Platform
• Remote Operation for Telesurgery/Telementoring
• Master-Slave Position Tracking, Force Estimation, Feedback, and Gravity Compensation
• Uses Multiple Commercially available Laparoscopic Tools
• Can be used as a Joystick for other Surgical Manipulators and Robots

Robotic Eye Surgery
The IRISS surgical platform is capable of performing anterior and posterior surgical procedures via teleoperation and/or automation. The IRISS has the unique capability to manipulate two surgical instruments simultaneously through ocular incisions spaced millimeters apart. To facilitate comprehensive surgical procedures, the IRISS can automatically alternate between multiple surgical instruments on each arm. Dedicated master surgical manipulators and microscope mounted cameras allow for 3-D teleoperated surgical visualization based commands. This configuration also lends itself to computer vision based intervention.

Automated Mouse Tail Injection
Some laboratory testing requires the injection of a medium into the tail vein of mice. Manual injection by a trained technician is costly ($50 per injection) and time-consuming. The automated system aims to provide a robust and efficient approach for the task of mouse tail injection, which includes 1) Locating the tail vein, and 2) Accurately placing the catheter needle.

Locating the Tail Vein
An infrared camera captures images and image processing determines location and orientation of the vein. Location coordinates are then provided to motors.

Placing the catheter needle
3 Degree-of-Freedom system uses linear motors provide X and Y translation, a rotary motor provides “yaw”. A pressure transducer in the catheter line detects successful insertion.