

Robotic Surgery

Christopher Pizza, 3/3/2003

ELE 282: Biomedical Engineering Seminar I, Professor Ying Sun

The first generation of surgical robots are already being installed in a number of operating rooms. These robots are being introduced to the following fields: neurosurgery, orthopedics, ophthalmology, dentistry, urology, general surgery and gynecology. These robotics will not replace the physician altogether, but will lend a mechanical helping hand to the surgeon because they are not yet true autonomous robots.

There are currently several complex surgical devices in use including the Zeus Robotic Surgical System, the da Vinci Surgical System and the RoboDoc.

Instead of open surgery, where doctors open large holes in the patient, robotic surgery machines will be a positive alternative. A surgeon will peer into a video monitor that shows in three dimensions what is going on at the other end of the robots hands. The surgeons hands will be strapped into two controls so he is connected with the machine. The robot's hands will mimic the movements of the surgeon's own hands. This signal will go from the controls, through a powerful computer, to the robots arms which hover over the patient.

According to an article in the USA TODAY a woman in Little Rock, Arkansas underwent a hip replacement surgery and became RoboDoc's first Arkansas patient. Developed at the University of Arkansas for Medical Sciences, the RoboDoc drills a precise cavity in the bone so an implant can be inserted and the bone can start regeneration around the implant. This method is much more effective than the chisel and hammer technique. The RoboDoc scans the femur bone and stores the information as a three-dimensional image. The data is then uploaded to an operating room computer that is connected to the RoboDoc's surgical drilling arm. A surgeon helps RoboDoc find the exact location of the drilling

point and RoboDoc takes over, using the image of the bone to tailor the cut.

The da Vinci System was FDA approved on July 11, 2000, making it the first robotic system allowed to be used in American operating rooms.

It was developed by Intuitive Surgical, and the \$1 Million da Vince System consists of a viewing and control console and a surgical arm unit. The surgeon looks into a viewfinder to examine the 3-D images being sent by the camera inside the patient. Joystick controls are used by the surgeon to manipulate the surgical instruments in real time.

Dr. Ralph Damiano, Jr. chief of cardiothoracic surgery at the Milton S. Hershey Medical Center at Penn State College of Medicine in Hershey, Pennsylvania performed the first coronary bypass surgery in a human patient using robotic arms. The Zeus Robotic Surgical System consists of three robotic arms that are used to manipulate instruments inserted into the chest through pencil-sized incisions. This \$750,000 system may lead to the elimination of the large incision and to a much faster recovery time. It has a similar setup to that of the da Vince System but has not yet been cleared for American use beyond clinical trials. German doctors have already used the system to perform coronary bypass surgery.

Although surgical robots offer some advantages over the human hand, we are a long way from the day when autonomous robots will operate on the patients without human interaction. With advancements in computers and artificial intelligence, it could be this century that a robot could perform a complicated surgery unaided by any human.

<http://electronics.howstuffworks.com/robotic-surgery.htm>

http://www.sptimes.com/2003/01/25/Hernando/Robotic_hands_to_work.shtml

http://www.usatoday.com/tech/news/techinnovations/2003-02-26-robotic-doc_x.htm

http://ed.tsud.edu/tcubed/cool_tech/robotic_surgery.htm