INTRODUCTION

The use of computer integration in surgery or simply the use of robots in surgery is termed as robotic surgery.

The surgeons view the patient via a terminal and manipulates robotic surgical instructions via a control panel.
BACKGROUND AND HISTORY OF SURGICAL ROBOTS

Voice activated robotic arms were used earlier. Minimally invasive surgery (MIS) began with the first laparoscopic surgery. History of robotics in surgery begins with the puma560, a robot used to perform neurosurgical biopsies with greater precision. This system led to the development of PROBOT. ISS Ltd of Sacramento, developed NASA and Ames Research Center. Later US army developed a Mobile Advanced Surgical Hospital (MASH) with surgical equipments and operated on remotely by a surgeon. Later AESOP, davinci system & ZEUS was developed.
Principle behind the robotic surgery. Surgeon can use a computer simulation to run a practice session of robotic surgery beforehand.

Major distinction between the computer assisted and robotic surgery is that robotic surgeries may use a large degree of computer assistance but CAS do not use robots. Robotic surgery employs CAS with the aid of a surgeon.
FURTHER DIVISION OF ROBOTIC SURGERY

Divided into 3 subcategories depending on the degree of interaction of surgeon during the procedure.

- Supervisory control system
- Telesurgical system
- Shared control system
SUPERVISORY CONTROLLED SYSTEM

Procedure is executed solely by the robot, which acts according to the computer program that the surgeon inputs into it prior to the procedure. Surgeon does not take part directly. Extremely expensive to gather several images and data for one patient.
TELESURGICAL SYSTEM

Also known as remote surgery. Requires the surgeons to manipulate the robotic arms during the procedure rather than allowing the robotic arms to work from a predetermined program. Uses real-time image feedback. eg- davinci surgical system, the current leading device in this field.
SHARED CONTROL SYSTEM

Has the most surgeon involvement. The robot offers a steady hand manipulation of the instrument. Both the surgeon & the robot jointly perform the task.
ROBOTIC SURGICAL SYSTEMS

Da Vinci surgical system

ZEUS system

AESOP system
Robotic surgery requires the use of computer imaging to diagnose. The main imaging techniques used is Computer Tomography (CT).
Before the procedure 3 steps are carried out:
Planning
Registration
Navigation
Da Vinci surgical robot in use
The software designed in the Chir team for the planning and simulation of surgical interventions. Upper right: the endoscopic view, left: the external positionning the robot in the thoracic cage.
The Chir Team at INRIA Sophia Antipolis integrates vision and robotic algorithms around the Da Vinci (TM Intuitive Surgical, Inc) system in collaboration with Professor Carpentier’s team (Hopital Broussais) in heart surgery.
Figure 1. Using the da Vinci Surgical System, the surgeon operates while seated at a console viewing a 3D image of the surgical field. His or her fingers grasp the master controls below the display, and the system translates the surgeon’s hand, wrist, and finger movements into precise, real-time movements of surgical instruments.
Figure 2. The two bars for each robot’s instruments at the bottom of the view at the surgeon’s console represent the visual feedback for the speed at which the instruments move.
Figure 3. NI LabVIEW is used to control the robotic arm responsible for extremely precise photodynamic therapy application for cancer patients.
ROBOTIC SURGICAL SYSTEMS

Mainly three types

- Da Vinci Surgical System
- ZEUS System
- AESOP System
PRACTICAL USES OF SURGICAL ROBOTS TODAY

- Organizations are interested in making themselves “cutting edge” institutions with advanced technological equipment & very newest treatment & testing modalities.
- Development of robotics is spurring interest in improving the instruments & digital integrity of already existing technologies.
ADVANTAGES OF ROBOTIC SURGERY

- Most significant advantage to the patient is the decrease in pain and scaring.
- By using cameras and enhanced visual effects, doctors can make the tiniest of incisions.
- Due to small and precise cuttings, patients hospital stay is greatly reduced and recovered faster.
- Risk of infection or complications decreases.
ADVANTAGES CONT'D....

- Proves advantageous to both hospital and surgeons.
- Clearest advantage to using robots in surgery is in long operations.
- Physiological stresses of surgeons are reduced.
DISADVANTAGES OF ROBOTIC SURGERY

- The question of safety
- Human presence
- Fault consequences
- Non-generic task
- Problem of error
- Large size
FUTURE OF ROBOTIC SURGERY

- Shorter surgery hours are now in check with robotic surgery.
- Da Vinci surgical system are designed to a much decreased size.
- Three principle device manufacturers in this area are Intuitive Surgical, Computer Motion, and Integrated Surgical Systems
ROBOTIC SURGERY UNDER ZERO GRAVITY

- SRI developed software to assist surgeons to compensate for “errors in the movement”.
- Robots will be controlled remotely from a distant location using a telecommunication network.
- Provides emergency medical & surgical care to astronauts during space flights.
CONCLUSION

- Robotic surgery will soon replace conventional surgical procedures.
- It brings surgery to the digital age.
- Further research must evaluate cost effectiveness or a true benefit over conventional therapy for robotic surgery to take full root.