Strasbourg University
ENPS
Master ISTI

MEDICAL ROBOTICS

Year 2008-2009

February 2nd – 10th 2009

Pr : Michel de Mathelin
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50h

Teaching staff :
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Prerequisite :
Basis of Geometry, Algebra, Control Theory, and Digital Signal Processing

Goal :

- To provide necessary knowledge in order to start research projects in the area of medical robotics;
- To give an exposure to the specific constraints of an operating room;
- To present the robotics devices and systems (sensors, actuators, mechanical structures, control architectures, …) used for computer aided surgery;
- To become able to analyze medical procedure in order to provide adapted assistive technologies and systems.

Detailed program :

Fundamental of robotics :
- Modeling and parametrization of poly-articulate objects in 3D space
- Direct and indirect kinematics
- Differential kinematics and control

Robot vision :
- Vision models
- 3D reconstruction
- Visual servoing

Medical robotics and computer aided surgery:
- State of the art
- Operating room equipment
- Basis of laparoscopic surgery and NOTES
- Sensors, registration and visual servoing
- Augmented reality
- Specific robot architectures and actuators
- Trajectory tracking and control
- Telemanipulation
- Comanipulation

Practical work :

- Kinematic control of robot in Cartesian space and image based visual servoing
- Experimental laboratory in the surgical suite of IRCAD

Knowledge control modalities :

- Homeworks : homeworks will be completed at the end of the two practical sessions;
- Final examination : a two hours final examination will be done at the end of the course.