



Ali Sengul  
EPFL - LSRO

9/23/2009

Surgical Robotics 4th Summer School

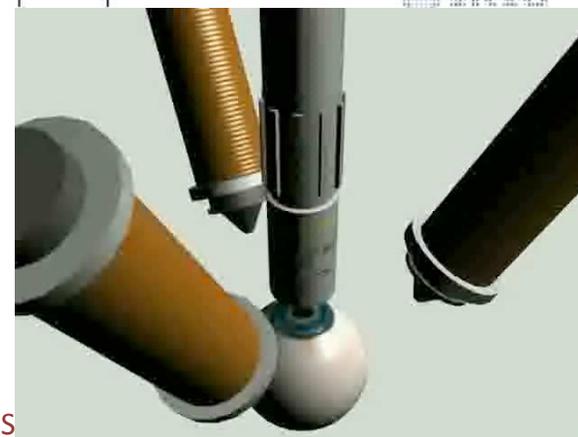
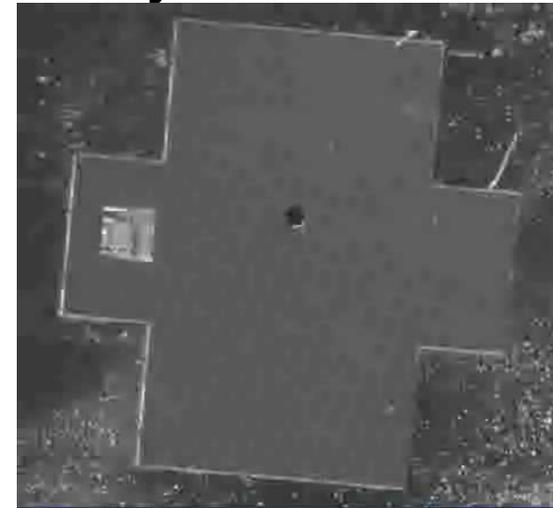


# Background

## Education

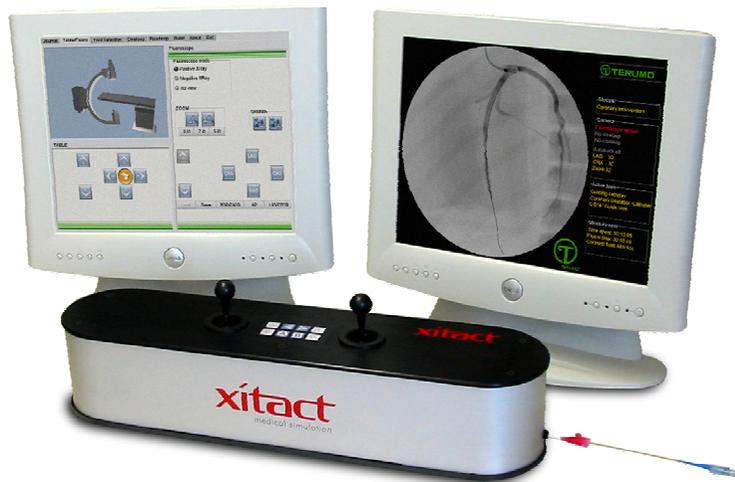
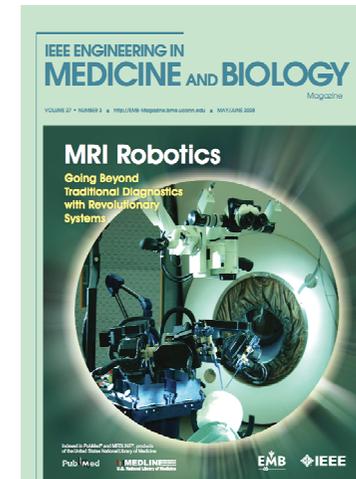
- Started in December 2008 PhD at EPFL Advisor Hannes Bleuler
- Masters at ETHZ in major robotics, Advisor Bradley Nelson
- BS Koc University, Istanbul in Computer and Mechanical Engineering, Advisor Cagatay Basdogan

## Past Projects





# EPFL - LSRO



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# ARAKNES



To integrate the advantages of traditional open surgery, laparoscopic surgery (MIS), and robotics surgery into a system for bi-manual, ambulatory, tethered, visible scarless surgery, based on an array of microrobotic instrumentation.



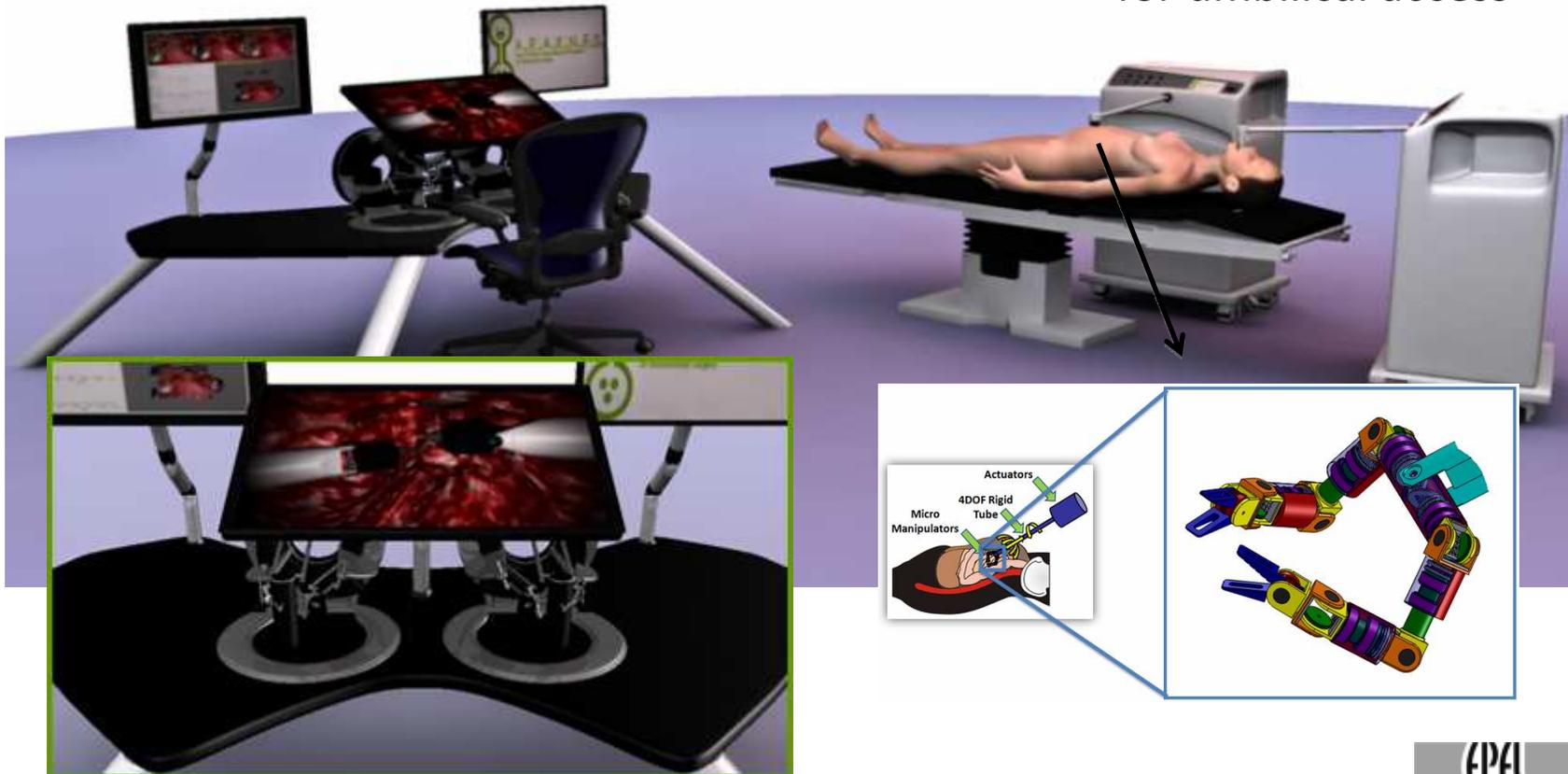
## Main intended interventions:

- 1) Endoluminal and transluminal surgery:
  - bariatric surgery
  - local excision
  - others
- 2) Single-port surgery



# EPFL tasks in ARAKNES

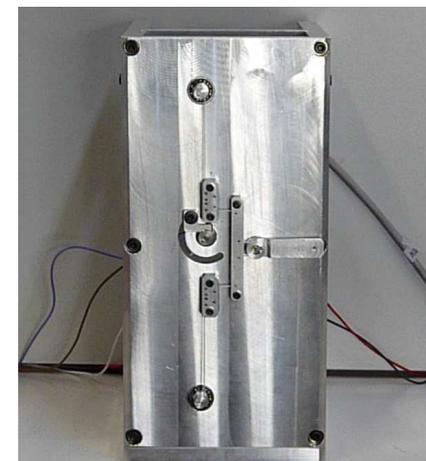
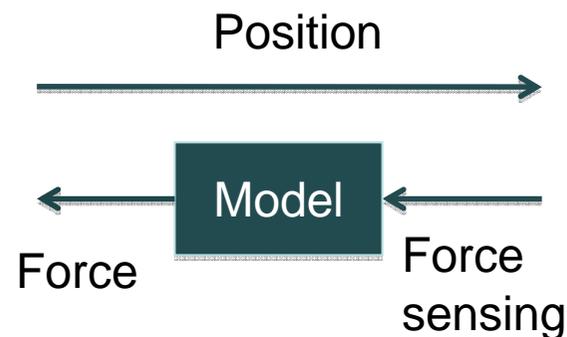
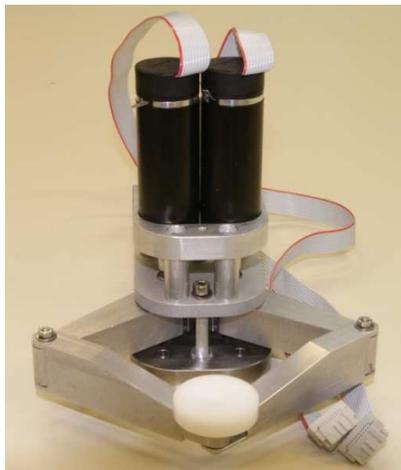
ARAKNES robotic unit for umbilical access





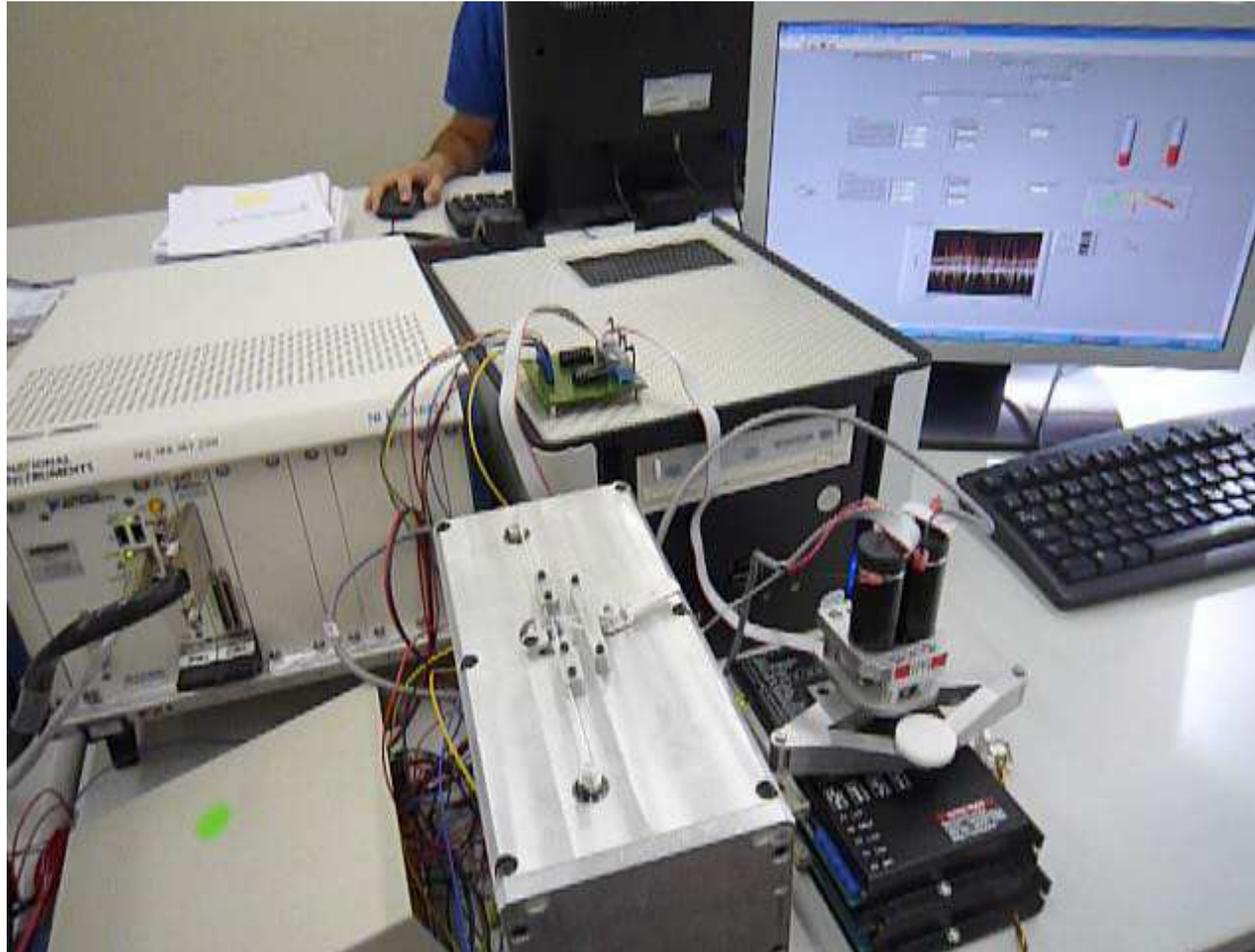
# Master-slave connection

- Collaboration with University of Montpellier (LIRMM)
- Force reflecting bilateral teleoperation
- Real-time operating control
- Similar kinematic for intuitive usage
- Preliminary Master-slave experimental setup





# Video





# Control Hardware

- NI PXI system with R series card
- Maxon motor control 4-Q-DC
- FPGA for fast encoder, analog input and output readings
- Position loop at 65kHz
- Force loop at 50kHz





# Additional Focus

- Integration of preoperative images for intelligent assistantance and visual servoing.
- Surgeons operate and robotic system monitors the surgeon's performance and provides support through active constraint.
- Active constraint is defining regions on a patient based on preoperative images.
- Shared control to increase the precision and safety.
- To do this localization information is needed for control.  
Vision can be used for localization.



# Conclusion

- Master slave connection with force reflecting teleoperation.
- Integration of preoperative images for shared control and visual servoing.
- Shared control to increase the precision and safety.



# Thank you!