

# Computer Integrated Surgery – Introduction

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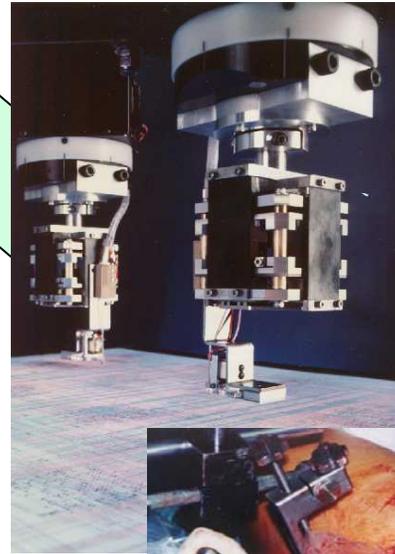
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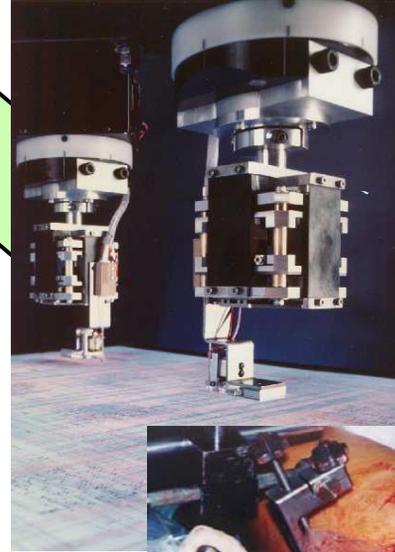
# Prediction

The impact of aided interventional technology on medical care in the next 30 years will be as great as the impact of CAD/CAM systems and technology on industrial production over the past 30 years.



# Mission Statement

Develop basic science, technology, and engineered systems working cooperatively with physicians to significantly change the way interventions and surgical procedures are planned, carried out, monitored, and assessed.



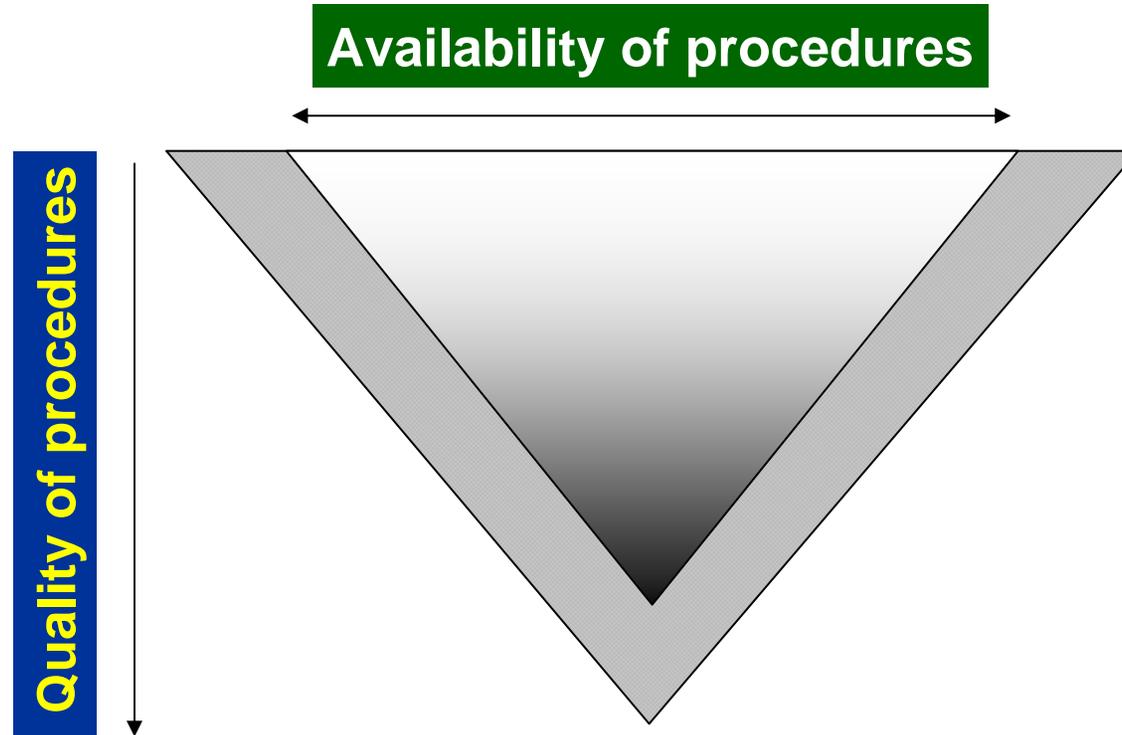
# Couple the Information to Action



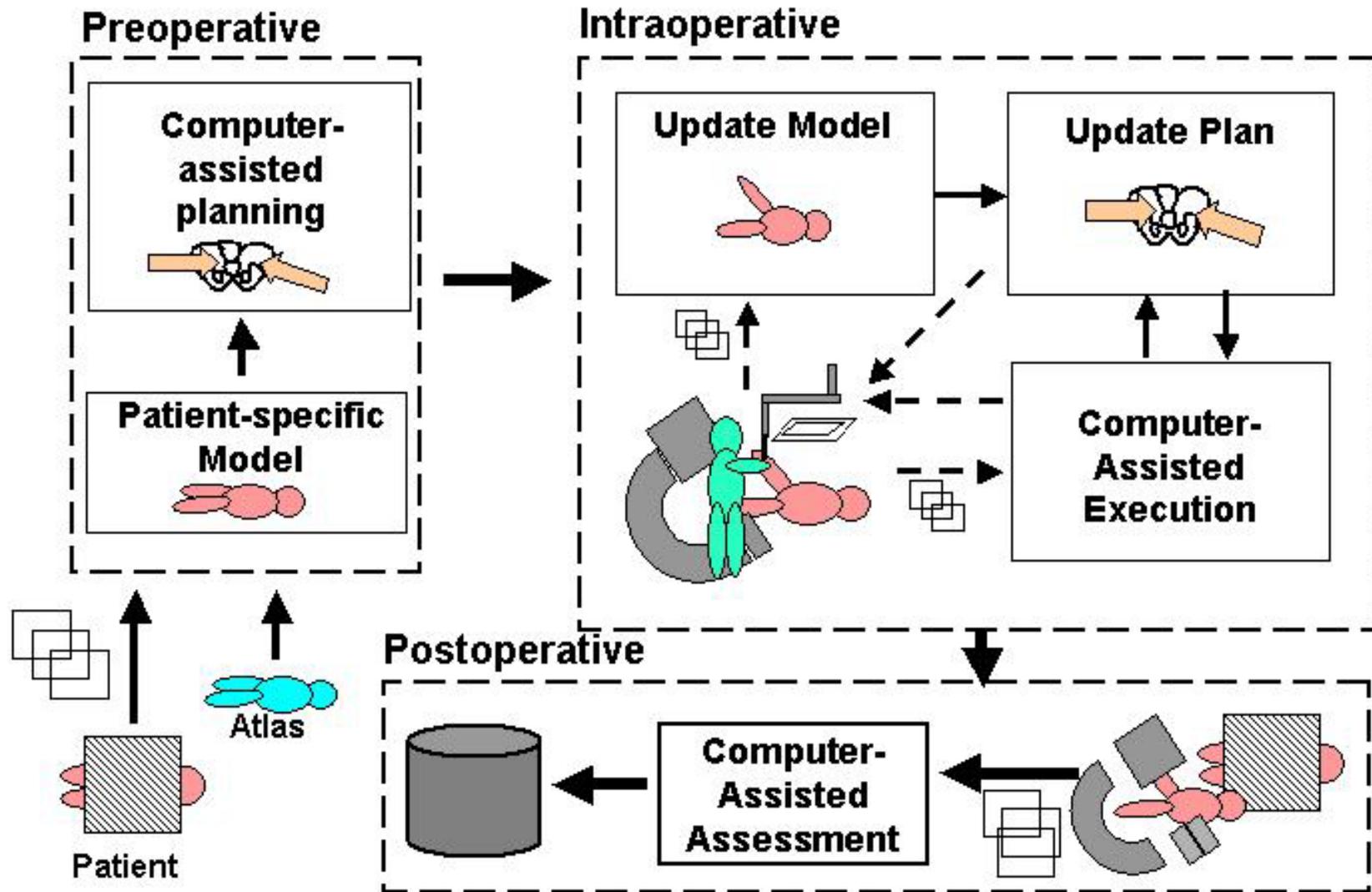
- **Mental computation**
- **Mental coupling of plan to action**
- **Hand-eye coordination**

# Impact of CIS

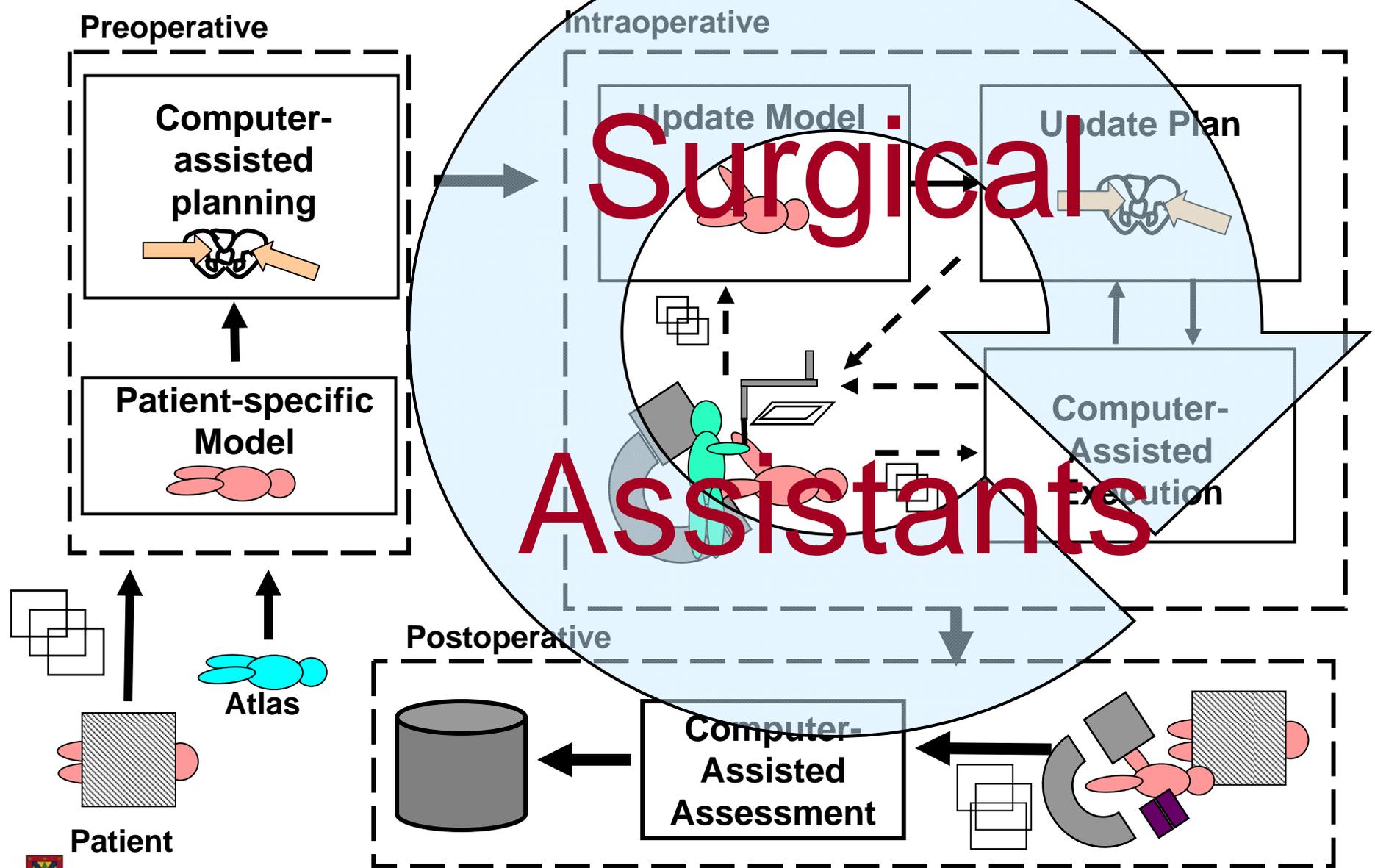
- Procedures performed “better”
- Availability increased



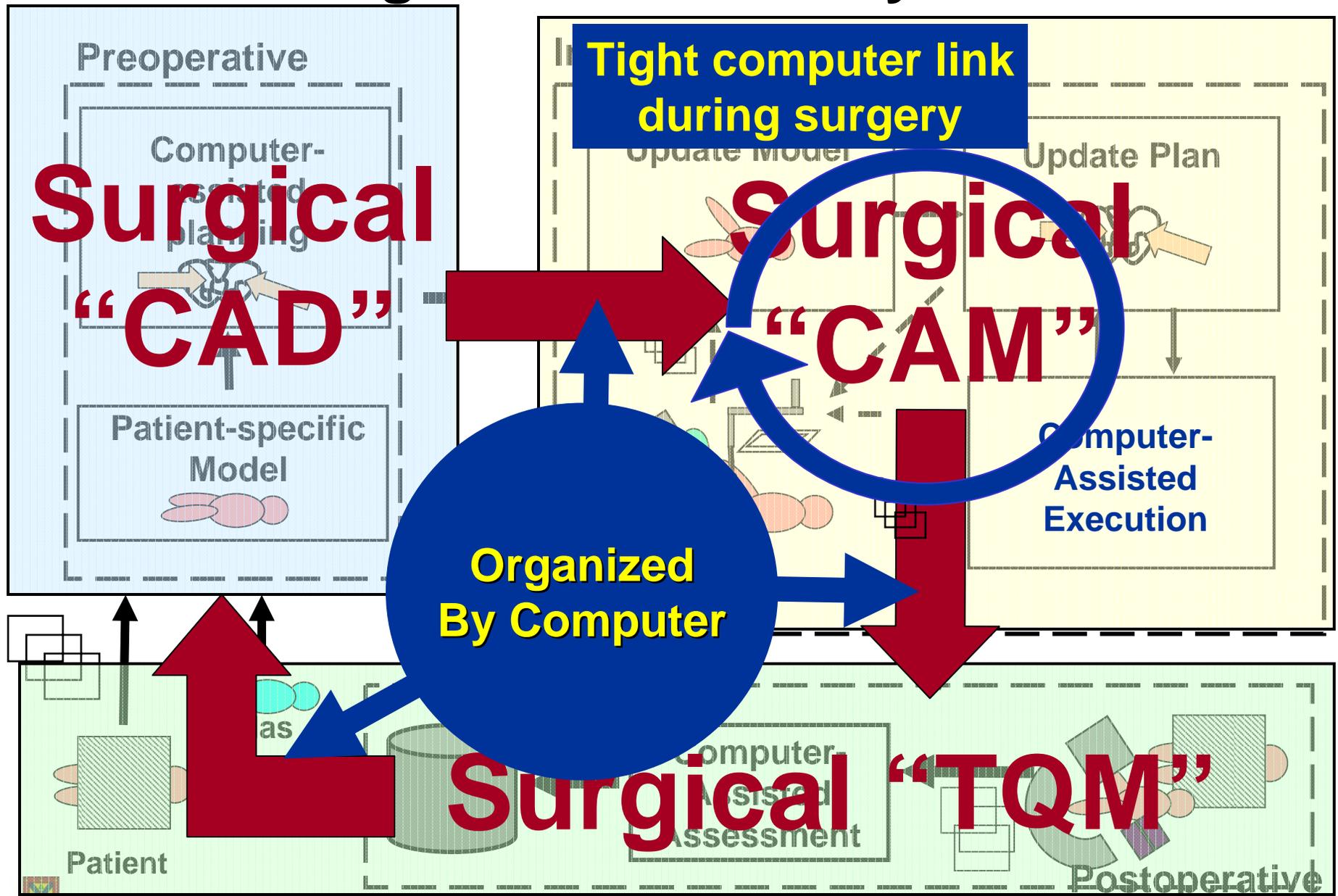
# Computer Integrated Surgery Systems



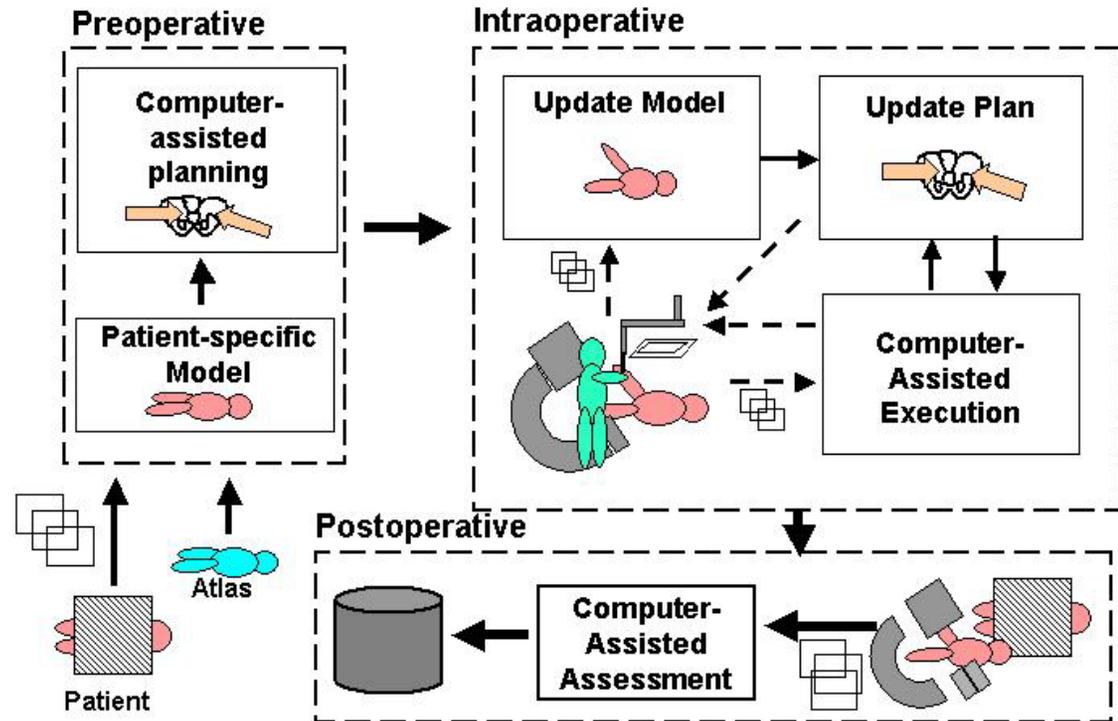
# Surgical Assistant Systems



# Surgical CAD/CAM Systems



# Computer Integrated Surgery



# Fundamental research barriers

## Modeling & Analysis

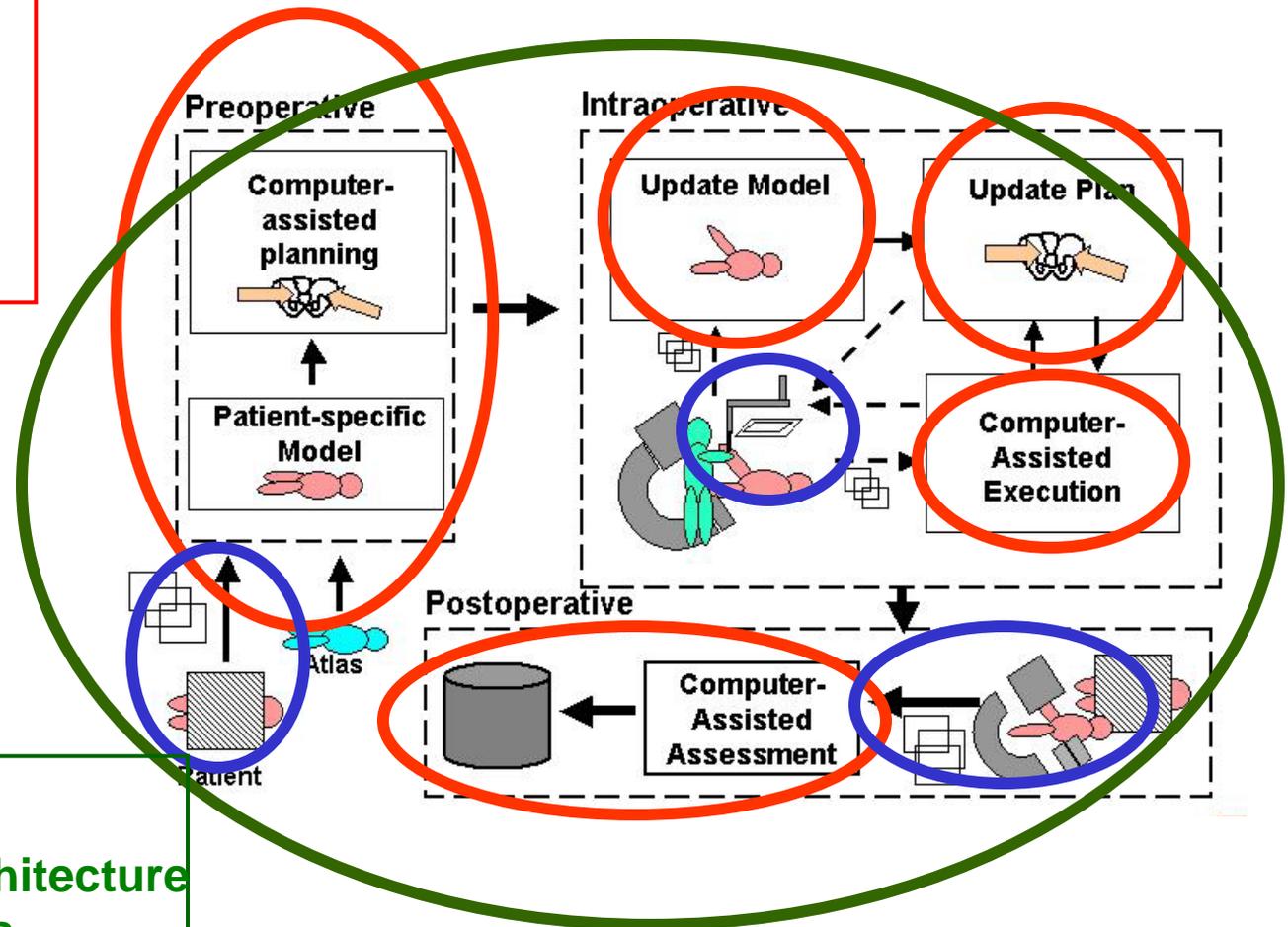
- Segmentation
- Reconstruction
- Data fusion
- Treatment planning

## Physical Interfaces

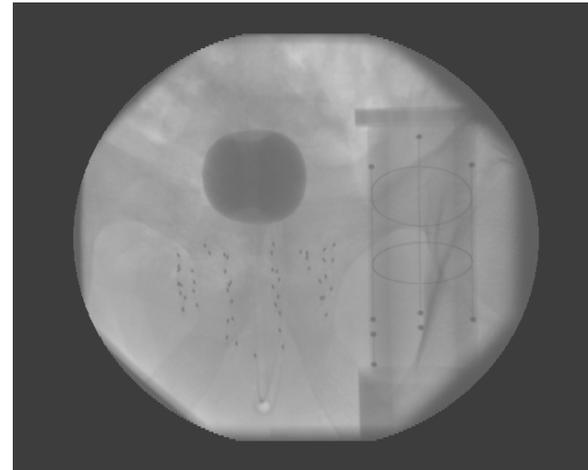
- Imaging
- Tracking & sensing
- Robotics
- Augmented reality

## Systems Integration

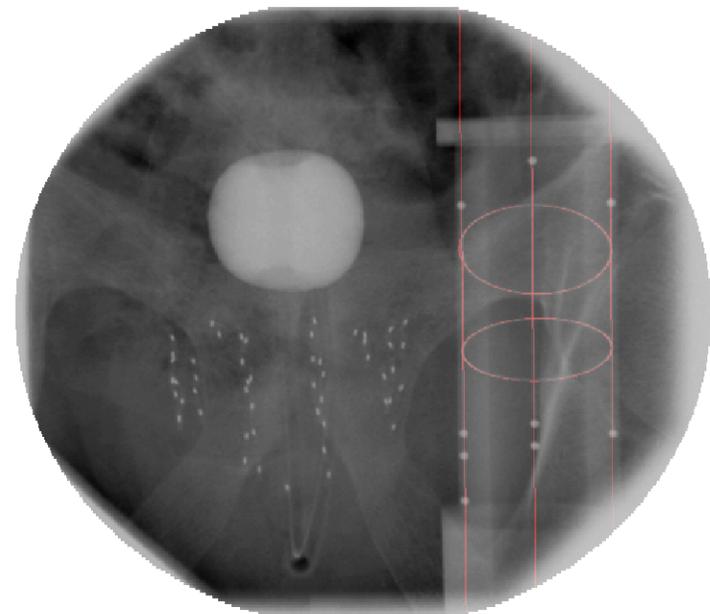
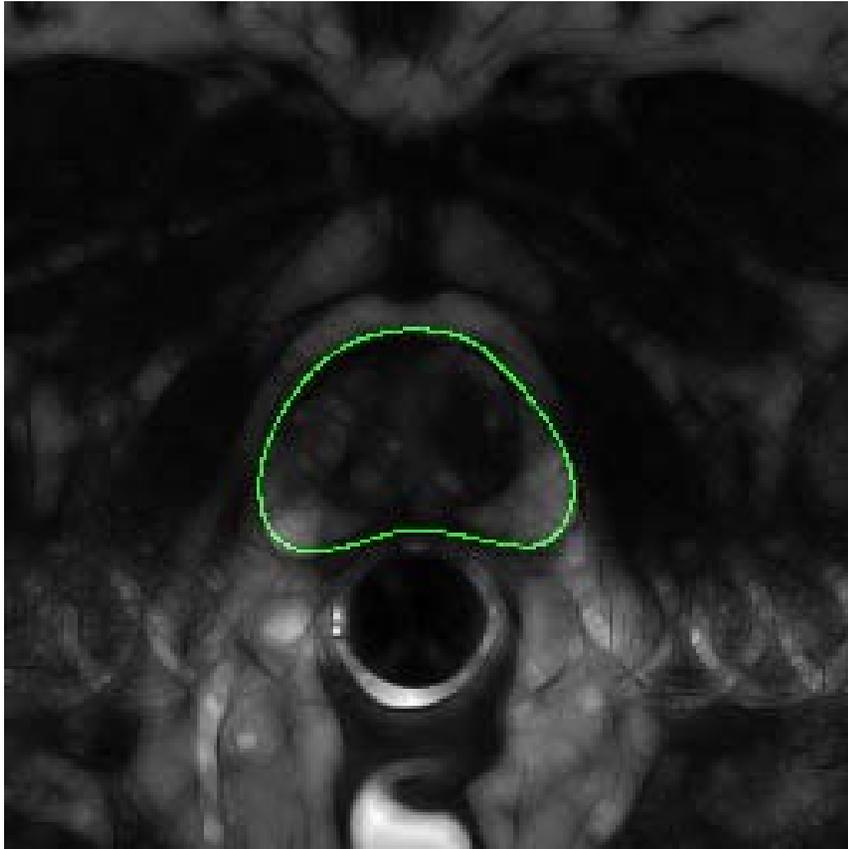
- System design & architecture
- Performance analysis
- Clinical applications



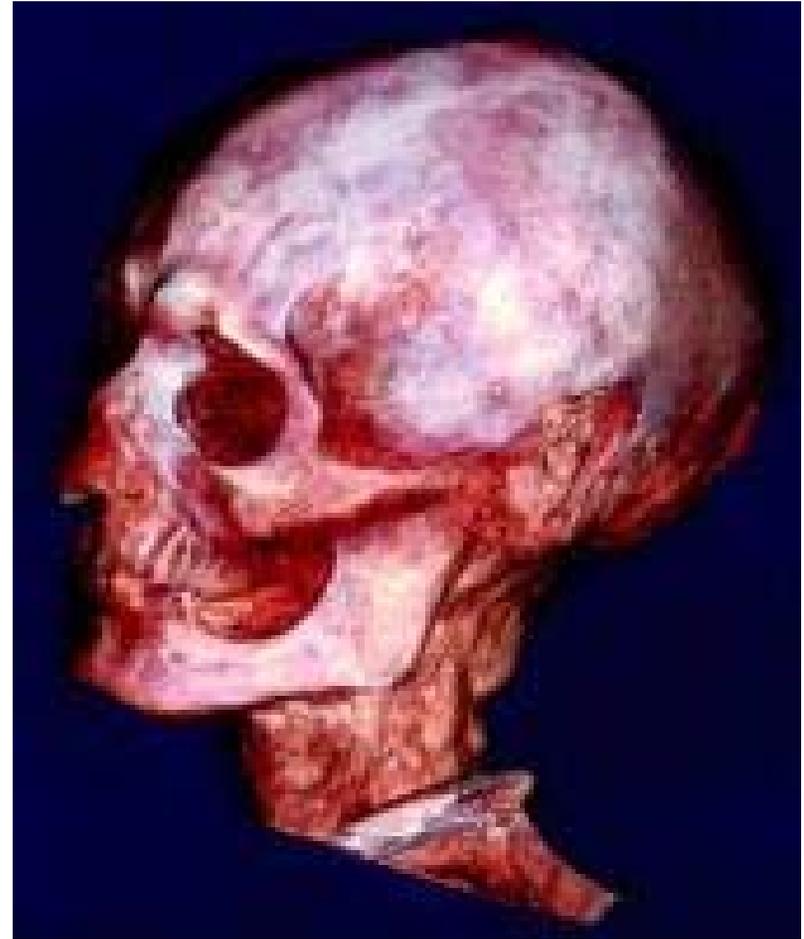
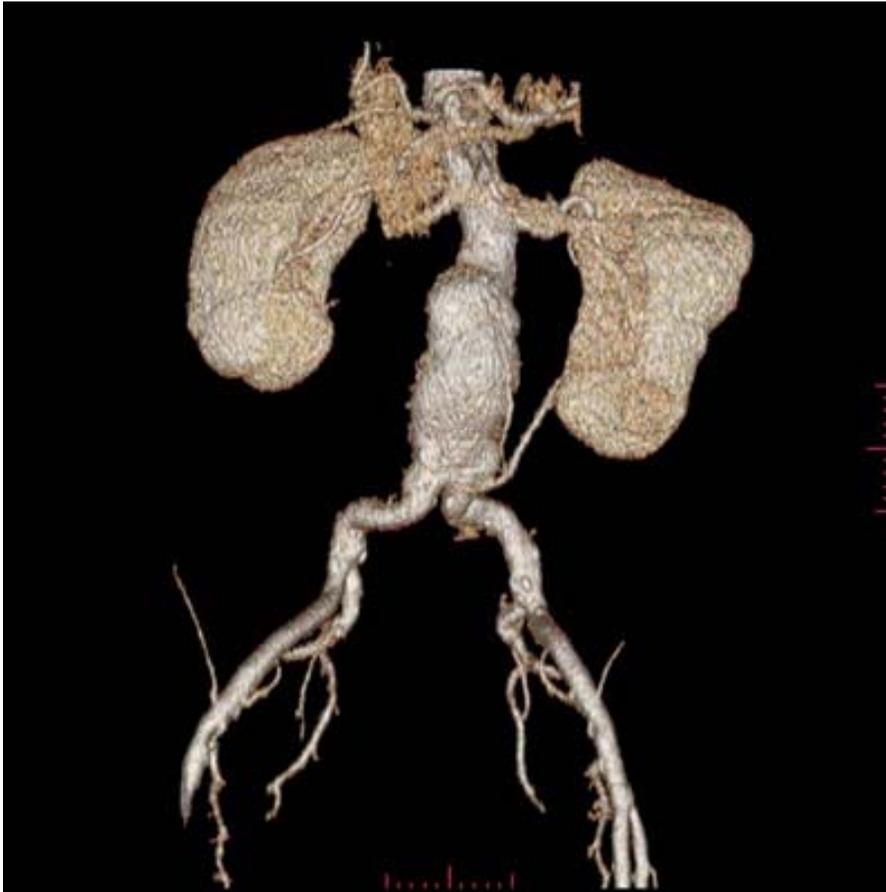
# Imaging



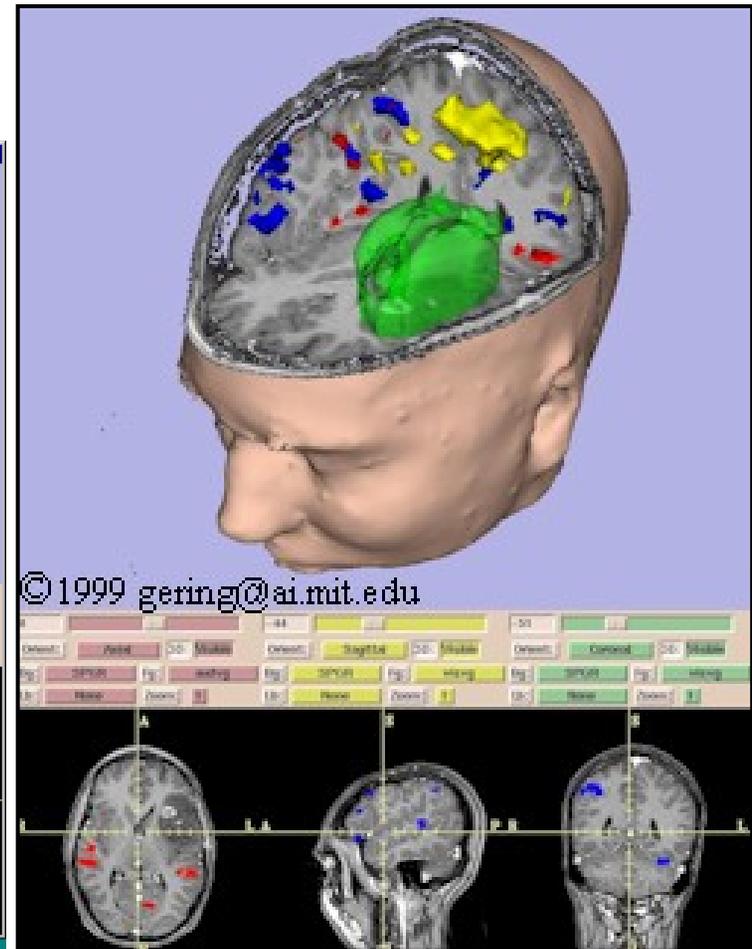
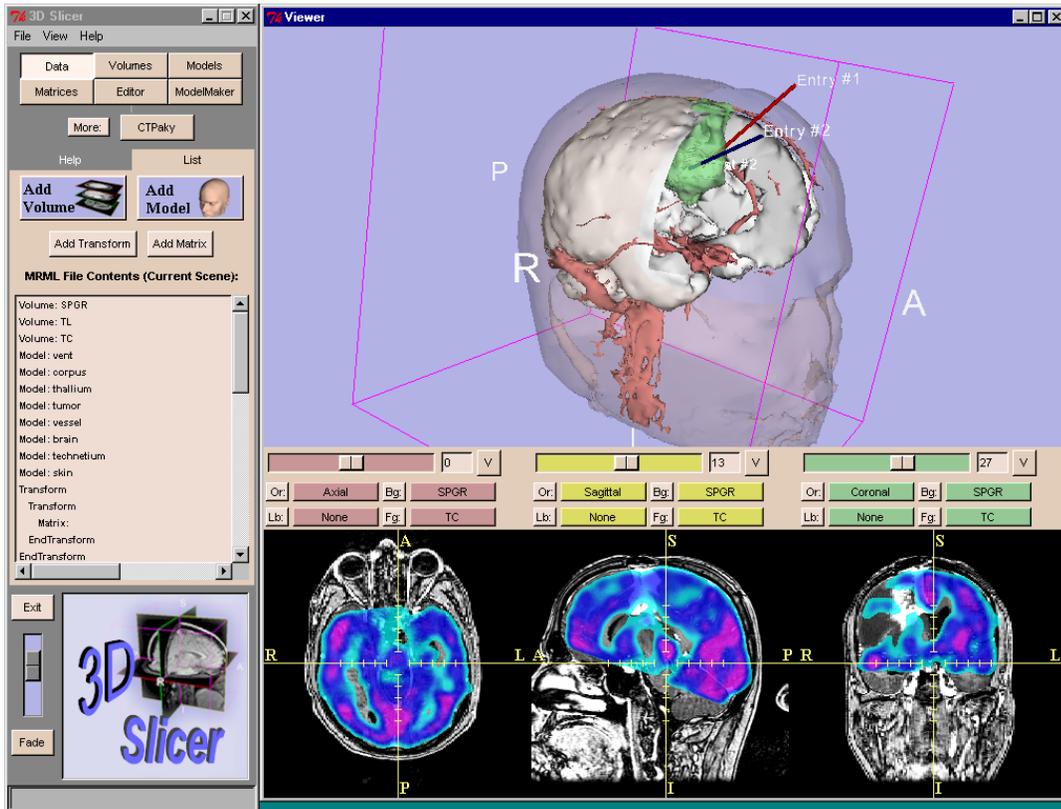
# Segmentation



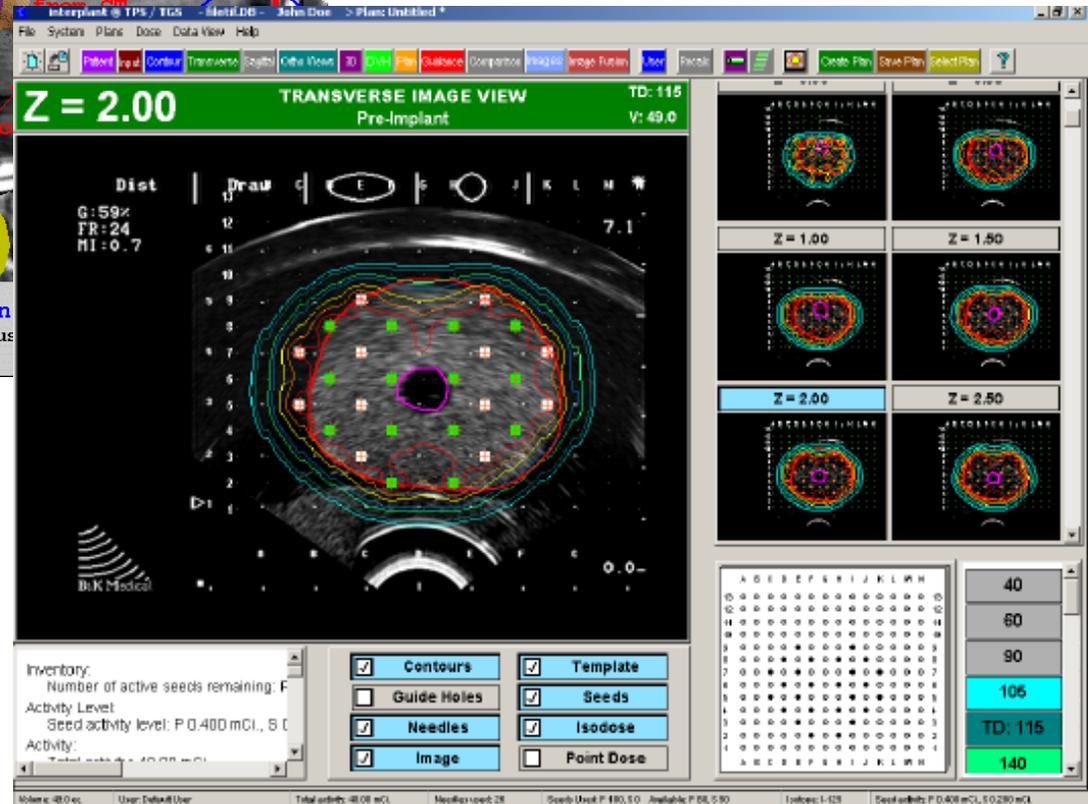
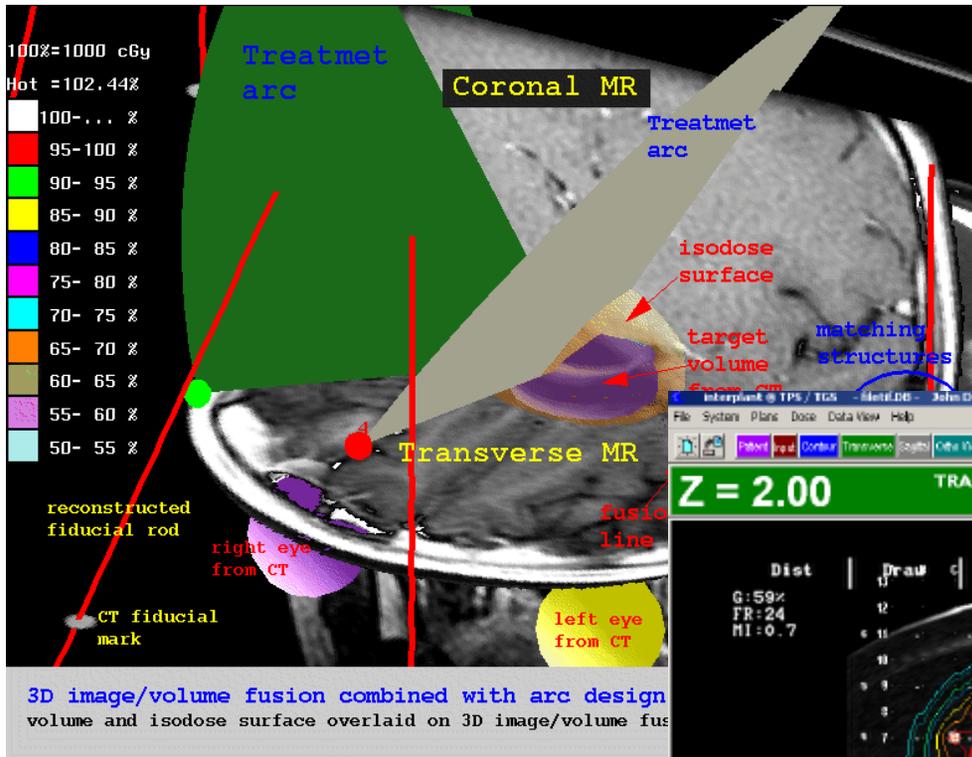
# Reconstruction



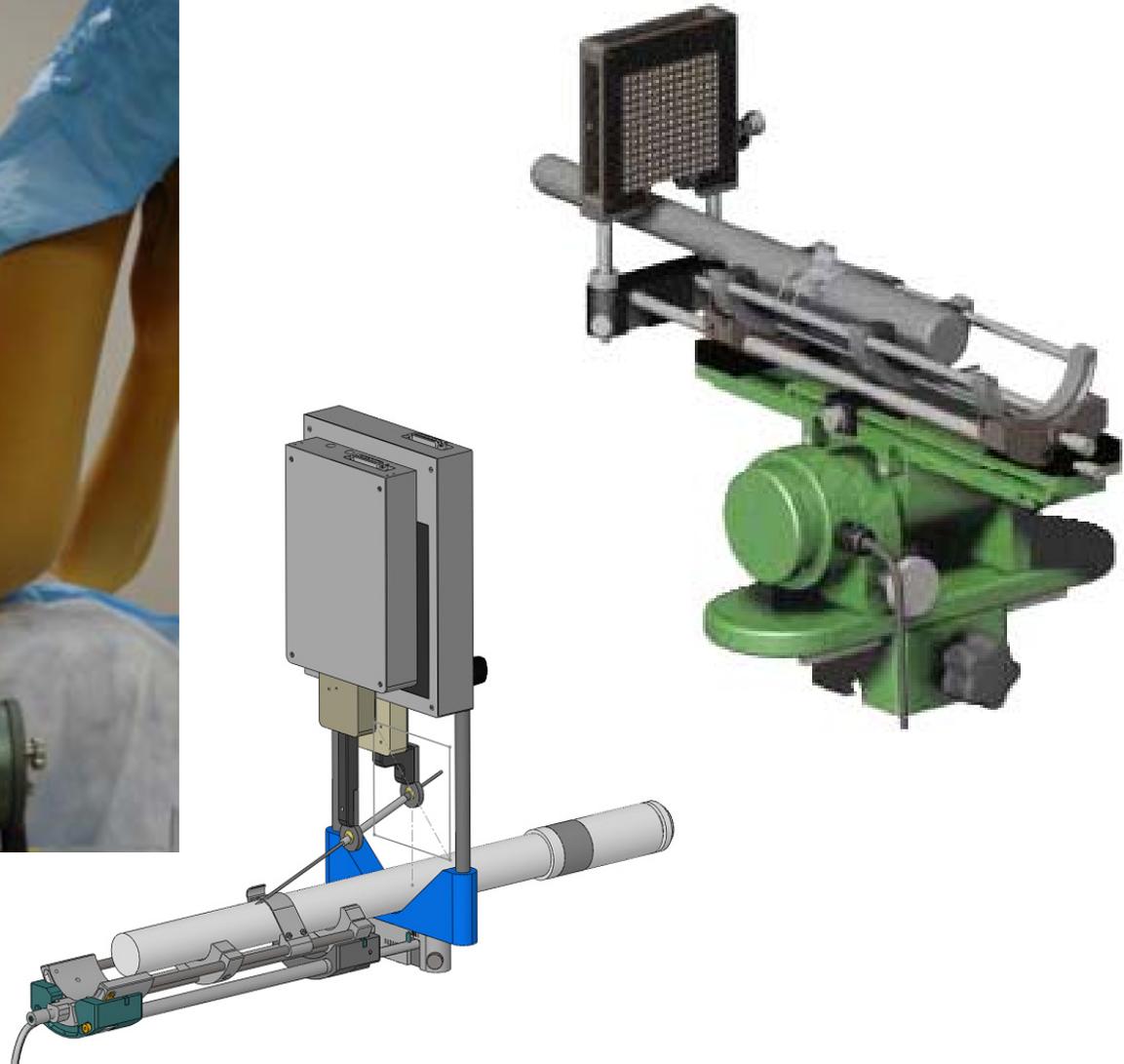
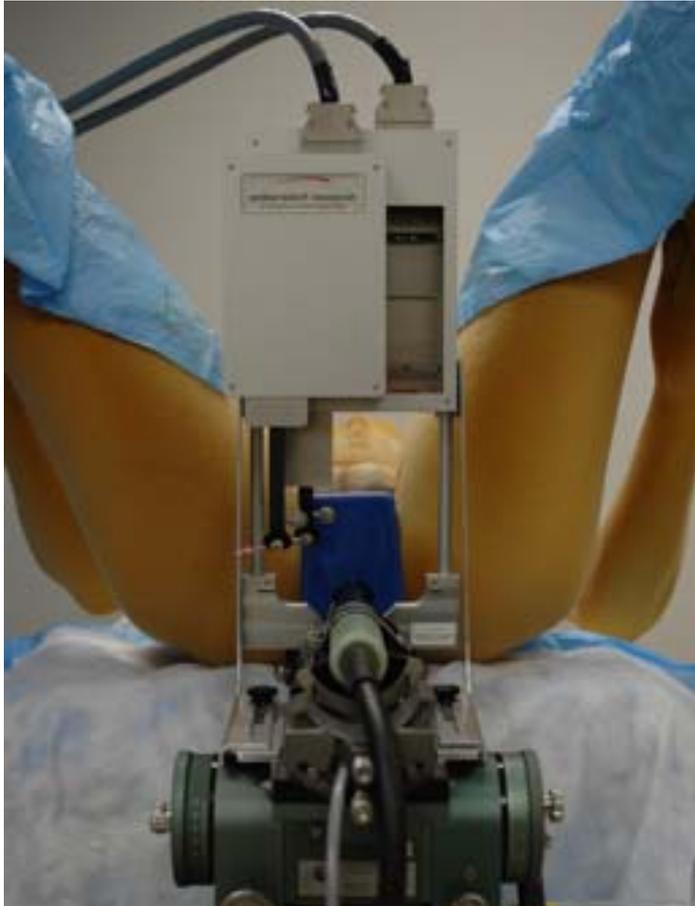
# Data fusion



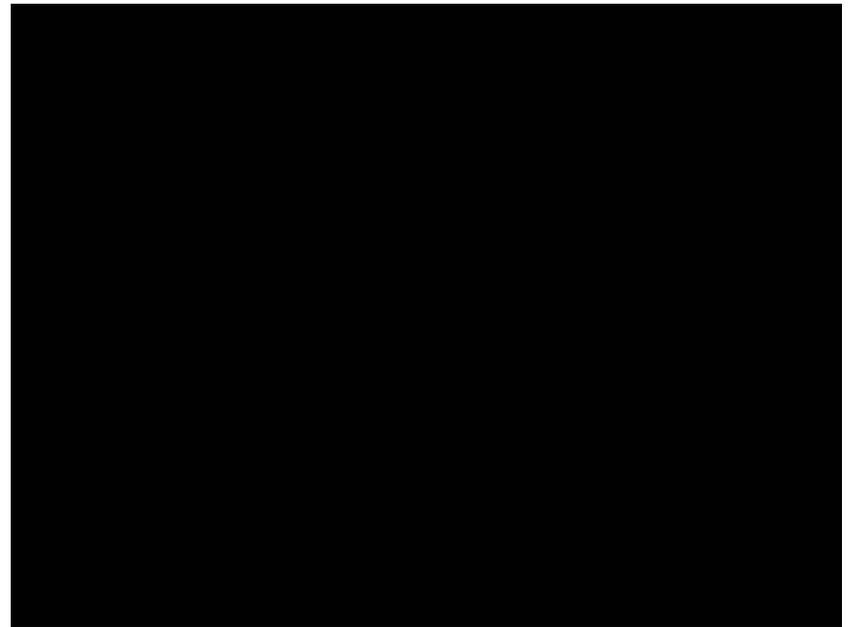
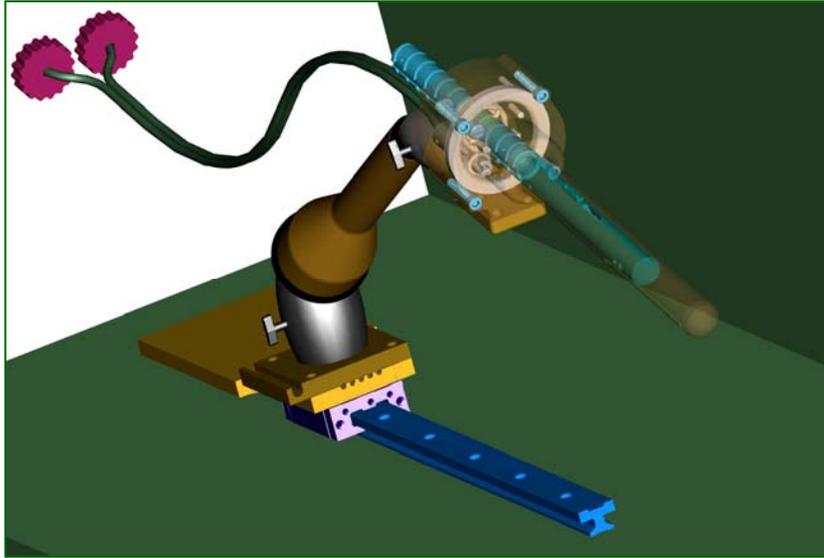
# Treatment planning



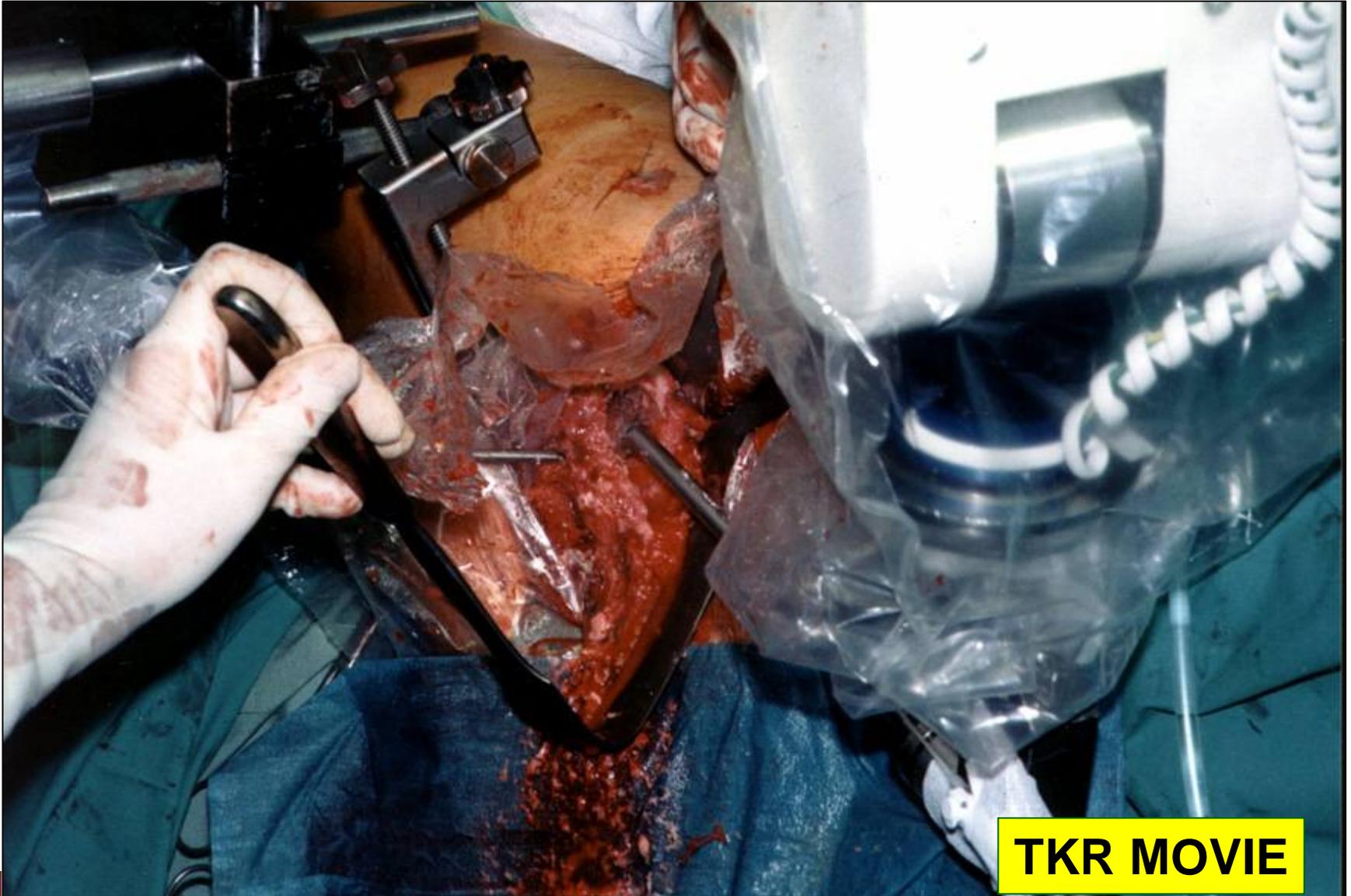
# Robots – for prostate cancer implants



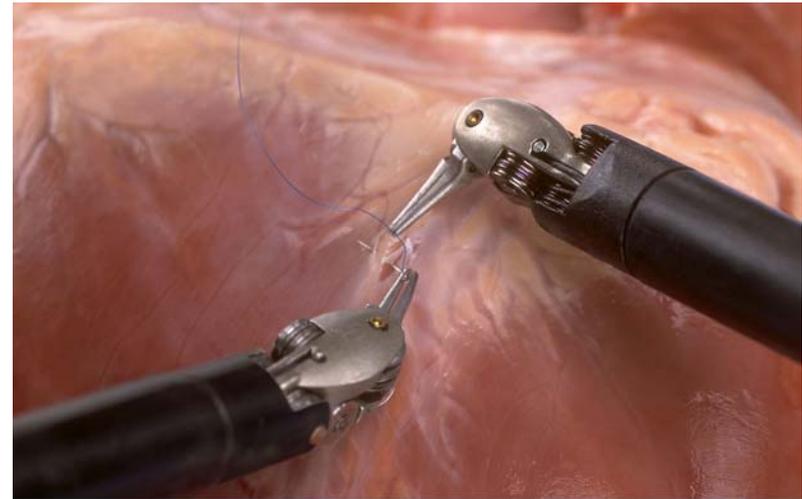
# Robots – for prostate cancer biopsy



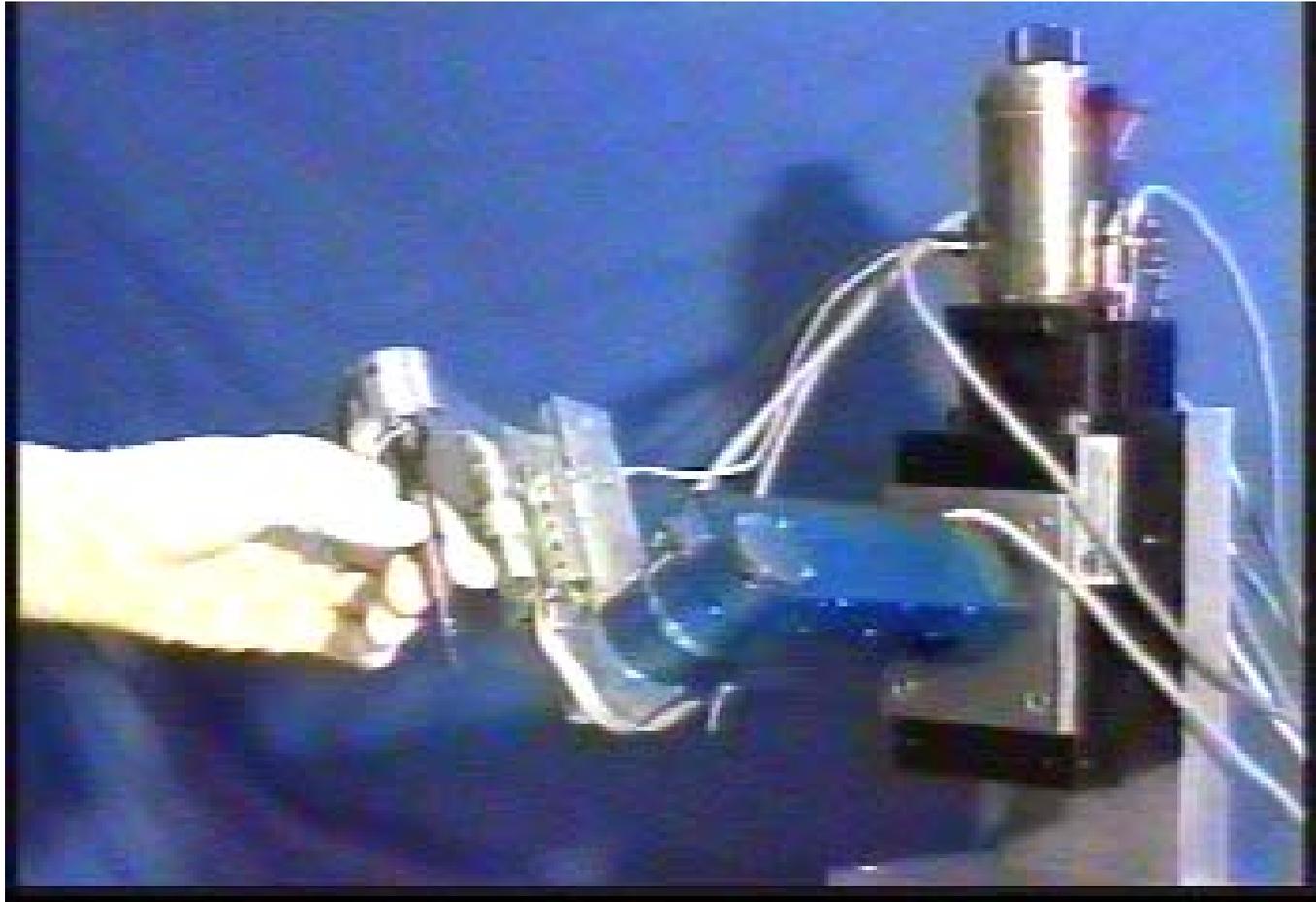
# Robots – for total hip/knee replacement



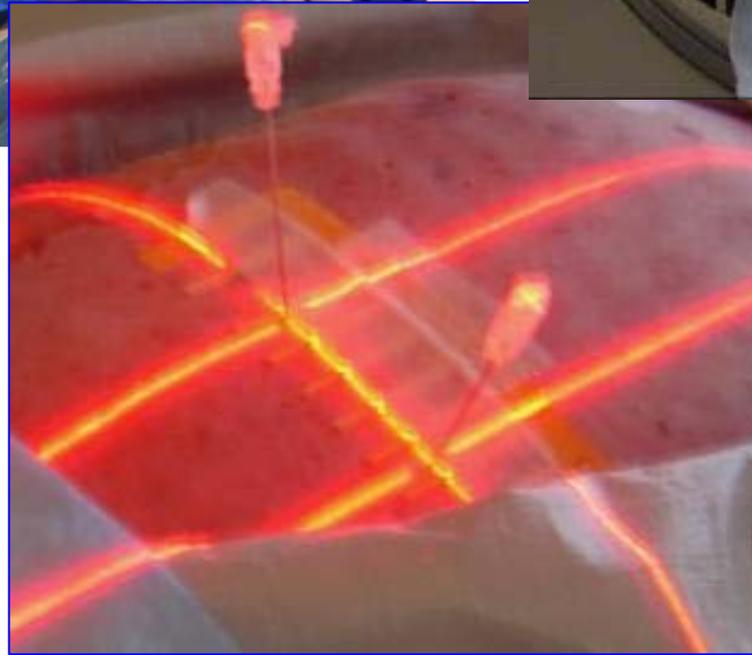
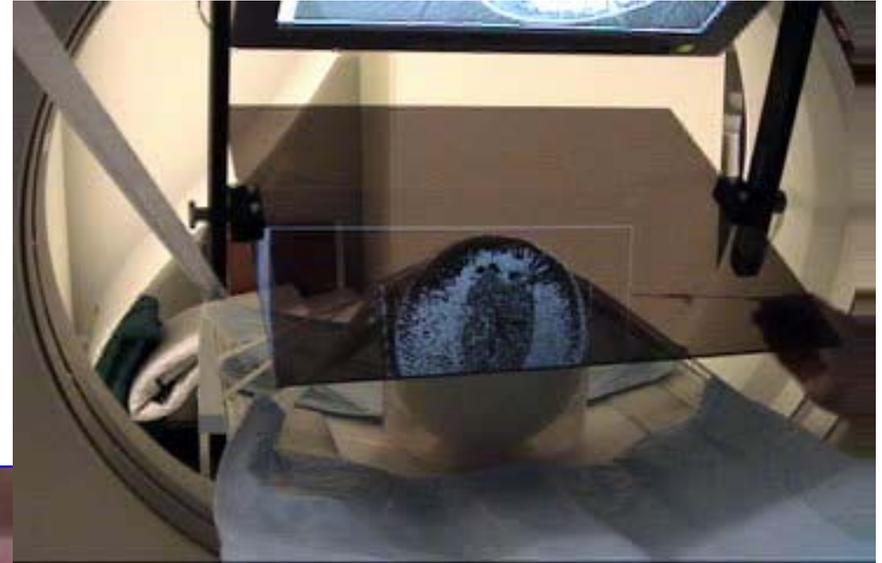
# Robot – for laparoscopic telesurgery



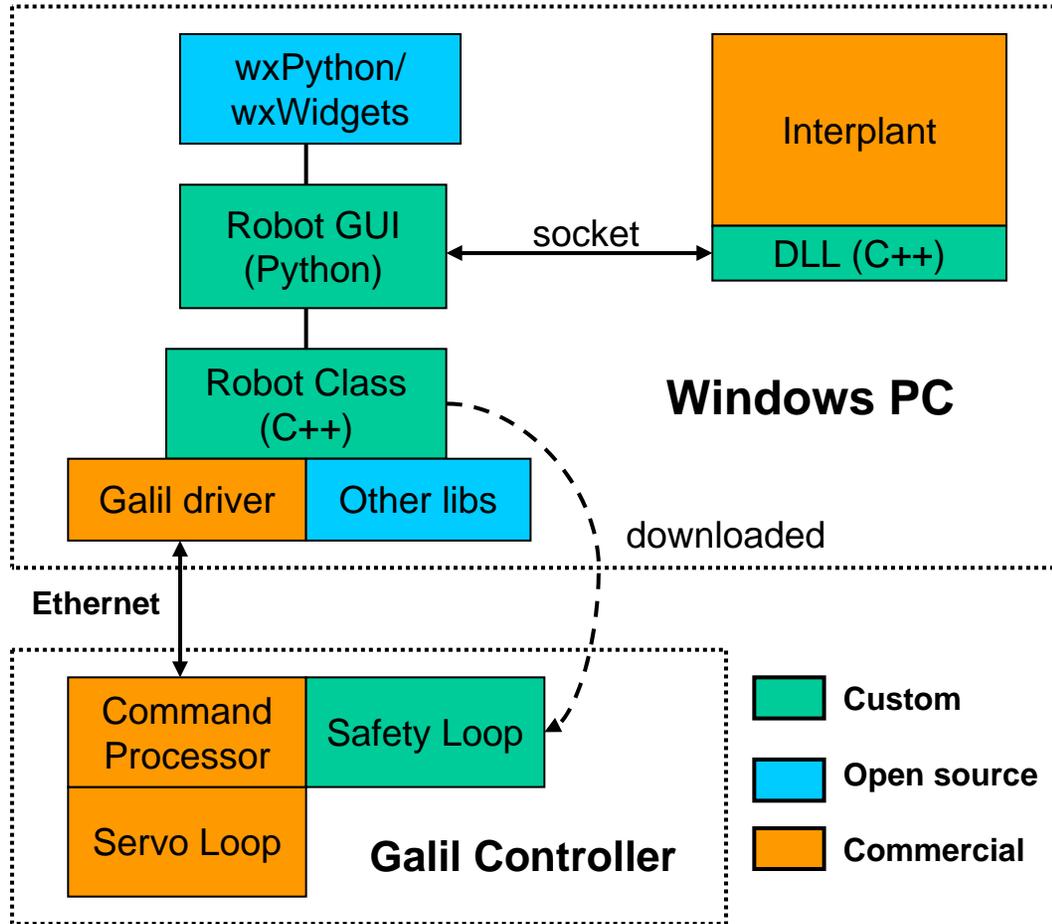
# Robot – Steady Hand microsurgery



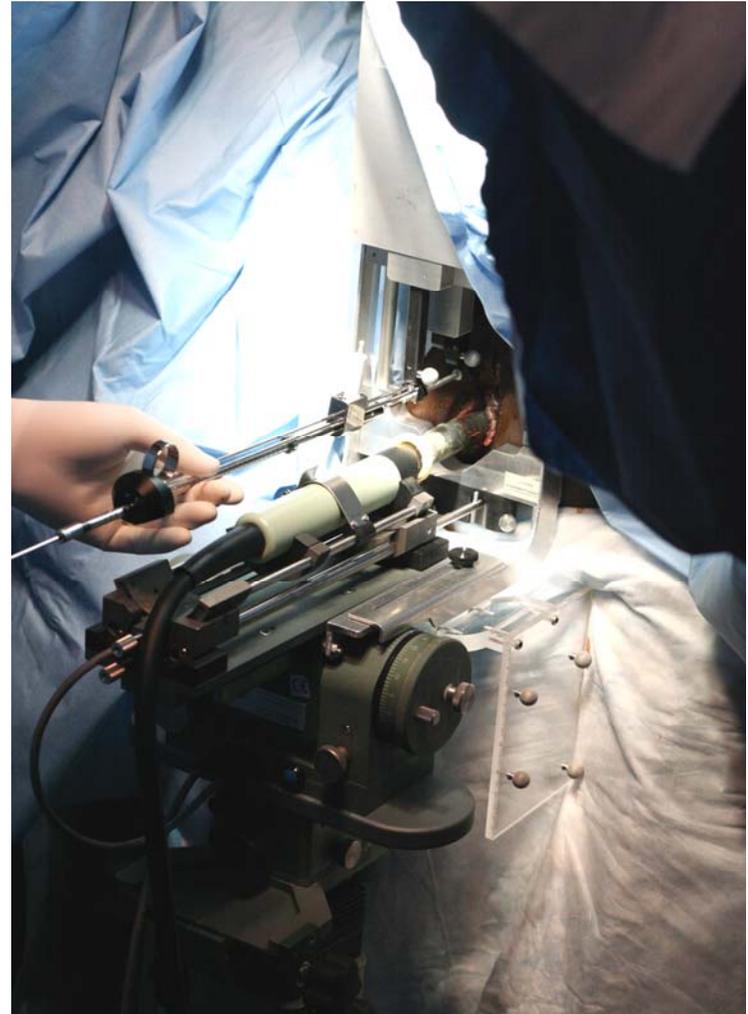
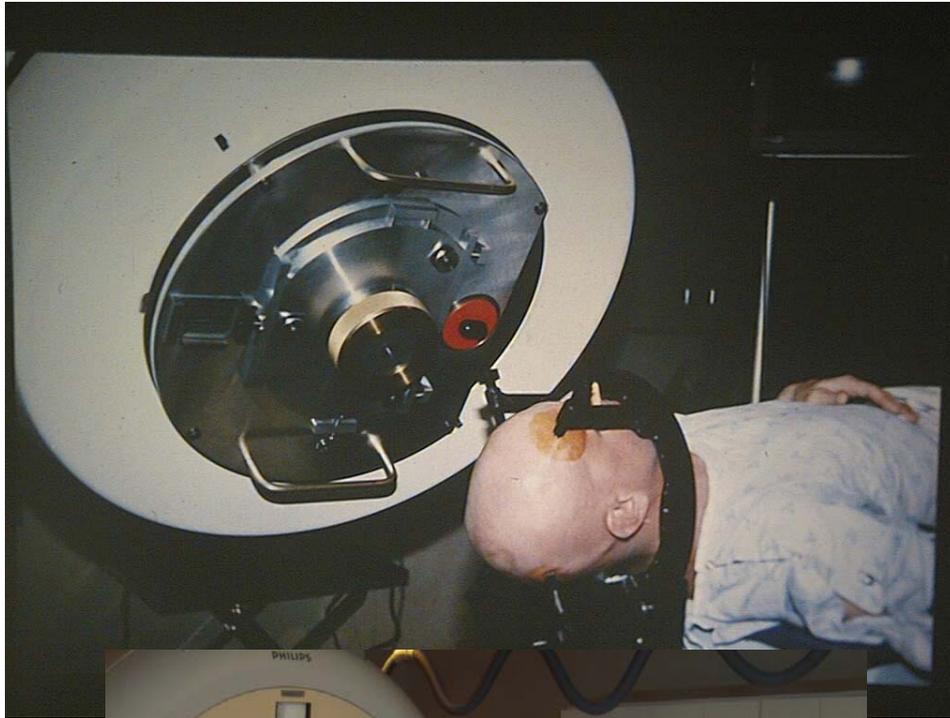
# Augmented reality



# System architecture



# Clinical applications



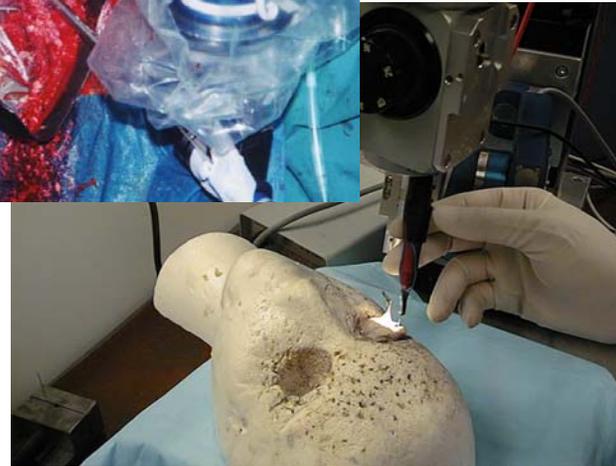
# How can we get there?

## Strong and committed teams

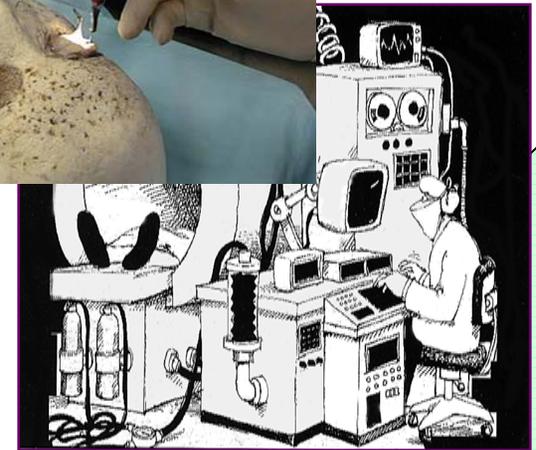
- Surgeons
- Engineers
- Industry



## Focus on systems that address important needs



## Rapid iteration with measurable goals



## Have fun!

# The real bottom line: patient care

- Provide new capabilities that **transcend human limitations** in surgery
- Increase **consistency and quality** of surgical treatments
- Promote **better outcomes** and more **cost-effective** processes in surgical practice



# Thank you !



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