

Navigational guidance systems for interventions & tumor ablations: How will automation affect the performance of image-guided interventional procedures?

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Disclosures



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Why Automate?

The Promise of Navigational Guidance Tools

New Tools in Loco-Regional Treatments: State of Art and Future Directions – Review

Robotics in Interventional Radiology: Review of Current and Future Applications

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Automation has a high bar to cross Can Automation Surpass The Gold Standard?

Level #1 Augment Skills of the Interventional Radiologist

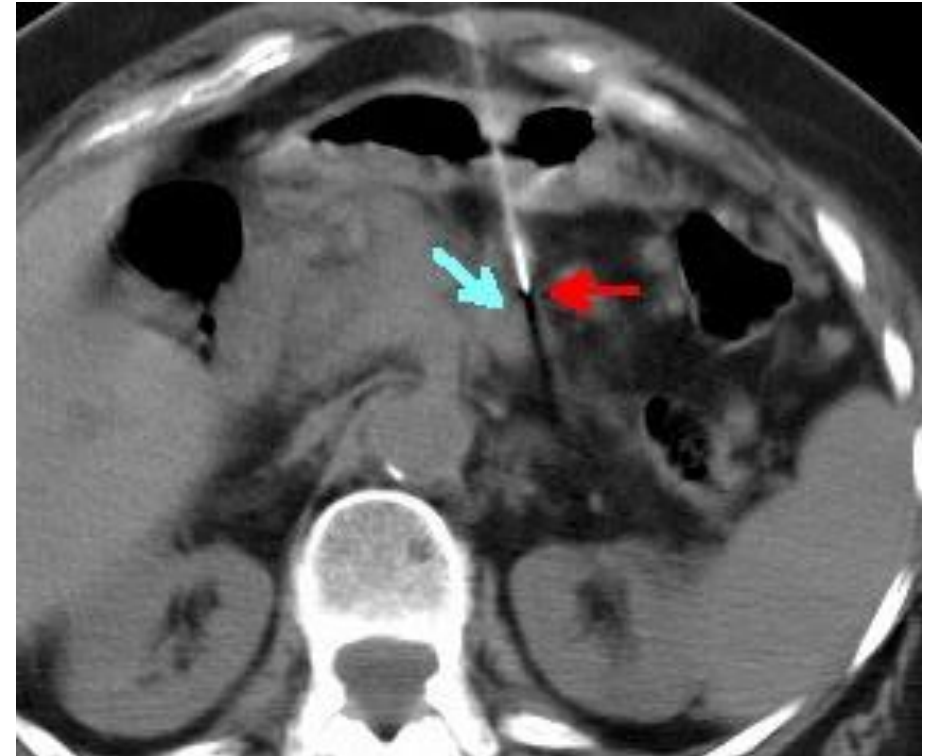
Level #2 Do procedures that can not otherwise be done

Francisco Santiago, MD

Understand Challenges of CT-Guided Biopsy

Procedural Steps for CT Biopsy

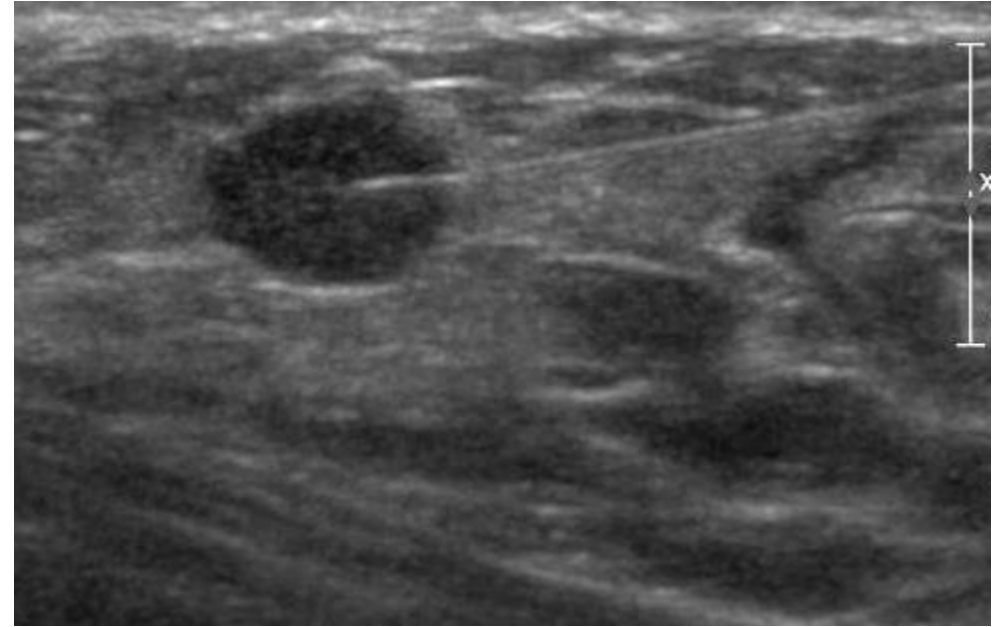
- Identify target
- Place guiding grid
- Identify entrance site
- Choose trajectory to lesion avoiding critical structures
 - **Medial/lateral angulation**
 - **Cranial/caudal angulation**
- Measure depth to target
- **Account for breathing motion**
- **Account for patient motion.**



Understand Challenges of Ultrasound Biopsies

Procedural Steps for Conventional Ultrasound Guided Biopsies

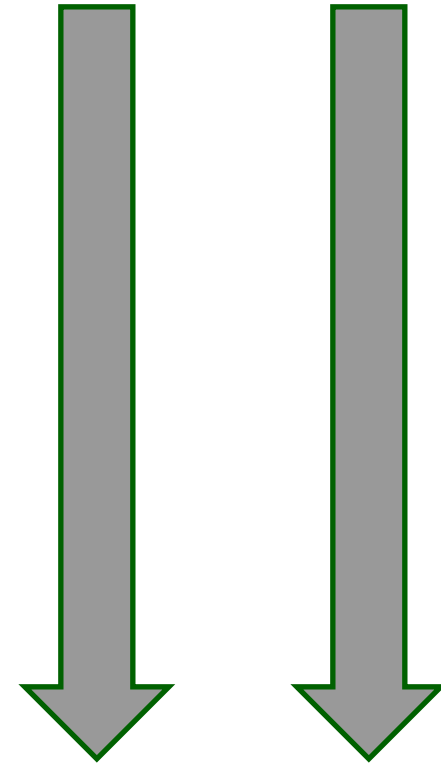
- Identify target - Is the lesion visible on ultrasound?
- Choose entrance site
- Operator skill to line up lesion with needle trajectory on same ultrasound plane
- Adjust for breathing motion
- Adjust for patient motion



Building Blocks Evolving Towards Automation

- Trajectory Guidance
- Needle Tracking
- Body GPS
- Image Fusion
- Ablation Volume Planning

Evolution Complexity



Trajectory Guidance



Image courtesy Willet F. Whitmore III MD FACS, CIVCO Medical Solutions



Photograph courtesy of Perfint Healthcare Pvt Ltd. Not available for sale in the US (CE certified)



Image courtesy of ActiViews



<https://xacrobotics.com/>

Image Fusion

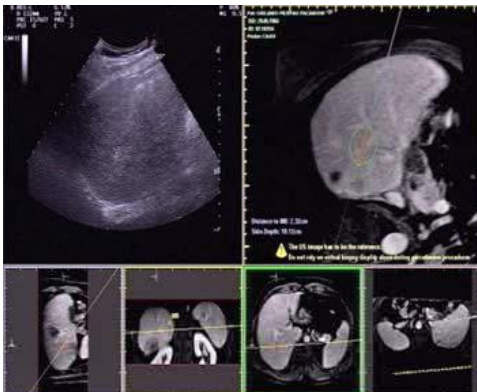


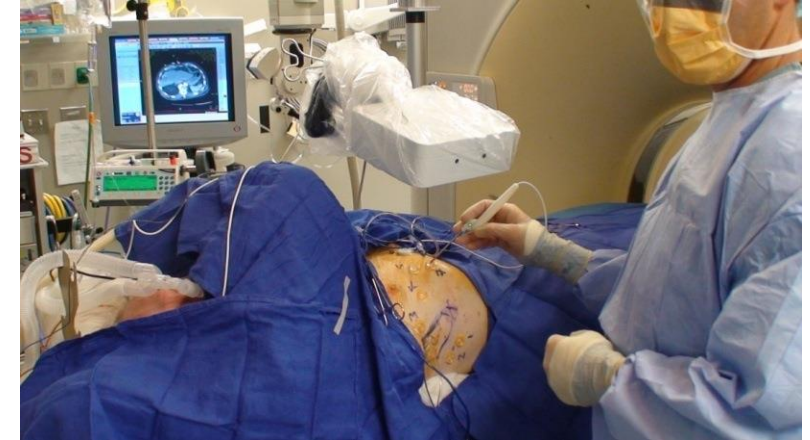
Image courtesy of Luigi Solbiati, MD

Needle Tracking



Image courtesy of Philips Healthcare

Body GPS



Images courtesy of Traxtal/Philips Healthcare

Ablation Volume Planning

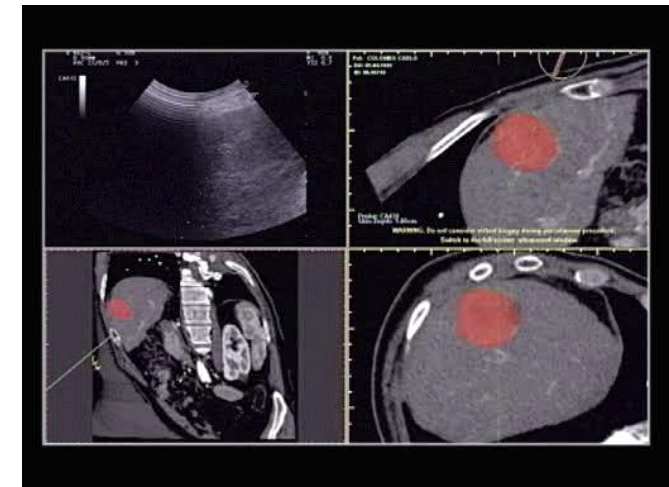
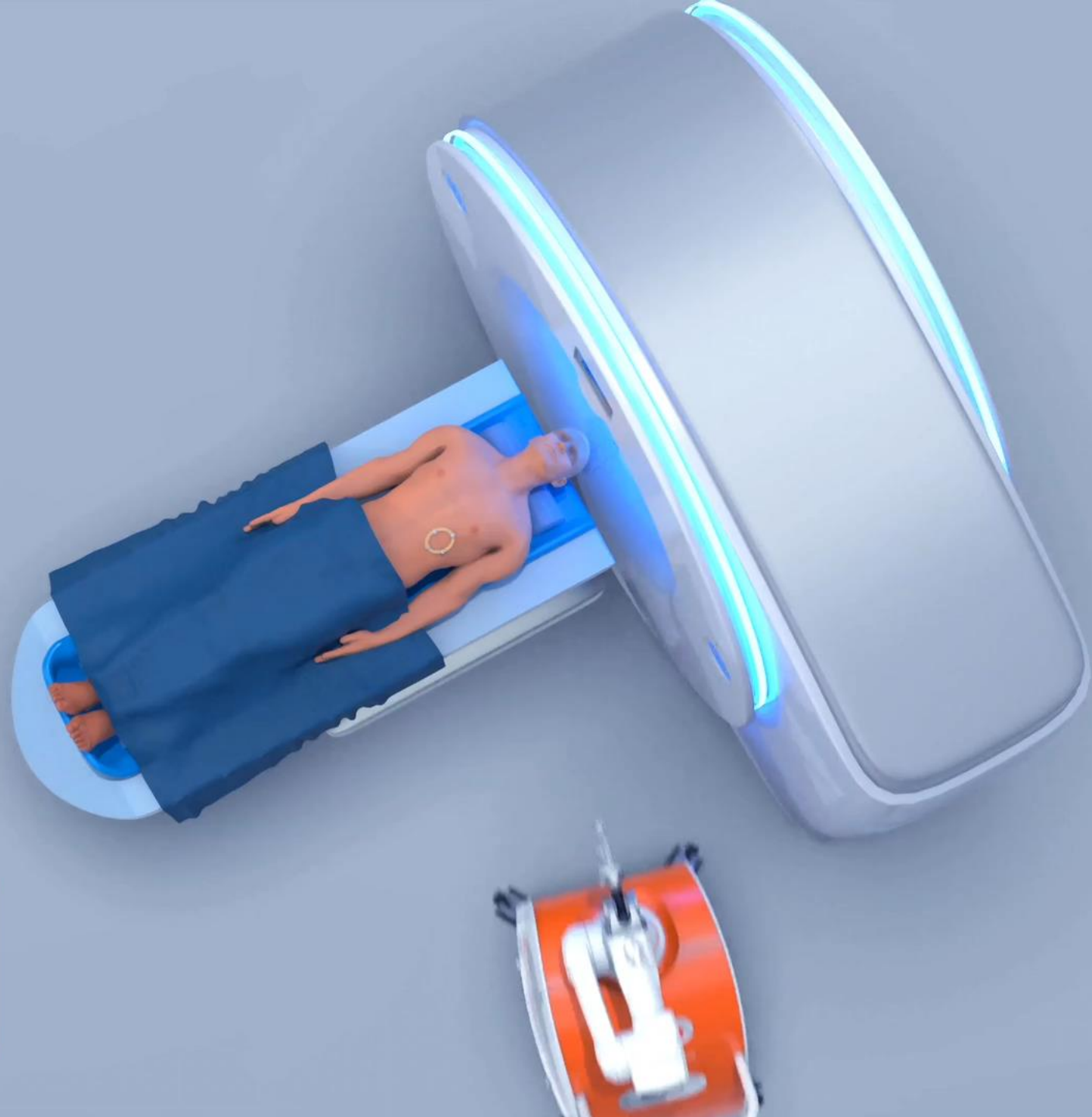


Image courtesy of Luigi Solbiati, MD

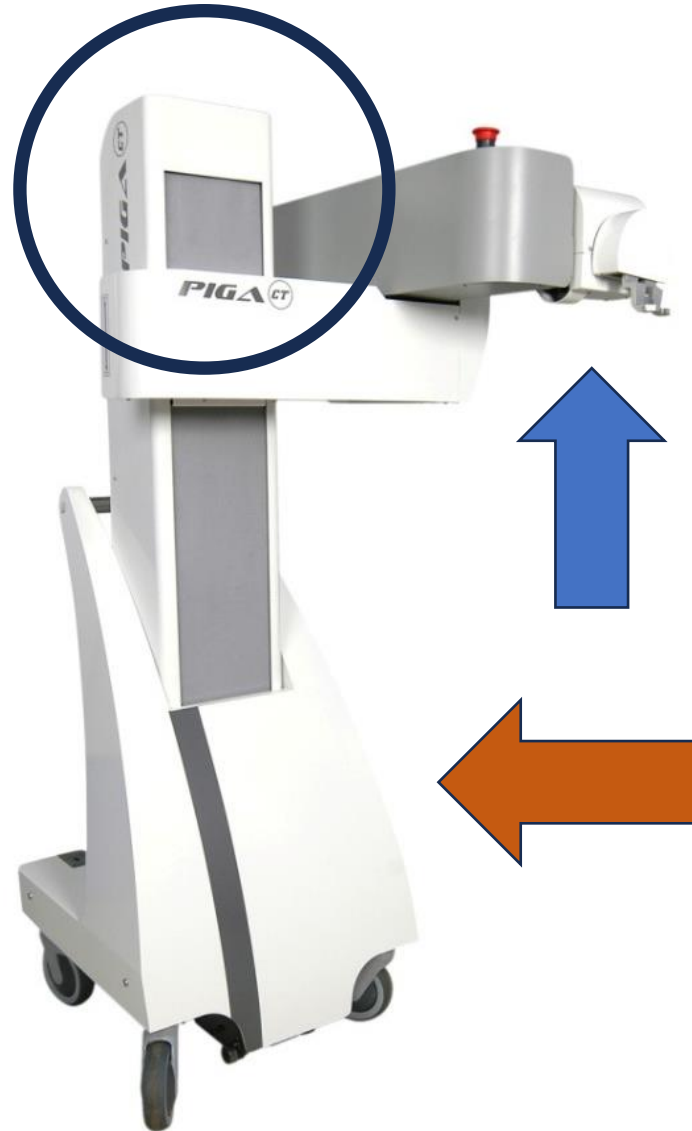


**A MOBILE
ROBOTIC SYSTEM**

Limitations of Navigational Guidance Systems

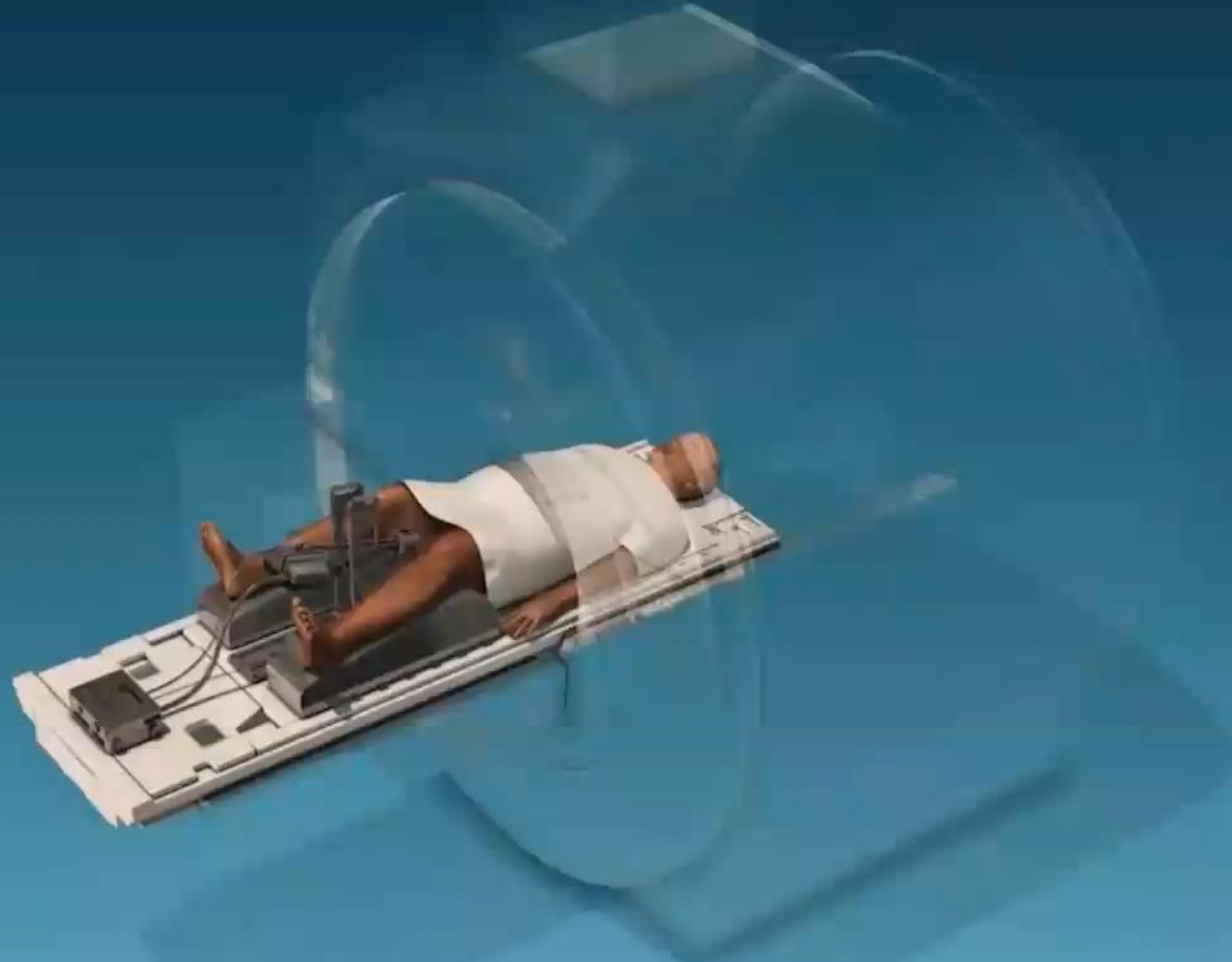
- Set up time
- Breathing motion
- Learning curve/ User Interface
- Interface with legacy equipment/ IT
- Physical space
- Costs – No CPT planning codes

Failure of Imagination?



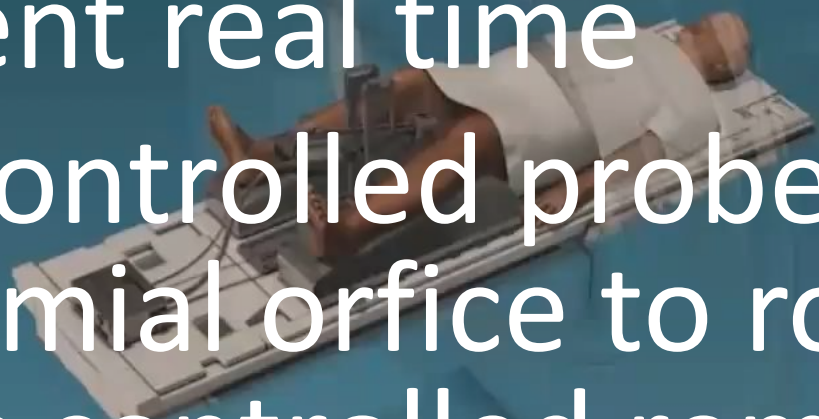
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Use of automation in new ways



Do procedures that can not otherwise be done

Developed in the Modern era

- MR for imaging guidance
 - Fusion with thermometry to monitor treatment real time
 - Robot controlled probe that uses endo-luminal orifice to rotate at set rate which is controlled remotely by operator.
- 
- A photograph of a medical robot arm, likely a Mako robot, holding a patient's leg. The robot is white and has a gripper mechanism. In the foreground, there is a control panel with various buttons and a joystick. The background is a light blue wall.

IS3R To Do List for Automation

- Get CPT codes for IR planning

Thank You

- Integrate into existing legacy equipment
- Explore application of AI? Needle tracking
- Be imaginative!

TO PROVE YOU'RE A HUMAN,
CLICK ON ALL THE PHOTOS
THAT SHOW PLACES YOU
WOULD RUN FOR SHELTER
DURING A ROBOT UPRISING.



DON'T FALL FOR IT! See More

