

# Robotic Assistance for Interventional Radiology

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Robotics in the 21st Century: New  
Frontiers

Panel: Medical Robotics – Born in space  
17/02/2015, Budapest

- + **Development of new technology approaches for „Minimally Invasive Procedures“ and modern therapies in an integrative way**
- + **Research and innovation center for collaborative and translational research between science and industry**
- + **Key data:**
  - 1st funding period (2010-2014): overall budget of 18MEUR
  - 2nd funding period (2014-2017): overall budget 13MEUR
  - International network:
    - 25 industry partners
    - 27 research partners (technical + clinical)
  - Match funding

- **Surgical Robotics** ⇔ **Medical Robotics?**
  - Laparoscopy (daVinci, Surgenius, TeleLap ALF-X, Raven)



- Strong and increasing presence in the commercial and academic arenas
- Established research groups and strong companies

## ■ Surgical Robotics

- Laparoscopy (daVinci, RAVEN), Orthopedics (MAKO, SpineAssist)
- Strong and increasing presence in the commercial and academic arenas
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## ■ Interventional Robotics

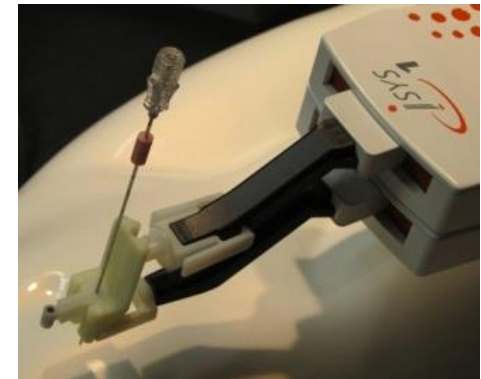
- Active academic interest; variable commercial experience
- Still to make a breakthrough



Innomedic

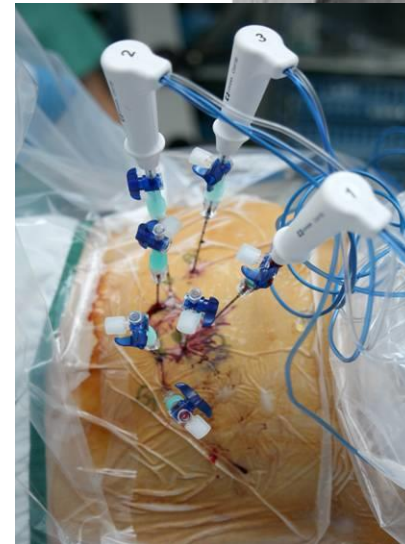


Perfint



iSYS Medizintechnik

- + **Access the site of treatment percutaneously, with the use of tubular, flexible devices (needle, ablation probe, etc.) under control by intra-operative imaging**
  - Ultrasound
  - CBCT, CT (volumetric, fluoro mode)
  - MRT
- + **Wide range of applications**
  - Biopsy
  - Brachytherapy
  - Cryotherapy
  - Injection of agents
  - Tumor ablation



## + **Some difficulties ...**

- Exact planning to avoid critical structures
- Requires mental registration of the patient's anatomy to the image during targeting
- Precise hand-eye coordination
- Stable positioning during insertion while penetrating tissues with heterogeneous stiffness
- Physician exposed to radiation

## + **... and how robots could help**

- “Third hand” during intervention
- Exact tool positioning in 3D space
- Keeping hands out of beam
- Stable positioning over time



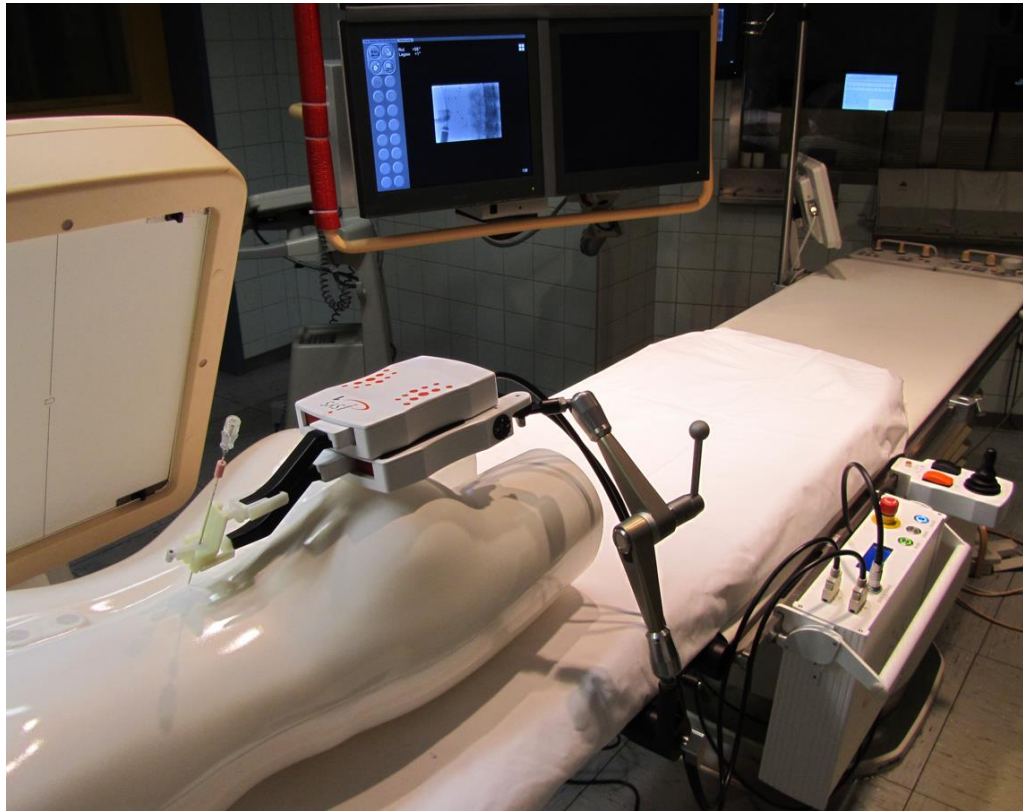
# InnoMotion: Innomedic



# ROXIO: Perfint







# Requirements for an Interventional Robot System

- + **Registration robot and image**
  - Coordinate transformation between imaging system ↔ Robot ↔ Tool
- + **Planning system / Monitoring**
  - Tool tracking
- + **Robot**
  - Compatible to imaging modality (US, CBCT, CT, MRT)
  - Integration to imaging device
  - Compact
  - High degree of dexterity
  - Precision
  - Working in sterile field
- + **Patient/target movement**
  - Immobilisation
  - Monitoring
  - Stable guidance of tool vs free angulation?

## Potential

### + Advantages:

- Robot serving as a “third hand” during intervention
- Improved visualisation and planning of the needle trajectory in order to avoid critical structures
- Improved accuracy and consistent results of needle placement
- Optimal support for complex (double-)oblique access routes
- Shortening of interventional procedure
- Reduced radiation dose for radiologist and patient
- Improved safety and lower risk of complications

Source: SIP Lab



**Thank you!**

**ACMIT**

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