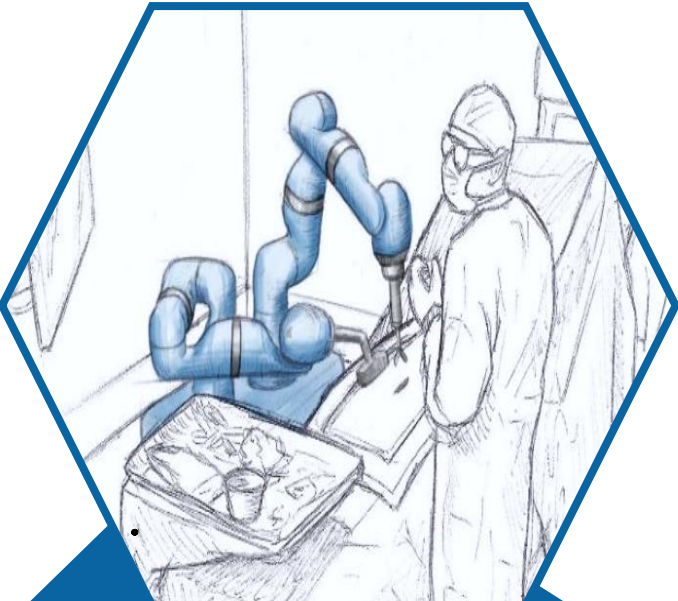


FAROS



Illustrator: Thibault Chandanson (SpineGuard)



Concept

FAROS - **Functionally Accurate Robotic Surgery** aims at improving functional accuracy through embedding physical intelligence in surgical robotics

Smart Instrumentation for embedding physical intelligence

- Modular robotic platform
- Smart instruments
- Multi-scale sensing



Microphone



Pliers



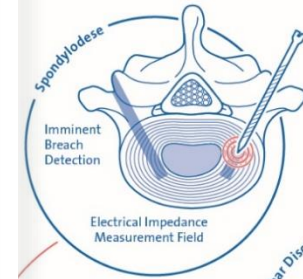
Ultrasound



Drill

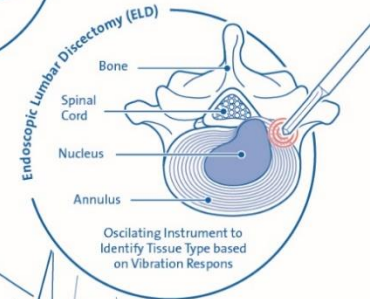
Real-time Autonomous robotic task execution

- Intervention plan
- Low-level control
- Active sensing
- Real-time decision making
- Autonomous execution



Online Sensor-based functional modeling

- Tissue classification
- Spine tracking
- Observational model
- Surgical action model
- Functional output metrics



Illustrator: University of Zurich, Information Technology, MELSI/VIC, Tara von Grebel.



Definition

Functional accuracy the degree to which the functional outcome of the surgery conforms to the expected value for a successful complication-free operation (functional objective).

Consortium

KU Leuven, Belgium
 Sorbonne University, France
 King's College London, United Kingdom
 University of Zurich, Switzerland

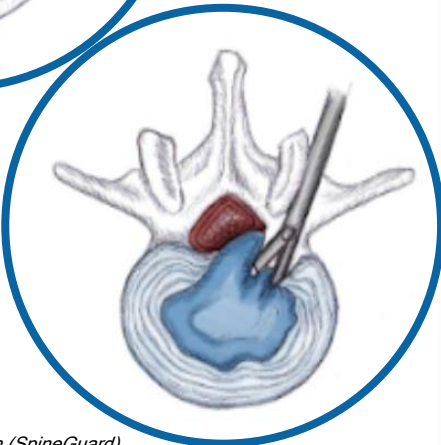


European Union's Horizon 2020 research and innovation programme under grant agreement No 101016985.



Pedicle screw placement (PSP)

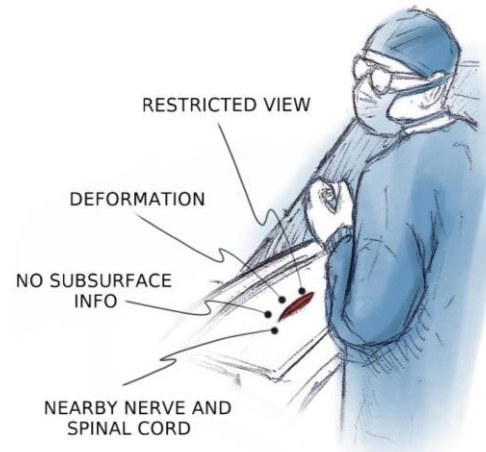
Endoscopic lumbar discectomy (ELD)



Illustrator: Thibault Chandanson (SpineGuard)

Challenges faced by conventional approaches:

- poor visual feedback
- radiation-based approaches
- dense anatomy, tight space
- large variability in tissue/bone
- large forces and deformations
- extreme accuracy needed
- nearby vital structures (nerves, vessels)
- critical parameters are poorly known



Illustrator: Thibault Chandanson (SpineGuard)

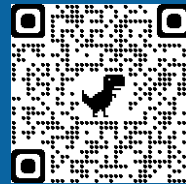
Core question: How to improve functional accuracy in the presence of uncertainty?



Core concept:

- exploit non-conventional, wide array of non-visual sensors integrated in a spine-surgical robotic system.
- understand/learn what matters for improving functional outcome: functional models link sensor data to outcome.
- embody physical intelligence in autonomous robotic systems to improve functional outcome in the presence of large amounts of uncertainty, variability and environmental changes.

The FAROS partners will deliver surgeon-like robotic autonomous behaviour through superhuman sensing and actuation coupled with fast adaptive control, thanks to various spectrum of non-visual sensing and physical intelligence.



European Union's Horizon 2020 research and innovation programme under grant agreement No 101016985.