



**A.R.A.K.N.E.S.**  
Array of Robots Augmenting the KiNematics  
of Endoluminal Surgery

# ARAKNES Project at a glance

- **Grant Agreement number:** 224565
- **Project acronym:** ARAKNES
- **Project title:** Array of Robots Augmenting the KiNematics of Endoluminal Surgery
- **Funding scheme:** Large-scale integrating project (IP), FP7-ICT-Challenge 3: Components, systems and engineering/Micro/nano systems
- **Project website address:** [www.araknes.org](http://www.araknes.org)
- **Start date of project:** 01/05/2008
- **Duration:** 48 Months
- **Total budget:** € 11.100.000,00
- **EU contribution:** € 8.100.000,00

## Consortium



**Coordinator**  
Scuola Superiore  
Sant'Anna (SSSA),  
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MicroTech S.r.l.  
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University of  
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Università di Pisa  
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University of St.  
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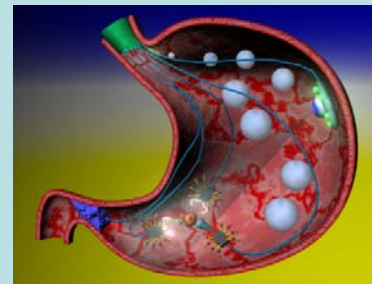
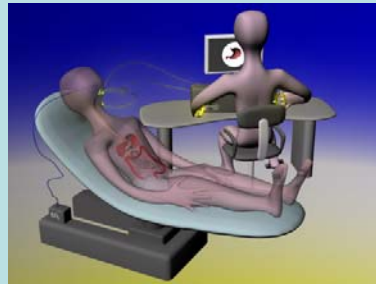
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Project presentation - July, 2008



# The ultimate goal

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



**Main intended interventions:**

**GERD (gastro-esophageal reflux disease), PREVALENCE 30%, in EU countries**

**MORBID OBESITY, PREVALENCE 20%, in EU countries**

# State of the art

## Market Competitors



DaVinci Surgical System  
Intuitive Surgical, Inc.  
USA



EndoWrist  
Instruments  
Intuitive Surgical, Inc.  
USA



Nebraska Surgical  
Solutions, Inc. USA

## Other Relevant Competitors

- Olympus Surgical
- Fujinon
- Boston Scientific
- Ethicon Endo-Surgery
- Covidien

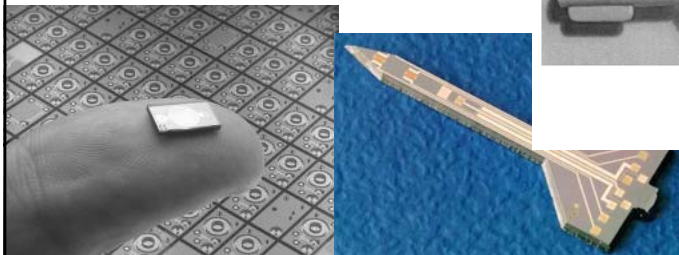


# Technical objectives

**ARAKNES** aims at bringing inside the patient's body cavities a set of advanced technologies for surgery, monitoring and therapy by approaching all constraints that arise when micro- and nano-bio-technologies are moved from on-bench applications to *in-vivo* surgical scenario.

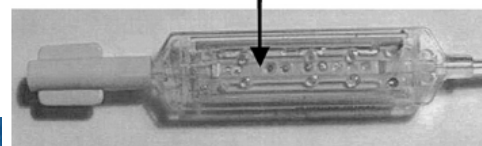
## MICRO/NANO/BIO AND INFO-TECHNOLOGIES

**micro-systems** for drug injection, tissue ablation, micrometric positioning and bio-magnetic therapy



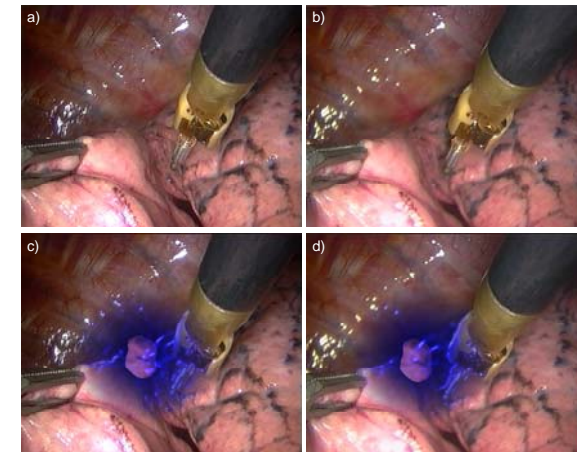
**bio-sensors** for surgical procedure monitoring

Central channel with sensor array



ca. 3.5 cm

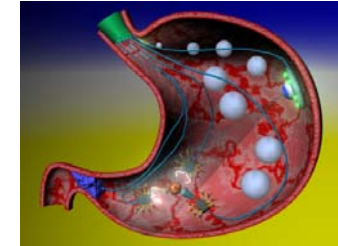
**information technology**, computer vision, human machine interfacing and augmented reality





# Main components of the ARAKNES system

- up to 4 smart microrobots: 2 assisting (retracting) and 2 operating
- 1 panoramic camera (in the esophageal insertion port)
- 1 operative site camera



Characteristic	ARAKNES	Da Vinci surgical Robot
Dexterity	7 DOF (3 mobility and 4 dexterity)	7 DOF–90 ° of articulation
Downscaling	Not applicable	3: 1-10: 1
Robotic arms	Integrated in the microrobots	Fixed to cart via trocars
Positional changes	3 DOF internal locomotion	Requires stop of robotic system and disconnection of instruments
Instruments	Highly sensorised with force feedback	Very bulky
Accuracy	Less than 2 mm	1.02 mm
Back drivability	Restricted to the robotic arm	High
Vision	Panoramic and operative site camera	3D
Pulling force	Up to 1 N (to be published)	More than 30 N
Kinematics ranges	Roll and yaw motion : $\pm 90^\circ$ - Gripper opening: $150^\circ$	Roll and yaw motion : $\pm 90^\circ$ - Gripper opening: $150^\circ$



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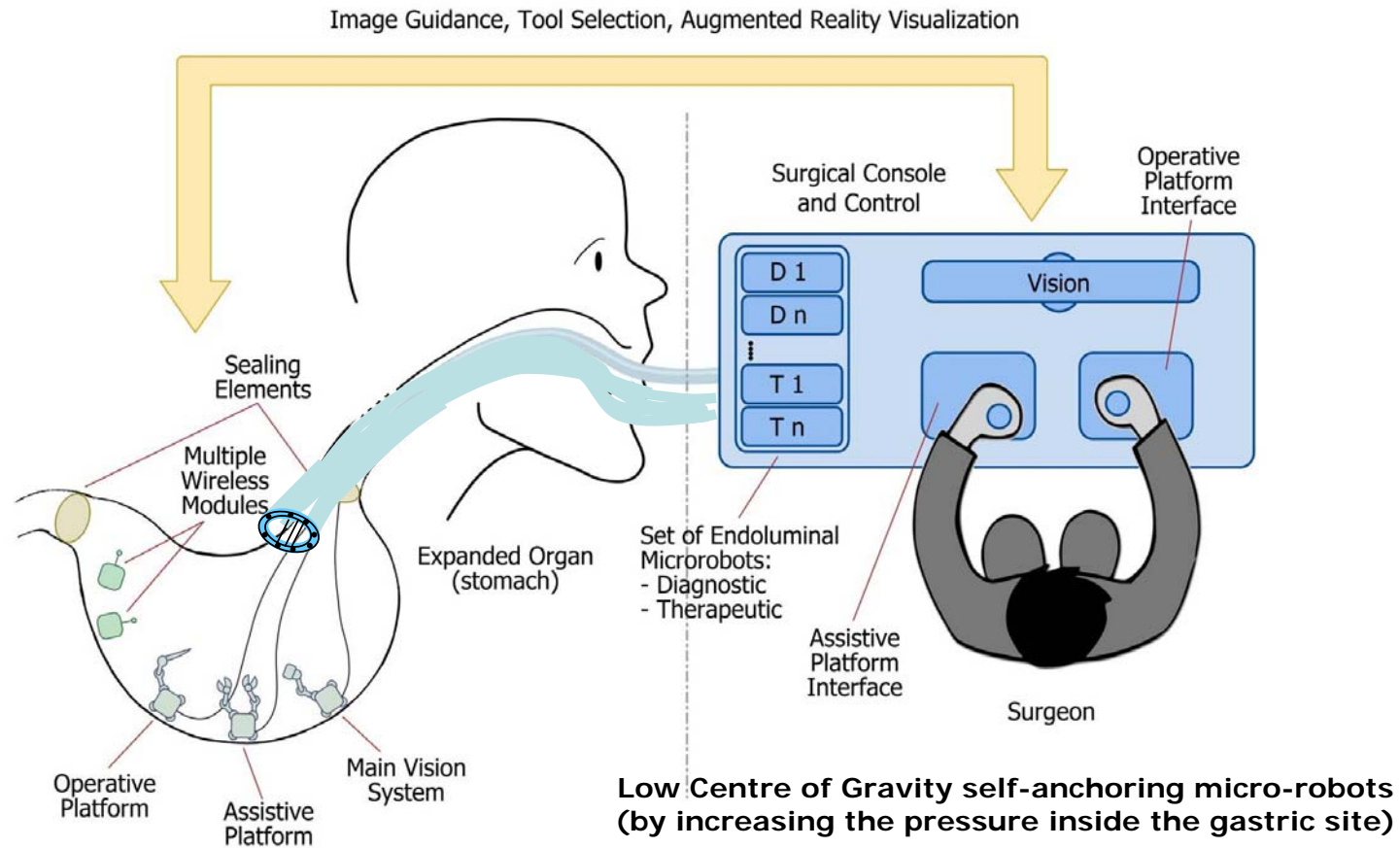
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# Hardware and Machine interface



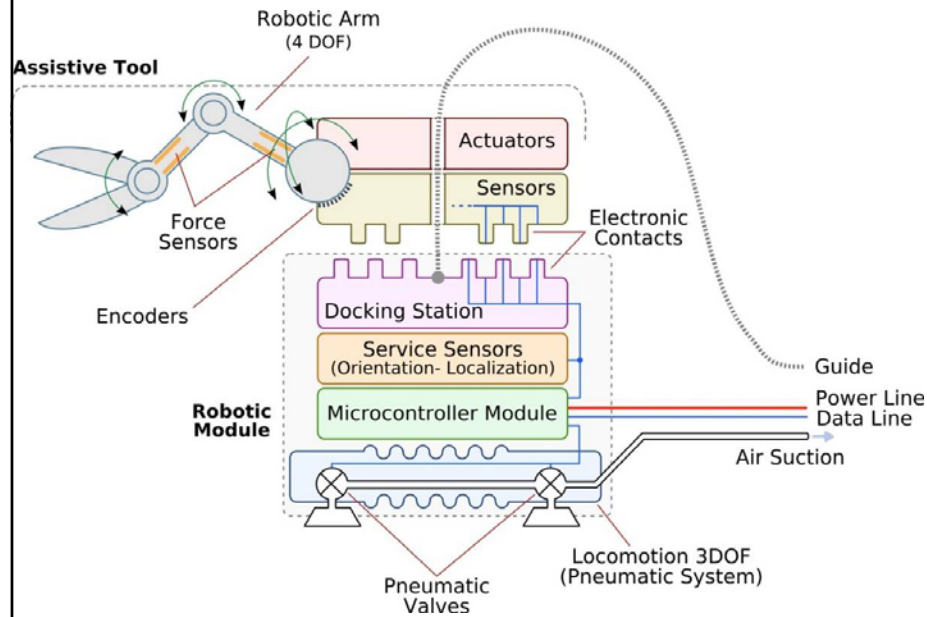
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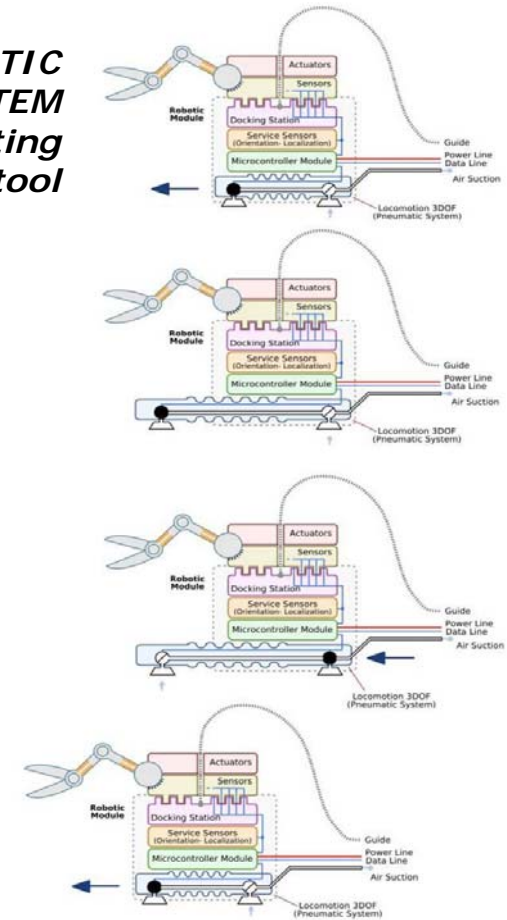


# Endoluminal Robotic Modules with locomotion ability

## ✓ ASSISTIVE TOOL

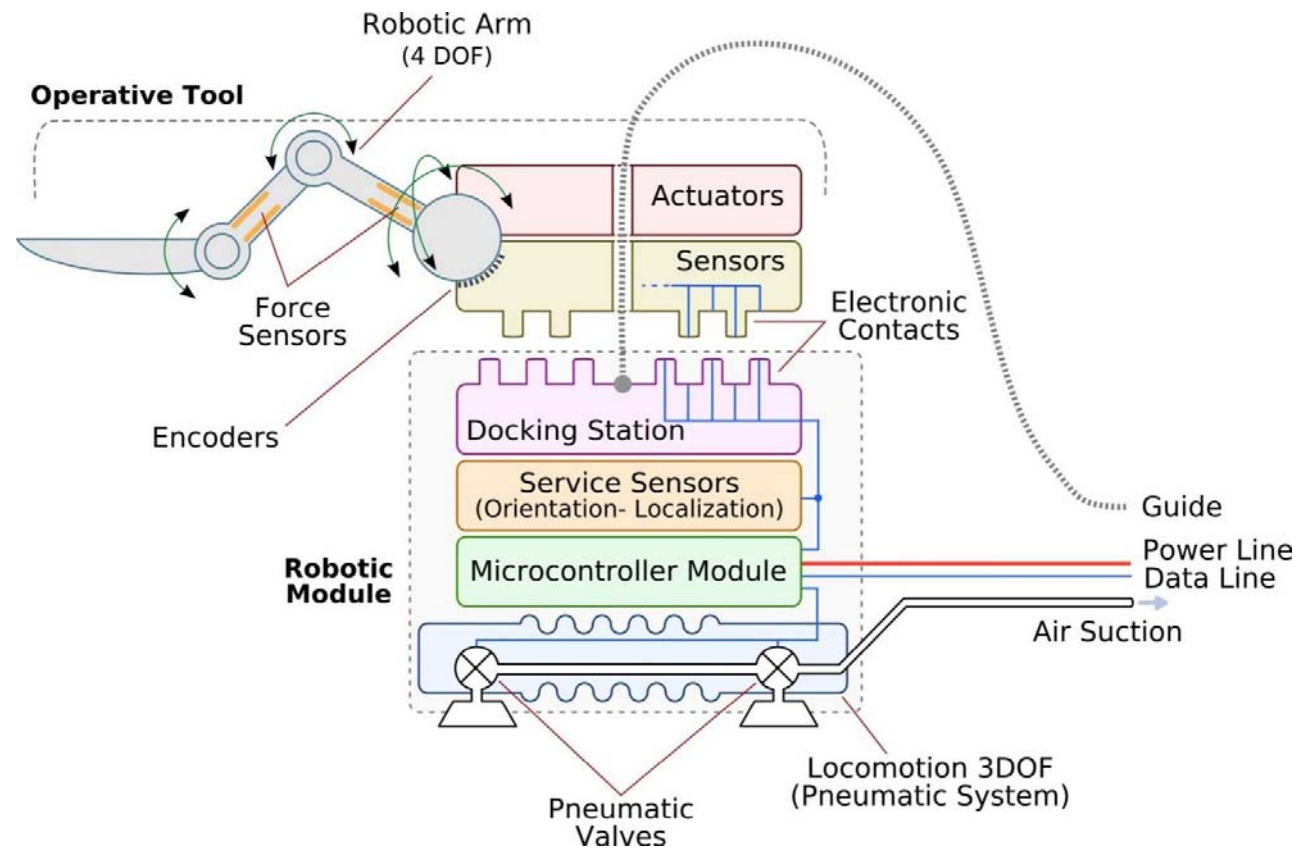


## *PNEUMATIC SYSTEM for locomoting the assistive tool*



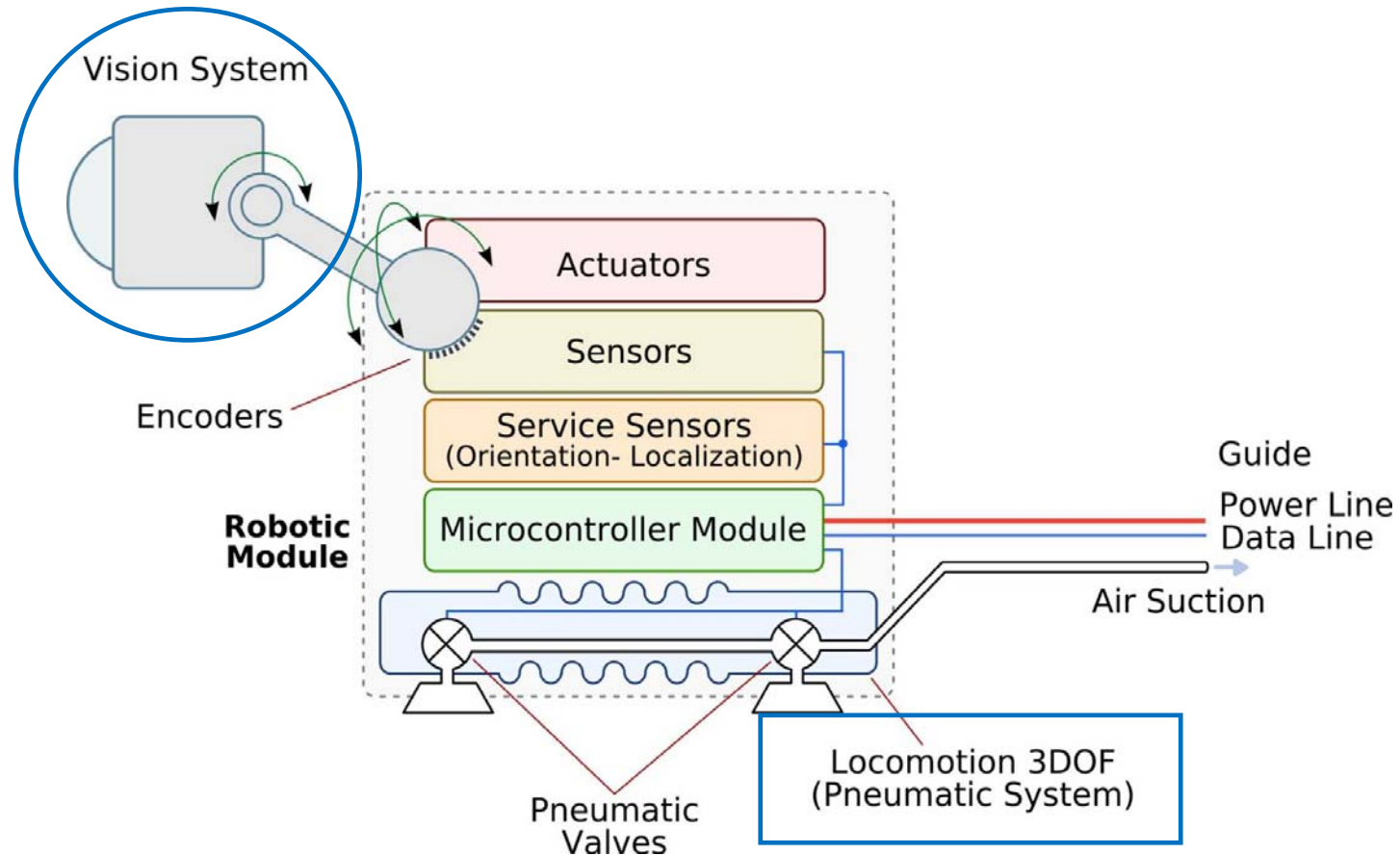
# Endoluminal Robotic Modules with locomotion ability

## ✓ OPERATIVE TOOL



# Endoluminal Robotic Modules with locomotion ability

## ✓ VISION ROBOT



## In case of questions please contact:

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