Objectives

SMARTsurg aims to:

1. Develop a dexterous, adaptable, anthropomorphic surgical instrument
2. Build a framework for providing haptic feedback from the surgical instrument to the surgeon
3. Deploy strategies for dynamic active constraints construction and their guaranteed satisfaction
4. Develop advanced cognition and perception abilities to achieve the real-time and on-the-fly reconstruction of the operation area
5. Validate SMARTsurg project results in realistic scenarios involving procedures on different surgical domains

Follow us on:

@SMARTsurg

/SMARTsurg-project

Who are we?

A European partnership of ten partners from five countries

LEAD PARTNER:
University of the West of England/ Bristol Robotics Laboratory
United Kingdom
www.uwe.ac.uk, www.brl.ac.uk

Centre for Research and Technology Hellas/ Information Technologies Institute (CERTH/ ITI)
Greece
www.iti.gr

Polytechnic di Milano
Italy
www.polimi.it,
www.nearlab.polimi.it/medical

Bristol Urological Institute (BUI) - North Bristol National Health Service Trust (NBT)
United Kingdom
www.nbt.nhs.uk/bristol-urological-institute

University of Bristol/ Translational Biomedical Research Centre (TBRC)
United Kingdom
www.bristol.ac.uk

European Institute of Oncology
Italy
www.ieo.it

Themis Orthopedic Center
Greece
www.the-mis.gr

Cybernetic
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www.cybernetix.fr

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Smart wearable Robotic Teleoperated surgery

SMART surg

www.smartsurg-project.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 732515

Breakthrough

The SMARTsurg project aims to develop an advanced system for performing R-A MIS, in order to **reduce the surgeon's cognitive load** related to the system's operation that will ultimately allow shorter training time, while delivering **increased accuracy, safety, reduced MIS procedure time**, and **expanded applicability**.

SMARTsurg project aims to design and develop a wearable interface for a surgical system using

a) highly dexterous anthropomorphic surgical instruments
b) wearable hand exoskeleton with haptic feedback for controlling the surgical instruments, and
c) wearable smart glasses for augmented reality guidance of the surgeon based on real-time 3D reconstruction of the surgical field.

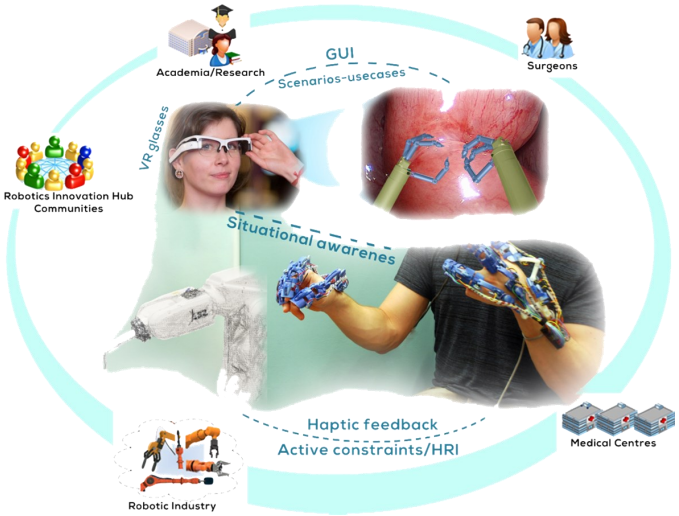
High dependability will be achieved by utilizing real-time dynamic active constraints to the instruments' motion, in order to restrict it to the safe regions. SMARTsurg developments will employ a user-centred approach for efficient technology adoption and commercialization. This will be achieved using short prototyping and testing cycles supported by focused end-user and commercials requirements.

SMART surg

Vision

The main vision of the SMARTsurg project is to enable complex minimally invasive surgical operations by developing a novel robotic platform for assisting the surgeon in such tasks. Advanced features will be developed and integrated into the proposed platform including:

1. Wearable surgical system to provide natural usability and high dexterity to allow the undertaking of more complex surgical procedures and to reduce the surgeon's cognitive load.
2. Anthropomorphic multi-fingered surgical instrument controlled by the anthropomorphic wearable system, enabling user-centred design and modifications by means of additive manufacturing.
3. Software embedded visual and force augmentation for increased safety and dependability.
4. Functionalities enhancing the system's cognition abilities and dependability, such as dynamic active constraints construction and enforcement, as well as user intention detection.



Expected impact

SMARTsurg will have a considerable impact in the chosen medical domain and beyond, into the many areas that can benefit from tele-operation, haptic feedback, mechatronic design and user centred control. Tele-operation is linked to many areas of robotics, from nuclear industry to assistive robots where safety critical issues prevent use of autonomous robots. Ultimately SMARTsurg technology could provide a more dexterous, natural to use system with much improved interfaces that would render fast learning and acceptance by surgeons.

More specifically SMARTsurg:

1. Address healthcare issues that have a widespread applicability and at the same time reduce high cost on national healthcare systems
2. Improve patient outcomes through a much wider offer of MIS
3. Reduce surgeons' effort by improving their ergonomics and information flow between them and the surgical field (through visualisation, haptics and novel controllers)
4. Propose a cost-effective system that is built on top of commercial 6DOF robotic manipulators
5. Provide a more dexterous, natural to use system with:
   - Improved interfaces that would render fast learning and acceptance by surgeons
   - Increased cognition abilities and dependability