

# PRoF Award abstract – Call 2018

Please send to: [PRoF-Award@uzgent.be](mailto:PRoF-Award@uzgent.be).

## SARA Surgical Augmented Reality Assistance

### 1. Research Outline

Acronym	SARA
Project name in English	Surgical Augmented Reality Assistance
Pitch (1 sentence)	Augmented reality through a head-mounted display as a method for surgical navigation has the potential to increase surgical safety and accuracy and to reduce duration and cost of any type of surgical interventions
Executive summary (max. 10 lines)	
<p>The goal of this project is to develop software that is run on a head-mounted augmented reality display (Microsoft HoloLens) , providing the surgeon with anatomical information on the patient before him, as well as additional information. This implies coregistering the patient in his position in the OR with a pre- or peroperatively made CT,MRI or echoscan and displaying the anatomical information as a 3d-hologram overlaid on the patient, completed by additional useful planning information such as angles, trajectories, etc. Attention is paid to extreme intuitivity (voice- and gesture control) for the surgeon, attractive but useful visualisation of anatomical information in 3d (use of colors, shading, transparency where needed,etc), minimal workflow interruption and distraction of the surgeon and fluent automated data transfer between imaging machines and the head-mounted display. Upon development, several additional aspects such as semi-automated trajectory planning, deformation prediction of anatomy, prediction of useful displayed information (through artificial intelligence),etc will be explored as well.</p>	

## 2. Cause and context of the research

Need for improved visual anatomical control in the quest for minimizing surgical approaches and maximizing safety and accuracy in surgical procedures.

## 3. Innovation results achieved

We have created software for the Microsoft HoloLens that allows for intuitive inspection of 3d-anatomy of the patient as well as additional planning information (trajectories) represented as vectors. The 3d models of relevant layers are visually attractive and display useful information. Automatic registration is performed from the device itself, without external depth cameras. Voice-control as well as optimal manual control has been implemented and valued useful by participating surgeons. Further steps will include automating the process of segmentation and importing of the 3d models and optimizing the coregistration of the models with the patient.

The device and software will be clinically validated in cranial and spinal neurosurgery to begin with. This will start in the cadaver lab with quantifiable precision testing and also outcome testing (accuracy of pedicle screw placement and of cranial drain placement) and followed-up by randomized clinical trials in cranial and spinal neurosurgery. Use cases have also been identified in orthopedic surgery, maxillofacial surgery, ORL, anesthesiology and interventional radiology, and clinical validation trials will be set up and conducted within these specialities as well.

When the product is developed as envisioned, it could imply a radical change in the way surgery is performed. Simple interventions that are often performed free-hand but still have a significant chance of error (such as drain placement) but also more complex surgical procedures could be performed under direct visual control of all relevant anatomy. External navigation systems and even screens in the Operating Theatre to document patient anatomy will become obsolete, safety and accuracy of the interventions will increase, duration and cost will be significantly reduced.

## 4. Link to the PRoF values

The project, once sufficiently developed and widely implemented, will prove beneficial for patients, physicians, individual hospitals and society. Incisions will become smaller (percutaneous procedure more implemented), tissue damage due to surgical exploration will be minimized and complication rate thus greatly reduced, improving patient comfort and recovery.

Significant attention will be paid to automated data transfer (after segmentation) between imaging stations and the head-worn device but within the protected network environment of the institution, maximally respecting patient privacy and protection of medical data.

The intuitivity of this new approach to surgery and greatly improved ergonomics compared to existing solutions for surgical navigation has the potential to greatly reduce learning curves for complex surgeries and make these safer for the patient.

The ultimate goal is also maximal flexibility, meaning that there is a very fluent workflow between scanning the patient and using the device, which is portable and untethered, offering maximal flexibility (use inside but also outside of operating room, for any procedure that is invasive in nature, including any percutaneous procedure (example central venous line placement, deep arterial catheter placement, etc)

## 5. Applicable IPR rules

Intellectual Property will be shared according to each of the partners in the consortium's contribution. This is yet to be defined. Development has started in university, the project by the consortium with each partner doing his part will start september 2018

## 6. Information on the partners

Academic partners:

- VUB faculty of Medicine, department of Neurosurgery (Research Group NEUR, part of C4N, Centre for Neurosciences)
- VUB faculty of Medicine, department of Orthopedic surgery (Research Group MIMA)
- VUB, Department of Engineering and Informatics (ETRO)
- VUB, Department of Studies in Media, Innovation and Technology (SMIT)

Industrial partners :

- Materialize
- eSaturnus
- Cronos
- Microsoft

### Note:

If your project is selected as laureate for the Award Symposium, a powerpoint presentation that reflects the project as suggested will be required (in advance), including a future plan how the funding will be used.

If your project is selected as the winner of the Award, you will be invited to present the results achieved thanks to the award during the Award Symposium of the next year.



## **Addendum: Contact information**

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