DOCTORAL THESIS IN ATOMIC AND MOLECULAR PHOTONICS

Real-time tracking of micro-robots

PhD open position within the doctoral network "Soft Active Matter Microrobots for Medicine (SAM3)", funded by EU HORIZON-MSCA-2025-DN-01-01 # 101312674

Collaboration Prof Sarthak MISRA (University of Twente, Enschede, Netherlands), Dr Loïc Blanc (Lys Medical, Gosslies, Belgium), Prof Kanty RABENOROSOA (UMLP, Besançon, France), Dr Johann ANGUENOT (Statice, Besançon, France)

Research project on Real-time tracking of micro-robots (SAM3/ESR10 - realtime)

This project takes place within the Marie Curie Doctoral Network on Soft Active Matter Microrobots for Medicine (SAM3). This doctoral network of 12 PhD candidates aims at exploring the ear-nose-throat area from a microrobotics perspective. Thanks to active matter and small scale microrobotics engineering, three specific goals are targeted: (1) access the middle ear through the Eustachian tube; (2) access the olfactory clefts for mucosal biopsy; (3) access the skull cavity through the nose and the cribble plate for cerebrospinal fluid biopsy.

This PhD research topic on real-time tracking of micro-robots is part of the first endoscopic application area, namely the Eustachian tube. The objective is to develop a miniaturized, real-time fluorescence-based imaging modality for sensing and tracking micro-robots in confined biological environments.

The proposed system will **enable real-time localization of micro-robots** operating within soft tissue by exploiting fluorescence-based contrast mechanisms. It will be designed for **integration into endoscopic** or other minimally invasive surgical platforms, and will address key technical challenges including light scattering in biological tissue, low signal-to-noise ratios, and severe spatial constraints imposed by endoluminal environments.

The expected results are further set as follows: **Platform for tracking micro-robots** in deep-seated regions of the human body.

The candidate will be enrolled as doctoral candidate at the Surgical Robotics Laboratory, UT (Enschede, The Netherlands), in the Doctoral Degree of Surgical Robotics, Department of Biomechanical Engineering, Faculty of Engineering Technology. A co-supervision is planned with Prof Kanty KABENOROSOA (UMLP, Besançon, France).

An industrial stay of 5 months is planned at Lys Medical (Dr Loïc Blanc, Gosselies, Belgium) for the imaging in the lungs, an academic stay of 3 months is planned at UMLP (Prof Kanty KABENOROSOA (UMLP, Besançon, France) for control methods and a second industrial stay of 3 months is planned at Statice (Dr Johann ANGUENOT, Besançon, France) for advancing TRL of the tracking device integrated into endoscope).

Research environment

The main research laboratory will be the Surgical Robotics Laboratory, Department of Biomechanical Engineering, University of Twente, Enschede, The Netherlands.

The PhD candidate will be supervised by Sarthak Misra and co-supervised by Kanty Rabenorosoa. Both supervisors bring complementary expertise spanning microrobotics, biomedical system integration, smart materials, and microscale fabrication technologies, which are central to the objectives of this PhD.

More information on the supervisors:

- Prof. Sarthak Misra is a leading researcher in surgical robotics and micro-scale medical systems. His work focuses on the design, modeling, and control of soft and continuum robotic systems for minimally invasive medical applications, with a particular emphasis on image-guided interventions, microrobotics, and translational biomedical technologies.
- Prof. Kanty Rabenorosoa is a specialist in smart materials and microfabrication. His research activities focus on the synthesis, characterization, and structuring of functional materials for microsystems, with strong expertise in the development of responsive and programmable materials for biomedical and robotic applications.

The main research environment is the Surgical Robotics Laboratory at the University of Twente, which focuses on micro- and soft robotics for biomedical applications. The laboratory operates advanced experimental facilities for microscale fabrication, characterization, and system integration, supporting research in:

- Soft microrobotics
- Optical and fluorescence-based imaging systems
- Biomedical device prototyping
- Minimally invasive robotic systems

For the implementation of the project, the candidate will move for 5 months to Lys Medical (Belgium), 3 months to UMLP (Besançon, France) and 3 months to Statice (Besançon, France).

Job description and profile for SAM3/ESR10

We will appoint 1 PhD student on this project, related to 11 other positions open in the SAM3 EU network.

He/she will be registered within the Doctoral School of Faculty of Engineering Technology at UT with Prof. S. MISRA as supervisor.

The candidate should have a master's degree (MSc/MEng) in applied physics, biomedical/electrical/mechanical engineering, or robotics, less than 5 years of career at the recruitment date and not having a doctoral degree.

We are seeking talented and enthusiastic students to perform a PhD, with a solid background in optics, image processing, mechanical design and/or mechatronics. An experience in optical systems design, microfluidics, fluorescence microscopy, and computer vision is a strong advantage. Regarding skills, we look at ability for research management, dissemination, communication with colleagues and supervisors, strong teamwork spirit, creativity, problem solving and attention to safety.

The candidate should have good command of spoken and written English, and Dutch or French skills are of course an asset.

For more information regarding the PhD studies at UT please check the website https://www.utwente.nl/en/education/tgs/

How to apply

Applications should be sent to the mailbox SAM3@umons.ac.be dedicated only to recruitment. They should include: a) a digital copy with all academic certificates and the respective official transcription in English; b) a detailed CV and a motivation letter in English; c) 2 letters of recommendation.

Duration: 4 years full time.
Starting date: Autumn 2026
Deadline for the submission of applications: 15/7/26 with position open until filled