

Advancements in Robotically Assisted Medical Procedures

Robotics in healthcare has brought forth a new era of precision and efficiency in medical procedures. But how exactly are these advancements shaping the future of patient care? In this session, we will explore the cutting-edge techniques used for precise patient localization in robotic medical interventions. The focus will be on image-guided methods, including CT, MRI, and ultrasound (US), which are at the core of these innovations.

We will examine both traditional extrinsic methods, such as the use of stereotactic frames and bone-attached markers, as well as more advanced intrinsic, markerless techniques based on anatomical landmarks. Why are these methods important? Because accurate patient registration—combining data from multiple imaging sources—is the key to successful robotic interventions, allowing for integration of advanced technology and medicine.

This presentation will also highlight the latest applied research from CRTA (Regional center of excellence for robotic technology) in the fields of neurosurgery, robotic ultrasound diagnostics, and urology. By demonstrating practical innovations, we invite you to look deeper into the future of robotics in medical care, offering new solutions for researchers, academics, and professionals who are navigating the dynamic intersection of computer vision, medical imaging, and robotics.



Filip Šuligoj was born on March 25, 1986, in Zagreb, Croatia. He enrolled in the Faculty of Mechanical Engineering and Naval Architecture at the University of Zagreb in 2004 and graduated in October 2009, completing a thesis on the synchronous control of dual-arm robots.

After obtaining his master's degree, he continued his academic career by enrolling in a doctoral program focused on Robotics and Automation. In February 2013, he joined the same faculty as an assistant, initially in the Department of Design and Manufacturing Systems and later in the Department of Autonomous Systems and Computer Intelligence as a senior assistant and assistant professor.

He earned his Ph.D. in October 2018 with a dissertation that delved into spatial registration techniques in robotic neurosurgery. Šuligoj has been an active contributor to multiple scientific initiatives and projects, such as "ACRON – A New Concept of Applied Cognitive Robotics in Clinical Neuroscience," "Application of Robots in Neurosurgery – RONNA," and the "RONNA – Robotic Neuronavigation" structural project.

He also participated in the "CRTA – Regional Center of Excellence in Robotic Technologies," a structural project funded by the European Regional Development Fund.

As a postdoctoral researcher, he spent a year from March 2020 to March 2021 at the Surgical Robotics Laboratory at the University of Twente in the Netherlands, contributing to the SAMURAI project (Steering Actuated Probes Under Magnetic- and Ultrasound-Guidance for Targeted Interventions). In recognition of his contributions, he received the "FESTO Prize for Young Researchers and Scientists" in 2013 and was part of a team that won the "Best Integration and Innovation Award" at the prestigious Hamlyn Symposium on Medical Robotics in 2018.

Šuligoj is the author or co-author of 20 scientific papers in internationally peer-reviewed journals and 14 conference papers with international peer review.

Additionally, he serves as a reviewer for an array of scientific journals, including but not limited to Applied Sciences, Expert Systems with Applications, Transactions of FAMENA, Mathematics, Robotics, Sensors, Frontiers in Neurorobotics, Frontiers in Neurosciences, and IEEE Transactions on Industrial Electronics.