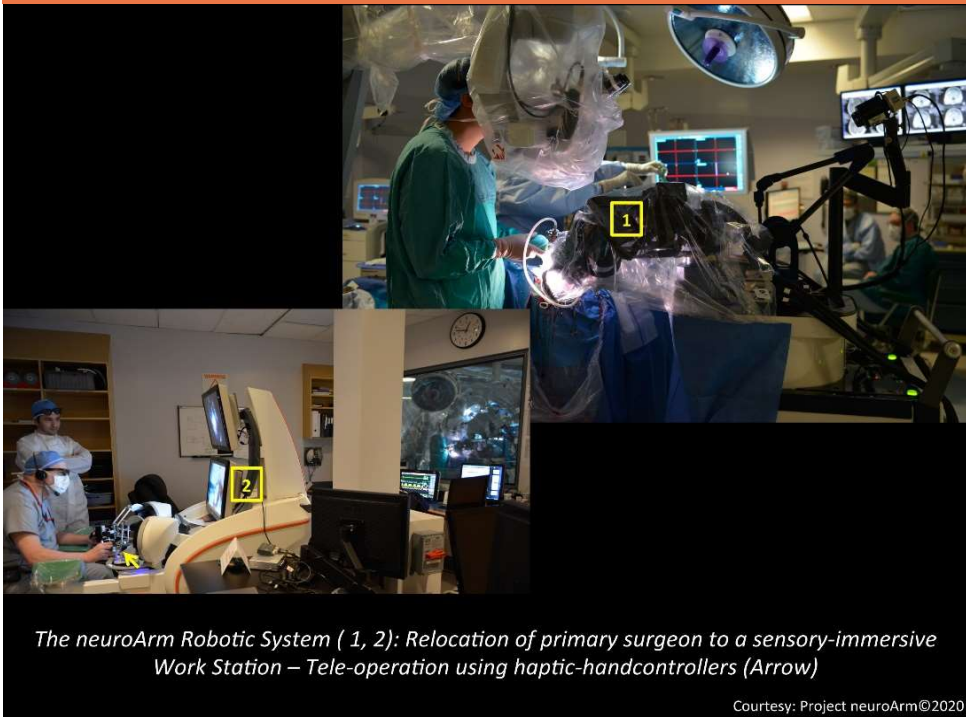


# AUTONOMOUS SYSTEMS INITIATIVE

ASi Newsletter Volume 1 Issue 1 August 2020

Welcome to the Inaugural Edition of the ASi Newsletter! Each month we will bring you feature articles on research and people at the heart of ASi. The newsletter is available on our website or can be subscribed to by email. We look forward to bringing you exciting and timely news about everything that is going on at ASi!

## Research Highlight



*The neuroArm Robotic System ( 1, 2): Relocation of primary surgeon to a sensory-immersive Work Station – Tele-operation using haptic-handcontrollers (Arrow)*

Courtesy: Project neuroArm©2020

## ASI NEWS IN BRIEF

- ASI Logo Contest Winner: Abdullah AL Zahid (ASI M.Sc. Student, UofA)
- ASI Theme 1 Workshop: Methodologies and Tools for Autonomous Systems, August 20, 2020 (via Zoom)
- ASI Theme 2 Workshop: Real-World Automated Transport, October 2, 2020
- Special Frontiers issue: <https://www.frontiersin.org/research-topics/14462>

**Ensuring the safest environment possible** when it comes to the health of millions of Canadians is a major concern, not least in the wake of the COVID-19 pandemic. Automated or semi-automated technologies offer health professionals exciting new tools that can boost the safety of procedures and treatments and reduce the risks of viral or other contagion spread in medical environments. Development of prescient

new ideas and technologies in this field is the focus of ongoing research under the ASI theme *Healthy Communities*.

The team at Project neuroArm-University of Calgary, led by Dr. Garnette Sutherland, is advancing the field of telerobotics for microsurgery-stereotaxy, whereby image-guidance, sensory input, and precision controls re-create the sight, sound, and touch of surgery at a sensory-immersive remote workstation. "Autonomous robotics would be the natural next step and would take full advantage of technological progress to improve the safety of surgery", says Dr. Sutherland. Especially relevant in the current climate is the ability for contactless deployment during pandemic situations or other hazardous environments, be either natural or human-made.

Building upon the prior success of the **neuroArm** robot that is currently operational at Foothills Hospital, Calgary, the ASI team is now completing **neuroArmPLUS**, the next generation system – a compact, intelligent and agile robot suited for whole body application. Equipped with state-of-the-art system design and the latest sensory input features including haptics, vision, and acoustics, a built-in reactive software interface with high level machine intelligence adds an element of semi-autonomy with expert surgeon in the loop. Since a procedure-specific toolset is key for applications beyond

brain surgery, this multi-purpose dextrous system drives a whole new level of innovation in the smart robotic toolset. Autonomous analytics and continuous feedback loops using artificial intelligence principles create a data-rich environment, further enhancing robotic performance to catalogue procedural best practices. Similar to the aerospace industry, this technology

"Autonomous robotics would be the natural next step and would take full advantage of technological progress to improve the safety of surgery"

thereby standardizes surgical procedures and training towards increased safety.

The neuroArmPLUS will provide wide-ranging benefits to patients around the world through increased safety and standardized care paradigms. In addition, ongoing research and development supports surgical trainees and aspiring academicians who will have greater access to data, information, and learning modules available through smartphone apps and publications including social media.

The future vision focuses on sustainability through product development, global adoption, and spin-off companies for smart medical devices underpinned by robotics and machine intelligence. "This is an exciting development for Alberta," adds Dr. Sanju Lama, a key team member who leads clinical translation and uptake. "We are working with important local, national and international bodies and industrial partners, including MDA, IMRIS-Deerfield, Stryker, Medtronic, Bissinger GmbH, Canadian Circuits, Improving, Sullivan Machine Works, and OrbSurgical Ltd., to bring economic benefits, international visibility and a competitive edge to the province."

The team is aiming to complete work by 2021 with future developments currently in planning.



In addition to Garnette Sutherland, M.D., Professor of Neurosurgery, and Sanju Lama, M.D., Ph.D., Clinical Integration/Regulatory Framework, this multi-disciplinary team includes Hamidreza Hoshyarmanesh, Ph.D., Chief Engineer - Mechatronics, Amir Baghdadi, Ph.D., Post-doctoral Associate, AI and Data Science, Fangwei Yang, M.D., Robot Technician, Mohammadsaleh Razmi M.Sc. Electrical Engineer, Kazi Ishfaq Ahmed, M.Sc. Electrical Engineer, Mojtaba Esfandiari, Ph.D. Student (Snake-like Continuum Robotics for brain surgery) and Rahul Singh, Expert - Data Science and AI.

## Spotlight on HQP

This month we focus on the winner of the ASI Logo Design Competition and ASI researcher, Abdullah El Zahid



The Autonomous Initiative Systems held a successful Logo Design competition in May with a number of compelling entries to choose from. Our clear winner, however, was an Engineering graduate student and ASI researcher Abdullah Al Zahid.

Zahid is currently an M.Sc. student in the Department of Civil and Environmental Engineering at the University of Alberta, arriving after completion of his undergraduate

degree from the Bangladesh University of Engineering and Technology in October 2018. Under the supervision of Dr. Amy Kim, ASI project leader for Theme 3 Sustainable Communities, his research focus is Multimodal Transportation Systems Design and Analysis. Currently he is examining how evacuation mechanisms can perform by integrating both air and ground transportation systems and positively impact mobility capacity in emergency situations, such as wildfires. This will help transportation planners, emergency services, and industry understand how an integrated both air and road transportation network might perform as compared to relying solely on the available roadway network.

In addition to his studies, Zahid's striking logo design stems from a creative streak that he hones through his favourite past time - designing motion

graphics, producing illustrations, and rendering animation, which he often uploads to his YouTube channel. He is also an active debater and has participated in several international debating

"Autonomous systems will change our perception of mobility, reaching beyond our current horizon of thinking"

tournaments as well as serving as the president of Ideal Debating Club during 2010-2011 and Director of BUET Debating Club in 2017-2018.

But he sees an exciting future for himself in the rapidly changing field of transportation. "I think autonomous systems will change our perception of mobility, reaching beyond our current horizon of thinking. It will bring one of the most significant changes in the history of transportation, transforming our lives in the 21st century.

## About ASI

The Autonomous Systems Initiative (ASI) is a forward-thinking, multimillion-dollar research program that teams up research and industry experts across Alberta to develop automated technologies spanning key areas of health, transportation, sustainability and industry. Understanding and developing these systems will help us to remain economically competitive in a global context, while effectively addressing the challenges of climate change, efficient energy production and use, transportation needs, advanced manufacturing, and medical advancement. This program develops new Information, Communications and Technology (ICT)-enabled Autonomous Systems to support healthy and sustainable communities with a focus on sensing, communication, control, and computation technologies, all linked together by artificial intelligence.

## Contact Us

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