

Hazardous Site Access using Robots

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Robotic systems have been used to access remote locations and difficult to access areas where it is too risky and costly to send human workers. Activities for remediation of contaminated soil often require physical access to areas that are intraversable and hazardous, such as mine tailings deposits. This abstract presents the development of a class of all-terrain amphibious robots that can be used to aid in remediation work. The robots use a screw-drive propulsion system that allows them to move on open water, sludge, muds, snow, soft and hard ground. The platforms are customizable to carry payloads for measuring geotechnical soil properties, such as the strength of the soil, and collecting samples. The robots have been primarily used to investigate and work on previously inaccessible areas in sampling, bathymetry, and geotechnical campaigns. Remote deployable sampling tools have been designed to collect tailings, water and sediment samples. Remote cone penetrometer (CPTu) studies have aided studies on ground stability and provided guidance on dredging activities of tailings. Another project involved direct remediation of oil sands tailings. This example highlights the capabilities of the robot to plant seedlings, broadcast seeds and fertilizers, and deploy wick drains. The main objective of the project was to aid in the dewatering and strengthening of the test area. The robot was deployed on an oil sands tailings test cell and the different planting systems were tested. The results of the program are discussed, and further recommendations, lessons learned, and use cases are presented.

Nicolas Olmedo

Dr. Nicolas Olmedo is the co-founder and CTO of Copperstone Technologies, where he leads a team to develop amphibious field robots. His postdoctoral work at the University of Alberta has enabled advancements in robotic control systems, essential for the reliable operation of Copperstone's all-terrain, screw-drive robots, called HELIX.

He has published articles in leading journals such as Journal of Terramechanics, Mechanical Systems and Signal Processing, Drone Systems and Applications. His passions for Formula One racing and space robotics inspire his work and one day he hopes to land a robot on the moon.

Craig Milne

Craig is the CEO of Copperstone Technologies, a company bridging robotics, artificial intelligence and the mining industry. He is a serial entrepreneur with extensive experience in technology-enabled companies, strategy, finance, and business development. Craig was co-Founder and President of Stream Technologies Inc. and developed a product for agricultural imaging prior to a venture-backed exit. He is a Director of a TSX-listed biotech firm and has served as Chair of the Audit Committee and member of the Executive Committee. Craig has a PhD in stem cell biology from the University of Toronto and an MBA in Finance from the University of Alberta.