



Enabling data to drive the future of offshore robotics

Vaarst, the new technology spin-off company from Rovco launched March 2021, with the vision to bring artificial intelligence, machine learning and autonomy to all offshore robotics. Enabling the integration of their technology into all robotic vehicles, both new and as a retrofit solution to existing ROVs.

A technology company borne from a services business

Rovco, out of which Vaarst was born, has operated as a service provider to the offshore sector since 2016, supplying survey and asset integrity services across the offshore lifecycle. But it is Vaarst who has provided the technology that has sat behind Rovco's innovation-led services. Indeed, Rovco has operated as the testing ground for Vaarst, enabling the technology to be refined and established in the real-world scenario. It has also enabled the naturally cautious energy sector to see the huge benefits that Vaarst technology can bring.

Vaarst technology was created to transform offshore data collection in the survey and O&M domain, where processes and systems are ripe for modernisation. At present, offshore data-gathering demands the deployment of sizeable vessels, that create remarkably high levels of environmental pollution. Each vessel can produce, depending on the job, up to 275K tonnes of CO2 over its lifetime. And can require up to 60 people working in risky conditions, with each vessel costing £1-10m a month to run.

Vaarst is looking at how to do things differently. They started their investigations with educational establishments across the US and Europe, into new methods of data collection in aerial drone technologies. This led them to explore the ExoMars Rover and the methods employed to evaluate landscapes. There was a clear parallel between the challenge of transferring data from Mars back to Earth, and the problem of sending data from deep underwater back to shore. Most evidently with sending video back over this distance. This took Vaarst down the route of SLAM and using 3D data reconstruction as a compression tool.

SubSLAM X2, an AI-driven intelligent data collection system

Vaarst's SLAM product, SubSLAM X2, is a data-driven computer vision system that delivers live underwater 3D point cloud reconstructions. The model builds in real-time as the vehicle is navigating around the asset. And because the team are still on

the vessel while the information is being collected, they can ensure that all the data needed has been obtained during the dive. So, there's no need for any expensive rework.

Using relative positioning technology, SubSLAM guarantees that the ROV always knows where it is, eliminating the requirement for additional positioning apparatus or scale bars. Although, they can also switch on the IMU for those infrequent times where the visibility isn't optimal.

Alongside gathering 3D data, their system also collects 4K video, which can be post-processed for high-resolution photogrammetry. So, the customer receives live 3D data on all their assets while on the job and is then able to concentrate their attention when post-processing on creating high detail photogrammetry models for areas of significant interest.

Live streaming for instant asset insight

The 3D data, gathered by SubSLAM, is suitably small in file size (150-200 kbits/s) that it can be live-streamed back to any device in the world via a low bandwidth data link, through a ship's VSAT system. This gives onshore staff access to survey and

construction data instantaneously, so they can make knowledgeable assessments while the job is still underway. While Vaarst already provides this to customers today on a custom-built basis, in 3 to 6 months, this will be part of their harmonised product set.

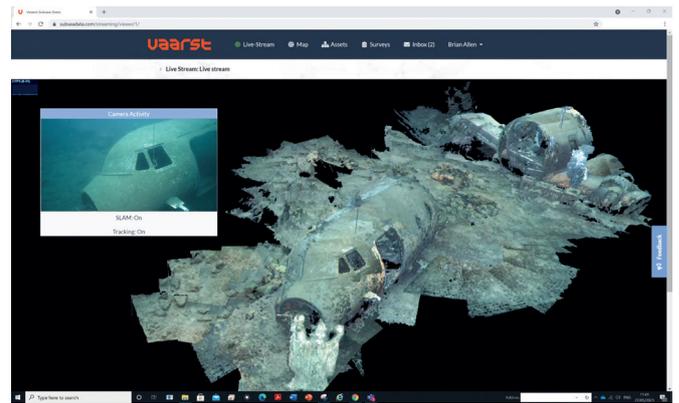
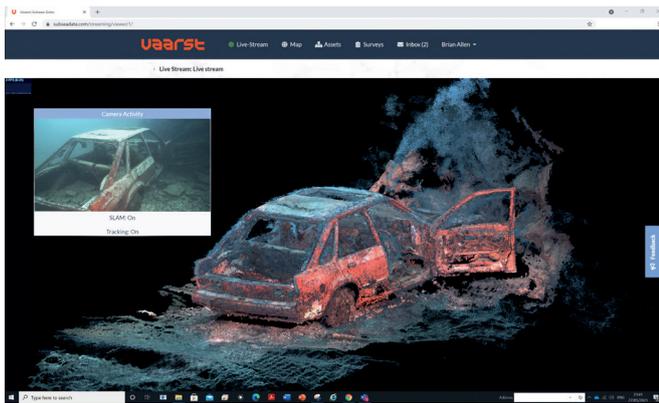
Live-streamed data will also be automatically uploaded to a geo-referenced data platform. This will keep a historical record of all customer assets. So, teams will be able to work together in a smarter, more secure and a well-organised way. The geo-referenced data platform is also planned for release later this year.

Multiplying human effort with machine learning

The Vaarst ML platform takes visual data and enables much faster analysis than traditional methods.

For example, to undertake a regular inspection on a subsea pipeline, an ROV must travel down the pipeline to gather video footage. An operator, or a team of operators, then observe images manually, identifying issues and potential risks that will need action, such as free span, corrosion, debris, and large rocks. One example data set that





Vaarst has worked with previously was approximately 120 hours long.

Using the ML solution it only takes 7hrs to examine the footage, enabling a significant reduction in human effort. This system has now just completed trials with an oil supermajor, with plans for rollout.

While currently the ML solution is primarily focused on analysis in post-processing, their machine learning capabilities are now being combined into SubSLAM at the edge, so it can work at the same time as the data gathering is taking place. These technologies have not been merged before and create a unique and ground-breaking solution for the offshore energy sector. The outcome being, that there will be no requirement to transfer visual data back to shore, instead only the answers will need to be sent.

A future vision, that differentiates Vaarst from others

The overall challenge that Vaarst is tackling, is how to remove large vessels from our waters. But at the same time, they want to ensure that the replacement solution is efficient and intelligent, and not dependent

on a remote operations centre to operate the robots. So, they are building cloud robotics with true autonomy abilities, where the purpose of the operations centre is only to oversee and supervise, with the vehicles driving themselves through their own data-driven intelligence.

They are enabling robotic vehicles to answer key questions: Where am I now? What's around me? And where shall I go next? So that the system can understand its own environment, predict the next step, and operate without assistance.

Vaarst is also enabling live machine learning at the edge, to deliver fast, live-feature detection and analysis, all while navigating autonomously at close range around complex underwater structures. The next step is then to take things yet further, enabling multiple robots to work together collaboratively. Combine all that with an autonomous vessel, and it enables a significant scale-up of operations through connected robotics.

A true cloud robotics company

The individual technology components, when combined, deliver a powerful cloud robotics

solution. SubSLAM sits at the edge and gathers the data, machine learning analyses on the fly, then the analysis is transferred in real-time back to the shore, with the data being stored on the platform for collaborative analysis and future comparison.

Once this is all bonded together, that's a true cloud robotics solution.

Getting access to the technology

The SubSLAM X2 is available today for integration with any suitable ROV, and the system has already been interfaced with several widely used vehicles. Pricing starts at £36K per annum over a fixed 3-year term or is available on day rates for short-term projects.

For more information go to: www.vaarst.com

