BluHaptics

Safer and More Efficient Undersea Robotic Operations

Narrator: Can a robotic arm function as a more life-like extension of the human hand? Faster, more precise, safer, and better at the assigned task? A team of UW scientists and engineers working at the Applied Physics Laboratory believe the answer is yes.

Andy Stewart: What we're doing here is working with the submersible manipulator test bed at APL. And what's unique about this project is our ability to combine the spatial awareness of a computer system with the perceptive capability of a human operator. We use what is called a haptic device.

Narrator: Haptics: tactile feedback technology that takes advantage of the sense of touch by applying forces, vibrations, or motions to the user. Doing for the sense of touch what computer graphics do for vision.

Stewart: It's an input device just like you would use a mouse with a computer but it's actually giving three-dimensional input. So you're actually defining a point in space where you want your robotic arm to go.

Fredrik Ryden: It senses the position of your hand and it can exert force on your hand as well. So that means that when you control the robot using the haptic device, we can actually give you force feedback through the same device.

Force feedback can essentially assist you to guide places where you should go by pushing you there and preventing you from making mistakes or a collision by pushing back on your hand.

Narrator: The BluHaptics robotic control system is based upon key algorithms developed by Fredrik Ryden at the UW Department of Electrical Engineering — algorithms originally applied to robotic surgery. Then re-applied to robotics under water.

Howard Chizeck: In thinking about it as a group, we decided we have a way to have sense of touch for remote tele-robotics. Maybe it'll work underwater using the algorithms that have already been developed.

What APL brought us is expertise in underwater operations, underwater sensors, and underwater robotics that we could combine with our haptic technnology.

Narrator: BluHaptics technology creates a virtual representation based on a combination of sonar, video, and laser inputs.

Ryden: The coolest thing about this project is that we're taking technology developed in a university lab and we're actually commercializing it.

Mark Lunde: BluHaptics chose the underwater market to be our first commercialization opportunity because there are over a thousand ROVs operating today in the oil and gas industry. And that is a number that is growing by 27 percent year over year.

There's also 1.7 billion dollars a year being invested in this industry.

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Narrator: Helping BluHaptics grow into a going concern: the University of Washington's Center for Commercialization – C4C

Ryan Buckmaster: C4C is able to provide a lot of resources to allow them to move very fast. One of the key inventors of the technology, Dr. Fredrick Ryden – most of this work was done as part of his PhD – really wanted to be involved in commercializing this startup. And we were able to provide a commercialization fellowship to Fredrick to give him a year to work on the technology as well as explore the business issues and figure out what is the ideal product.

Ryden: What BluHaptics would like to do is give the operator a more immersive experience of underwater operations so they get better spatial awareness and a better sensation of tele-presence and therefore make better operations.

Chizeck: BluHaptics is making it easier and safer and more reliable to have humans use remote robots. This has implications for infrastructure inspection, for homeland security, for anti-pollution activities. It shouldn't be harder to use a robot than to use your hand. We would like to bring some of that sense of touch back from the robot to the hand so it can be used to guide precision operations.

Stewart: There are multiple areas of research – this is a multi-disciplinary project involving computer vision, sensor fusion, control theory, and ocean engineering to be able to package this in a system that can operate at depth.

Science at Work for You.

This is APL The Applied Physics Laboratory at the University of Washington in Seattle.