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Todd Hylton, San Diego Scientist and Entrepreneur, Joins UC San Diego Contextual Robotics Institute

Todd Hylton will serve as the executive director for the Contextual Robotics Institute at UC San Diego.

Todd Hylton, a well-known San Diego scientist and entrepreneur, is joining the University of California San Diego to become the executive director of the UC San Diego Contextual Robotics Institute. Since 2012, Hylton served as executive vice president of strategy and research at Brain Corporation, a San Diego-based robotics startup. Prior to Brain Corp., Hylton launched a series of successful projects as a program manager at DARPA, including a multi-million dollar effort to develop a chip inspired by the function of biological nervous systems.

"The Contextual Robotics Institute at UC San Diego is hard at work building the premier R&D institute in robotics encompassing world-class research, new education programs, and strong collaboration with industry," said Henrik Christensen, Director of the Contextual Robotics Institute and a professor in the computer science and engineering department at the UC San Diego Jacobs School of Engineering. "I am excited that we will have Todd Hylton as the executive director. He will play a key role as we focus on industry collaborations both locally and globally. Todd has a strong history both from government positions and work in the local industry that will facilitate rapid growth of our project portfolio and industry network."

Hylton will serve as a Professor of Practice in the Department of Electrical and Computer Engineering at the Jacobs School.

"I'm excited to work with Henrik and the rest of the faculty to create multidisciplinary teams that will develop research projects that are both ambitious and relevant. We are looking to spin out startups, license our breakthroughs and feed the robotics talent pipeline in the region, state and nation," said Hylton. "There are many difficult technical and business problems that must be addressed in order to bring robots into our everyday lives. We are going to address all of them at the Contextual Robotics Institute."

Hylton will also teach courses focused on enabling technology for robotics and pursue research alongside the rest of the faculty, researchers and students who make up the Contextual Robotics Institute.

According to Hylton, one of the most promising areas for robotics systems in the immediate future is commercial products and services.

Primary targets include moving goods, cleaning surfaces, and monitoring inventories and processes in large commercial settings like big-box stores, as well as office buildings and warehouses.

"Brain Corporation's first product is an autonomous floor scrubbing robot targeting big-box retailers, warehouses and other commercial applications – we discovered that applications like these are exciting, pragmatic business and technical opportunities. I am looking forward to Brain Corporation's success and working with them as part of my new position."

The Internet of Things (IoT) also holds great potential, but in the longer term, Hylton said. "I believe that huge opportunities in both industrial and consumer IoT will emerge only when the technologies to integrate and understand diverse sources of real-world, real-time information

emerge," he said. "IoT is like robotics where the 'building' or the 'factory' is the robot. There are lots of similar technical challenges around making the systems 'smart'. Current Artificial Intelligence techniques are a step in the right direction, but there is still a lot to do."

Recently, the R&D team at Brain Corporation that Hylton led published a new machine learning technique where the computers learn simply by watching videos of the natural world.

Artificial Intelligence that functions and learns in the real world is one of the focus areas for the UC San Diego Contextual Robotics Institute, which officially launched in October 2015 at the second annual Contextual Robotics Forum. The third annual Contextual Robotics Forum will be held on Friday Oct. 28, 2016.

"Todd Hylton and Henrik Christensen are a powerful leadership team well suited for leading our joint efforts between engineering and the social sciences to develop safe and useful robotics systems that rely on contextual information processed in real time," said Albert P. Pisano, dean of the UC San Diego Jacobs School of Engineering. "Our annual Contextual Robotics Forum on October 28 is a great opportunity for the regional robotics community from industry, government and academia to come together. This year's theme is shared autonomy between humans and machines."

The Contextual Robotics Institute is a partnership between the Jacobs School of Engineering and the Division of Social Sciences and includes the UC San Diego Qualcomm Institute, which houses parts of the Institute. The mission of this interdisciplinary institute is to develop safe, useful and human-friendly robotics systems that are deeply integrated with how humans live.

"With the interdisciplinary Contextual Robotics Institute we are pushing forward on both science and service – making state-of-the-art machines that serve humanity," said UC San Diego Dean of Social Sciences Carol Padden. "Social scientists are in the business of solving society's problems. We could have called this an institute of robotics, but we made a point of calling it contextual robotics, integrating context from the start. To solve the challenges that people and industries face, we need robots that are compatible with the human brain and behavior, our public space and cultural infrastructure."

Brain Corporation

Over the past four years at Brain Corp., Hylton managed a team of scientists and engineers that created the first version of BrainOS, a software framework that will allow the creation of robotic systems that adapt to their environments and learn from humans. The software was tested on a low-power, embedded computing platform developed by the company and based

on Qualcomm's Snapdragon processor. Hylton also led a team that worked on developing a new class of machine learning algorithms for robots to learn online and without supervision as well as to grasp the concept of time and anticipate how their surrounding environment will change.

DARPA Years

Prior to joining Brain Corp., Hylton served as a DARPA program manager. He launched DARPA's SyNAPSE program in 2007, which developed a chip whose architecture is inspired by the brain. True North, developed by IBM with DARPA funding, has the same computing capacity as a supercomputer but consumes dramatically less power—just 70 milliwatts, the equivalent of what it takes to run a hearing aid. In 2009, the engineers who developed the chip — led by IBM Fellow Dharmendra Modha (a Jacobs School of Engineering alumnus) — received the prestigious Gordon Bell prize for outstanding achievement in high performance computing. The prize is considered the equivalent of the Nobel Prize in the field of supercomputing. The work landed on the cover of the journal *Science* twice, and was featured in *The New York Times, Washington Post* and *Scientific American*, among other publications.

Under Hylton's leadership, the SyNAPSE program accomplishments reached beyond the True North chip, which IBM is making available to research laboratories. SyNAPSE kick started research in the field with large companies, like HP, Samsung and Intel, and research institutions, such as the Sandia and Oak Ridge national laboratories and HRL laboratories, launching efforts to build neuromorphic chips and technologies.

Hylton's Nano Air Vehicle program at DARPA sponsored Aerovironment's development of the "hummingbird drone" that was featured on the cover of TIME magazine in November 2011 and likenesses of which continue to appear in Hollywood films including the recent hit "Eye in the Sky."

The New England Complex Systems Institute received a Wired Science 2011 Top 10 Scientific Discoveries award for another project that Hylton developed, funded and managed for DARPA. The work showed that financial speculation in food markets was strongly correlated with food crises affecting particularly poor people and nations.

Inventor and Entrepreneur

Hylton has a track record as an inventor and entrepreneur and has been awarded 19 patents. In the early 2000s, he cofounded 4Wave, a startup specializing in semiconductor equipment. He developed a new way to deposit a nano-meter thin film onto surfaces—a process used in electronics and optics manufacturing, among other things. The new process, called "biased target ion beam deposition," solved many well-known problems in existing techniques to create very thin film devices. The company built and sold capital equipment to many Fortune 500 companies, including IBM and Northrop Grumman.

Hylton earned his Ph.D. in applied physics from Stanford in 1991. He has taught at Georgetown University as an adjunct professor.

MEDIA CONTACT

Ioana Patringenaru, 858-822-0899, ipatrin@ucsd.edu

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