Lockheed Martin To Develop Automated Object Recognition Using Brain-Inspired Technology

The Defense Advanced Research Projects Agency (DARPA) and the National Geospatial-Intelligence Agency awarded Lockheed Martin a $4.9-million, 18-month program to use brain-inspired technologies to develop a system that will speed an image analyst's job by 100 times.

Called Object Recognition via Brain-Inspired Technology (ORBIT), the system will use electro-optical (EO), light detection and ranging (LIDAR), and brain-inspired technologies to automatically recognize objects in urban environments from ground and aerial surveillance. ORBIT will fuse commercial airborne EO and LIDAR sensor data into a three-dimensional, photorealistic model of the landscape. Its brain-inspired object-recognition technology will automatically generate lists of recognizable imagery, like mailboxes and dumpsters.

"ORBIT's automated, 3D, object-recognition capability will help eliminate the time analysts spend manually identifying objects," said Dr. Peter Bilazarian, ORBIT program manager, Lockheed Martin Advanced Technology Laboratories (ATL). "We think ORBIT will reduce analysis time of one square kilometer of imagery from 1,300 hours to less than 10 hours. Faster turnaround time for analysts means more timely and accurate mission planning."

Central to ORBIT are three complementary brain-inspired and machine- learning approaches to object recognition: Numenta's Hierarchical Temporal Memory technology, which performs invariant pattern learning based on a model of the brain's neocortex; a standard model of the brain's visual cortex for spatial recognition; and a computer-vision technology, which mimics the process of human vision and recognition.

ORBIT's object-recognition algorithms will recognize images as humans do -- based on low-level and complex patterns, object shape and texture, and features common to a class of objects. ORBIT will also recognize objects based on position in the landscape -- called contextual spatial analysis. For example: An object in the middle of the street is not a mailbox because mailboxes are not found in the middle of streets.

Bilazarian said that ORBIT will determine if an area is of interest, propose potential recognitions of the area, and use previous recognitions to improve the accuracy of object recognition. Analysts could then use previously identified objects to track changes in landscape over time or show possible hostile activity: For example: An image associated with trash may contain an improvised explosive device.

ORBIT is part of DARPA's Urban Reasoning and Geospatial Exploitation Technology (URGENT) program.

ATL leads a team of experts in object recognition and extraction, three- dimensional rendering, and spatial analysis. Teammates include Numenta, SPADAC Inc., Signetron, Inc., Teknowledge Corporation, and the University of Pennsylvania.

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