CMC MICROSYSTEMS IMPACT

A Multi-University Research Team Designs Super 'Eyes' for the Next Generation of the Canadarm

Researchers at Queen's University, the University of Toronto and Ryerson University are working together with CMC Microsystems and MDA Space Missions to develop a new generation of space-borne stereovision systems for the Canadarm2 and other space applications.

"There are two key differentiators in this project that will help us to increase the commercial potential of this research: CMC Microsystems and our industrial partner, MDA Space Missions. CMC provided our team with access to industry-grade tools and capability while connecting us to a network of users and developers who have experience with these technologies."

Dr. Michael Greenspan
Associate Professor, Electrical and Computer Engineering
Queen's University

Dr. Michael Greenspan of Queen's University is leading a multi-university research team on the development of a three-dimensional stereovision tracking system that would make it easier for Canadarm2 to grasp fast-moving objects and for the International Space Station (ISS) to dock with satellites.

Dr. Michael Greenspan of Queen's University aims to help the Canadarm2 and International Space Station (ISS) perform the delicate manoeuvres required in space research and exploration with even greater speed and accuracy.

The Associate Professor of Electrical and Computer Engineering is working with colleagues at the University of Toronto and Ryerson University, MDA Space Missions and CMC to develop a three-dimensional stereovision tracking system that would make it easier for Canadarm2 to grasp fast-moving objects and for the ISS to dock with satellites. The project team benefits from the microsystems research infrastructure delivered by CMC, and funding from MDA and the Ontario Centres of Excellence.

"Our long-term goal is to build a system that can perform these tasks without any human control or intervention. This requires a very high level of accuracy. There is no margin for error in space exploration," says Dr. Greenspan, who is working with Dr. James MacLean at the University of Toronto and Dr. Lev Kirischian at Ryerson University.

To create such a high-performance system, the researchers required a dynamic and robust development platform. CMC supplied the team with FPGA (field-programmable gate array)-based prototyping platforms to enable rapid processing of video imagery at high frame rates. Using this technology, the researchers integrated high-frame rate/stereovision-extraction and model-based tracking algorithms onto a single platform. This led to the creation of a new sensor that offers faster data processing and reduced power consumption in a more compact device—key considerations for space application.

This integrated sensor, called Fast Track™, captures video images and extracts stereovision data at 200 frames per second—10 times faster than the standard commercial stereovision sensors available today. It can also track the position and movement of objects in three-dimensional space. This provides scientists with more accurate information about the location of the object at each image frame, enabling the robotic arm to grasp the moving object autonomously.

The team is now aiming to test the sensor in real-world applications, and promote it to companies that conduct space exploration. *cmc*