USCAR Task Force Supports the Growth of National Science Foundation Cyber-Physical Systems R&D

SOUTHFIELD, Mich. /PRNewswire-USNewswire/ -- Few within the automotive industry would deny that the technological complexity of cars and trucks is growing at an exponential rate. Increasingly, the relatively simple stand-alone computing systems that once helped control the basic functions of engines, transmissions and braking systems have evolved into a network of highly sophisticated, electro-mechanical subsystems - or cyber-physical systems - autonomously controlling such things as complex as hybrid drive systems, automated parking assist systems and crash avoidance systems.

At the United States Council for Automotive Research LLC, (USCAR) researchers and engineers from Chrysler Group LLC, Ford Motor Company and General Motors Company are working to stay ahead of the "mechatronics" trend, as well as support the broader development of cyber-physical systems (CPS) research. Through USCAR's Cyber-Physical Systems Task Force, the U.S. automakers have taken a proactive role in supporting the National Science Foundation's interest in CPS research.

In 2006, the NSF began a series of workshops in which it identified CPS among "key areas of research." One year later, the USCAR CPS Task Force was formed and immediately became a leader in the NSF workshop discussions, providing an automotive perspective at the events. As a result, CPS have gained increased visibility and interest across scientific communities and within a variety of industries.

Bill Milam, chair of the USCAR CPS Task Force and Ford technical expert for Embedded Systems, served as technical co-chair for several NSF workshops and provided an automotive perspective along with Alan Taub, USCAR Council member and GM vice president. Other CPS Task Force members from Chrysler Group, Ford and GM also helped coordinate NSF workshops and gave presentations.

"For many, it really was an eye-opener," Milam said of the presentations. "People rarely understand the deep complexity in today's cars and trucks. The systems that interact within them - engine, transmission controllers, braking, steering, communications, passenger safety and comfort - are as complex as any electro-mechanical systems out there.

"As a result of the workshops, many now understand two things about the automotive deployment of CPS: it is already highly sophisticated, and it has a larger deployment than most other industries. This makes it a great launching pad for further study from many perspectives," he said.

Developing vehicle systems through the CPS "philosophy" requires a more holistic approach to understand how extremely complex systems function on a deep level, and simultaneously, how they function from a very high-level perspective.

"If you always engineer systems from the top down, you miss opportunities to utilize the processing capabilities on the deep-level computational system, and conversely, engineers on the embedded system level frequently cannot see where their systems can be better leveraged for the overarching structure," Milam added. "They can miss out on opportunities to help high-level problem solving."

For automotive systems, CPS are already changing the view of vendors in the vehicle electrification arena where multiple networked control systems are expanding rapidly. This has brought suppliers and systems integrators into the product development/design process earlier than ever before.

From the NSF perspective, there has been a growing interest from various industries, including aerospace, medical and educational communities, which are expected to be a hotbed for CPS R&D and where the benefits of further CPS research appear to be wide open.

"Universities, along with industry partners, can lead a lot of the development of experimental platforms that can be useful in many different industries," Milam said. "USCAR and the auto industry have been a perfect fit at the workshops, as we bring our experience and expertise to help shape how the next generation of scientists and engineers will be cross-trained to consider computational, controls, engineering and programming perspectives simultaneously."

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