Bandwidth Reduction for Controller Area Networks

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ABSTRACT:

The rising complexity of many modern engineering systems such as robots, automation systems, and automobiles is gradually demanding that more and more actuators and sensors be available to interact with the system environment. In the past, it was common to give each actuator or sensor a dedicated channel to or from a main computational node, which we refer to as the controller or the control node. However, this situation is giving way to the notion of decentralized control, where controllers, actuators and sensors all communicate via one high-speed real time network backbone. One of the most reliable and well-understood such network protocols is the Controller Area Network (CAN). CAN is widely used by automobile manufacturers in Europe, and has seen application to various robotics and automation systems worldwide. Though the topics in this presentation are not limited to CAN systems, we use CAN as our motivating example without loss of generality.

This presentation will introduce a method by which controllers operating on real-time networks such as the Controller Area Network (CAN) can reduce their bandwidth requirements in response to periods of high network traffic from sporadic sources. The method derives from advances in the theory of dynamic systems on time scales.

KEY WORDS: Controller Area Network, Adaptive Sampling, Dynamic Systems, Time Scales

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