

John Kenney, 2013-04-15

Abstract:

A Linear Adaptive Control Approach to Congestion Management in Cooperative ITS

Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication hold great promise for significantly reducing the human and financial costs of vehicle collisions. A common characteristic of this communication is the broadcast of a device's core state information at regular intervals, e.g. via the Cooperative Awareness Message defined by ETSI, or the Basic Safety Message defined by SAE. Unless controlled, the aggregate of these broadcasts will congest the channel under dense traffic scenarios.

This talk explores the problems and characteristics of this congestion, and presents a congestion control approach based on adapting safety message transmission rates. The LInear MESSage Rate Integrated Control (LIMERIC) algorithm uses linear, as opposed to binary, adaptive feedback to keep channel load at a level that achieves high throughput and acceptable MAC frame collision probability. LIMERIC has provable stability and fairness properties.

The talk also presents extensions to LIMERIC that enable differentiated transmission opportunities based on vehicle characteristics (e.g. dynamics). Analytical and NS-2 simulation results are presented that illustrate the performance and key characteristics of LIMERIC.

John Kenney

Biography

John Kenney leads a vehicular networking research team at Toyota InfoTechnology Center in Mountain View, California.

Research interests include wireless protocols at the MAC and Physical layers, congestion control, security, and performance optimization.

He represents Toyota in the CAMP VSC consortium and in international standards organizations including IEEE, SAE, and ETSI.

He was General Co-Chair of the ACM VANET Workshop in 2011 and 2012.

He holds a Bachelor's degree and Ph.D. from the University of Notre Dame and a Master's from Stanford University. He also was an adjunct professor at Notre Dame from 1990-2010.

Prior to his work for Toyota his research interests included high speed Internet switches, QoS, and adaptive systems.