ACAR: Adaptive Connectivity Aware Routing for Vehicular Ad Hoc Networks in City Scenarios

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Abstract

Multi-hop vehicle-to-vehicle communication is useful for supporting many vehicular applications that provide drivers with safety and convenience. Developing multi-hop communication in vehicular ad hoc networks (VANET) is a challenging problem due to the rapidly changing topology and frequent network disconnections, which cause failure or inefficiency in traditional ad hoc routing protocols. We propose an adaptive connectivity aware routing (ACAR) protocol that addresses these problems by adaptively selecting an optimal route with the best network transmission quality based on statistical and real-time density data that are gathered through an on-the-fly density collection process. The protocol consists of two parts: 1) select an optimal route, consisting of road segments, with the best estimated transmission quality, and 2) in each road segment of the chosen route, select the most efficient multi-hop path that will improve the delivery ratio and throughput. The optimal route is selected using our transmission quality model that takes into account vehicle densities and traffic light periods to estimate the probability of network connectivity and data delivery ratio for transmitting packets. Our simulation results show that the proposed ACAR protocol outperforms existing VANET routing protocols in terms of data delivery ratio, throughput and data packet delay. Since the proposed model is not constrained by network densities, the ACAR protocol is suitable for both daytime and nighttime city VANET scenarios.

Bio

Qing Yang received his B.E. and M.E. degree in computer science and technology from Nankai University (China) and Harbin Institute of Technology (China) in 2003 and 2005, respectively. He is currently a Ph.D candidate in the Department of Computer Science and Software Engineering, Auburn University. He is a student member of IEEE and ACM, and has been a Vodafone Fellow from 2005 to 2008. His research interests include target tracking in distributed sensor networks, routing in vehicular networks (VANET) and real-time embedding systems.

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