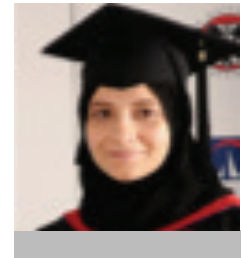


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Dissertation

Title Scalable Multi-hop Data Dissemination in Vehicular Ad hoc Networks
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Abstract

Vehicular Ad hoc Networks (VANETs) aim at improving road safety and travel comfort, by providing self-organizing environments to disseminate traffic data, without requiring fixed infrastructure or centralized administration. Since traffic data is of public interest and usually benefit a group of users rather than a specific individual, it is more appropriate to rely on broadcasting for data dissemination in VANETs. However, broadcasting under dense networks suffers from high percentage of data redundancy that wastes the limited radio channel bandwidth. Moreover, packet collisions may lead to the broadcast storm problem when large number of vehicles in the same vicinity rebroadcast nearly simultaneously. The broadcast storm problem is still challenging in the context of VANET, due to the rapid changes in the network topology, which are difficult to predict and manage. Existing solutions either do not scale well under high density scenarios, or require extra communication overhead to estimate traffic density, so as to manage data dissemination accordingly. In this dissertation, we specifically aim at providing an efficient solution for the broadcast storm problem in VANETs, in order to support different types of applications. A novel approach is developed to provide scalable broadcast without extra communication overhead, by relying on traffic regime estimation using speed data. We theoretically validate the utilization of speed instead of the density to estimate traffic flow. The results of simulating our approach under different density scenarios show its efficiency in providing scalable multi-hop data dissemination for VANETs.

Research Relevance and Potential Impact

This research aims at improving data exchange in vehicular networks. The proposed solution contributes greatly to the deployment of safety and comfort applications in next generation transportation systems. By exploiting communication between vehicles these applications make our everyday travelling safer and more efficient.

Relevant Publications

- Chaqfeh, Moumena, Abderrahmane Lakas. "A Novel Approach for Scalable Multi-hop Data Dissemination in Vehicular Ad hoc Networks." Accepted in the Journal of Ad hoc Networks. 2015.
- Chaqfeh, Moumena, Abderrahmane Lakas. "Beacon-less Scalable Multi-hop Data Dissemination in Vehicular Ad hoc Networks." Accepted in the International Wireless Communications and Mobile Computing Conference (IWCMC). 2015.
- Chaqfeh, Moumena, Abderrahmane Lakas. "Scalable Multi-hop Data Dissemination in Vehicular Ad hoc Networks." Accepted in the UAE Graduate Students Research Conference (GSRC). 2015.
- Chaqfeh, Moumena, Abderrahmane Lakas, and Imad Jawhar. "A survey on data dissemination in vehicular ad hoc networks." Vehicular Communications 1.4 (2014): 214-225.
- Chaqfeh, Moumena, and Abderrahmane Lakas. "SAB: Speed Adaptive Broadcast for Scalable Multi-hop Data Dissemination in Vehicular Ad hoc Networks." The International Wireless Communications and Mobile Computing Conference (IWCMC). 2014.
- Chaqfeh, Moumena, and Abderrahmane Lakas. "Shortest-time route finding application using vehicular communication." IEEE Wireless Communications and Networking Conference (WCNC). IEEE, 2014.
- Chaqfeh, Moumena, Abderrahmane Lakas, and Sanja Lazarova-Molnar. "Performance Modeling of Data Dissemination in Vehicular Ad Hoc Networks." IEEE/ACM 17th International Symposium on Distributed Simulation and Real Time Applications (DS-RT). IEEE, 2013.

Career Aspirations

I am planning to become a professor and a leading researcher in the field of vehicular networking. My objective is to contribute in making our everyday driving safer and more convenient.