Content Dissemination in Vehicular Social Networks: Taxonomy and User Satisfaction

Farouk Mezghani, Riadh Dhaou, Michele Nogueira, and André-Luc Beylot

ABSTRACT

Social networking applications have gained huge popularity. With the widespread use of smart devices (e.g., on-board units, smartphones), these social networks are increasingly going mobile. As a result, a new trend of networking has emerged, referred to as vehicular social networking (VSN), which combines the wireless communications between vehicles with their social relationships. In a broader view, VSNs are social networks formed on roadways by users who have social relationships, interactions, and common interests. The exploitation of vehicular users' social properties provides better networking and social support to innovative applications and services. This article overviews recent achievements in VSN by providing an organized view of existing approaches. Its contribution lies in a taxonomy for content dissemination approaches in the context of VSN. Also, a framework is outlined to tackle a major new challenge: supporting user satisfaction. Finally, this article emphasizes open research and future trends.

INTRODUCTION

Social networks have gained significant attention in the research and industrial communities. With the rapid evolution of the Internet, online social networks (OSNs) such as Facebook appeared as the first form of social networking, but have been limited to online activity. With the advent of wireless mobile devices (e.g., smartphones, onboard units — OBUs) that have the capability to detect proximity to other users, and communicate and share data with them, various types of networks are emerging as new paradigms to exploit social properties of mobile nodes such as vehicular social networks (VSNs), mobile social networks (MSNs), and delay-tolerant networks (DTNs).

VSNs [1] enable drivers and passengers who usually travel every day between home, office, and points of interest to socialize and exchange information with other commuters on the road. These commuters may perceive the traffic situation and share the driving experience (e.g., road hazards and traffic jams) in order to enhance traffic management. Furthermore, they can support the exchange of useful information for commuter entertainment (e.g., gas prices and video news). Due to the resource constraints of mobile devices and communication networks, content dissemination in VSNs presents several challenges. For example, due to the high dynamism of the network, it is hard to understand the social properties of the nodes and how to take advantage of users' behavior to improve the performance of the network in terms of content dissemination [2]. Communication links between vehicles might remain active only for short periods of time because of the high mobility of vehicles.

In the last decade, researchers have begun to address these issues. However, the literature on VSN lacks work that can present the state-of-the-art challenges in content dissemination. Furthermore, the literature lacks work pointing out the main characteristics of existing approaches for content dissemination and outlining open issues. Hence, this article:
- Reviews recent achievements related to content dissemination in VSNs
- Provides an organizing view of existing approaches by clearly pointing out their advantages and constraints
- Facilitates deep study of advances in the state of the art

Furthermore, it has been observed that interesting approaches exploit classic metrics such as delivery delay and delivery ratio to support the content dissemination schemes. Although those solutions represent improved results, another important feature has been left behind: *user satisfaction*, a quantitative metric that computes how well users are satisfied. It calculates, through a function of users' interests, the benefit (gain) of users in receiving the content. In VSN content dissemination is interest-driven; hence, it is necessary to provide a scheme that maximally satisfies users' interests (i.e., maximize the total data utility by sending the appropriate content objects that match user interests). This work presents a framework to measure and maximize the satisfaction of users' interests.

Farouk Mezghani, Riadh Dhaou, and André-Luc Beylot are with the National Polytechnics Institute of Toulouse.

Michele Nogueira is with the Federal University of Paraná.