Chapter 3

Survey on Risk-Based Decision-Making Models for Trust Management in VANETs

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ABSTRACT

Ubiquitous use of wireless technology and ad-hoc networks have paved the way for intelligent transportation systems also known as vehicular ad-hoc networks (VANETs). Several trust-based frameworks have been proposed to counter the challenges posed by such fast mobile networks. However, the dynamic nature of VANETs make it difficult to maintain security and reliability solely based on trust within peers. Decision-making upon collaborative communications is critical to functioning of VANETs in safe, secured, and reliable manner. Decision taken over malicious or wrong information could lead to serious consequences. Hence, risk management within paradigm of trust becomes an important factor to be considered. In this chapter, a survey of the existing works having incorporated risk factor in their trust models has been explored to give an overview of approaches utilized. The parameters chosen in these models are analyzed and categorized based on the approaches modeled. Finally, future research directions will be presented.

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INTRODUCTION

With ever growing population and significant increase in the number of vehicles on the road, traffic efficiency and road-safety have become important issues to be addressed. Several studies have been conducted on the number of accidents, giving harrowing statistics to the number of lives lost due to road accidents each year (“Wikipedia on road traffic safety, n.d.). In Saudi Arabia alone, there is an accident every minute, claiming 20 deaths every day (Gazette, 2018).

Recent advancement in technology and better connectivity over wireless connection have given rise to set of technologies to tackle such problems. More vehicles connected with Wi-Fi devices and equipped with GPS technology has enabled vehicle to vehicle (V2V) or vehicle to road side units (RSUs) communication, thus forming peer-to-peer network known as vehicular ad-hoc network (VANET). Connected vehicles can communicate and share information about the condition of the road or any relevant information to avoid accidents and ensure efficient traffic as well road safety. Several applications have been developed to aid the driver through all the information collected besides providing entertainment (Al-Sultan, Al-Doori, Al-Bayatti, & Zedan, 2013). These applications could be classified as traffic related, safety related, and entertainment related (Shaikh, 2016). Thus, VANET has garnered significant interest and hence an interesting area of research in tackling issues pertaining to road safety, traffic management as well as comfort (Zeadally, Hunt, Chen, Irwin, & Hassan, 2010). Several projects have been established in industrial and academic arenas e.g. TRIG Project (London, 2015), GST, PreVent and Car-to-Car Consortium (Car 2 Car Consortium, n.d.) to solve the problems pertaining to VANET and establish safer and efficient mobility. Car manufacturers have already started to equip their vehicle with devices that help them to establish vehicular connectivity and also propose algorithms that issue a warning if there is highly likely possibility of a crash or an accident (Zhang J., A Survey on Trust Management for VANETs, 2011).

Lot of effort is being put to ensure secure and reliable delivery of the information shared through peers in VANET. However, evaluating the quality of the message shared, for instance, message forwarded by a malicious peer that leads to false warning could bring traffic to halt or even cause a fatal accident, the notion of trust has been incorporated in various models (Wei & Chen, 2014; Cohen, Zhang, Finnson, Tran, & Minhas, 2014; Mui, Mohtashemi, & Halberstadt, 2002) to seek out the peers that are dishonest or exhibiting malicious behavior. Several works have been established in the discipline and quite a number of comprehensive surveys have also been published related to the work.
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