Abstract

This paper presents a violation detection and collision avoidance system to vehicles at road intersections. The system relies on secure messages to assist vehicles in a constant size neighborhood by detecting traffic rule violations and finding trajectory conflicts at intersections. Each vehicle is modeled as an automaton that, regardless of its visual range, can see the states of other vehicles through on-board sensors and/or by using wireless communications. Traffic rules are encoded in the program of a vehicle and guide the changing state of the vehicle in traffic. Each vehicle can autonomously decide if the vehicles in its neighborhood comply with the traffic rules by observing the movements of the vehicles on the road and then anonymously reporting the observed violations to a traffic authority be further processed. Each vehicle periodically generates shared secrets which are then used as part of messages it sends to achieve security and privacy. The location of these messages is not traceable by any single traffic authority in the system, including the authentication parties and the road infrastructure. Yet, the proposed system is able find the location and real identity of any vehicle whenever it commits a rule violation in traffic with a lightweight protocol. Further, the security analysis is
Intersection Safety through Traffic Violation Detection

provided and the performance simulation results show that the system allows no false positives.

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Index Terms

Computer Science Information Systems

Keywords

Vehicular ad hoc networks (VANETs), Dedicated Short Range Communications (DSRC), traffic
violation and ticketing, traffic safety, location privacy