Intelligent beaconless geographical forwarding for urban vehicular environments

Abstract :

A Vehicular Ad hoc Network is a type of wireless ad hoc network that facilitates ubiquitous connectivity between vehicles in the absence of fixed infrastructure. Source based geographical routing has been proven to perform well in unstable vehicular networks. However, these routing protocols leverage beacon messages to update the positional information of all direct neighbour nodes. As a result, high channel congestion or problems with outdated neighbour lists may occur. To this end, we propose a street-aware, Intelligent Beaconless (IB) geographical forwarding protocol based on modified 802.11 Request To Send (RTS)/ Clear To Send frames, for urban vehicular networks. That is, at the intersection, each candidate junction node leverage digital road maps as well as distance to destination, power signal strength of the RTS frame and direction routing metrics to determine if it should elect itself as a next relay node. For packet forwarding between Intersections, on the other hand, the candidate node considers the relative direction to the packet carrier node and power signal strength of the RTS frame as routing metrics to elect itself based on intelligently combined metrics. After designing the IB protocol, we implemented it and compared it with standard protocols. The simulation results show that the proposed protocol can improve average delay and successful packet delivery ratio in realistic wireless channel conditions and urban vehicular scenarios.