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Dynamic Multiple Junction Selection Based Routing Protocol for VANETs in City Environment

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Abstract: VANET (Vehicular Ad-hoc Network) is an emerging offshoot of MANETs (Mobile Ad-hoc Networks) with highly mobile nodes. It is envisioned to play a vital role in providing safety communications and commercial applications to the on-road public. Establishing an optimal route for vehicles to send packets to their respective destinations in VANETs is challenging because of quick speed of vehicles, dynamic nature of the network, and intermittent connectivity among nodes. This paper presents a novel position based routing technique called Dynamic Multiple Junction Selection based Routing (DMJSR) for the city environment. The novelty of DMJSR as compared to existing approaches comes from its novel dynamic multiple junction selection mechanism and an improved greedy forwarding mechanism based on one-hop neighbors between the junctions. To the best of our knowledge, it is the first ever attempt to study the impact of multiple junction selection mechanism on routing in VANETs. We present a detailed depiction of our protocol and the improvements it brings as compared to existing routing strategies. The simulation study exhibits that our proposed protocol outperforms the existing protocols like Geographic Source Routing Protocol (GSR), Enhanced Greedy Traffic Aware Routing Protocol (E-GyTAR) and Traffic Flow Oriented Routing Protocol (TFOR) in terms of packet delivery ratio, end-to-end delay, and routing overhead.

Keywords: intelligent transportation; multiple junctions; position based routing; optimal route

1. Introduction

The emerging Vehicular Ad-hoc Networks (VANETs) is getting a spotlight from entities like academicians, research institutes, and industries because it is envisioned to play a very important role for the future transportation system. It aims at enhancing the driving experience of the users by playing a crucial role in developing Intelligent Transportation System (ITS) and road safety by providing road conditions and vehicular traffic information to the drivers. For the safety of drivers and regulating the flow of vehicles, the drivers have to be alerted to unwanted traffic accidents, traffic congestion, road conditions, and other associated features. The main objective of VANETs is to address these issues by providing the exact and timely information to the drivers [1–12].

In VANETs, nodes are self-organized and capable of communicating in an infrastructure-less environment [1–5,13,14]. The integration of advanced wireless technologies in vehicles helps them to communicate without any infrastructure, which reduces the cost of hefty infrastructure deployment. For the wireless access in a vehicular environment, IEEE 802.11 committee has developed a standard named as IEEE 802.11p. For Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications,