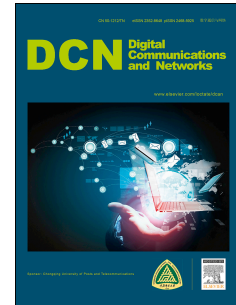


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Trade-off between Accuracy, Cost and QoS Using Beacon on Demand Strategy and Kalman Filtering Over VANET

Zineb Squalli Houssain ^{*,a}, Imane Zaimi ^b, Maroua Drissi ^b,
Mohammed Oumsis ^{b,c}, and Saïd El Alaoui Ouatik ^a

^a IT laboratory and Modelling (LIM) Faculty of Science at Dhar El Mahraz (FSDM) Sidi Mohammed Ben Abdellah University (USMBA), Fez, Morocco.

^b LRIT, Associated Unit to CNRST (URAC 29) Faculty of Science, Mohammed V University, Rabat, Morocco.

^c High School of Technology, Mohammed V University, Sale, Morocco.

Abstract

Vehicular Ad-hoc Network (VANET) has been suggested as an active and powerful field for research due to the fact that its environment encounters many challenges. The mainly challenge in VANET is to ensure the routing with a good quality of service (QoS). The Greedy Perimeter Stateless Routing (GPSR) protocol is one of the most promising position-based routing mechanisms elected to overcome this challenge. In fact, its effectiveness depends entirely on the information of node's mobility and their precision. Through broadcasting periodic beaconing within transmission boundary ranges, GPSR can manage neighbors' mobility information and maintain the up-to-date of neighbor's lists. Nevertheless, the information about the position of a neighbor vehicle is fast outdated, which negatively influences the efficiency of the routing. In order to monitor information mobility and increase QoS over this challenging area, positions estimation needs to be considered.

Thus, in this paper, we study the position estimation problem, and we propose an improvement of GPSR, named KF-GPSR, where each vehicle estimate in real time the position of its neighbors by using kalman filter algorithm. Indeed, by employing this strong estimation technique, it is possible to reduce considerably the frequency of exchanged beacon packet while keeping position accuracy highest. For more reliability, we also propose an extension of KF-GPSR, denominated BOD-KF-GPSR that involves 'Beacon on Demand' process only if a node needs to rediscover its neighborhood. The simulation experiments with network simulator NS-2 are presented in order to prove the ability and usefulness of our two proposals. The comparison study took into account diverse common protocols: GPSR, AODV, DSR and ZRP. The results show that BOD-KF-GPSR achieves a significant enhancement in terms of packet delivery ratio, routing cost, normalized routing load, end-to-end delay and throughput.

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KEYWORDS: VANET, KALMAN FILTER, GPSR, Beacon on Demand, Estimation, Routing, QOS.

1. Introduction

Current transport systems are pivotal to achieving sustainable development in a rapidly changing world.

However, there is a wide range of intractable challenges that are directly related to this sector, such as pollution caused by carbon emissions, traffic accidents, resource depletion and difficulty of ensuring a pleasant driving experience. To this end, innovation and improvement of existing systems are compulsory to overcome all the latter problems.

In this context, Vehicular Ad-hoc Network (VANET) is a promising technology for emerging intelligent transport systems (ITS)[1]. VANET

*Zineb Squalli Houssaini (email:zinebsqualli@gmail.com).

¹Imane zaimi (email:imanzaimi@gmail.com).

²Maroua Drissi (email:drissimaroua@gmail.com).

³Mohammed Oumsis (email:mohamed.oumsis@um5.ac.ma).

⁴Saïd El Alaoui Ouatik (email:s.ouatik@yahoo.com).

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