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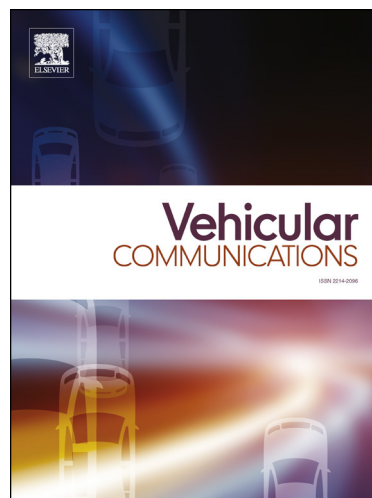
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Mobility Routing Model for Vehicular Ad-hoc Networks (VANETs), Smart City Scenarios

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Abstract— **Vehicular Ad-hoc Networks (VANET) is one of the most actual and challenging research area in automotive companies and ITS designers. The presence of such these networks opens the way for a wide range of applications such as safety applications, mobility and connectivity for both driver and passengers to exploit the transport systems in a smoothly, efficiently and safer way. For safety applications the best routing protocol must be selected. The most three common routing protocols that are used in VANET are: DSR, AODV and DSDV. Indeed, it is important and essential to test and evaluate different routing protocols that related to VANET system before apply them in the real environment which can be done via VANET simulation tools. This paper evaluates the performance of three different routing protocols for VANET system in city of Khartoum. The performance are evaluated and compared in terms of PDR, average throughput, delay and total energy. Our objective is to estimate the performance of routing model for city scenario. The main goal is to find the suitable routing protocol in a high density traffic area in Khartoum. We have considered three routing protocols DSR, AODV and DSDV. The results indicate the poor quality of DSDV protocol which is a type from proactive routing protocols. The AODV protocol achieves maximum average throughput which is equals to 330.07Kbps. The minimum value of delay is obtained from using DSR protocol was 15.81 ms.**

Keywords— **VANET, ITS, DSR, AODV Mobility Simulator, SUMO, MOVE.**

I. INTRODUCTION

Intelligent Transportation Systems (ITS) have been one of the promising technology that has a big interest attention from many researchers over the world. Indeed, automotive companies, ITS designers, and even the industry academic research communities are all looking forward to design and deploy different ITS applications and systems. The main goal of ITS is to introduce improvements in terms of efficiency and safety level of the road and the transportation system via new applications, protocols and standard. Besides that, increasing number of vehicles gives the motivations for improving road safety and inter-vehicle entertainment via vehicular systems [1-3]. Indeed, Inter Vehicle Communication system (IVC) including VANET systems as part of ITS has become an exciting field of research area in Japan, EU and US with a large body of many problems in order to achieve variety of applications with high level of accuracy in efficient manner. The main goal of these different applications is to make the transportation system more efficient and secure [2, 4, 5].

Different routing protocols can be used for VANET. These protocols are used to transfer the message from source to sink. Following the unique characteristics of VANET system, unique routing protocols must be selected and then evaluated by using VANET simulators. Generally, the routing protocols are categorized into three types: Proactive, Reactive and Hybrid between the first two types [6, 7]. In general, the proactive protocols are called as well Table Drive such as Destination Sequenced Distance Vector (DSDV). In this type of protocol, each node only needs to identify the next hop to the sink, and the numbers of hops away the sink. This information is located in a table. On the other hand, the reactive protocols including AODV and DSR try to set up routes on-demand when the node needs to initiate communication with a node to which it has no route, the routing protocol will try to establish such a route.

According to the above, ITS designers need to work on simulation for VANET in order to evaluate the system performance before deploying these new applications to the real environment. It is important and crucial to know the best routing protocols in VANET systems so the system is less time transmission in case of safety applications. On the other hand, for development purposes, simulation tools are needed. The main idea behind VANET simulation is to make sure about traffic mobility model which is real world model for VANET system and hence evaluate the system performance and analysis the importance system's parameters. Moreover, it is important to study the impact of different routing protocols on VANET in case of using system which will provide the user with safety applications.

In this paper, three different routing protocols (AODV, DSR and DSDV) are simulated and compared in terms of PDR, average throughput, delay and total energy. Section II reviews several different VANET routing protocols that are popular. In Section III, the mobility and traffic models steps are discussed and simulation environment is explained in details. Section IV presents the results analysis for three different scenarios. Section V concludes the results of this paper.

II. Related Works

Many efforts have been done by researchers for finding the best routing protocols in VANET system. Different routing protocols with different VANET's simulator are evaluated in terms of different parameters. In [8], the authors conducted a simulation studies by using NS-2 tool to evaluate performance of AODV, DSDV and DSR routing protocols on the basis performance metric packet delivery ratio, end to end delay, and throughput in the cluster based VANET environment. The results proved that, DSR protocol is more applicable in small size of cluster but as size of the cluster increased AODV protocol shows drastic changes in its performance and more applicable while DSDV evaluation results are not desirable in comparison with other two reactive routing protocols. The simulation here did not consider any network traffic. Similarly, in [9] the authors examined the