Effect of Mobility Models on Broadcasting Beacon Messages in VANETs

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Abstract

The rising number of road accidents and the limited capacity of the streets are some of the main reasons of the increasing interest in the research area of vehicular applications. These applications concentrate mainly on improving drivers and passengers’ safety and comfort over the course of their travel on roads. Vehicular Ad-Hoc Networks (VANETs) is a class of Intelligent Transportation Systems (ITS) which aim to reduce the number of accidents, improve vehicular traffic flows and provide comfort for the drivers and passengers. Mobility models are the key requirement that provide realistic environment for VANETs simulation. They represent the realistic behavior and movement of vehicular traffic. As a consequence, these models should be as close as possible to the realistic situations and describe truthfully the real world behavior to provide accurate results. This thesis investigates the impact of broadcasting beacon messages between vehicles with four most popular mobility models which are, Car Following, Lane Changing, Intersection Management and Roundabout Layout. These four mobility models provide further understanding on the effects of introducing realistic details that can be found in physical world. The mobility models are generated using Simulation of Urban Mobility (SUMO) traffic generator and the broadcast protocol is implemented in Network simulator NS-2. The performance of the broadcast protocol is evaluated by means of the Packet Delivery Ratio (PDR). The main contribution to this thesis is the definition of the mobility model: Car Following Model with Roundabout Layout. This mobility model is applied on Burj Al Sahwa Roundabout which is a well-known roundabout in Muscat-Oman. Our qualitative and quantitative results demonstrate that these mobility models have great impact on packets delivery among vehicles in particular dense environments. The average PDR in highway road topology decreases as the number of vehicles travel through it increases. In addition, intersections and roundabouts are segments of roads where the vehicle density is high which results in low PDR performance.