Visualization of Spatial Distribution of Random Waypoint Mobility Models

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Abstract: In multi-hop wireless network simulation, mobility model is one of the crucial factors affecting the performance of networks. This paper aims to analyze the spatial distribution of Random Waypoint mobility models with the progress of time. Additionally, we study the network performance of a random-based mobility model. The results from the evaluation show the uniform node distribution of Random Waypoint model in sparse network environment. In fact, we observe that nodes tend to be clustered in the middle with more number of nodes and progress of time. On the performance evaluation, the results show that Random Waypoint gain moderately higher delivery ratio than Random Walk and Random Direction models.

Key words: Random Waypoint, MANET, Mobility Model, Wireless Network.

1. Introduction

The most widely used mobility model for Mobile Ad- hoc Network (MANET) simulation is the Random Waypoint Model (RWP) [1] in which each node moves independently of each other in the obstacle-free environment. It is a simple stochastic mobility model to simulate the movement behavior of mobile nodes in two dimensional areas [2]. In fact, RWP is normally used in OppNets simulation such as in [3]–[6] where every node chooses a random location in the simulation area and moves towards it at a random speed uniformly chosen from (V_{min},V_{max}). The simplicity of analysis of this stochastic RWP has made it a benchmark for multi-hop mobile network simulation [7]. In the simulation, V_{min} is the minimum and V_{max} is the maximum speed of the nodes

In RWP model which is a generalization of Random Walk (RW), a new destination inside the network area is chosen randomly. Then the node moves towards that destination with a randomly selected speed as can be seen in the example topology in Fig. 1 and movement pattern in Fig. 2. Normally the Network Simulator implements this mobility model as follows:

- A node randomly chooses a destination and moves to- wards it with a velocity chosen uniformly and randomly from pre-defined ranges [0, V_{max}]
- The direction and velocity of a node are chosen independently of other nodes.
- Upon reaching the destination, the node stops for the pause time parameter, T_{pause}, duration.
- After this duration, it again chooses a random destination and repeats the whole process again until the simulation ends.