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ScienceDirect
Karbala International Journal of Modern Science 2 (2016) 29–40
http://www.journals.elsevier.com/karbala-international-journal-of-modern-science/

Hybrid fuzzy social mobility model

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Received 21 October 2015; revised 6 November 2015; accepted 12 December 2015
Available online 6 January 2016

Abstract

Wireless ad hoc network is one of the best types of networks because of the flexibility where there is no need of additional infrastructure to be installed. For the development of such type of networks, the simulation process is one of the low-cost reliable tools. Network protocols validation is the most important factors that can be tested and developed through a simulation process. The simulation process and environment must be close to the reality as more as possible. In addition, the network's node is considered as moving objects, so it is necessary to introduce dedicated models reflect the movement of these nodes which emulates the movement in the real world. In literature, there are many models to simulate the random movement, others tried to emulate the node's movement in the real world, but most of them are incomplete. The realistic model must takes the considerations of human and social aspects from one hand and on the other hand, the geographical constraints of locations. It is very important to know that these considerations cannot be considered perfect because the mobility model represents general aspects and not a private movement case. Therefore, this information must be represented as inaccurate. The work presented in this research aims to provide a realistic mobility model for Manet networks. This model takes into account the human and social relationship on one hand, and geographical restrictions of location on other hand. It also addresses the problem of imprecision in social relationships and the location where we apply Fuzzy logic concept.

Keywords: Manet; Mobility model; Realistic model; Social aspects; Fuzzy logic

1. Introduction

The rapid growth in the online world has made communication process is an important factor and integrated in the world of computing, and with the great development of smart devices has made it important to stay in touch all the time, and to keep in touch all the time be possible by connecting to the network quickly and efficiently when moving between built a different infrastructure, came Ad Hoc networks to address these issues [1].

Wireless Ad Hoc networks is a set of wireless nodes associated with each other wirelessly, and does not need any additional infrastructure such as base-station or wireless access points. Therefore, each node not only play the role as the end of the system but also possible to play the role of router and send packets to the desired node.

The aim of the Ad Hoc networks provides assistance in environments that cannot create a wired networks such as battlefields or disaster environments

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Peer review under responsibility of University of Kerbala.

http://dx.doi.org/10.1016/j.kijoms.2015.12.004

because it is difficult or expensive to create such infrastructure. Ad Hoc networks means wireless networks without infrastructure, which is also called self-networks.

As a result of the availability of small and non-expensive devices that communicate with each other wirelessly, so the search field in MANETs networks [2] attract a lot of attention in recent years.

The simulation process is an essential tool for the assessment of protocols and other parameters in computer networks before they are applied on the real world. As well as the simulation process can also be accomplished easily and with small overhead, while the application of Ad hoc networks in the real world is expensive and more difficult. Moreover, the simulation enables us to repeat scenarios, isolate the parameters, and so forth. To be close to real world the simulation must reflect the real-world components completely. One of these components which are the subject of our attention in this research is the movement models.

Mobility models are designed to describe the movement patterns of mobile users, their speed and their acceleration over time. In this study, the mobile users are human where their speed is between 0 and 1.4 m/sec and the pause time is in-between 10 and 300 s. The mobility model built according the proposed node movement, where this movement will be based on time and position and destination. There are many models of mobility, which is, discussed briefly further where a new model has been proposed which takes in confederations the pros and cons of the previous research works. This reset of this paper includes a study of the movement patterns in MANETs networks, a mathematical model and the proposed algorithm.

Fuzzy logic [3] is a technique used to make a decision from the input parameters. The advantage of fuzzy logic is the ability to take into account a large number of parameters and provide the best possible solution that is help to take the decision. Based on fuzzy logic, the decision can be made through three major steps: Fuzzification Fuzzy inference system, Defuzzification (Fig. 1).

In the Fuzzification the input parameters are compared with standard values using specific functions. Each of the input parameters are assigned to one of the output fuzzy sets. In the second step, the fuzzy inference system has rules that map the input to the output. This map maybe represented using “if -then” which are used to analyze and evaluate the fuzzy sets corresponding to the input parameters. From the value obtained, the decision is made.

Toolbox of Fuzzy Logic in Matlab offers functions and a Simulink block for developing systems based on fuzzy logic(from analysis to simulation). The toolbox lets us model complex system behaviors using simple logic rules, and then implement these rules in a fuzzy inference system.

2. Related works

Mobility models are designed to describe the movement of mobile users, a speed, a path, destination and their acceleration over time.

There are several mobility models that developed as a result of research works and that came with realistic solutions to the problems faced by the basic random models (Fig. 2). The researchers in Ref. [4] presented a paper titled mobility models for MANETs from mathematic perspective. Where the researchers divided the models into two groups. The first group titled individual mobility models which includes six models (random walk model, Random Way Point, Random direction, Boundless simulation area, probabilistic version of the random walk model and city section mobility model). The second group, nomadic community which includes mobility models for groups and research purpose. It comprises four different models like column mobility model, The nomadic community model or Bedouins, Pursue mobility and RPGM. In column mobility model a group of nodes uniformly moving together that is useful mainly for the purposes of the scan.

In the nomadic community or Bedouins a group of nodes moving together from one location to another. This model runs on the same network reference while the previous model uses a reference point for each column. The third Pursue mobility model describes a set of nodes follow one node. It is used to keep track of the selected target. The last model (RPGM), contains a central logical node, which is followed by all members of the group. This model used by armies for telecommunication purpose in battle field.

In Ref. [5] the authors classify the mobility models into four different groups depending on a set of characteristics. These groups are: a random models [6], models with temporal dependency, models with spatial dependency and models geographic restriction.

The above models are not taken into the consideration of human and social aspects, which effect the group and industrial mobility models. As Albert Einstein said “Man is, at one at the same time, a solitary being and a social being. As a solitary being, he attempts to protect his own existence and that of those who are