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A REALISTIC SMART MODEL FOR MANETS

D.Hemanand, N.Sankarram, S.Manikandan
Department of Computer Science and Engineering & Sriram Engineering College, Tiruvallur, India
E-mail: [1]d.hemanand@gmail.com

Abstract—Mobility is one of the key characteristics of a class of wireless ad hoc networks called mobile ad hoc Networks (MANETs). To study the performance of MANET protocols in a simulation environment, we employ mobility models that duplicate close to how devices move in reality. Actually each node moves independent of other nodes in the network. The existing mobility models assume either free space for deployment and random node movement or the movement pattern does not contend real-world situation properly in the presence of obstacles because of their generation of bounded paths. These demands for the development of a node movement pattern with accurately representing any obstacle and existing path in a complex and realistic deployment scenario. In this paper, we propose a general mobility model called realistic smart model (RSM) capable of making a more naturalistic node movement convention by deploying the concept of elastic keystone. Since the model dynamically locates keystones depending upon the context of the environment through which nodes are guided to move towards the destination, it is capable of representing any obstacle realistically. In addition, obstacles of any kind of shapes can be integrated which makes the simulation environment more realistic.

Keywords- MANET, Mobility Model, Elastic Keystone,

I. INTRODUCTION

A Mobile Ad hoc NETwork (MANET) is a collection of wireless mobile nodes forming a network without using any existing infrastructure. MANETs are frequently changing networks. Here partioning or breakage in nodes are of common thing. All mobile nodes function as mobile routers that discover and maintain routes to other mobile nodes of the network and therefore, can be connected dynamically in an arbitrary manner. The mobility attribute of MANETs is a very significant one. Most important factor for a simulation environment is to reflect and assess real-world scenario accurately as much as possible. After deployment of nodes, the mobility model used in simulation is responsible for directing the nodes when and where to move.

In most of the existing mobility models nodes move randomly in open space, but real world is more complex and diverse that make the existing models inappropriate of representing the real world context correctly. The essential thing needed to emulate real world scenario is obstacles.

These models are used for simulation purposes. For mobility modeling, the activity of a movement of user can be described using both analytical and simulation models.

Our proposed mobility model embed with all the above mentioned real world features.

II. ELASTIC KEYSTONE

Elastic keystones are assumed to be cubical shaped geographic positions and can be located anywhere in the deployment area depending on the context such as predefined path, obstacles.

Therefore, their positions in a way define the mobility framework in the deployment area. For example, Elastic keystone can be defined around each convex corner of an obstacle and entry points. Thus keystone will contribute to launching a ray that will guide the node movement in a corresponding way. A node can reach any position in the simulation area by selecting a elastic keystone as the next step. The size of keystone defines the freedom and flexibility of the node movement. Since according to this model a node selects a random point in the next keystone to be visited, it can produce a more flexible

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node movement scenario which is able to capture a wide variety of movement pattern.

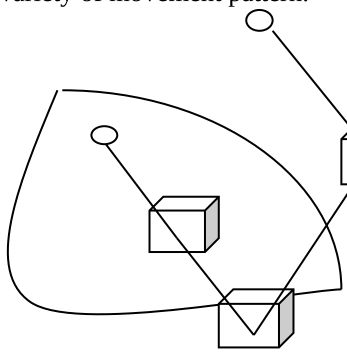

Fig 1. Node Movement in mobility model that rely on graph

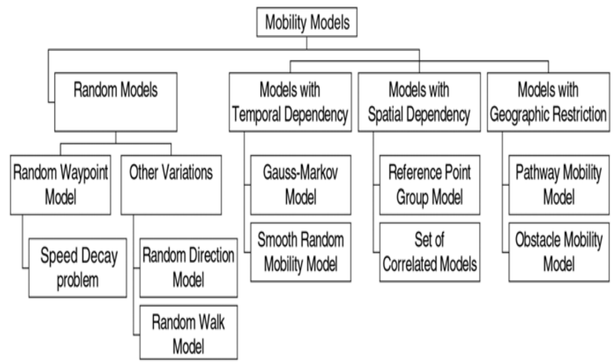

Fig. 2. The categories of mobility models in Mobile Ad hoc Network

III. EXISTING MOBILITY MODELS

A Mobile Ad hoc NETwork (MANET) is a collection of wireless mobile nodes forming a self-configuring network without using any existing infrastructure. Since MANETs are not currently deployed on a large scale, research in this area is mostly simulation based. Among other simulation parameters, the mobility model plays a very important role in determining the protocol performance in MANET. Thus, it is essential to study and analyze various mobility models and their effect on MANET protocols. In this chapter, we survey and examine different mobility models proposed in the recent research literature. Beside the commonly used Random Waypoint model and its variants, we also discuss various models that exhibit the characteristics of temporal dependency, spatial dependency and geographic constraint. Hence, we attempt to provide an overview of the current research status of mobility modeling and analysis.

A. Random Mobility modelIn random-based mobility models, the mobile nodes move randomly and freely without restrictions. To be more specific, the destination, speed and direction are all chosen randomly and independently of other nodes. This kind of model has been used in many simulation studies.

B. Random Waypoint Mobility Model

The Random Waypoint Model was first proposed by Johnson and Maltz. Soon, it became a 'benchmark' mobility model to evaluate the MANET routing protocols, because of its simplicity and wide availability. To generate the node trace of the Random Waypoint model the setdest tool from the CMU Monarch group may be used. This tool is included in the widely used network simulator ns-2.

C.Random Walk Model

The Random Walk model was originally proposed to emulate the unpredictable movement of particles in physics. It is also referred to as the Brownian Motion. Because some mobile nodes are believed to move in an unexpected way, Random Walk mobility model is proposed to mimic their movement behavior[2]. The Random Walk model has similarities with the Random Waypoint model because the node movement has strong randomness in both models. We can think the Random Walk model as the specific Random Waypoint model with zero pause time.

However, in the Random Walk model, the nodes change their speed and direction at each time interval.

D. A Probabilistic Version of the Random Mobility Model

It is a model that utilizes a probability matrix to determine the next position of an MN

E. Constant Velocity Random Direction Mobility Model

It is a revised version of the Random Mobility Model.

F. City Area, Area Zone, and Street Unit Mobility Models

These models describing simulation areas representing different granular scales of a city.

IV. A REALISTIC SMART MOBILITY MODEL

This Mobility Model is based on the following real-life observations. First, people move towards specific destinations rather than randomly choosing some destinations. Second, there are obstacles in the real world. These obstacles, most commonly the buildings block people's movements as well hinder signal propagation. Third, people do not walk along random trajectories; they usually move along pathways and select shortest paths. Thus a realistic mobility model must be flexible enough to cater a variety of situations.

Present mobility model do not imitate the real time scenarios as this much perfectness using the elastic keystones technique.

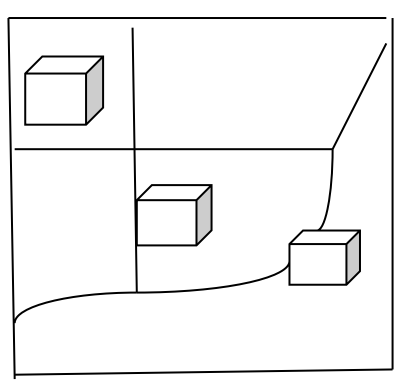

Fig 3. Node Movement in mobility model by elastic keystone

The developed new realistic smart mobility model does not rely on a graph. To move from a source location to a destination one, each node has to find its appropriate pathway through the environment. In order to allow nodes not to pass through obstacles, we implemented a path finding algorithm. This algorithm uses a ray launching technique coupled with an optimized sweep line algorithm for the fast ray intersection search computation.

An Algorithm:

A path is a set of location points which form adjacent segments and no segment intersects with an obstacle in the environment.

The algorithm is as follows.

Step a: Assigning the starting and stop point.
Step b: Depict ray in between these points.
Step c: Whether keystone found if yes go to step d, otherwise go to step g.
Step d: Depict ray from hit position to nearest keystone position. Repeat step d till reaches destination.
Step e: Now check first edge of obstacle hit. If it is then go to step f otherwise go to step c.
Step f: Add hit position to path. Go to step d.
Step g: Add destination position to path. Go to step h.
Step h: stop

Keystones are specific geographic positions to guide the node movement in order to consider the existing pathways and the obstacles including buildings with entry or exit points through doorways. At the beginning, the start position and the actual position are the same. We lunch a ray from source to destination and At the beginning, the start position and the actual position are the same. We lunch a ray from source to destination and search for the first obstacle hit by this ray. Now we add the first hit point to the path and try to border this first obstacle. For do this, we search for the first edge hit in this obstacle. If an edge is hit, the actual position moves to the intersection point on this edge. We choose the nearest side of the hit edge in order to minimize the final path length. We repeat until the obstacle is encountered. This means that the ray from the node position to destination does not hit any edge of this obstacle. the elastic keystones are generated according to the curvature e.g., corners of obstacles, pathways.

V. CONCLUSION

Mobility models play an important role in the evaluation of wireless network protocols. Wireless ad hoc simulation models need to approximate accurately common real world environments in order for the simulations to assess conveniently any studied ad hoc communication protocol. The work presented in this paper introduced a new realistic smart mobility model along with a scenario generation tool for MANET that enables to create a wide variety of simulation scenario closely resembling to real world environment. Proposed a new mobility model that generates node movement patterns more realistically than the existing mobility models, and thereby, more suitable to simulate MANET in real world deployment because of the following reasons: 1. facility to introduce any shaped obstacles. 2. Computing node movement based on the dynamically generated elastic keystones. 3. Does not rely on graphs, instead of graph, ray launching technique is used.

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