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A SURVEY ON MOBILITY MODELS IN MOBILE AD-HOC NETWORKS

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Abstract: In Ad-hoc networks, routes are mostly multihop and network hosts communicate via packet radios. Each host moves in an arbitrary manner and thus routes are subject to frequent disconnections. In typical mobile networks, nodes exhibit some degree of regularity in the mobility pattern.

By exploiting a mobile user's non-random travelling pattern, we can predict the future state of network topology and thus provide a transparent network access during the period of topology changes.

The main characteristics of Ad-hoc wireless networks include mobility which is one of the major characteristics of most Ad-hoc wireless environments. There are several exceptions where mobility does not need to be considered, but when we want to construct the virtual backbone, it is necessary to take into account mobility. A global positioning system (GPS) can be used to handle the mobility problems, but its usage must be limited as secondary information because the location information such as latitude longitude and height does not directly relate to the connectivity

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1.0 Introduction: A Mobile Ad-hoc network is a self configuring networks of Mobile Networks connected in different wireless channels or different wireless mediums. In Mobile Ad-Hoc networks, communication may be possible between various devices which make it possible to provide unique, innovative, secure and reliable services for any wireless networks. The inter device communication (Inter Device) is a very powerful mechanism but it is a complex and clumsy mechanism, leading to a lot of complexity in the present-day systems.

2.0

Mobile Ad-hoc networks originated from the U.S. Government's Defense Advanced Research Projects Agency (DARPA) Packet Radio Network (PRNet) and SURAN project.

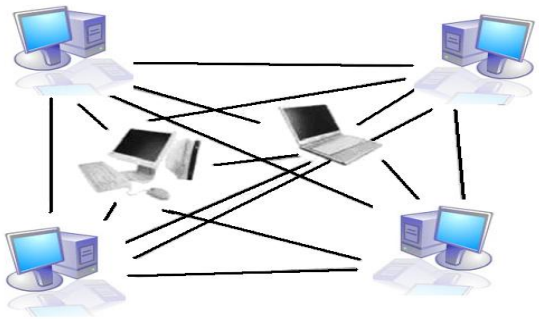

Figure 1.0: Overview of Mobile Ad-Hoc Networks

1.1 Characteristics of MANET:

Mobile Ad-Hoc networks have multiple characteristics but to keep it technical uses, following are some important Characteristics of MANET:-

1. Mobility of Nodes
2. Limited System Capacity
3. Change of Topology
4. Variable Link Capacity
5. Limited Signal Power
6. Receiver Sensitivity
7. Capture Effect
8. QoS not defined

2.0 Issues of Mobile Ad-Hoc Networks:

MANET is a secure networks but sometimes it may occur some issues related to it frequency, bandwidth, energy and sometimes security. Following are some issues:

2.1 Bandwidth: The channel capacity of wireless networks is significantly lower than the capacity of wired networks. Route discovery and updates may cause significant bandwidth problems as the size of the density of the network grows.

2.2 End-to-end delay: Data packets traveling between two nodes may experience long delays. This can be due to route recalculation as a result of broken links, queuing for gaining access to the transmission medium due to heavy channel contention, processing delays at each node, and traffic bottlenecks.

2.3 Energy (Power): Each mobile node is powered by batteries. Periodic route updates, beaconing, and data transmission significant amounts of battery power which may require each node to frequently recharge its power supply. This means that each node must minimize processing to preserve battery; thus, special light weight protocols are desirable.

2.4 Security: Because each node in a MANET broadcasts via a radio channel, there is a high security risk from eavesdropping, spoofing, denial-of-service, and other types of attacks from rogue users.

3.0 Category of Mobility Models:

3.1 Trace based mobility Model

Traces are those mobility patterns that are observed in real-life systems. Traces provide accurate information, especially when they involve a large number of participants and an appropriately long observation period. However, new network environments (e.g., ad hoc networks) are not easily modeled if traces have not yet been created

3.2 Synthetic Mobility Model

Synthetic models attempt to realistically represent the behaviors of MNs without the use of traces. Therefore, various researchers proposed different kinds of mobility models, attempting to capture various characteristics of mobility and represent mobility in a somewhat realistic fashion. Much of the current research has focused on the so-called synthetic mobility models

4.0 Types of Advance Mobility Models:

4.1 Graph-Based Mobility Model

This model has some similarities with the City Section Model. Every MH moves following the edges of a graph defining the infrastructure of the area. The target destination is one vertex of the graph, randomly selected, and the route is always the shortest path. This model relies on a spatial model graph that describes the underlying spatial infrastructure. The vertices of the graph represent places (e.g., points of interest such as restaurants, museums, etc.) that users might visit and the edges model interconnections between the places (streets or rail connections).

4.2 Obstacle Mobility Model

Obstacle Mobility Model takes obstacles into account that might be located in the simulation area. Such obstacles can be described by polygons. The obstacles not only prevent movement of nodes, but also block wireless transmissions. The Voronoi diagram of the obstacle corners are used to generate a movement path, which is a planar graph whose edges are line segments that are equidistant from two obstacle corners. . A Voronoi diagram partitions a plane with n sites into n regions such that each region contains exactly one site and every point in the region around that site is closer to that site than any other sites.

4.3 Generic Mobility Model

Each of the approaches satisfies only a specific set of scenarios. For example, the Random Waypoint Mobility Model may be sufficient to simulate movement of pedestrians in an open area (e.g., rescue missions or military operations). To model movement of users in a city, it is necessary to reflect spatial area constraints (e.g., streets) using the graph-based model. To simulate movement of cars, it is necessary to include car-specific speed and direction changing dynamics to the model. The state of the art in the area of mobility modeling is the use of specific models for specific scenarios.

5.0 Advantages of Mobility Models:

5.1 Mobility helps security

Security and mobility seem to be at odds with each other. Security is usually enforced by a static, central authority that is generally in charge of securing the system under consideration, be it a communication network, an operating system, or the access system to the vault of a bank. In this case, because users are static as well, their locations are predictable, they are more likely to be available, and the system can more easily perform appropriate controls.

5.2 Mobility Enlarge Node Coverage

Many works on the coverage of mobile node networks focus on algorithms to reposition nodes in order to achieve a static configuration with an enlarged covered area. As time goes by, a position is more likely to be covered; targets that might never be detected in a stationary node network can now be detected by moving nodes. The main metrics to measure node coverage could be the area coverage at specific time instants and during time intervals, as well as the time it takes to detect a randomly located stationary target. Exploiting mobility, both metrics can be improved.

5.3 Mobility Reduce Uncertainty

Uncertainty increases the transaction cost and decreases the acceptance of communication and cooperation. Our objective is to reduce the trustor's perceived uncertainty so that transaction cost is lowered and a long-term exchange relationship is sustained. One key way to efficiently reduce uncertainty is to exploit one important property of MANETs mobility. Node movement can increase the scope of direct interaction and recommendation propagation, hence speeding-up trust convergence.

6.0 Conclusion: As the underlying mobility model is an important factor in the performance of all of the above and future mobility-assisted schemes, there is an increasing need for mobility models that capture the realistic mobility characteristics and remain mathematically manageable. For these new and usually more complex mobility models, researchers also need to re-analyze the performance of those mobility-assisted schemes and make some changes in the detailed schemes. We realize that the Random Waypoint Mobility Model has been the default mobility

model for many years and we advocate its continued usage for the purpose of comparing current simulation results with previously obtained simulation results.

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