# A SURVEY ON MOBILITY MODELLING & PREDICTION IN WIRELESS NETWORKS

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## Abstract:

Wireless networks have become increasingly popular in the computing industry since 1970. It is particularly true within the past decade, which has seen wireless networks being adapted to enable mobility. The area of wireless communication has been and is continuing to develop at a rapid pace over the years. The most wireless network of today consists of cells. Each cell contains (or is represented by) a base station, which is wired to a fixed wire network. The base stations interact with the portable handheld devices and provide these devices the wireless link to the network.

Mobility has a major effect on the channel holding time in circuit-switched services. The latter has in turn huge influence on the call blocking and dropping probability.

When evaluating mobility models for wireless ad hoc networks with respect to performance or functional correctness, several assumptions have to be decided upon. Such assumptions may include the size and shape of the area used by the wireless devices, their transmission ranges and their movement pattern including allowed directional changes and speeds.

**Keywords: Mobility Modelling, Prediction, Wireless Network, Ad-HOC Network,**

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**Introduction:**

**M**obile ad hoc network is a self-configuring network of mobile devices connected by wireless links. Communication between various devices makes it possible to provide unique and innovative services. The inter device communication is a very powerful mechanism but it is a complex and clumsy mechanism, leading to a lot of complexity in the present-day systems.

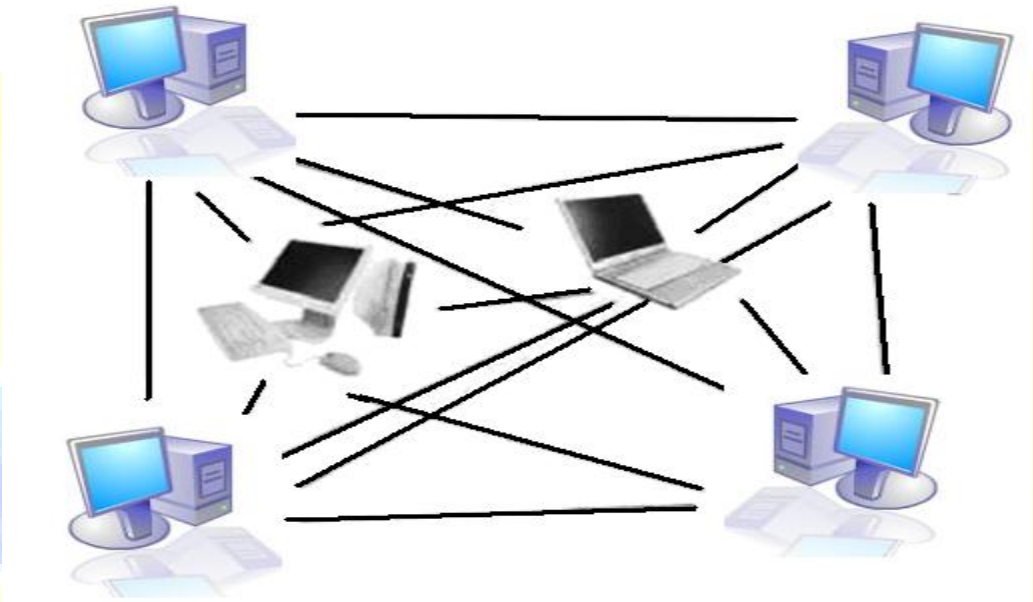

**Figure 1.1: Mobile Ad hoc Network**

**Overview of Wireless Network:**

Wireless networks have become increasingly popular in the computing industry since 1970. It is particularly true within the past decade, which has seen wireless networks being adapted to enable mobility. The area of wireless communication has been and is continuing to develop at a rapid pace over the years. The most wireless network of today consists of cells. Each cell contains (or is represented by) a base station, which is wired to a fixed wire network. The base stations interact with the portable handheld devices and provide these devices the wireless link to the network.

Nodes in mobile ad-hoc network are free to move and organize themselves in an arbitrary fashion. Each user is free to roam about while communication with others. The path between each pair of the users may have multiple links and the radio between them can be heterogeneous. This allows an association of various links to be a part of the same network. Mobile Ad-hoc networks have recently attracted a lot of attention in the research community as well as in

industry. The mobility model is one of the most important factors in the performance evaluation of a mobile ad hoc network. Ad hoc networks are dynamically created and maintained by the individual nodes comprising the network. They do not require a pre-existing architecture for communication purposes and do not rely on any type of wired infrastructure; in an ad hoc network all communication occurs through a wireless median. Traditionally, the random waypoint mobility model has been used to model the node mobility, where the movement of one node is modeled as independent from all others.

**Overview of Mobile ad-hoc Network (MANET):**

Mobile ad hoc networks originated from the U.S. Government's Defense Advanced Research Projects Agency (DARPA) Packet Radio Network (PRNet) and SURAN project. Being independent on pre established infrastructure, mobile ad hoc networks have advantages such as rapidity and ease of deployment, improved flexibility, and reduced costs. Mobile ad hoc networks are appropriate for mobile applications in either hostile environments where no infrastructure is available, or temporarily established mobile applications, which are cost crucial. In recent years, application domains of mobile ad hoc networks have gained more and more importance in nonmilitary public organizations and in commercial and industrial areas. The typical application scenarios include rescue missions, law enforcement operations, cooperating industrial robots, traffic management, and educational operations in campus.

A mobility pattern aware routing algorithm is shown to have several distinct advantages such as

i. A more precise view of the entire network topology as the nodes move
ii. A more precise view of the location of the individual nodes
iii. Ability to predict with reasonably accuracy the future locations of nodes
iv. Ability to switch over to an alternate route before a link is disrupted due to node movements.

The absence of fixed infrastructure for ad hoc networks means that the nodes communicate directly with one another in a peer-to-peer fashion. The mobility of these nodes imposes limitations on their power capacity, as well as their transmission range. Mobile hosts are no longer just end systems; each node must be able to function as a router, and also must relay packets generated by other nodes. As the nodes move in and out of range with respect to one another, including those that operate as routers, the resulting topology changes must somehow be

communicated to all other nodes so the up to-date topology information for routing purposes is maintained. In addition, the communication needs of the user applications, the limited bandwidth of wireless channels and the generally hostile transmission characteristics all impose additional constraints on the type, size and frequency of information to be exchanged. Thus ensuring effective routing is one of the greatest challenges for ad hoc networking.

**Study of Existing Mobility Models:**

Mobility models represent the movement of mobile users and how their location, acceleration and velocity change over time. Such models are frequently used for simulation purpose when new communication techniques are investigated. Mobility management schemes for mobile communication systems make use of mobility models for future user positions.

For mobility modeling, the behavior of a user's movement can be described using both analytical and simulation models. The input to analytical mobility models are simplifying assumptions regarding the movement behaviours of users. Such models can provide performance parameters for simple cases through mathematical calculations.

**Purpose of Mobility Models:**

The purpose of mobility models is to describe typical terminal movement so that the analysis for these purposes can be made. Thus, the movement pattern of user plays an important role in performance analysis of mobile and wireless networks, especially in third-generation mobile communication (Jonahing Kim, 2005). One frequently used mobility; model in MANET simulations is the Random Way point Model (Broch et al., 1998), in which nodes move independently to a randomly chosen destination with a randomly selected velocity. The simplicity of Random Waypoint model may have been one reason for its widespread use in simulations. Hence, recent research has started to focus on the alternative mobility models with different mobility characteristics. In these models, the movement of a node is more or, less restricted by its history, or other nodes in the neighbourhood or the environment.

**Modification of Existing Mobility Models:**

To produce a real-world environment within which an adhoc network formed among a set of nodes, there is a need for the modification of realistic, generic and comprehensive mobility models. Simulation environment is an important tool for the evaluation of new concepts in

networking. Here we show the modified mobility model has a significant impact on network performance, especially when compared to other mobility models. The mobile adhoc networks depend on understanding protocols from simulations, before these protocols are implemented in a real world setting.

**Methodology:**

In this work following methods/network simulator will use for implementation.

**MAT LAB**

**NS-2(Network Simulator) tool.**

**MATLAB (Matrix Laboratory)** is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and FORTRAN.

Although MAT LAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems.

In 2004, MAT LAB had around one million users across industry and academia.[2] MAT LAB users come from various backgrounds of engineering, science, and economics. MAT LAB is widely used in academic and research institutions as well as industrial enterprises.

**NS (from network simulator)** is a name for series of discrete event network simulators, specifically ns-2 and ns-3. Both simulators are used in the simulation of routing protocols, among others, and are heavily used in ad-hoc networking research, and support popular network protocols, offering simulation results for wired and wireless networks alike.

NS-2 was built in C++ and provides a simulation interface through OTcl, an object-oriented dialect of Tcl. The user describes a network topology by writing OTcl scripts, and then the main ns-2 program simulates that topology with specified parameters. It runs on Linux, FreeBSD, Solaris, Mac OS X and on Windows using Cygwin. It is licensed for use under version 2 of the GNU General Public License.

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