A Routing Protocol Based on Mobility Prediction for Mobile Ad Hoc Networks

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***Abstract*—In Mobile Ad hoc Networks (MANETs), where nodes have limited transmitting power, the transmission is typically multi-hop. The network topology changes frequently due to the unpredictable movement of mobile nodes because each node is free to move arbitrarily with different speeds. Thus, when one node enters in the transmission range of another node a link between those two nodes is established, and an existent link is broken when either node is out of the transmission range of the other. We refer as link duration, the time interval during in which the link still established.**

This paper presents a novel mobility metric for mobile ad hoc networks, called link duration (LD) that measures the stability of an active link. This mobility metric is introduced to represent relative mobility between nodes in multi-hop distance.

***Index Terms*—Mobile Ad hoc networks, on demand distance vector routing, mobility, velocity, Transmission range, Link expiration time, Link duration prediction.**

I. INTRODUCTION

A mobile ad-hoc network (MANET) [1-4] is a self-configuring network of routers connected by wireless links. Due to the limited transmission range, if two mobile nodes are not within direct wireless transmission range of each other, the communication between them must pass through one or more other nodes. So, these kinds of networks are multi-hop networks where each node acts both as router and as host, which contributes to and maintains connectivity of the network. Each mobile node moves randomly with the capability of changing its links to other nodes frequently.

Different ad hoc routing schemes have been proposed for MANETs [2-6]. Those routing protocols must adapt to frequently changing network topologies caused by nodes mobility, as well as other network characteristics. Since nodes can move at any time, wireless links are prone to be broken.

Any link breakage along an established routing path will lead to a path failure. A shortest path may fail sooner than other path connecting a given source and destination pair. Frequent routing discovery is costly and inefficient. Moreover, shortest path routing cannot support many Quality of Service (QoS) connection requests when path duration is a requirement. For example, a video stream may need to be transferred from a source node to a destination node without any interruption for 100 seconds in a multimedia application. Instead of shortest paths, more durable paths or paths with duration guarantees are preferred to be used for packet routing in such applications.

Mobility management in Ad Hoc network has been a topic of significant researches in recent years. Since frequent topology changes may break existing paths, thus decreases the routing performances. In this work, we aim to minimize the effect of mobility. We present a mobility estimation method to enhance AODV routing protocol by selecting the route that can decrease the variation of link quality. The rest of this paper is organized as follows; in the section 2, we briefly survey some related work. In section 3, we present some basis of mobility estimation. Section 4 gives a formulation of the problem. In Section 5, we describe in detail our proposition. In Section 6, we evaluate the performance of the proposed approach via simulation. Finally, we conclude and give future direction in Section 7.

II. RELATED WORK

Traditionally, the AODV algorithm [5] is a widely implemented and well known routing algorithm for MANETs. However, AODV does not take into account mobility parameters during route discovery, resulting in paths which break often in highly mobile scenarios, causing excessive broadcasting and flooding the entire network to discover new routes.

Several mobility prediction algorithms have been proposed in the literature for improving reactive routing protocols.
An improved mobility aware AODV was presented in [17]. In AODV, Hello packets were used to enhance mobility awareness. When receiving a Hello packet with the Global Positioning System (GPS) coordinates of the source node, a lightweight mobility aware agent on each node of the network compares these coordinates with previous ones and then can determine information about the mobility of the originator node. Now, when a node receives a RREQ packet and has to send a RREP (it is either the destination, or it has an active route to the desired destination), it will use the mobility awareness to choose the best neighbor that is not frequently moving.

In [5], the authors established a relational model of route and link duration. This duration is determined by the relative speed between the two nodes and the distance during which the link is connected. In [18], Path duration models have been used to predict link and route duration and consequentialy

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