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Analyzing Hybrid Technique for Traffic Control in MANET

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Abstract - The user demands for fast accessible network that transmit data efficiently when various devices send data to another devices. There is a requirement for"Control the Traffic on network". This research paper contains the concept of new efficient Hybrid Techniquethat controls the traffic on MANET. This paper based on study and analyzing proposed hybrid technique withNext-Hop prediction, GA and AHP based route optimization techniques. The proposed technique shows minimum real route and false route break over traditional approaches with minimum routing overhead and bandwidth usage.

Keywords:MANET, Traffic, PRE Prediction, POST Prediction, Genetics Algorithm, Hybrid Technique.

I. Introduction

MANET is a dynamic network that changesits topology rapidly i.e. MANET is a self-configuration wireless ad-hoc network [3, 10] of mobile nodes where each node has their own router connected through a wireless connection. The union of connections is in an arbitrary topology.In fixed network, routers are separately used for route the messages over network but in MANET there is no need of separate router.The MANET organization depends upon the location of the nodes, their connectivity, their servicesdiscovery capability and theirability to search and route messages using nearest node or nearby nodes as shown in fig 1.There are mainly three types of traffic in MANET. First is Peer-to-Peer where two nodes communicate with in one hop. Second isRemote-to-Remotewhere two nodes communicate beyond a single hop and maintain a stable route between them. Third isDynamic Traffic where two nodes are dynamic and change their location rapidly. For dynamic traffic route must bereconstructed.

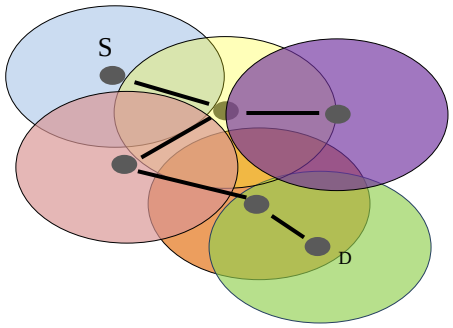

Fig 1: Mobile Ad-hoc Network

There are mainly three types of Routing protocols[2,4]used in MANET as shown in fig 2. First is Proactive Routing Protocol(Table Driven).It periodically update the routing table e.g. Optimized Link State Routing(OLSR), Flat Routing Table Driven(FRTD), Cluster-head Gateway Switch Routing(CGSR) Fish-eye State Routing(FSR). Second is Reactive Routing Protocol(On Demand).It does not periodically update the routing table e.g. Ad-hoc On-demand Distance Vector Routing(AODV), Dynamic Source Routing(DSR), Temporally OrderedRouting Algorithm(TORA), Associativity Based Routing (ABR).Third is Hybrid Routing Protocol (Proactive/Reactive). It is a combination of both Proactive and reactive protocols e.g.Zone Routing Protocol(ZRP), Wireless Ad hoc Routing Protocol(WARP).

II. Traffic Control Techniques

There are many techniques for controlling the traffic but in this paper only two techniques GA (Genetic Algorithm) and AHP (Analytical Hierarchy Process) based route optimization technique [5] and NEXT-HOP Prediction technique [7] are discussed.

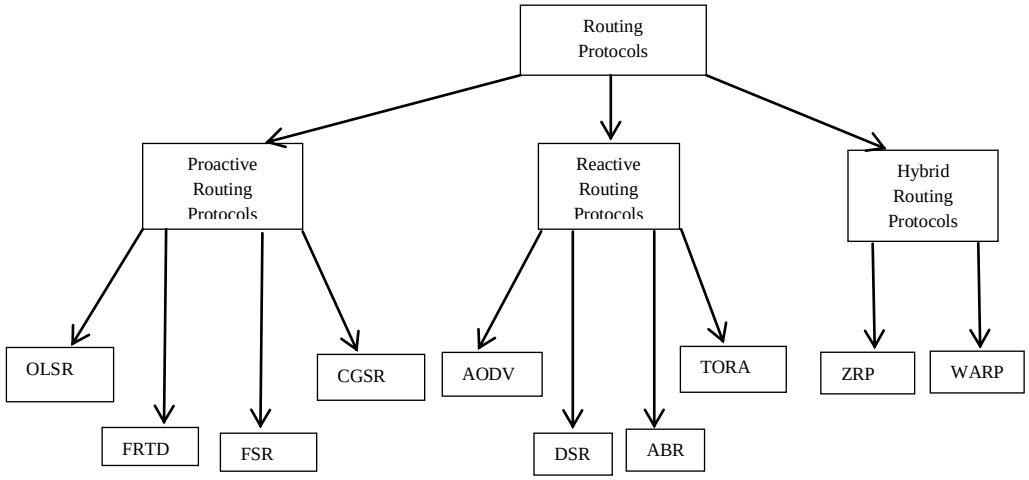

Fig. 2 Routing Protocols

A. GA AND AHP BASED ROUTE OPTIMIZATION TECHNIQUE

It uses integrity of network services, traffic congestion, node status, power consumption & node density the network for node selection so as to optimize the route determination. As high-speed networks have flourished across the globe, their topologies have become sparser due to the increased capacity of communication media and cost considerations. So there is a requirement to select the suitable intermediate node for communication with another node. A Genetic Algorithm (GA) [8] is a learning algorithm which operates by simulating evolution.

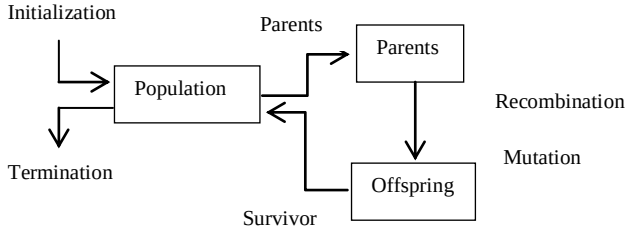

Fig. 3:Working process of Genetic Algorithm

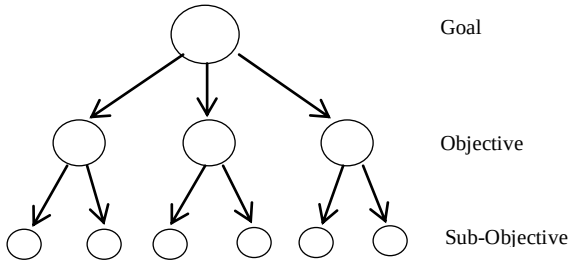

Fig. 4: Working process of Analytical Hierarchy Process

This algorithm include individual nodes by randomly generating an initial population, computing and saving the fitness for each individual in the proportional to generating by probabilistically selecting individuals from population to produce offspring via genetic operators, repeating the computation for of fitness function for each individual until satisfying solution is obtained as shown in fig 3.Individuals are typically binary strings, but in the context of routing it takes as a sequence of nodes. Analytical Hierarchy Process (AHP) [6] is a method for comparing a list of objectives or alternatives. AHP is a comprehensive, logical and structured framework.The AHP is based on three principles: Decomposition of the decision problem, Comparative judgment of the elements, Synthesis of the priorities. It allows improving the understanding of complex decisions by decomposing the problem in a hierarchical structure as shown in fig 4.

B. NEXT-HOP PREDICTION TECHNIQUE

This technique predicts the next hop which is suitable for route the message when one node communicate with another node. The data is transmitted to such a node that is either out of communication range (permanent failure) or will not respond to a transmitting node it is exposed to another transmission (temporary failure) are basic problem with MANET. Which causes two types of route break, one is false route break (it affect the MANET when it is above saturation) and other is real route break (affect packet delivery rate and lower the MANET performance). For predicting nexthop this technique uses two schemes. First is pre-transmission prediction technique in which the sending node predicts whether the next hop node is in range or out of range even before attempting to transmit data as shown in fig 5.

Second is post-transmission prediction technique. In post-transmission prediction technique, the sending node predicts,after a transmission attempt fails, whether the non-responsive next hop is still in range or has moved out of range of communication as shown in fig 6.Both types of predictions can be implemented by modifying the MAC layer [1] and require no changes to the routing protocol. Both these techniques that is used for predicting next hop uses Time-based prediction, Distance-based prediction, Signal-to-Noise ratio (SNR) prediction, State-based prediction, Distance predictor with global knowledge (Global) criteria.

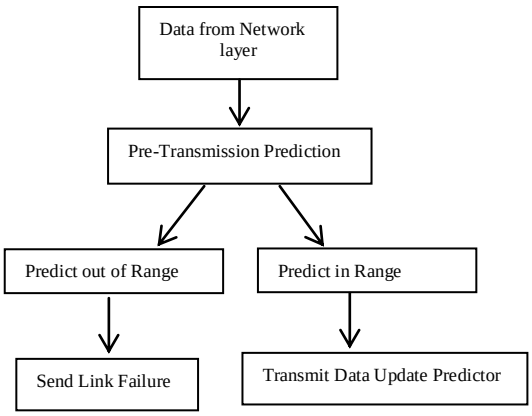

Fig 5:Pre-Transmission Prediction Technique

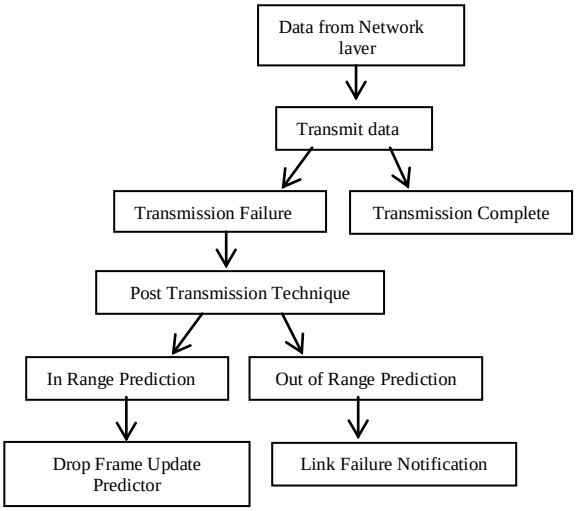

Fig 6: Post-Transmission Prediction Technique

III. Proposed Hybrid Prediction Technique

It is a combination ofboth prediction techniques of Next-hop status prediction(Pre and Post Transmission) [9]. This technique uses same methods for predicting next hop status (i.e. Time-Based prediction, Distance-based prediction etc.) as used with Next-Hop prediction techniques. This technique worked as where every node first applying Pre Transmission Prediction technique to check next node in range or not before attempting to transmission, then if node is in range it transmit the data to another node. Here transmission is notsuccessful completely but it is in process. There is two conditions arises either transmission completed or failed. If transmission failed then sending node applying the post transmission prediction techniqueto check reasons of transmission failure as shown in fig 7(either next hop goes out of range or in range but not give a response). So proposed hybrid technique effectively find the status of next hop just not only before transmission and after transmission but also during transmission.

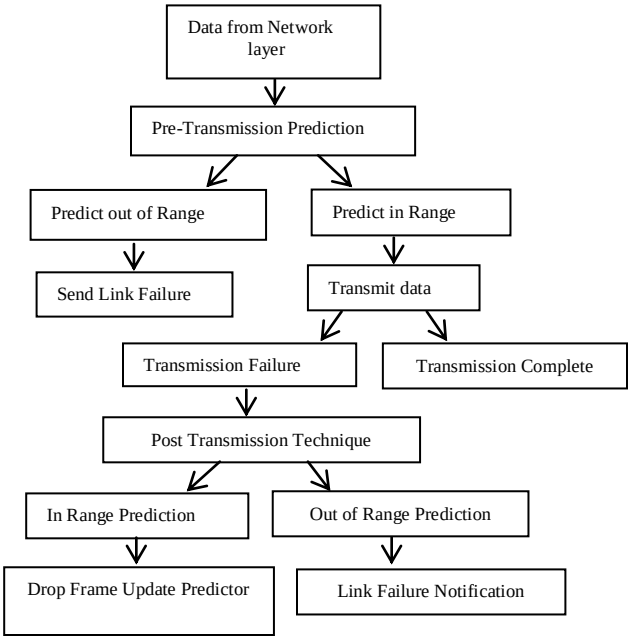

Fig 7:Hybrid Prediction Technique

IV. Analysis of Hybrid Technique

Comparison of traffic control techniques is based on various parameter i.e. bandwidth usage, real and false route break, node energy consumption and routing overhead. Hybrid technique shows less real and false route break in MANET because it detects the transmission failure before and after data transmission than others(GA and AHP, Next-Hop Prediction Technique) where no guarantee of successful data transmission because it predict next-hop either before or after data transmission not during transmission where they increases the chance of either real route break or false route break.Routing overhead of pre transmission and GA and AHP techniques is more than others because of incorrect out of range prediction of the next hop causes an increase in false route breaks and these false route breaks increase the control overhead incurred to maintain routes.So correct checkingof a node that is out of range during transmission reduced therouting overhead that must be possible after attempting transmission only possible with post prediction and hybrid technique . Bandwidth usage of post transmission is more because of incorrect out of range prediction delays detection of real route breaks, which result in the use of a route that is no longer valid. Therefore, incorrect out of range prediction increases the number of invalid routes that increases bandwidth usage. The node energy consumption of hybrid technique is more than other because it continuously check the status of next hop that consume more node power until transmission is not successful so it consumes more node power. Table 1 shows comparison of traffic control techniques (Next-Hop status prediction, GA and AHP and Hybrid Technique).

TABLE 1:
COMPARISON OF TRAFFIC CONTROLLING TECHNIQUES

Parameter	GA and AHP	Pre Transmission Prediction	Post Transmission Prediction	Hybrid Transmission Prediction
Bandwidth Usage	Less	Less	More	Less
False Route Break	More	More	Less	Less
Real Route Break	Less	Less	More	Less
Node Energy Consumption	Less	Less	Less	More
Routing Overhead	More	More	Less	Less

V. Conclusions

Analyzing the Hybrid Technique with other traffic control techniques (GA and AHP, Next Hop Status Prediction Technique) on MANET shows that proposed hybrid technique is much better than other traditional techniquesbecause it shows minimum real route and false route break with minimum routing overhead and bandwidth usage.There is one drawback of hybrid technique that it consumes more node energy than other techniques.

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