

A Study on Termite Based Routing Protocols for Mobile Ad Hoc Networks

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Swarm Intelligence (SI) is proved to be most successful technique in solving routing problems in dynamic networks such as Mobile Ad Hoc Networks (MANETs). High throughput, more robust and low control packet overhead are the highlights of SI based routing protocols. In this paper a comparative study of different termite inspired routing protocols for MANETs is done. The present termite based routing protocols for MANETs uses either *inter packet arrival time* or *distance between the nodes* as a variable to update and decay the pheromone over the link. The primary objective of the article is to determine which protocols perform better, time based protocol or distance based protocol and to determine how these protocols behave under different mobility conditions. The available termite based routing protocols are simulated in NS-2 and the results are compared against the state-of-the-art non bio-inspired routing protocol for their evaluation. Distance based termite algorithm is found to be convincing in the carried out simulations.

Keywords : Bio Inspired, Comparison, Distance between the Nodes, MANETs, Termite.

1. INTRODUCTION

The dynamic nature of the topology, lack of organization structure and real world implementation restrictions have made providing Quality of Service (QoS) more challenging in MANETs. As a result current research trends are focusing more towards providing best QoS in MANETs. A pool of independent wireless Mobile Nodes (MNs) forms a MANET working together to deliver the message from source MN to destination MN. Despite lack of central coordination MNs are able to coordinate together to achieve global task. MANETs works on hop by hop basis, thus every MN has to relay on its fellow MN to deliver the message. These fellow MNs receive and forwards the messages towards the destination and are called as intermediate or relay nodes. Thus all MNs in MANET play a dual role, a terminal and a router. Due to mobility of these MNs the topology of MANETs is dynamic in nature which makes route setup and maintenance a difficult job. The frequent link breakups due to mobility causes source MN to spend most of its time in route setup and maintenance

than sending the messages thus MANET suffers from low throughput and high control packet overhead. Finding the best path in terms of resource richness and stability between the source MN and destination MN is the main concern in MANET.

Recent trends in research have incorporated Swarm Intelligence (SI) for finding the best possible path in MANET and have found that it is giving the best results. The survey papers in [1-3] tells that the behavior of the ants and bees has attracted more researchers than other social insects for developing adaptive routing protocols for MANET. According to these survey papers only a few notable works have been done in an effort to incorporate the intelligence of social insect termite in MANET. In [4,5], Martin Ruth and Stephen Wicker proposed a very first termite based routing algorithm for MANET called as Termite algorithm. Termite is a per packet, adaptive, probabilistic multipath routing protocol which works on stigmergy to achieve robustness. Termite achieves high data good throughput while reducing the control packet overhead. But Termite algo-

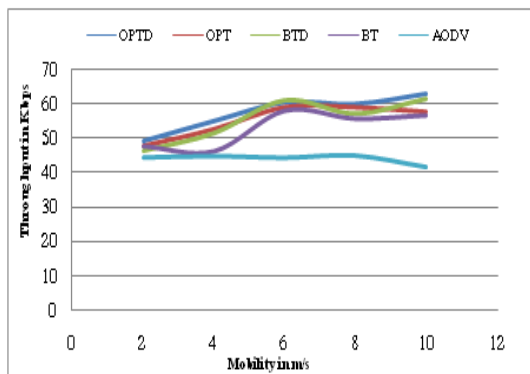


Figure 1. Throughput Vs. Mobility

but OPTD is slightly better than the other protocols. The reason is it finds the stable nodes for the paths and as the paths are reliable in terms of mobility chances of link breakages is less. Whereas in AODV as mobility is not handled properly the control packet overhead is more and as mobility increases control packet also increases.

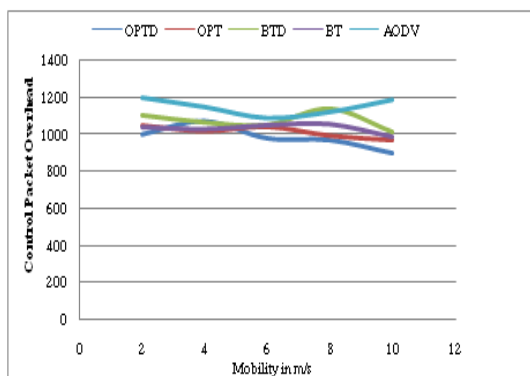


Figure 2. Control Packet Overhead Vs. Mobility

7. CONCLUSION AND FUTURE ENHANCEMENT

In this article a study on different literature found termite based routing protocols for MANET is done. Existing termite based routing protocols for MANET uses either inter packet arrival time or inter packet distance between the mobile nodes as the variable to

update and decay the pheromone over the link. As MANET's topology is vulnerable, the main objective of the study was to see how these protocols behave under different mobility conditions and which variable better reflects the current context of the network while updating and decaying the pheromone over the link. The protocols are simulated in ns-2 and the results are compared with primary evaluation metrics, throughput and control packet overhead and it shows that the Optimized Termite with Distance parameter performance better than the other protocols for the obvious reasons load balancing and reliable path between source and destination. In the near future authors would like to develop an analytical proof for distance based pheromone update and decay.

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