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Simulation and performance evaluation of bio-inspired routing protocol in MANETs emphasizing on the energy metric

Annapurna P Patil
M S Ramaiah Institute of Technology, India

A Mobile Ad hoc Network (MANET) is a mobile wireless network composed of several mobile nodes that communicate among themselves without the intervention of any centralized management or existing infrastructure. Hence, these mobile nodes must necessarily be able to cooperate to allow communication between them. MANETs have vast applications in the areas of personal area networking and other common areas. There are also existing and future military networking requirements for robust, IP-compliant data services within mobile wireless communication networks. Routing in MANETs is a particularly challenging task because the topology of the network changes dynamically, the bandwidth of the wireless medium is limited, the medium is shared and it lacks central control or infrastructure in the network. Adaptability is therefore, an important factor in MANETs. Hence, the present work has experimented with the bio-inspired protocols which are inherently adaptive in nature. Motivations to investigate bio-inspired routing are the following: No topology update is needed and the latency for route determination is zero. AntHocNet is one such protocol which is chosen to conduct the experiments. AntHocNet has been designed after the Ant Colony Optimization framework and its general architecture shares strong similarities with the architectures of typical ACO implementations for network routing. Using a substantial set of simulation experiments in ns-2, we have compared and analyzed the performance of the AntHocNet algorithm with the traditional AODV algorithm. The metrics used for performance evaluation: Energy consumption, convergence time, average end to end delay, throughput and overall network lifetime etc. It is observed that the bio-inspired adaptive hybrid routing protocol has outperformed the traditional routing protocol AODV on the different performance evaluation metrics while changing the parameter like density of nodes and pause time.

annapurnap2@yahoo.com

Two use case scenarios for social network analysis: Countermeasure through biosurveillance graphs and fault tolerance in wireless sensor networks

Izzet Senturk
Bursa Technical University, Turkey

Centrality analysis is a common approach to identify influence of a node on other nodes in social networks. Based on the application, it may be more desirable to remove the most/least influential node from the network. Consider an outbreak of an infectious disease where an agent emerges, evolves, and spreads over several countries. It is crucial to take countermeasures such as vaccination, culling, social distancing, etc. and limit the scope of the consequences. To analyze the available data, a transmission graph can be defined where each transmission is represented by a directed edge from the source node to the destination node. In order to evaluate the importance of the nodes in the transmission graph, various centrality methods can be applied such as page rank, closeness centrality, betweenness centrality, etc. To avoid limiting results by only considering the shortest paths, we defined a novel centrality metric called adapted betweenness which also considers paths that are longer up to a user provided threshold. To apply countermeasure, we prefer more influential nodes in the network. On the other hand, consider a mobile sensor network partitioned into multiple disjoint segments. To restore network connectivity, a reactive recovery approach is restructuring the network through node mobility. However, movement of a node may cause further partitioning in the partition. Thus, it is crucial to identify nodes for movement such that the total movement cost can be minimized. The idea in this approach is identifying the least influential node among the candidates for movement and selecting it to perform the movement.

izzet.senturk@btu.edu.tr