# ABSTRACT

The field of *Mobile Ad hoc Networks* (MANETs) has gained an important part of the interest of researchers and become very popular in last few years. MANETs can operate without fixed infrastructure and can survive rapid changes in the network topology. They can be studied formally as graphs in which the set of edges varies in time. The main method for evaluating the performance of MANETs is simulation. Our thesis presents a new adaptive and dynamic routing algorithm for MANETs inspired by the *Ant Colony Optimization* (ACO) algorithms in combination with network delay analysis. Ant colony optimization algorithms have all been inspired by a specific foraging behavior of ant colonies which are able to find, if not the shortest, at least a very good path connecting the colony's nest with a source of food.

Our evaluation of MANETs is based on the evaluation of the mean End-to-End delay to send a packet from source to destination node through a MANET. We evaluated the mean End-to-End delay as one of the most important performance evaluation metrics in computer networks.

Finally, we evaluate our proposed ant algorithm by a comparative study with respect to one of the famous On-Demand (reactive) routing protocols called *Ad hoc On-Demand Distance Vector* (AODV) protocol. The evaluation shows that, the ant algorithm provides a better performance by reducing the mean End-to-End delay than the AODV algorithm.

We investigated various simulation scenarios with different node density and pause times. Our new algorithm gives good results under certain conditions such as, increasing the pause time and decreasing node density. The scenarios that are applied for evaluating our routing algorithm have the following assumptions: 2-D rectangular area, no obstacles, bi-directional links, fixed number of nodes operate for the whole simulation time and nodes movements are performed according to the *Random Waypoint Mobility* (RWM) or the *Boundless Simulation Area Mobility* (BSAM) model.

**KEYWORDS:** Ant Colony Optimization (ACO), Mobile Ad hoc Network (MANET), Queuing Network Analysis, Routing Algorithms, Mobility Models, Hybrid Simulation.