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| 64563 | Focus on Powder Coatings | UNIV | Science | Elsevier | 13645439 | 18737048 | Netherlands |
| 64565 | International journal of microbiological research | UNIV | Science | International Digital Organization for Scientific Information (IDOSI) | | 20792093 | U.A.E. |
| 64575 | International Journal on Information | UNIV | Science | Praise Worthy Prize | 22812911 | 22812954 | United States |

# Bee-Inspired Routing the ultimate routing process for Energy Efficient MANET

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## Abstract

Mobile ad hoc network (MANET) is one of the most important and unique network in wireless network which has brought maximum mobility and scalability. High efficient routing is an important issue in the design of limited energy resource MANETs. In the last few decades many research work have been conducted by the researchers in the field of routing protocols for MANETs. Nowadays the main area of concern is based on routing protocols utilizing the concept of swarm intelligence in which bee inspired routing and ant inspired routing are suggested. But among these two Bee inspired routing has been accepted widely for energy efficient and scalable multipath routing protocol based on dynamic cluster and foraging behavior of a bee swarm. Here in this paper the advantages of Bee inspired routing have been discussed with respect to its architecture and working for choosing the intermediate nodes and different paths by comparing different parameters of all the algorithms from the ant colony optimization and bee colony optimization for energy efficient MANETs where the performance of Bee-AdHoc-C is found to be best.

**Keywords—** MANET;Energy Efficiency;Bee Inspired Protocols; Scouting; Foraging; Bee-AdHoc-C

## INTRODUCTION

MANET is self-organizing, rapidly deployable which does not require any fixed infrastructure. Mobile nodes self-organize to form a network over radio links. The goal of MANETs is to broaden mobility into the area of autonomous, mobile and wireless domains, where a set of nodes form the network routing infrastructure in an ad-hoc manner. The main characteristics of a MANET are:

- Packets may need to be forwarded by several nodes to reach the destination.
- Dynamic topology due to the nodes' mobility or nodes leaving/joining the network, which causes packet loss and route change.
- Resource constrains: wireless medium bandwidth, device's battery, processing speed and memory.

As the nodes in the MANET are battery operated so there are possibilities that some of the nodes may fail for communication in between for which care has been taken to make the MANETs energy efficient. In this purpose the swarm intelligence concept is considered as one of the best way. Swarm intelligence (SI) is the collective behavior of decentralized, self-organized systems natural or artificial. Ants, Bees, flock of birds or Termites show impressive collective problem-solving capabilities. Properties associated with their group behavior like self-organization, robustness and flexibility are best characteristics for optimization of artificial systems, control or task execution. Swarm Intelligence mainly consists on Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO) and Honeybees paradigms. A swarm is defined as a set of (mobile) agents that collectively solve problems. In the nature animals form into swarms to search food, build nests, to hunt and avoid being hunted etc. Each individual of the swarm has simple rule of action and access to a limited amount of information via its immediate neighbors or local environment. Due to the nature, architecture, topology and functionality of ad hoc and wireless networks, Swarm Intelligence approaches are most suitable for the routing and energy resources optimization related issues in MANETs. Bio inspired, Swarm Intelligence approaches are more promising for ad hoc and wireless AdHoc networks due to

i) Locality of interactions

ii) Availability of multiple paths,

iii) Self-organizing behaviors

iv) Failure backup,

v) Ability to adapt in a quick and robust way to topological and traffic changes and component failures,

vi) Scalable performance robustness to failures,

vii) Losses internal to the protocol,

viii) Easiness of design and tuning.

In this paper we have discussed regarding different algorithms for ant colony and bee colony optimization required for energy efficient MANETs and have discussed the advantages of bee colony optimization with respect to its architecture and working principle for packet transfer between the nodes. Lastly we have done comparative analysis of different algorithms for ant and bee colony with respect to different parameters.