“Analogy And Analysis Of Randomised Approach And Advanced ACO Algorithm”

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Abstract: ACO-based transmission scheme, named the Unity of MPEE and MPEB (UMM), is proposed to improve the longevity of WSNs. Different from general transmission methods, it has two distinct characteristics: First, by considering energy consumption in different areas, it achieves not only Maximum Possible Energy Efficiency MPEE and also Maximum Possible Energy Balancing MPEB, and finally prolongs the network longevity. Second, it not only considers MPEB, but also advances two inter-related strategies of MPEB. The UMM algorithm has a unique proposition that improves the longevity of the network and also takes care that the number of alive nodes are more as compared to other nodes in the network.

In the current approach we use “A Transmission Scheme for Ant Colony Optimizations Using Ant Colony Optimization with Unconventional Characteristics” which is an effective transmission strategy should achieve maximum possible energy efficiency (MPEE) and maximum possible energy balancing (MPEB) for lifespan maximization in Ant Colony Optimizations (WSNs). A transmission scheme with two strategies of MPEB is proposed to realize the unity of MPEE and MPEB, and ultimately to maximize the lifetime of WSNs. This transmission scheme is based on ant colony optimization (ACO), but it is quite different from conventional ACO algorithms in two aspects: every ant only needs to move few steps to finish its complete trip, and there is no heuristic information in the transition probability of the ant.

Keywords: Maximum possible energy efficiency (MPEE), maximum possible energy balancing (MPEB), ACO, WSN.

I. INTRODUCTION

Swarm intelligence is defined as the collective behavior of decentralized, self-organized groups. They are made up of simple agents that interact with the environment (so called stigmergy) and between each other. The agents follow simple rules and possess themselves limited capabilities. They don’t follow centralized orders for each individual and interact locally and randomly but together, from a global point of view, their behaviour emerges as “intelligent”.

Examples for such behaviour are searching for food by ants, or searching for nectar by bees. The nature of swarms largely resembles mobile ad-hoc networks (MANETs) and that is why ideas from swarm animals like ants and bees are used for creating suitable routing protocols for MANETs.

The basic idea behind ant-based routing algorithm is taken from the food searching strategy of real ants. They start searching food from their nest and walk towards the food, sampling different routes. When an ant reaches an intersection it has to make a decision which way to take next. Also while walking (to the food source and back), ants leave pheromone, a chemical substance, which marks the route they took. Other ants can smell the pheromone. They can distinguish its concentration as well, which gives a hint to them for the usage of the route and influences their choice. With time the concentration of pheromone decreases due to diffusion. This property is important for knowing which route is becoming less occupied, probably due to some deterioration.

A swarm of ants in the search for food shows the remarkable capability of finding shortest paths between a found food source and the anthill. Even though any single ant could be said to possess the capability of finding a short path from the anthill to a nearby food source, the probability of this occurring is very small, since an ant is not a very smart animal. The amazing thing is that when many ants cooperate on finding food, using pheromone trails as a simple indirect form of communication, the swarm of ants seems to be able to find a shortest path effectively. Another feature is their ability to adapt to a changing environment. If an obstacle is placed on the path from the food source back to the anthill, ants are capable of finding the shortest path around the obstacle – and possibly find food sources closer to the anthill.
SYSTEM ARCHITECTURE

Figure 2: System Architecture for TS-ACO (Transmission Scheme Ant Colony Optimization)

NODE DEPLOYMENT

This module is responsible for placing out the nodes deployed in the particular area which takes number of nodes and limits as an input and it generates the topology matrix.

ROUTING TABLE GENERATION

This is responsible for generating the routing tables based on the number of nodes in the network. The routing table will contain all nodes information in the form of node id, sector id, and distance between the nodes.

RANDOM PROPAGATION ALGORITHM

Random Propagation Algorithm will first find the neighbors. If the neighbors has destination then stop the process otherwise among pick the next neighbor and move forward and repeat process until destination is reached.

PRELIMINARY ENERGY BALANCING

The selectable maximal transmission level of Sector is given by

\[ C_i = \left[K_0 \left(1 - \frac{d_{\text{max}} - d_{\text{sink}}(t)}{\lambda(d_{\text{max}} - d_{\text{min}})}\right)\right] \]

Where,

\[ K_0 = 6, \]
\[ \lambda = 2, \]
\[ d_{\text{max}} = \text{maximum distance}, \]
\[ d_{\text{min}} = \text{minimum distance} \]
and which value of C is maximum the node in that sector is chosen as the next node to move in.

ACCURATE ENERGY BALANCING

ACO-based strategy of accurate energy balancing (AEB), where each ant chooses its destination sector with a probability according to the pheromone intensity

\[ P_{ij} = \frac{\tau_{ij}}{\sum_{r \in R} \tau_{ir}} \]
\[ \tau_{ij} = \text{pheromone parameter between node i and node j} \]
\[ \tau_{ij}(t+1) = (1-\rho)\tau_{ij}(t) + \Delta \tau_{ij} \]
\[ \rho = \text{pheromone evaporation parameter} \]
\[ 0 \leq \rho \leq 1 \]
\[ \Delta \tau_{ij} = \frac{1}{\sum_{r \in R} E_r(t)} \left[ \frac{1}{E_{\text{max}}(t) - E_{\text{max}}(t) + \delta} \right] \]
\[ \mu = \text{Level of MPEE} \]
\[ \varphi = \text{Level of MPEB} \]
\[ E_r(t) = \text{energy level of i\textsuperscript{th} node} \]
\[ E_{\text{max}} = \text{maximum energy level of node in the sector} \]
\[ E_{\text{min}} = \text{minimum energy level of node in the sector} \]

II. PREVIOUS APPROACH

RANDOMIZED ALGORITHM

Figure 2: Randomized Route Discovery

The following are the steps of Randomized Route Discovery algorithm
Network
1→2→3→4→5→6→7→8→9→10
Each Node Spread by distance of 10m
✓ SOURCE NODE =1
DESTINATION NODE =9
COVERAGE AREA =20
✓ Fetch the Routing Table i.e RT1→{1,2,3,4,5,6,7,8,9,10}
✓ Neighbour List→{2,3}
✓ NL→{2,3} destination→9 NL=dest (NO)
✓ 1→2
✓ SN=2
DN=9
CA=20
✓ Fetch the Routing Table i.e RT2→{1,2,3,4,5,6,7,8,9,10}
✓ NL2→{1,3,4}
NL2 =destnode →{1,3,4}→{9} NO
✓ 1→2→1
✓ SN=1
DN=9
CA=20
✓ Fetch the Routing Table i.e RT1→{1,2,3,4,5,6,7,8,9,10}
✓ NL1→{2,3}
NL1=destnode →{2,3}→{9} NO
✓ SN=3
DN=9
CA=20
✓ Fetch the Routing Table i.e RT3→{1,2,3,4,5,6,7,8,9,10}
✓ NL3→{1,2,4,5} dest node→{9} NO
✓ SN=5
DN=9
CA=20
✓ Fetch the Routing Table i.e RT5→{1,2,3,4,5,6,7,8,9,10}
✓ NL5→{3,4,6,7} dest node→{9} NO
✓ SN=7
DN=9
CA=20
✓ Fetch the Routing Table i.e RT7→{1,2,3,4,5,6,7,8,9,10}
✓ NL7→{5,6,8,9} dest node→{9} YES
✓ 1→2→3→5→7→9

III. CURRENT APPROACH

TRANSMISSION SCHEME ROUTE DISCOVERY

RESULT

COMPARING THE ALGORITHMS WITH THEIR PARAMETER
Figure 4: This shows that time taken to discover the route by transmission scheme algorithm is lesser when compared to randomised algorithm.

Figure 5: We find that when randomised algorithm is used, number of hops is more and a little less in transmission scheme algorithm.

Figure 6: Energy consumption is very much lesser in transmission scheme when compared to randomised approach.

Figure 7: Comparison Of Alive Nodes.
REFERENCES


