A Case Study On Swarm Intelligence Based Senor Network Optimization

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Abstract- Wireless senor network technology was the promising technology applied for many applications. The performance of network is highly depends on architecture, routing algorithm and protocols. There has been a rapid growth in Research on swarm intelligence and many of the researcher has been selected swarm intelligence concept for senor network optimization. This research paper is a review of swarm intelligence were applied in the wireless senor network optimization

Keywords- Swarm intelligence, Artificial Bee Colony, Wireless Sensor Network

1. INTRODUCTION

Wireless sensor network (WSN) widely used in monitoring purpose which is formed by collective of sensor nodes deployed in the monitoring domain. Sensor node is developed by integrating sensors with processing unit, transceiver, memory unit, and external power supply. Figure.1 is sensor node architecture.

![Sensor Node Architecture](image)

Sensor nodes sense the environment and sends the gathered the information to the sink node in terms of wireless communication and defined as sensor network. The size of the network is depends on the density of the nodes, sink node in a network has been selected single or multiple centered by density of nodes[1]. The network performance is assessed by its architecture topology, routing technique and characteristic like lifetime, responsive, robustness, scalability, heterogeneity, and self-configuration. WSN was widely used in many real time application like Military applications, Environmental applications, Health applications, Home applications and other commercial applications[2]

Researchers has been adopted techniques for sensor network performance optimizations in terms of routing techniques, network topologies, data aggregation and synchronization for providing low cost limited energy constrain and self-organized network. Gaussian distribution, genetic algorithms, Radio Sleep Mode Optimization and Particle Swarm Optimization are some of the optimization models available in WSN[3].

2. SWARM INTELLIGENCE

In the year of 1989 the swarm intelligent concept was introduced by Gerardo Beni and Jing Wang. Swarm intelligence (SI) uses food foraging behavior of animals and the concept in decentralized and self-organized system naturally[4]. SI based algorithms gives the best solution for the optimization problems
like finding of best path for transmission, self-organization by finding of nearing neighbors. In WSN Based on the natural behavior of ant, honey bee, fish cuckoo and bat optimization problems were solved [5][6][7]. Fig.2 shows SI techniques used in WSN. SI models are broadly used by the researchers, in that artificial bee colony model have been used widely sensor network optimization. Table.1 shows survey on the SI algorithm used in WSN.

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3. ARTIFICIAL BEE COLONY ALGORITHM:

Artificial bee colony algorithm (ABC) is one of the SI algorithm inherits the natural honey bee food forage behavior. Bees are identifying the rich food location by conveying information among themselves which is the good example for team work, self-organizing and task performance[5].

There are three types of bee sets (employed bee, onlooker bee and scout bee) being in ABC, each bee sets performs optimization process like searching of food source by employed bees, finding of the location of The ABC initially create a randomly distributed swarm group size denoted as N, the i\(^{th}\) location of the food source is given as \( A_i = \{ A_{i1}, A_{i2}, \ldots, A_{in} \} \). Each employed bee \( A_i \) generates new candidate solution \( V_i \) in the neighborhood of its present position \( V_{ik} = A_{ik} + \varphi_{ik}(A_{ik} - A_{jk}) \), rich food source by onlooker bees and moves towards new food source by scout bees[8].

Four types of tasks performed by ABC algorithms[9].-initialization, updating of population, source selection and elimination of populations.

Where, \( A_i \neq A_j \quad K : \{1,2,3,\ldots,n\} \) number of employed bees \( \varphi_{ik} \): Random number [-1, +1]

\( A_i \): Randomly selected food source. If the fitness value of \( V_i \) is better than \( A_i \) then \( A_i \) is updated with \( V_i \), otherwise \( A_i \) keep unchanged. An
onlooker bees select the food source depending upon its probability value is given as

\[ P_i = \frac{fit}{\sum_{n=1}^{N} fit_n} \]

Where, \( fit \) is the fitness of the \( i^{th} \) food source


4. CONCLUSION
It is evident, that swarm intelligence concepts has been adopted in sensor network optimization problem solving. ABC algorithm widely used in sensor network for solving problems in all aspect. It is one of the promising concept in WSN to improve network efficient in terms of node deployment, data collection, energy aware transmission and increases in network life.

REFERENCE