Power Control in non-uniform Wireless Senor Network based on Parallel Bee colony Algorithm

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***Abstract*—in wireless sensor networks, Energy consumption is one of the major problems. A new mechanism of power control based on the Parallel Bee Colony Optimization algorithm (PBCO) presented for the Energy consumption optimization by considering the non-uniform network. The device can examine the solution space and optimize the route of data transmission to regulate the energy consumption of the nodes. Due to this network lifetime increases. In this project measuring the different parameters and comparing parallel bee colony algorithm (PBCO) with Random Bee colony algorithm (RBCO) is carried out.**

Keywords:* Swarm intelligence (SI), Bee colony algorithm, Parallel bee colony algorithm, wireless sensor network (WSN), Energy consumption.

I. INTRODUCTION

The swarm method is used in an aggregation of animals like fishes, birds and insects namely as ants, termites, and bees performing a collective behavior. The individual agents of these swarms behave without supervision, and each of these agents has a stochastic behavior. The swarm lies between the agent and environment. Swarm Intelligence is becoming increasingly important research area for computer engineers, scientist's economists, bio-informaticians, operational researchers, and many other disciplines. The problems that the natural intelligent swarms can solve in (finding food, dividing labor among nest mates, building nests, etc.) Several engineering areas. Artificial Intelligence (AI) is one of the oldest and best-known research fields. Many researchers have studied in this area Bonabeau et al. [1] show features of self-organization and division of labor and Millions show the satisfaction principles required by Swarm Intelligence (SI) are strongly seen in honey bee colonies, used to solve many optimization problems in the energy consumption.

II. LITERATURE SURVEY

A new mechanism in WSN in bee colony algorithm (BCA) is proposed for the optimization of energy consumption. The proposed mechanism can realize the best allocation of the energy for each multiple nodes in a given network.

The author has discussed many relevant theoretical problems of bee colony algorithm, analyses the defects of the traditional bee colony algorithm, and proposed an improved bee colony algorithm to solve these problems. In literature survey, many papers are studied based on energy consumption. Which shows the different Swarm intelligence based algorithm used to increase the lifetime of the network.

The ant colony algorithm, as one of the available heuristic algorithms, is used to find the optimal route from the source node to destination node. A route supporting multi-constrained quality of service (QoS) is developed for increase network throughput and reduce network energy consumption, A routing algorithm (IAMQER) was proposed [2]. Analysis of local node information is based on an algorithm. Following are sequences adopted: queue length, node forwarding number of data packets, node residual energy, balances the relationship between the network throughput and the energy consumption, which improves the performance of the network in multi-constrained QoS routing. Simulation results show that this IAMQER algorithm can find the QoS route that reduces average energy consumption and improves network packet delivery ratio under the end-to-end delay and packet loss ratio constraints.

Sensor nodes in Wireless Sensor Networks (WSNs) are usually distributed in difficult areas and accessed to collect and send the data to the main sink location. Problems occur when WSNs are subjected to critical situations such as the node or link failure, [3] the authors have studied the Optimization in Ant Colony (ACO) with the combination with Breadth First Search (BFS).The results have revealed the best and shortest path to improve data transmission with the least amount of energy consumption, reduce the probability of data loss. This proposal, a balance between some packets, time and energy consumption can be determined which leads to increase the network performance. The paper is focused on decreasing energy consumption which leads to increase of the network's lifetime.

Research on [4]comprehensive routing protocol (CRP) based on the ant colony algorithm for the applications of Wireless Sensor Network proposes. Protocol for both the lifetime of network and the arrival rate of the data packet into account. Multiple paths are found between source and destination, and sub-optimal paths are used to the probabilistic forwarding table to provide substantial gains. Factors such as the remained energy of the node, the square of the distance between it and the current node, and the strength of pheromone on this branch are considered to balance the energy consumption between nodes.

Simulation results have shown that the proposed protocol not only prolongs the network lifetime but also decreases the packet loss rate.

The prototypical example of a cross-layer design problem is Transmit power control. The transmit power level affects signal quality and impacts the physical layer, determines the neighboring nodes that can hear the packet and network layer affects interference which causes congestion and affects the transport layer. The task is to identify where in the design the power control problem is to be located, to define the suitable power level by studying its effects impact on several concert problems, the multiple effects of transmitting power control to provide a solution and provide a software architecture for realizing the solution. Decontaminate some basic principles on power control, which inform the subsequent design process, the design of a sequence of increasingly complex protocols, address the multidimensional ramifications of the power control problem. Many of these protocols have been implemented and may be the only implementations for power control in a real system. [5].

A wireless sensor network (WSN) is consist of a vast collection of sensor nodes with limited resources regarding battery supplied energy, processing capability, and storage. The design of an energy-efficient and scalable routing protocol is a crucial concern for WSN applications. In this paper, [6] author proposed scalable multipath routing protocol and an energy-aware based on the foraging behavior of a bee swarm and dynamic cluster. Bee-Sensor-C is an evolution from Bee Sensor which is a bee-inspired routing protocol for WSNs .introducing a dynamic clustering scheme, Bee-Sensor-C offers parallel data transmissions close to the event area. This development reduces routing overhead and improves the scalability. Moreover, Bee Sensor-adopts an enhanced multipath construction method to achieve the balance of the network energy consumption. Bee-Sensor-C can well support the multi-cluster scenario. The network performance is evaluated, through simulations, and the results demonstrate that Bee-Sensor- C outperforms the existing protocols regarding energy efficiency, energy consumption balance, packet delivery rate, and scalability.

Conclusion:-From the literature, we conclude that different swarm intelligence algorithms and methods are used for extending the lifetime of the network.

III. METHODOLOGY

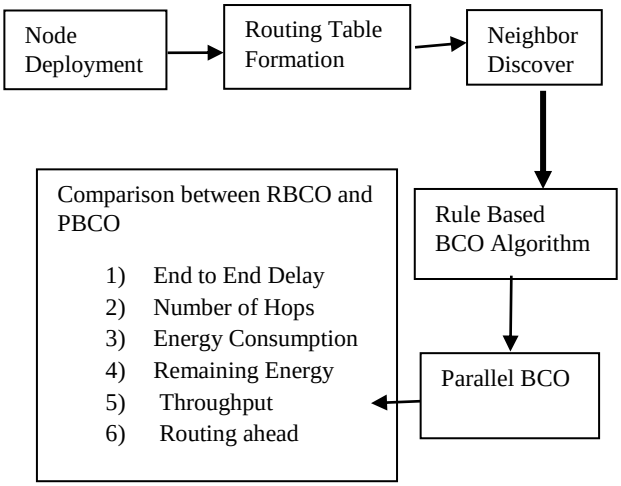

Fig 1: Proposed methodology

To place the nodes in the network for the given areaNode deployment algorithm is used.The routing tables for the nodes in the network is formed using Route table formation algorithms. Where each record will have the {node id, distance}, each of the routing tables will have N entries. Finding the neighbor nodes is by the process of Neighbor Discovery process. These are a set of nodes which fall within the transmission range. Rule-based BCO Algorithm is used to find the rules first, and then the number of routes will be equal to the number of standards with a multiplicative factor of neighbors. For each path, discovery route is revealed between source nodes to the destination node based on the rule. The RBCO protocol (RBCO) is based on source routing, which means that the originator of each packet determines an ordered list of nodes through which the packet must pass while traveling to the destination. Parallel BCO Algorithm is used to compute multiple routes, and each route is computed based on grade level and the residual power level between the source node and destination node. Finally, for the paths the pheromone, delta pheromone and probabilistic measures are computed and then the route which has the highest probabilistic measure that will transmit maximum packets.

IV. RESULTS

The simulation results obtained in the Parallel Bee Colony algorithm and Rule Base BCA were discussed. Simulation studies were carried out, and the results were obtained by using MATLAB and coding were developed.Fig 2. Shows the nodes are placed in the given area. Fig 3 and Fig 4 shows the energy consumed and remaining energy of the Random bee colony algorithm, the same method is used for parallel bee colony algorithm.

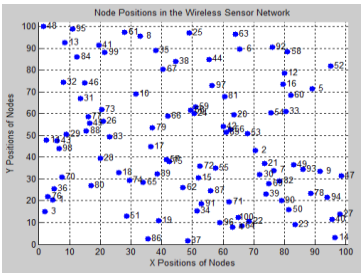

Fig.2 nodes deployed in WSN

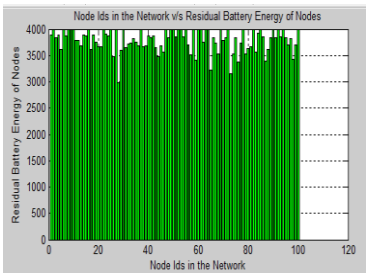

Fig 3: Energy Consumption inBee colony algorithms

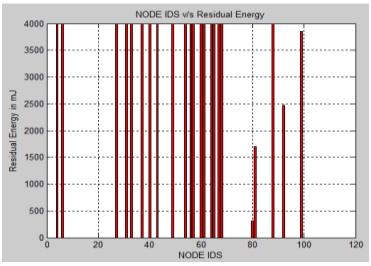

Fig.4 Remaining energy

Similarly, in the present project, we are comparing the PBCO with RBCO for different parameters, the result shows PBCO is best.

V. CONCLUSION

The following observation based on, a new mechanism based on parallel ant colony algorithm which reduces the maximum energy consumption, and also in the reduction of the time requirement. The transmission speed increases with homogenizing the energy cost of the nodes. In this project network model, the nodes are distributed unevenly. Finally, we conclude that proposed mechanism is better when compared to the existing power routing.

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