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A Study in Wireless Sensor Network (WSN)

Using Artificial Bee Colony (ABC) Algorithms with Dynamic Technique

Mirza Samiulla Beg[1], Dr. Akhilesh A. Waoo[2]

[1]PhD Scholar Department of Computer Science and IT, AKS University Satna (M.P.), India
[2]Head Department of Computer Science and IT, AKS University Satna (M.P.) , India

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Abstract - Artificial bee colony algorithm could be a good optimization algorithm supported the bee's acquisition model. This review proposed a study in wireless sensor networks (WSN) using an artificial bee colony (ABC) algorithm with dynamic technique. Till now using greedy technique the result is good but it does not give guaranty and memorization of data. Dynamic technique gives guaranty and memorizes the data. In this review study the both technique and analyze the both technique.

Keyword: - ABC (Artificial Bee Colony), WSN (Wireless Sensor Network), PSO (Particle Swarm Optimization), CH (Cluster Head), BS (Base Station).

1. Introduction

The recent progress of wireless communication technologies has attracted the attention of researchers during the last decade. A WSN is a powerful infrastructure less ad hoc network that consists of a number of distributed sensor nodes. In this kind of network, sensors are randomly or manually deployed on a physical environment. WSNs include both monitoring applications such as prevention of natural disasters or agricultural irrigation management, and tracking applications such as military strategies or seismic measurements [16]. To increase network lifespan, clustering is the widely used technique for efficiently managing network energy consumption and scalability. The clustering technique consists of partitioning the network into a number of sensor groups called clusters, each group with a leader called cluster head (CH). Sensors gather data and send it to their corresponding CHs, which aggregate all received data and transmit it to the Base Station (BS). Since, clustering is known to be a NP-Hard optimization problem [17], some of evolutionary algorithms [18], [19], are used to produce solutions to these problems by providing mathematical models based on certain biological behaviors.

1.1 WSN Network Topologies

For radio communication networks, the structure of a WSN includes various topologies like the ones given below.

1. Star Topologies

Star topology is a communication topology, where each node connects directly to a gateway. A single gateway can send or receive a message to a number of remote nodes. In star topologies, the nodes are not permitted to send messages to each other. This allows low-latency communications between the remote node and the gateway (base station).

Due to its dependency on a single node to manage the network, the gateway must be within the radio transmission range of all the individual nodes. The advantage includes the ability to keep the remote nodes' power consumption to a minimum and simply under control. The size of the network depends on the number of connections made to the hub.

2. Tree Topologies

Tree topology is also called as cascaded star topology. In tree topologies, each node connects to a node that is placed higher in the tree, and then to the gateway. The main advantage of the tree topology is that the expansion of a network can be easily possible, and also error detection becomes easy. The disadvantage with this network is that it relies heavily on the bus cable; if it breaks, all the network will collapse.

3. Mesh Topologies

The Mesh topologies allow transmission of data from one node to another, which is within its radio transmission range. If a node wants to send a message to another node, which is out of radio communication range, it needs an intermediate node to forward the message to the desired node. The advantage with this mesh topology includes easy isolation and detection of faults in the network. The disadvantage is that the network is large and requires huge investment.

1.2 ABC Algorithm

In a 2005 study, inspired by the foraging behavior found in bee colonies, Zhang et al. [20] proposed an innovative heuristic method called the artificial bee colony (ABC) algorithm. In the ABC algorithm, there are three "bee" groups in the "colony": onlookers, scouts, and employed bees, where each bee represents a position in the search space; the ABC algorithm employs populations of bees to identify the optimal path. A bee waiting on the "dance" area to choose a food source is an onlooker, a bee randomly

searching is a scout, and a bee going to a previously visited food source is an employed bee. The positions of food sources represent possible solutions to the optimization problem, and the amount of "nectar" of a food source corresponds to the quality (fitness) of the associated solution. The first half of the colony consists of employed bees and the second half consists of onlooker bees.

1.3 How ABC algorithm works?

The ABC was first proposed to solve numerical optimization problems by Karaboga [6]. ABC consists of employed and unemployed foragers, and

food sources. The ABC consists of three groups of artificial bees: employed foragers, onlookers and scouts. The employed bees comprise the first half of the colony whereas the second half consists of the onlookers. In the basic ABC [6], there are 3 kinds of bees: employed, onlooker, and scout bees. It generally consists of four phases.

1) Initialization of ABC. Determine the number of artificial bees. 50% are employed bees and 50% are onlooker's bees. Generate the random initial candidate solutions for employed bees using equation. [6] Determine the limit value.

2) Employed bee phase for all employed bees Generate new candidate solution using equation. [6] Calculate the fitness value of the new solution using Equation. [6] If fitness of new candidate solution is better than the existing solution replace the older solution. Calculate the probability for each individual.

3) Onlooker bee phase. For all onlooker bees Select an employed bees using roulette wheel. Produce new candidate solution. Compute fitness of individual. If fitness of new candidate solution is better than the existing solution replace the older solution.

4) Scout bee phase If any food source exhausted then replace it by randomly generated solution by scout memorize the best solution. Until (stopping criteria is not met).

2. Review of Literature

Alina Rakhi et al [1] [2013] suggested associate improved alphabet rule has been planned to match the various characteristics of wireless device network readying method, which is able to be optimum for real time dynamic network functioning. Out of the varied Swarm intelligent algorithms developed thus far, Artificial Bee Colony (ABC) rule offers a vivid scope for this objective. Wireless device Networks plays a large role in instrumenting the trendy day world; thus it's crucial to develop associate best style flow.

Rajeev Kumar et al [2] [2016] presented ABCACO algorithm is divided into three main parts: (i) selection of optimal number of sub regions and further sub region parts, (ii) cluster head selection using ABC algorithm, and (iii) efficient data transmission using ACO algorithm. They use a hierarchical clustering technique for data transmission; the data is transmitted from member nodes to the sub cluster heads and then from sub cluster heads to the elected cluster heads based on some threshold value.

Hashim A. et al [3] [2016] proposed approach improves the network lifespan significantly when put next to solutions rumored within the literature like Shortest Path 3-D grid preparation (SP3D) rule. The ABC-based preparation is sure to extend the lifespan by optimizing the network parameters and restricting the full variety of deployed relay.

Yinggao Yue et al [4] [2016] presented ancient knowledge assortment strategies solely concentrate on increasing the quantity knowledge assortment or reducing the general network energy consumption, that is why they designed the projected heuristic algorithmic program to put together contemplate cluster head choice, the routing path from normal nodes to the cluster head node, and mobile Sink path designing improvement. They targeted on a large-scale and intensive MWSN that permits particular quantity latency by investigation mobile Sink balance from 3 aspects: data assortment maximization, mobile path.

Satyasen Panda et al [5] [2018] presented the simulation results prove the superiority of the ABC algorithm compared to other algorithms in maximizing the energy efficiency and longevity of the network. The ABC algorithm has less number of control parameters in the objective function compared to other algorithms, so it is simple to implement in clustered sensor network. The proposed algorithm can reduce the energy dissipation of nodes, balance the energy consumption across nodes and maximize the lifetime of the network. The various sensor nodes in a wireless sensor network (WSN) have restricted energy resources which severely affect the long time performance of the network. They propose artificial bee colony (ABC) algorithm with a clustering model to improve the energy capability of the network. So, the current research focus is to design energy efficient algorithms for WSNs for improving network lifetime.

Yan Song et al [6] [2018] suggested article aims to mix the mesh network of LoRa wireless communication system with associate improved artificial bee colony rule. once victimization this improved network system structure to send transmission data, it shows obvious superiority in terms of the high potency and real-timeliness of transmission. Video streaming communication networks are a really vital thanks to send transmission data anytime and anyplace, and therefore the construction of the network base station that transmits signals is crucial in future. Specifically, a man-made bee colony rule, which

relies on RBF radial basis neural network trained with random gradient technique, is intended.

Sourav Sinha et al [7] [2017] suggested paper provides a gist of the existing bio-inspired routing algorithms and describes a new energy efficient data collection strategy with mobile sinks in wireless sensor networks. As wireless sensor networks comprise of a vast number of resource constrained tiny sensor nodes which are designed to operate for a long period of time, it is inevitable to efficiently utilize the available resources.

Vinod Kumar Menaria et al [8] [2018] proposed analysis work, an endeavor has been created to create use of a man-made bee colony approach to search out knowledge aggregation for providing fault tolerance in wireless device networks (WSNs) and to create effective utilization of the present resources over the net. it's tried to use quadratic minimum spanning tree (Q-MST) that is a man-made intelligence technique to produce fault tolerance together with knowledge aggregation in WSN. within the on-demand usage of wireless device networks over the net, fault tolerance is Associate in Nursing exigent task to enhance the performance of service computing.

Vaishali R. Kulkarni et al [9] [2016] presented correct localization of every which way deployed detector nodes is critically necessary in wireless detector networks (WSNs) deployed for watching and following applications. Further, the results ar compared with those of the localization methodology supported the particle swarm improvement (PSO) algorithmic rule. A comparison of the performances of fundamentals and PSO algorithms has been bestowed in terms of the quantity of nodes localized, localization accuracy and therefore the computation time. The results show that the fundamentals algorithmic rule delivers higher accuracy of localization than the PSO algorithmic rule does; however, it takes longer to converge. Results of Matlab simulation of ABC-based time period localization are bestowed. The fundamentals algorithmic rule has been investigated as a tool for anchor-assisted detector localization in WSNs.

D. Devipriya et al [10] [2016] they projected a man-made Bee Colony (ABC) rule, to boost the energy potency of WSN by correct Cluster Head (CH) choice. The Particle Swarm improvement (PSO) uses the sleeping mechanism that provided energy improvement in Wireless detector Networks (WSN), however did not offer higher energy potency.

Rajeev Kumar et al [11] [2016] suggested the hybrid optimisation formula referred to as, multi-objective aliquot artificial bee colony is developed to manage the convergence rate of fundamental principle with the fresh designed fitness operate that thought of 3 objectives like, energy consumption, distance cosmopolitan and delays to attenuate the general objective. consequently, associate degree energy economical cluster mechanism, supported artificial bee colony formula and factional calculus is planned during this paper to maximize the network energy and life time of nodes by optimally choosing cluster-head. Because of the promising application of collection info from remote or inaccessible location, wireless sensing element networks create huge challenge for knowledge routing to maximize the communication with additional energy economical.

Ado Adamou Abba Ari et al [12] [2016] bestowed the obtained results demonstrate the effectiveness of the projected protocol in terms of network period and also the quantity of transferred packets. within the projected protocol, a centralized bunch method is adopted whereas the information gathering and routing operations area unit complete in a very distributed manner. The projected protocol is intensively experimented and also the results area unit compared with the number of the well-known bunch and routing protocols. They gift associate energy economical biologically galvanized bunch protocol that uses the economical and quick looking out options of Artificial Bee Colony (ABC) algorithmic rule. The bunch technique with knowledge aggregation on cluster heads provides associate economical quantity ability in WSNs, pro a stronger network period.

Husna Jamal et al [13] [2017] presented international secretion update and native secretion update square measure utilized in the planned formula with the aim to distribute the packets fairly and to stop the energy depletion of the sensing element nodes. Performance of the planned formula has outperformed 5 different common algorithms in static WSN surroundings in terms of turnout, success rate, packet loss rate, energy consumption and energy potency. The planned formula can confirm the most effective path to be utilized in the submission of packets whereas considering the capability of every sensing element node like the remaining energy and distance to the destination node. Associate emmet colony system formula for packet routing in WSN that focuses on a secretion update technique is planned during this paper.

Arti et al [14] [2016] suggested WSN is applied in routing and troublesome power provide space or space that can't be reached and a few temporary things, that don't want fastened network supporting and it will quick deploy with sturdy anti-damage. planned formula will avoid network congestion and so it will prolong the life cycle of the entire network. Wireless device Networks consisting of nodes with restricted power area unit deployed to collect helpful info from the sphere.

Ankit Gambhir et al [15] [2018] suggested ABCO based mostly LEACH formula is tested loosely on numerous eventualities of WSNs, dynamic most range of rounds (rmax) in addition as range of detector nodes (n). Protocols supported clump like LEACH could be a competent approach, within which cluster has been planned; every cluster has plentiful nodes and lone cluster head (CH).

Most primaryconcern in wireless detector networks (WSN) is management of energy of the tiny nodes deployed for sensing physical or environmental conditions of a region.

3. Conclusion

In review, the various wireless sensor network using bee colony algorithms and works of literature show that different algorithm gives a different result if compare one to another algorithm then they give a better result. There are lots of opportunities to improve the search performance, reduce power consumption, shortest routing path and reduce data access time. In research, it is still needed to identify the problems where the ABC algorithm can do better as compared to other optimization algorithms. In the future, there is an opportunity to improve the search performance, reduce power consumption, shortest routing path and reduce data access time using artificial bee colony algorithm and particle swarm optimization.

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