e-ISSN 2320 –7876 www.ijfans.org
Vol.11, Iss.12, 2022

ENERGY EFFICIENT MOTH FLAME OPTIMIZATION ALGORITHM FOR WIRELESS SENSOR NETWORK

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ABSTRACT
Sensor Nodes play a vital role in wireless sensor networks (WSN). Routing protocols helps to enhance the lifespan and energy efficiency of battery powered sensor nodes. In wireless sensor network similar nodes are grouped to form clusters. Moth flame optimization algorithm is used for selecting the cluster head. MFO algorithm helps to solve the complex real-world problems. In this paper, we propose Moth flame optimization algorithm for Wireless sensor network. This paper presents the steps to form the clustering network in WSN and the transmission strategy.

Keywords – Moth and Flame, Routing Protocol, CH, PSO, flame optimization.

1 .INTRODUCTION

Wireless Sensor Network (WSN) encompasses of tiny, autonomous sensor nodes (SN) deployed over a network. The sensor nodes help to sense and monitor the environment. The monitored data gets transfer to the base node. Wireless sensor network has various applications in the field of military surveillance, traffic monitoring, industrial surveillances, health care, etc. Once we deploy the sensor node, it is difficult to replacing the batteries in some harsh working environment. To enhance the battery power of the nodes, the cluster is formed with cluster head and member nodes. In this work we are proposing the metaheuristic energy efficient Moth Flame algorithm to increase the lifetime of WSN. Moth Flame optimization algorithm helps to optimize Random position, updating position, calculating the fitness value and finding optimal path.

2. RELATED WORK

In 2015 S. Mirjalili proposed the moth flame optimization (MFO) which is a new method for solving optimization problem. The MFO is suitable for a variety of real-world optimization issues due to its dazzling qualities. The MFO which is well-thought-out as one of the novel nature-inspired algorithms simulates the navigation method of moths for travelling for long distances [12].Two-tier Particle Swarm Optimization Protocol for Cluster and Routing (TPSO-CR) in WSN discuss about optimal routing. Two- tier Particle Swarm Optimization Protocol for clustering and routing in WSN is made public by Riham S.Y. Elhabyan et al. in [2015]. It assists in resolving the clustering and routing issue. The social behaviour of fish schooling or flocks of birds served as the basis for particle swarm optimization (PSO). The network operation period in TPSO-CR is split up into rounds. The setup phase and the steady-state phase are just two of the two phases that make up each round.

3. MFO ALGORITHM

The proposed Moth flame Optimization (MFO) belongs to the Swarm intelligence (SI) family and it applied to solve optimization problems in image processing, medical applications, engineering design, power and energy systems and economic dispatch. MFO algorithm imitates the moth's navigation at night called transverse navigation mechanism. Moths belong to the phylum Arthropoda class of insects. In real world, there exists more than 160,000species of moths. It includes nocturnal, crepuscular and diurnal species. Each moth consists of two pairs of broad wings covered in tiny scales are purely nocturnal. They have a head, two antennae, a thorax, six legs and abdomen. The moth has unique navigation techniques. They are the night travellers using moonlight for its navigation. In MFO algorithm which has two key factors such as Moth(M) and Flame(F). MFO algorithm finds the optimum solution across the flame by inspiring the logarithmic spiral movement. The movement of moths can be assumed to be hyper ellipse across the flame. The position of moths can be expressed as a matrix format.

$$M=\begin{bmatrix} p_{1,1} & p_{1,2} & \cdots & \cdots & p_{1,d} \\ p_{2,1} & p_{2,2} & \cdots & \cdots & p_{2,d} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ p_{n,1} & p_{n,2} & \cdots & \cdots & p_{n,d} \end{bmatrix}$$ Where n is the number of moths and d is the dimensions of the moths. We also assume that an array exists for recording the corresponding fitness values for the flames, as shown below:

$$F=\begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_n \end{bmatrix}$$

As a result, it is possible to imagine a hyper circle surrounding the flame in all directions, and the moth would then be in this area. The fundamental element of the suggested strategy is spiral movement since it controls how the moths update their positions near flames. A moth can fly "around" a flame according to the spiral equation, rather than necessarily in the area between them.

4. MOTH FLAME OPTIMIZATION ALGORITHM IN WIRELESS SENSOR NETWORK

In WSN, the proposed network model forms a cluster network with CH and member nodes. Cluster Head is selected based on the MFO algorithm. These cluster-based energies efficient routing protocol then generates sub cluster for those nodes that are unable to survive with the selected CH. Each sub clusters then parallel selects CH for delivering data to BS. This optimized routing protocol with the help of node parameters analyse and generate results. Clusters are developed, each cluster is assigned CH using optimization technique and then each CH generated Time Division Multiple Access (TDMA) schedule within cluster. It provides a time slot for data collection and delivers data packets by each cluster member node. Frame length is based on cluster nodes. This algorithm has been proposed to reduce the energy hole problem. It's based on a hypothesis that modifies CH depending on certain factors, including distance, position, and energy. To quantify these variables, residual energy, typical energy, and the quantity and pace of energy consumption of the neighbors are considered. MFO is suggested as the best method for choosing CH. In the solution pool, a certain proportion (p) of top moths are thought to be the best moths, while the same proportion of the worst moths. The typical moths are represented by (M- best- worst) =m (average). Two randomly selected

moth are taken one of each are selected for mutation. The difference between the best and worst categories is added to the third moth chosen from the group of typical moths.

The network's energy consumption drops during data transmission, and it need to extract network properties with the remaining energy. This increased number of transmission rounds. Sensor nodes can able to store information about their neighboring nodes. Data transmission takes place between CH which have the maximum fitness value. Sub-cluster node transmits data between sub-cluster head and cluster.

Fig 2. Formation of Sub-cluster

Within the sub-cluster the cluster head is selected it help in transmission between sub-clusters. Selecting CH for an optimization, transferring data packets in a particular method that tends to reduce packet loss during transmission. With regards to the number of packets sent, successful transmissions.

5. CONCLUSION

In this paper, EFMOF method is proposed for efficient transmission of data to BS. Effective CH selection was used to accomplish it. The routing method was offered to circumvent the energy hole. The heterogeneous WSN problem was investigated as a future work. To meet the challenges of energy sufficiency and to enhance network lifetime from real time problems. The proposed metaheuristic Moth Flame optimization algorithm renders appropriate CH selection with respect to maximum fitness obtained by a node in each round of data transmission. It enhanced network lifetime and energy consumption by an optimized approach.

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