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Energy Optimization in Wireless Sensor Network

D Archana[1], S Prakasam[2]

[1]*Department of Computer Science and Application, Sri Chandrasekandra Vishwa Maha Vidhyalaya, Kanchipuram,India.*

[2] *Department of Computer Science and Application, Sri Chandrasekandra Vishwa Maha Vidhyalaya, Kanchipuram,India.*

ABSTRACT

Wireless sensor node is a collection of sensor node in which localization and energy efficiency play vital role in communication. A number of algorithm is proposed for node localization and energy conservation. The genetic algorithm uses fitness function to reduce the energy. A particle swarm optimization localize the node and extensive accuracy. The proposed algorithm grasshopper algorithm will improve the quality and quantitive performance. The main applications of GOA in various fields such as scheduling, economic dispatch, feature selection, load frequency control, distributed generation, wind energy system, and other engineering problems. In real world solve the problem of search space with energy efficiently utilized.

. *Keywords: Genetic Algorithm Ant colony Optimization,Grass hopper Algorithm*.

1. Introduction

The term "wireless sensor network" (WSN) refers to a system that integrates wireless communication, embedded computer, and sensor technologies. Sensor nodes and sink nodes make up a WSN. In a WSN, nodes often have limited resources for energy, processing, and memory. Small nodes, mobile nodes, a dynamic network topology, harsh operating environments, and limited energy or power resources are typical characteristics of sensor networks. These nodes should use these resources effectively because they may stay in an area for years without access to more energy (Akyildiz, I. F., & Vuran, M. C. 2010). As a result, research and development into low-computation resource-aware algorithms for WSNs are required, with a focus on small, embedded sensor nodes with limited resources. In WSNs, energy consumption is crucial, hence several algorithms and hardware were created to be energy efficient.In WSNs, energy consumption is crucial, hence several algorithms and hardware were developed with energy efficiency or energy awareness as their primary focuses. WSNs are employed on a broad basis. Due to the small size of the sensor nodes and their limited battery life, routing mechanisms should be created to transmit data in an energy-efficient manner. Another significant issue here is that the method should be such that it should provide the necessary level of service in addition to improving the network's energy efficiency. The main goal of this research is to increase the energy efficiency of WSNs in relation to the communication routing protocol. the localization method is required to ascertain the mobile nodes' new positions as they move within the sensor field (Wang J, Ghosh R.K Das, S.K 2010).. As a result, localization algorithms for portable sensor nodes require greater power. In our work, the energy effectiveness of the sensor network is optimised using a Grasshopper optimization algorithm (Saremi, Mirjalili, and Lewis 2017). This strategy uses mathematical modelling of grasshopper swarm behaviour to solve optimization problems.

This paper discusses Energy Efficiency in Wireless Sensor environment. The rest of the paper is organized as follows: Section 2 discusses some related work to Energy Efficient algorithm in wireless Sensor Network, Section 3 discusses Energy efficiency using Grasshopper algorithm in Wireless Sensor Network. We conclude our study in Section 4.

2.Literature Review

In WSN the communication is calculated between beacon node and unknown nodes.Using radio patterns, a unique, energy-efficient DV-Hop localization technique calculates the hop size between beacon nodes and unknown nodes. (K. Ren and C. M. Pan,2020).For mobile WSNs, the Lloyd- and distributed energy-efficient self-deployment (DEED) algorithm have been suggested. The first method regulates the size of the movement step for nodes, and the second algorithm caps the nodes' travel distances (Song. Y, Wang.B, Shi. Z, Pattipati. K.R, Gupta, S 2014). In order to reduce the localization mistakes in WSNs, an enhanced hop-count based technique is demonstrated in (El Assaf. A Zaidi. S, Affes. S, Kandil, 2013). In order to save energy, a weighted Monte Carlo localization (WMCL) based technique has been developed for mobile WSNs.To improve the sampling efficiency and localization accuracy, the bounding-box for nodes is smaller (Zhang. S.,Cao. J, Li-Jun. C, Chen.D,2010). For the internet of things (IoT), a new version of the DV-Hop algorithm has been created using the non-dominating sorting genetic algorithm-II (NSGA-II) (Wang, P, Xue. F,Li. H,Cui. Z, Chen,2019). The Grasshopper Optimization algorithm optimises using the fitness function after selecting a node at random (Amrinder singh,Dr. Anand sharma,2019). Indexes' weights will be determined using a weighted technique, Energy efficiency is achieved with the BPA function (Liangrui Tang,Zhilin Lu,Bing fan,2020). In order to increase network efficiency and address quality of service concerns, a multiconstraint model has been proposed, Automated distributed learning saves energy (H. Mostafaei,2019). To address energy issues increasing customer satisfaction while reducing energy use by shifting some loads into low-demand load hours without interfering with their operation(Ibrar U. et al. 2020).Scheduling method used to save energy consumption It reduced energy consumption with good results. GA was used to compare these findings. The findings revealed that the proposed algorithm uses 819.04 kilowatts of power while GA uses 932.69 kilowatts. Since the algorithm is also successful at scheduling, it can be said to be more efficient than GA(Dana M. U., et al.2021).To address the optical communication issue. Greater data transmission results in terms of transfer rate, packet delivery percentage, and end-to-end delay were achieved the protocol by reduce to regular costs and showing (Sharmila V. S.... et al 2021).The prediction was the Shanghai Stock Exchange Index closing prices According to the testing findings, the algorithm outperformed the comparator algorithms in terms of The least expected mistakes are contained in the average values and the predicted model. Consequently, the method works well for communication(Peng Q. H. et al2021).It used by to lower the amount of energy used for cloud computing The outcomes demonstrated that the algorithm greatly outperformed competing algorithms(H. Kurdi et al. 2018).

3. Energy Efficiency In Network

The metaheuristic optimization algorithms category includes the grasshopper algorithm. It imitates the actions of real grasshoppers. Insect pests like grasshoppers are thought to affect agricultural and crop output. Grasshoppers are known for forming one of the largest swarms of any animal. They are typically seen individually in nature, though. Farmers will not be able to believe the scale of the swarm when it arrives. Both as a nymph and as an adult, a grasshopper's swarming habit is established, and this particular element is special. Many grasshoppers move and leap together like rolling cylinders. They consume mostly veggies and grains along the way. When they reach adulthood, they are able to create a swarm in the air. The swarming behavior of grasshoppers is mathematically modeled as follows :

Pi = Si + Gi + Ai ----------(1)

where Pi indicates the i-th grasshopper' position, Si is the social interaction between grasshoppers, Gi denotes the gravity force on the i-th grasshopper, and Ai is the wind advection. To produce a random behavior of grasshoppers, Equation 1 can be rewritten as follows:

Pi = r1Si + r2Gi + r3Ai -----------(2)

where r1, r2, and r3 are random numbers in the range [0, 1] The social interaction Si is defined as follows:

Si = X N j=1 j6=i s(dij)dˆ ij---------- (3)

where N denotes the number of grasshoppers, dij = |Pj − Pi | defines the Euclidean distance between the i-th and the j-th grasshopper, dˆ ij = Pj−Pi dij is a unit vector from the i-th to the j-th grasshopper, and s represents the social forces designed by the following equation:

s(r) = f exp −r l − exp−r----------- (4)

where f and l are the attraction intensity and attraction length scale, respectively. The social interaction between grasshoppers can be defined as attraction and repulsion.

In WSN each source node communicates its sensed data to the base station by a single path in WSNs, which are based on the single-path routing algorithm. Although the single-path routing approach is straightforward because it can be implemented with the least amount of computational complexity and scalability, traffic load-balancing or reliability along the selected paths are not adequately taken into account (Xiang-Yang Li, Yu Wang, Haiming Chen, Yong, Qi, 2009). It is straightforward because pathways between source nodes and the base station can be built quickly. Copies of the sensed data are transmitted to the base station using a multi-path routing protocol over various paths. This tackles the single-path routing protocol's throughput, load balancing, reliability, and security issues. If the primary way cannot be used for data transmission because of congestion or low energy in individual sensor nodes, alternative, less crowded paths in the network will be employed.In order to select the best number of cluster heads from the dense node and the Ant colony optima, an optimization process called a butterfly is used (Rashmi,Rajesh ,2020).Swarm intelligence optimization ABC algorithm for cluster-based packet search. Energy optimization algorithms. The suggested method uses a two-phase grasshopper optimization algorithm as its foundation. The first step will involve the random selection of clustered controller nodes and the maintenance of a route table. The route table is shared by all controller nodes in the second phase in order to identify the unknown nodes. The fitness function is used during computation. The propogation delay reduced by providing flow table in advance to the controller.To improve energy optimization weight of flow table is utilized. This method enhances quality of service to survive nodes for communication.

4.Conclusion

One of the major problems with wireless sensor networks (WSNs), particularly for surveillance systems, is quality of service (QoS) routing. It is efficient in terms of energy use and can find a decent solution locally. With nodes, the energy efficiency is maintained in direct proportion to an increase of rounds. The Grasshopper algorithm can enhance service quality.

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