JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PSO-primarily based power-balanced Double Cluster-heads Clustering Routing for wireless sensor networks

VANDNA DESHMUKH[1], DR MOHD ZUBER[2]

Vandana Deshmukh[1]
Research Scholar, Department of Computer Science and Engineering, Madhyanchal Professional University Ratibad, Bhopal, Madhya Pradesh-462044, India

Dr. Mohd. Zuber[2]
Associate Professor, Department of Computer Science and Engineering, Madhyanchal Professional University Ratibad, Bhopal, Madhya Pradesh-462044, India

Abstract

Regarding on the way to optimize and improve the electricity efficiency of nodes, here offers a clustering protocol primarily based on PSO and has a balanced belief of distance and power of the double cluster head centralized community. It specifically improves the unique particle swarm optimization by optimizing the fitness characteristic. in addition, this set of rules information switch segment inside the number one department of labor from the cluster heads to increase the cluster head re- election cycle, and the simulation effects display that the set of rules in a balanced electricity consumption across the community even as extending the lifestyles cycle of the whole network.

Keywords: Energy Equilibrium; Wireless Sensor Network (WSN); Master-vice Cluster Heads; Asynchronous Clustering;

1. Introduction

Considering that wireless sensor networks (WSN[1]) nodes are normally deployed in inaccessible areas, and regularly powered via very limited micro-strength battery, so it's far nearly not possible to update the battery for the node again. Consequently, to improve the strength efficiency of nodes to increase the community life of a wifi sensor network routing are the important thing issues. this newsletter intention to store nodes' strength, stability power consumption to extend the community lifetime for the motive of the particle swarm is proposed to achieve balanced power consumption in wireless sensor networks from the cluster head grasp clustering routing protocol (PSO-MV), the agreement first Particle swarm set of rules to pick the excellent by the two nodes as the cluster head node, specifically the main cluster head (grasp Cluster Head, MCH) and from the cluster head (Vice Cluster Head, VCH); then the department of exertions between MCH and VCH, MCH is accountable for Cluster member nodes to gather information and send the effects of records fusion from the cluster head to the closest, VCH established between the inter-cluster routing, the implementation of single and multi-manner because the way to talk with the bottom station.

2. Particle Swarm Optimization

The PSO[2,3] is initialized to a set of random debris, after which find the gold standard solution through iteration. All the particles have to be optimized with the aid of a selection of the fitness feature, each particle has a speed to determine the route of their flight and distance,

and debris will observe the first-class particle in the answer area in look for the following first-class vicinity. At each new release, the particles update themselves by means of monitoring the two extremes. The primary one is the particle itself to discover the most useful answer P_{id}; the alternative extreme is the most gold standard solution of the modern-day population P_{gd}. The updating formulation [4] as follows:

$$v_{id}(t+1) = wv_{id}(t) \quad c_1 r_1 (p_{id} \quad x_{id}(t)) \quad c_2 r_2 (p_{gd} \quad x_{id}(t)) \qquad (1)$$

$$x_{id}(t+1) = x_{id}(t) \quad v_{id}(t+1) \qquad (2)$$

In formula t stands for Number of Iterations; v_{id} is the speed of particle i; x_{id} is the location of particle i; r_1 and r_2 are one random number between 0~1; c_1 and c_2 are accelerating factors; w is weighting coefficient.

3. Algorithm Review

PSO-MV clusters base on clustering routing, including the stages of generation and data transferring.

3.1 Cluster formation

3.1.1 Initialize the cluster-heads

Selected candidate cluster-head nodes compose the set of initial cluster, set the energy threshold E_λ:

$$E_\lambda = \sum_{i=1}^{N} E_i \Big/ N \qquad (3)$$

The cutting-edge residual energy extra than the edge cost as candidate cluster-head nodes. best the candidate cluster heads have the viable to come to be the modern-day spherical of the cluster hooked up Swait represent the set of candidate clusters, then: Swait = {ni | Ei > E}

In which N is the range of nodes in the network; Ei stands for the node's modern residual power. Information gathering stage of cluster

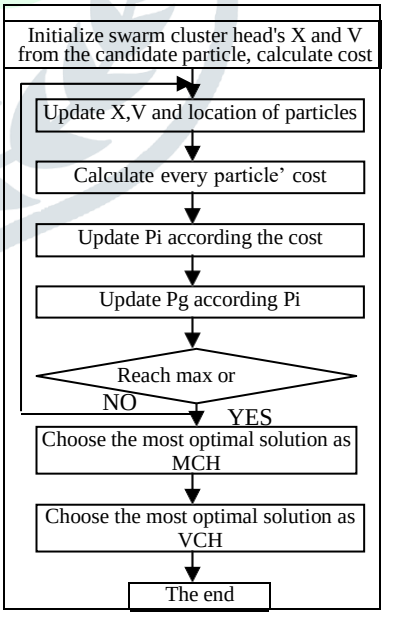


Fig.1 algorithm flow for selecting the cluster-heads

3.1.2 Information Gathering stage of cluster members

Nodes will ship the ultimate energy, function and id numbers and different statistics of the participants to the bottom station via the candidate cluster. Then every candidate neighbour cluster-head node to reap the identity, area and residual energy, and extra.

3.1.3 PSO-based optimization of cluster head election phase

Using PSO algorithm to optimize the choice of master-slave cluster-head is the core of this algorithm, the algorithm flow is

shown in Figure 1, follow these steps:

Step1: Initialize Q debris, randomly initialize swarm cluster head's X and V from the candidate particle.
Step2: Calculate the adaptive fee of each particle fee through using formula (four)
Step3: determine the choicest solution for every character par ticle and population most suitable solution.
Step4: replace thevelocity and vicinity of particles via system (1) and (2).
Step5: Repeat the step 2~four till meet pre-described wide variety of iterations, then pick out the maximum top-rated answer and the second-first-rate interpreted as the principle from the cluster head.

3.2 Data Transfer Stage

3.2.1 Data Transfer Within the Cluster

After the principle cluster head node assigns TDMA time slot, the cluster member nodes in the corresponding time slot to ship packets to the cluster head node. And with out the delivery time, the transceiver tool will be grew to become off and develop into sleep mode to lessen the intake .

3.2.2 Data Transfer Between the Clusters

The main cluster head node will ship the statistics fusion of the members of nodes to the closest slave cluster heads (which includes base station) after it receiving the records. so as to conquer LEACH protocol which reason some nodes in a single jump over early death troubles, cluster and multi-hop routing to a single soar combination. allow the cluster head node and Sink the distance between nodes d, set the restriction fee of d0, ① If d ≤ d0, a single hop from the cluster head in the form of direct conversation with the Sink node; ② If d>d0,use PSO in the upper search the most dvantageous path to achieve aircraft statistics transmissi on among clusters to reduce strength consumption to extend network life cycle.

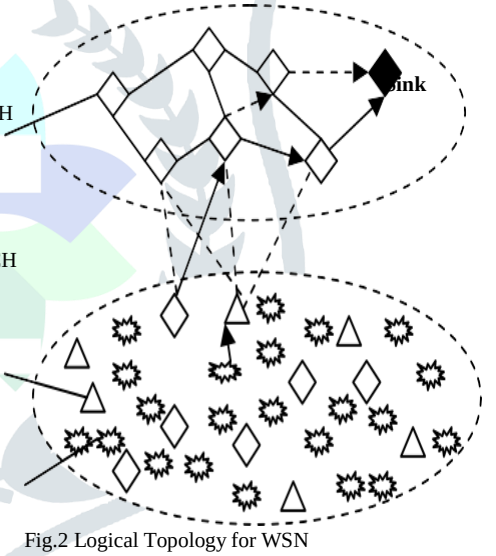


Fig.2 Logical Topology for WSN

Figure 2 is the network topology; the WSN is logically divided into upper and lower levels. VCH constitutes the upper virtual backbone, the remaining members of the network node as a lower layer.

3.3 Improved Fitness Function

For wifi sensor community routing optimization version characteristics and dreams, the fitness function is defined to recall the subsequent factors: ①cluster head energy rating thing f1: the cutting-edge candidate node closing strength ; ②cluster head from the evaluation factor f2: particularly recollect the distance among the remaining members of the cluster nodes and the node, the smaller the common distance, the higher for the node being the cluster; ③ the equilibrium stage of residual energy assessment issue f3, the rest of the network nodes in a balanced degree of residual power, the more effortlessly avoid the community empty. ④ Base station from the evaluation thing f4. The fitness function is defined

$$\text{cost} = {}_1f_1 \quad {}_2f_2 \quad {}_3f_3 + \quad {}_4f_4 \tag{4}$$

$$f_1 = E_0 / E_i;\ f_2 = \sum_{i \in C(i)} d(n_j, CH_i) \quad C(i)\Big|;\ f_3 = \sqrt{\sum_{j \in C(i)} (E_j - \mu)^2};\ f_4 = \max_{k=1,2,..K} \left\{ d(BS, CH_i) \right\} \Big/ d(BS, NC) \tag{5}$$

E_i is the current residual energy particle i, CH_i stands for the first candidate cluster head i, |C(i)| means the members of the nodes; d (n_j,CH_i) is members of the node j to the candidate cluster head node CH_i distance,

BS representative of the base station, NC on behalf of the network center coordinates: α_1,α_2,α_3 ,α_4 for each evaluation factor weight coefficient, $\alpha_1+\alpha_2+\alpha_3+\alpha_4=1$,so the smaller the fitness function, the more fitness to be a cluster head.

4. Energy Consumption Model for Wireless Communication

in this paper, we'll use power consumption model[5,6] for wireless communiqué as follows, wireless communication module has the feature of strength manipulate, the minimal electricity can be used to ship records to the receiver, every okay little bit of information dispatched to the space d will the amount of energy of:

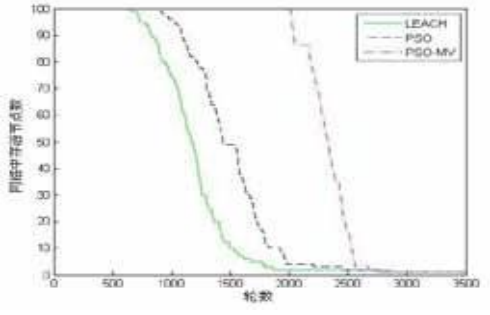
$$E_{Tx}(k,d) = \begin{cases} E_{elec} \times k + E_{fs} \times k \times d^2 & (d < d_0) \\ E_{elec} \times k + E_{mp} \times k \times d^4 & (d \geq d_0) \end{cases} \quad (6)$$

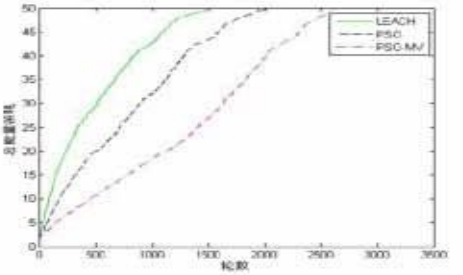
k stands for the dispatching binary digits, d is the sending distance, d0 is the threshold of sending distance. If the distance is less than d0, energy amplifier will use the loose space loss version; if the gap is more than d0, it'll use multi-direction fading version.

5. Network Simulation and Protocol Analysis

We will use the version of wifi verbal exchange cited in section four. In the simulation, wireless sensor networks composed by using 100 nodes, nodes randomly distributed in a 100m × 100m location. This paper will use Matlab to make the simulation. The main parameters of the wifi sensor network version are: the preliminary electricity for each node is 0.5J, population scale is: Q=30, c1=c2= 2, w=0.9. The rand could be given randomly at some point of the processing. Assessment factors: α1=zero.25,α2=zero. 3, αthree=zero.25, α4=0.2. To check the effectiveness of the set of rules, this article will evaluate the grasp-slave cluster head algorithm with LEACH protocol and the PSO set of rules.

The figure 3 shows the parameters of the identical in all cases, the loss of life speed of nodes and network lifetime contrast. The outcomes display that once the implementation of PSO-MV algorithm, starting from the operation of the community to the first node through the rounds of loss of life and the PSO longer than LEACH, the community lifetime has been renewed. The parent 4 suggests the entire energy intake of the LEACH, PSO and PSO-MV protocol settlement within the community. The parent shows, the proposed PSO-MV protocol to be considerably lower than the overall power intake of LEACH and the PSO settlement, indicating that even though the PSO-MV protocol used in the clustering manner of -particle swarm cluster head election more time consuming, but this set of rules makes the community extra balanced and compact, and greatly make bigger the network cluster head election cycle, for this reason saving greater power,so at





the give up it balanced the strength of the network, to extend the community cycle.

Fig.3Survival of the remaining nodes in the network

Fig. 4The total energy consumption of network

The table.1 lists the rounds of first node, the rest half nodes and 80% of nodes dying:

Table 1. Comparison of Life Cycle

	LEACH	PSO	PSO-MV
Rounds for 1st node dying	703	1001	2003
Rounds for half of nodes dying	1206	1507	2227
Rounds for 80% of the nodes dying	1456	1798	2466

5. Conclusion

In this paper, we achieve the WSN cluster heads optimized via the usage of debris swarm optimization (PSO) algorithm. And via deciding on the 2 primary-slave cluster heads cooperate with each different in transmission stage to shop the energy consumption and extend the life of network. The simulation results shows that the time of loss of life for the nodes in PSO-MV is more giant delays than LEACH and PSO. However this algorithm additionally has its shortcomings like choosing the quantity of most useful cluster heads and the distribution for parameters of α1、α2、α3、α4. That is just what ought to be performed within the next step of the research.

References

[1] M.Conti,M.D.Francesco,A.Passarella,G.Anastasi.Energy Conservation in Wireless Sensor Networks:A Survey[J].Ad Hoc Networks.2009,7:537-569.

[2] Jiang Changjiang,Shi Weiren.The wireless sensor network energy-saving clumping protocol based on PSO [Computer Engineering],2010,36(8).

[3] Cagalj M,Ganeriwal S,Aad I,et al.On Selfish Behavior in CSMA/CA Networks[C]//Proc.of IEEE INFOCOM'05. Miami,USA:[S.N.],2008.

[4] Heinzelman W R. An Application-specific Protocol Architecture for Wireless Microsensor Networks[J]. IEEE Transactions on Wireless Communications.2008,4(1):660-670.

[5] Kennedy J.Particle Swarm Optimization[C]//Proc.of IEEE International Conf.on Neural Networks.[S.l.]: IEEE Press,2009.

[6] Kyasanur P,Vaidya N.Detection and Handling of MAC Layer Misbehavior in Wireless Networks[C]//Proceedings of DSN'03.San Francisco,California,USA: [S.N.], 2009.