Clustering With Improved Ant Colony Optimization Based Routing Algorithm for Improving the WSN Energy Efficiency

M. MOHANKUMAR[1], K. DEEPA[2], F. RAVINDARAN[3]
[1] *Department of Computer Science and Engineering, KgiSL Institute of Technology*
[2] *Department of Computer Science and Engineering, Study World College of Engineering*
[3] *Department of Computer Science and Engineering (Cyper Security), Karpagapam College of Engineering*

Abstract- ***Nowadays IoT usages were increases and some of the forest areas need to monitoring these thinks were uses the WSN (Wireless Sensor Network) , Which will be works with the energy of Battery so need to use the energy with efficient manner, in this paper we have to go with the Clustering After that Improved Ant Colony Algorithm implemented to improve the life time of the battery, In cluster formation by using the distance around the Cluster Head (CH) and Fuzzification is used to select the Cluster Head, After Clustering we have to go for the Routing with help of Improved Ant Colony Algorithm(IACA). In IACA is optimizing the searching time and Pheromone Updating.***

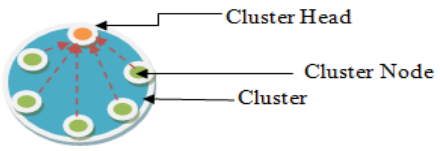
Indexed Terms- Clustering, Improved Ant Colony Algorithm, Fuzzyfication, WSN.

I. INTRODUCTION

In recent days IOT takes important role which will be works with the WSN. WSN are carry with sensors and they are operates with the limited battery power. These sensors are placed in specific region to collect and transmit data of particular place. WSN operates from the remote area which is not accessible areas. WSN's key components Sensor nodes, Wireless Communication, Network topology, Data Processing, Energy, Data Fusion and Localization and Security. Here WSN supports tree, star, mesh and hybrid topologies, in our project we are implement the star topology which will be adopt by Cluster Head (CH) and Cluster Nodes (CN) and tree topology used for the connecting CH with one another. Clustering is implementing in our project for saving energy of sensor nodes. Which will conserve the energy of nodes? Formed Cluster with selected nodes and elected the Head of the cluster, it will be responsible for the data transmission and other nodes power usage will be reduced automatically. After clustering we have to go with the routing, for routing here Improved ant colony algorithm are implemented, In IACA were local Pheromone Updates and Local Searching which includes the Ant Colony Algorithm (ACO) With local Search Heuristics will helps to improve the utilization of energy with efficient manner.

II. CLUSTERING WITH FUZZY

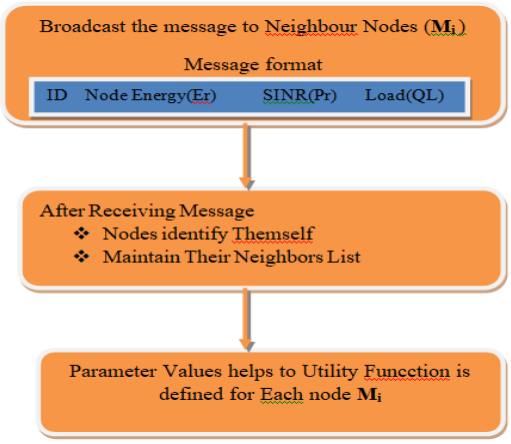
Clustering to any times at short interval employed to efficiently organize and manage the Network. In Cluster having two parts, there are Cluster Head and Cluster Node.



Before cluster formation we have to go for the Head node selection the cluster. With that head node going to construct the cluster. CN will be elected with the help of fuzzy.

2.1 Cluster Head Selection

Algorithm for cluster creation and head selection.



$$\partial_i = \frac{B_1 . E_r}{(B_2 . P_r * B_3 . Q_l)}$$

Where B_1, B_2, B_3 - Residual Energy

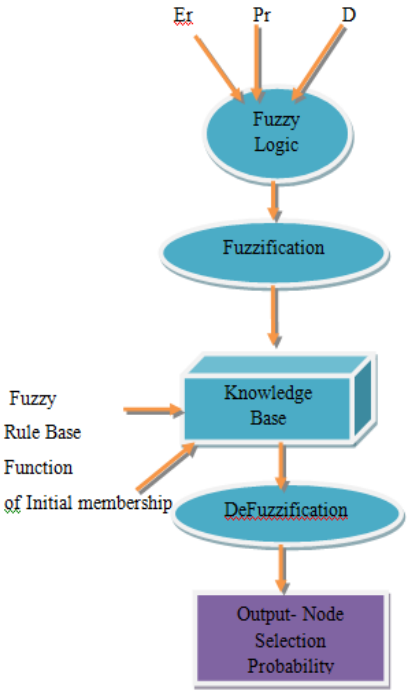
The value of SNR and load will between 0 to 1

2.2 Cluster Node Selection

For cluster formation select the node by using the fuzzy logic Distance and ten SNR from CH are the important input for fuzzy logic Fuzzy rules it will be desired the selection probability

2.3 Fuzzification

E_r, D, SNR(P_r) are the input to the fuzzy system. Early system having the High and Low are the two possibility but in this Fuzzification they have to consider Energy and SNR are need to maintain the high value and the distance have to be in low because of consumption of energy will minimize the transmission.



Cluster Node Selection

Rule Selecting the CN by Fuzzification Method

If ((Er==High && R==High && D== Low)

Then

The node will be take it into the given cluster

End

III. IMPROVEMENT OF ANT COLONY ALGORITHM

Source to destination path or route finding is taking much more energy and spend much more time

(1) In the region of observation deployed nodes where no more position change

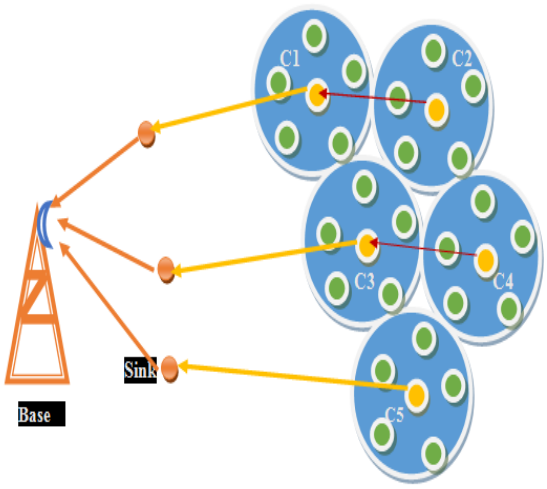
(2) Nodes were having similar appearance but genetically different

(3) Links were balanced the Rest is used to calculate the approximate distance of senders

(4) Transmit power will be adjusted based the distance of receiver

$$E_T(T_B, d_r) = \begin{cases} E_e * T_B + E_a * T_B * d_r^2, & d_r \le d_0 \\ E_e * T_B + E_f * T_B * d_r^4, & d_r > d_0 \end{cases}$$

$$E_T(T_B) = E_e * T_B$$



C1,C2,C3,C4,C5- Clusters

In ant colony optimization, ants can select the path of probabilities decision rule.

$$P_{ab}^{n} = \begin{cases} \dfrac{[P_{ab}(t)]^{x}[H_{ab}(t)]^{y}}{\sum_{\subset allowed_n}[P_{ac}(t)]^{x}[H_{ac}(t)]^{y}}, & b \subset allowed_n \end{cases}$$

Pab(t)- pheromone information on edge(a,b)
Hab(t)- Heuristic information on edge (a,b)
X,y – impact factors

$$x(j) = \lambda(1+e^{-\gamma j}), \quad 0 \le j \le J$$

Here, we have to reduce the searching time. If the searching time is reduces and then the consumption of energy is reduced.

3.1 Pheromone Update Strategy
Large pheromone concentrate makes the difficulties so need to avoid in each

It gives the faster local convergence
Threshold for limiting the pheromone

$$P_{ab}(t_H) = \begin{cases} T_r, & P_{ab}(t+1) > T_r \\ (1-\rho)P_{ab}(t) + \sum_{n=1}^{r}\Delta P_{ab}^{n}, & else \end{cases}$$

$$\Delta P_{ab}^{n} = \begin{cases} P_s / L_p, & if\ n^{th}\ ant\ utilize\ the\ node\ (a,b) \\ 0, & otherwise \end{cases}$$

Tr - Threshold value
Ps – Pheromone Strength
r – No of ants
Lp – Path length of n^{th} ant

- Pheromone coefficient

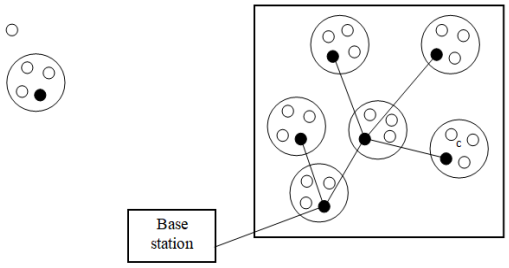
$$f_n^J = \frac{E_{avg} \times E_m}{L_n^J}$$

3.2 The Heuristic Information
Here we can calculate the distance of the cluster which will come more efficient transformation. Consider the transfer distance of the cluster head to the adjacent head of the cluster they did not consider the sink. Because the sink may be located away from head.

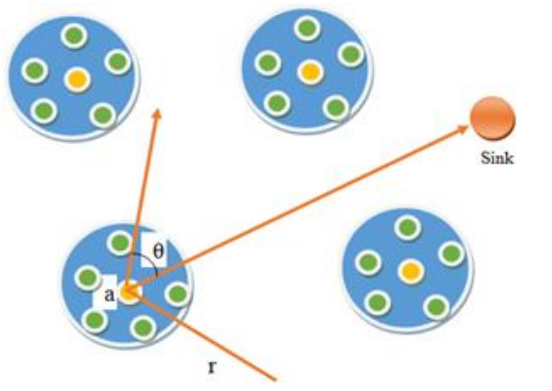
Heuristic calculate distance the next cluster head and sink

Here w_0 which means parameter of the contact weight of dab and lbs

Djs distance of beat cluster head and to the sink.



3.3 Ant Searching range
There was more important distance between the adjacent cluster heads. If the transmission is small them the energy consumption also gets reducer. After the distance calculation between clusters heads one another. We have to go for the path sink. This will be going of transmission from source node to the sink.



CONCLUSION

Technology and the introduction of the IoT part, WSN has been pressed to a new height in large scale purpose due to its advantages such as no wiring, strong invulnerability, timely in a row dissemination and low power consumption. However, the quality of no wiring also leads to the energy cannot be supplied directly to sensor nodes, only the battery with limited energy can provide energy to the nodes. Therefore, it is of enormous significance to design an energy-efficient routing protocol for WSNs. The problem of minimizing the energy consumption of WSNs is studied and an energy efficient routing protocol based on improved artificial bee colony algorithm is proposed. The goal of the planned algorithm is to balance the energy consumption and improve the energy efficiency under the constraint of the limited power of the sensor nodes, in that way extending the network life time. In order to select the reasonable cluster heads in the first round, this paper uses the improved ABC algorithm to optimize the fuzzy C-means clustering, cluster the network nodes, and select the optimum cluster heads when all nodes have the same energy levels. In the stable transmission phase, this paper introduces a polling control access mechanism based on busy idle nodes, instead of the TDMA mechanism used by common protocols, which saves energy and improves network throughput. The simulation results show that the future algorithm has good performance in energy consumption balance, energy efficiency, network life, and network stability period and network throughput. Because this work is carried out under the premise of fixed network, which makes the planned algorithm have some restrictions.

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