

Survey on Selection of Cluster Head In WSN Using Fuzzy Logic

Kamini Joshi

kaminijoshi381@gmail.com

School of computer science and Engineering

Lovely Professional University

Phagwara, Punjab, India

Abstract

Wireless Sensor Network is a decentralized network which is divided to number of nodes and a base station. The nodes are used for sensing the information and a base station is implanted to pass the information that has been sensed. But major concern in WSN is lifetime of the network. Lifetime mainly depends on selection of CH in the network. Many researchers have used Fuzzy Inference system for selection of cluster head in the wireless sensor network. This review focuses on various methodologies that have been proposed to increase the lifetime of the network using fuzzy logic. LEACH protocol has been used as base protocol in all the methodologies.

Keywords: WSN, LEACH, Fuzzy, CH, BS.

I.INTRODUCTION

WSN is one of the important concepts in networks which involve different types of nodes. The applications are completely based on the several types of sensors involved within them. The surrounding environments of applications are monitored within these networks such that any kinds of activities being performed can be brought to notice of the concerned authorities [1]. There are different role of Sensors in different applications. These can sense diverse natural (temperature, stickiness, light, and so on.), submerged (water saltiness, seismic checking, oil contamination observing, and so on.), and human body parameters (human crucial signs), and so forth, [2]. In WSN, nodes are the deployed in the network area to sense the information and after that information is passed to a base station to extract conclusions. Lifetime of sensor nodes depends on battery consumption; recharging and changing power component is very challenging.

Therefore increasing lifetime of the network is a major issue. Most efficient approach for the same is clustering. LEACH is one of the most popular clustering protocols.

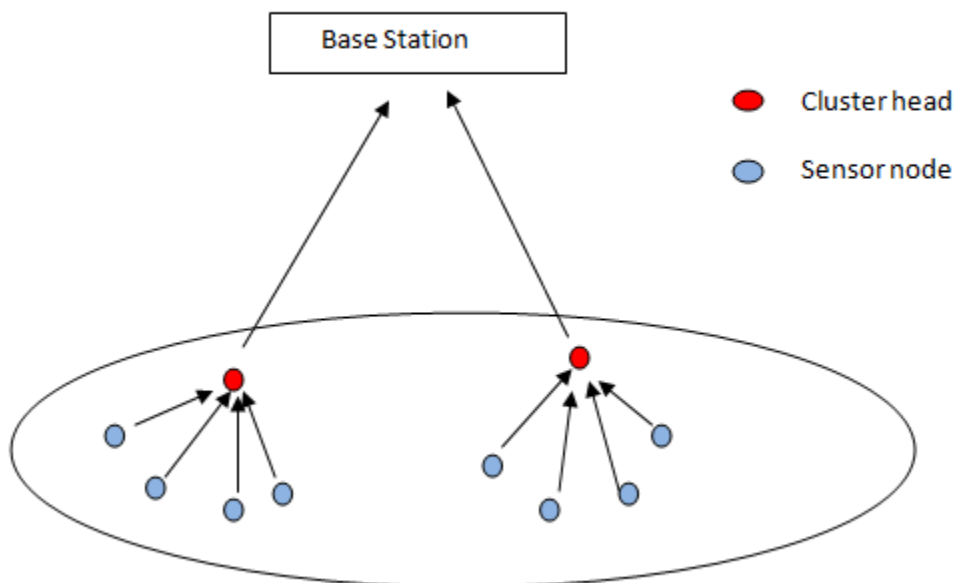


Figure 1 Clustered WSN

In clustering, nodes are divided into different groups known as clusters and a leader node known as cluster head is chosen on the basis of different parameters which leads to effectiveness of the wireless network. Choosing a CH in clustering is the most important task which will impact battery life of the network.[11,12] There are number of protocols for choosing an appropriate CH. LEACH uses a probabilistic approach which leads to a lot of disadvantages, so the concept of fuzzy logic has been combined to optimize the selection of CH in the wireless network.

II.LITERATURE REVIEW

I. Gupta et. al (2005) [3] have compared their study for selecting CH with LEACH protocol. Their approach uses three fuzzy descriptors i.e. energy, centrality, concentration for the selection of CH by calculating the chance of each node present in the sensor network to become a cluster head. This approach was able to achieve a substantial increase in lifetime of the sensor network.

J. Kim, et.al(2008)[4] have proposed an algorithm named as CHEF for electing CH using if-else fuzzy rule and this protocol claimed to be about 22.7% more efficient than LEACH. This approach involves energy and local distance as descriptors for calculating chance of a node to become a CH and node with maximum chance value is elected as a CH.

S. Sert et.al(2015)[5], in this paper a distribution-independent approach is proposed for clustering in Wireless Sensor Network. A multi-objective fuzzy clustering algorithm (MOFCA), have been proposed which addresses energy hole and hotspot problems in evolving and stationary networks. Total Remaining Energy, Half of Nodes Alive and First Node Dies (FND) have been used as efficiency metric for the calculation of lifetime of WSNs, which proved that MOFCA performs better than already present techniques. MOCFA have been implemented using MATLAB simulator.

M. Kalantari et.al (2017)[6] presented routing in the wireless sensor networks is very necessary due to which they proposed a new scheme in this paper. It is based on the concept in which data is collected by the various sensors and transfer it to a central node. In electrostatic theory, Maxwell's equation is very similar to partial differential equation, in proposed method. By using these equations in the networks the best routes are find out which gives the energy efficiency. They approximated the identified paths using a sequence of wireless links each between a pair of sensors in order to find the actual routes. As per done simulation and obtained results, it is demonstrated that there is improvement in the network lifetime as compared to other traditional shortest path approach.

B. Balakrishnan et.al(2017)[7] have proposed an algorithm FLECH for electing CH in non-uniform WSN .Instead of taking only residual energy into account as a fuzzy descriptor ,they have considered node centrality and distance to BS along with it. It was observed that as network size is increasing performance of the algorithm is also enhancing. Hence this algorithm is scalable.

R. Garimella et.al (2018)[8] presented an essential role is played by the energy efficiency in the WSN. Researchers have proposed various algorithms for energy problem of WSN. These algorithms are based on the clustering currently but missing the validation mathematically. Therefore, they proposed a system and method in this paper in order to fill the research gap. In

order to utilize the efficient energy techniques in the wireless sensor networks for the process of data gathering and routing, they utilized the concept of the Hessian matrix in this paper [8]. This concept was utilized for the validation of the proposed method having the multi variable calculus. These wireless sensor nodes are distributed in the multidimensional space is the assumption on which it is based. On the basis of performed experiment, it is illustrated that proposed method can be utilized in any clustering approach using its mathematical design and provides the low-energy communication structure.

P.S. Mehra et.al (2018)[9], This approach uses fuzzy inference system to calculate eligibility index for each node present in the network to be selected as a Cluster Head .Load balancing have been done by choosing best CH by considering probability assigned to each node. The stability period along with QND and HND have been significantly increased. The amount of information forwarded to BS in FBECS is far better than LEACH and some other protocols.

III.COMPARISON OF VARIOUS APPROACHES

Table1 Comparison Table

AUTHOR	YEAR	FUZZY DESCRIPTORS	SIMULATOR	ADVANTAGE	DISADVANTAGE
I.Gupta et. Al	2005	Concentration	Java Foundation Classes and the NRC fuzzy Java Expert System Shell (JESS) toolkit.	Performed better than LEACH	This approach does not work for biased distributed systems.
		Energy			
		Centrality			
J. Kim, et.al	2008	Local Distance	MATLAB	i)Perfomed	i)Fuzzy set was not

		Energy		22.7% better than LEACH	optimized.
T. Sharma et.al[10]	2012	Proximity Distance	Ns-2	i)Performs well in homogeneous environments ii)Stability period was extended	i)Algorithm doesn't work for heterogeneous WSN. ii)Comparison was done only with one existing protocol.
		Energy			
S. Sert et.al	2015	BS distance	C#,.net framework 4	i)Lifetime was increasing with increase in the network size.	i)Intended node location change was not considered in the study.
		Remaining Energy			
		Calculated Density			
B. Balakrishnan,et.al	2017	Residual Energy	MATLAB	Algorithm is scalable.	Considered Network size was small.
		Node centrality			
		Distance to BS			
P.S. Mehra et.al	2018	Distance to BS	MATLAB	The stability period along with the QND (Quarter Node Dead)and HND (half node dead) have significantly	Algorithm have been compared with LEACH rather than any latest study.
		Density			
		Energy			

				increased	
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IV.CONCLUSION

In Wireless Sensor Network, lifetime of the network is a crucial issue. Many researchers have given their means to increase its lifetime .Clustering is one of the technique helps in achieving this and using fuzzy logic with clustering is also one of the optimized solution to the problem. This review focuses on some of the algorithms or studies which are based on cluster head selection using fuzzy logic in WSN.By considering other parameters as fuzzy descriptors may lead to better results.

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