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Typical Analysis of Various Nodes Involved in EMA for Wireless Sensor Networks

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Abstract—The performance of EMARP for WSNs is measured in terms of Network Life Time (NLT), Energy Dissipation (ED), and Number of Data Packets Received at the sink (NDPR). NLT is defined as the time between the beginning of a sensor network and the death of the last node. A node is considered as a dead node if it runs out of its initial energy. There is no uniformly accepted definition of NLT. The ED of nodes relates to transmitting, receiving, listening and data aggregating. The main interest is the ED during clustering, which is used as the major criterion to evaluate hierarchical routing protocols.Given fixed initial energy, nodes exploit their resources to send data out to the sink. The NDPR at the sink is an important metric to compare the routing performance among different protocols. More data packets received at the sink is an indication that the protocol can provide better connections among nodes and the sink. The performance metrics are given at first, followed by the results and analysis of EMARP for WSNs. Different settings are used to evaluate the performance of EMARP and their performances are also compared with the state of the art routing protocols of WSNs such as LEACH and LEACH-C.

Keywords: NLT, EMARP, WSN, LEACH and routing protocol

I. INTRODUCTION

Three different setting are employed based on the location of sink, data rates, and initial energy at different node. For all experiments, the length of data is fixed at 500 bytes. The effect of changing the data rate is examined by changing data rate from 1 frame to 15 frames per 10 seconds. Each node sends data n (number of frames) times to the CH every 10 seconds. It is clearly noted that the NLT of EMARP is greater than LEACH and LEACH-C in WSNs. When the data rate is very low, the NLT of EMARP provides better performance than LEACH and LEACH-C protocols [1-3]. One of the settings used to evaluate the performance of EMARP for WSNs is the location of sink [4]. Three different settings of sink such as sink inside the network sink outside the network and different location of sink in the network. At first the performance of EMARP protocol is tested when the sink locates at the center of the network (100,100).

II. DATA RATES

In this section, the initial energy is increased from 1 to 2 and 3 to study the performance of EMARP for WSNs. Table 2.1 shows the performance of EMARP with different initial energy. For this calculation, the sink is located at (100,500). It is observed from the Table 2.1 that the performances of EMARP with different initial energy are better than LEACH and LEACH-C as the time taken by EMARP is higher than LEACH and LEACH-C. Among the LEACH protocols, LEACH-C provides better performance than LEACH.

Table 2.1 performance of EMARP with different initial energy

Energy	Protocol	Time taken by n% of node dead with different initial energy				
		1%	10%	25%	50%	100%
1	LEACH	370	495	548	588	649
	LEACH-C	470	654	711	770	821
	EMARP	617	700	774	863	969
2	LEACH	556	797	809	984	1091
	LEACH-C	949	1015	1219	1346	1398
	EMARP	1016	1161	1309	1454	1502
3	LEACH	764	1114	1272	1380	1544
	LEACH-C	1335	1550	1720	1899	1997
	EMARP	1592	1771	1887	2012	2360

III. CLUSTERING NODE ANALYSIS AND RESULTS

The objective of the clustering analysis is a separation of objects into groups, with the similar objects together and unrelated with another group of objects. It is being applied by various expert research communities such optimization, computational geometry, machine learning and statistic. Figures 3.1 to 3.3 show the visual representation of the data clustering.

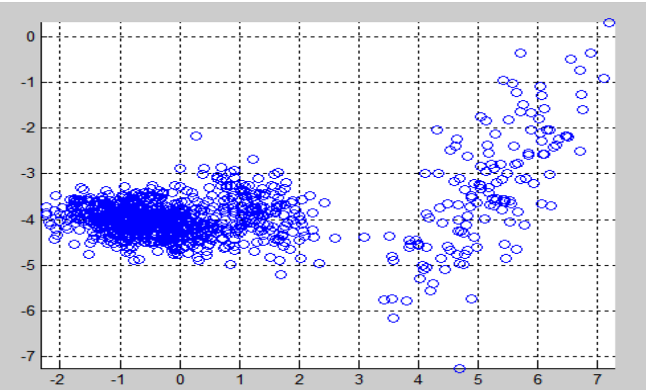

Figure 3.1 Clustering visualization with one cluster

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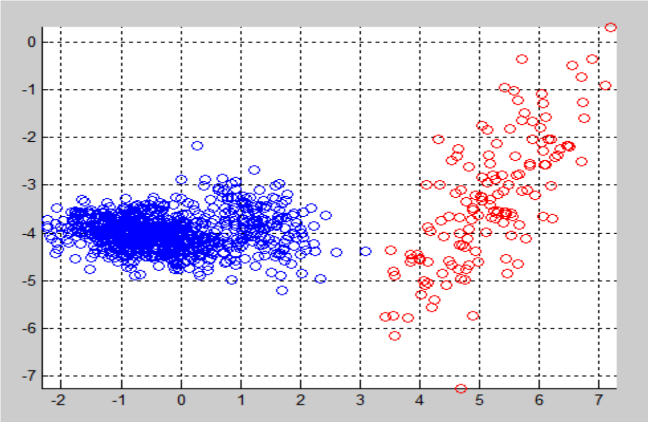

Figure 3.2 Clustering visualization with 2 clusters

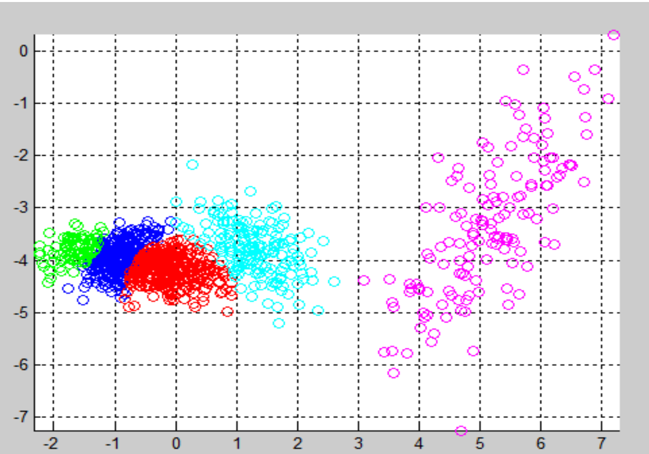

Figure 3.3 Clustering visualization with five clusters

A straightforward solution to such degeneracy is to take into account or impose some prior information on the solution for. One approach would be to restrict the set of possible. Such a restriction is equivalent to putting a uniform prior probability over the restricted set.

IV. CONCLUSIONS

Clustering has been a topic of interest in many different disciplines such as image processing, data mining and etc., for a long time. It has generated a lot of discussion to adapt to the constraints of WSNs. The application and evaluation of EMARP in WSNs is demonstrated well. Based on the results, the usage of EMARP to migrate the problems encountered with the existing protocols is illustrated with a vast analysis by simulation. At first, the EMARP model uses networks with a fixed number of nodes in a square field. EMARP is compared to LEACH and one of its variants LEACH-C. The simulation parameters such as sink locations, data rate, and initial energy of nodes are varied. The results show that EMARP outperforms LEACH and LEACH-C in terms of NLT, ED and NDPR at the sink.

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