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February 20, 2018

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1 Introduction

Over recent years, the importance of Wireless Sensor Networks (WSNs) in different domains is considerably increasing. It consists on a group of small sensor nodes capable to detect and monitor physical conditions from the field, and then to transmit data to the Base Station (BS) once gathered. These nodes are very low-cost and are capable to perform as an autonomous device, but have less storage capacity and a limited battery power, that can be depleted very quickly, due to the multiple tasks made, such as processing and exchanging packets with nodes.

The most important challenge in WSN is to extend the network lifetime. This can be achieved when the energy consumption is efficiently used, and balanced among nodes. Many clustering algorithms proposed in the last few years have the objective to improve this goal, and are focused on how to regroup the sensor nodes deployed into clusters. Each created cluster will have a Cluster Head (CH). This node, elected in each round, collect data from the other members of the cluster, and then send it to the BS.

Furthermore, to reduce energy consumption, previous researches in WSN have been done, considering the residual energy as parameter [1] [2] [3], taking into consideration the communication cost, the required amount of energy needed for a node to send a message to another one [4], or calculating a weight for each node to be compared [3]. Also, a random number was used in order to have a balanced CH election in the network [5] [6]. These different parameters are used to elect the suitable CH. But for the clustering step, in some researches, the whole network is divided into several clusters, choosing the number of clusters before each round of the clustering process [7].

blue

1 Introduction

Most of the previous clustering approaches have been done aiming to balance the energy consumption of the nodes over the network. In this section, we briefly introduce some of these proposed algorithms.

In Low-energy and adaptive clustering hierarchy (LEACH) [9], Energy-Efficient Unequal Clustering (EEUC) [5], Cluster Head Election mechanism using Fuzzy logic (CHEF) [6] and Multi Objectives Fuzzy Clustering Algorithm (MOFCA) [2] a probabilistic and distributed method is used, where, the node enters into a competition only if its random generated number is less than a predefined threshold value Th. For [5] [6] and [2], the competition is made by neighbors, they communicate and decide together the best node eligible to be elected as CH

The remainder of this paper is organized as follows: Section II discusses some of the existing clustering techniques; in Section III the system model is presented; Section IV and V present the proposed algorithms CHEREDC and evaluate its performance comparing with previous algorithms. Finally, we conclude the paper and discuss some possible future works in Section VI.

2

paramter	value
N (Number of deployed nodes)	22
R (Range of nodes in meter)	10
Eelec	50nJ/bit
ϵfs	10pJ/bit/m
ϵmp	0.001pJ/bit/mp4
E (Initial energy of nodes)	1J
ctrPacketLenth	2000bits
PacketLenth	4000bits

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6 Tableau II

(XBS,YBS)	FND	HNA	LND
((100,100))	1003	1521	2693
(0,0)	119	1009	2457
(250,250)	40	470	2063

7 Tableau II separation horizontal

(XBS,YBS)	FND	HNA	LND
((100,100))	1003	1521	2693
(0,0)	119	1009	2457
(250,250)	40	470	2063

8 Tableau II separation horizontal entre colonne

(XBS,YBS)	FND	HNA	LND
((100,100))	1003	1521	2693
(0,0)	119	1009	2457
(250,250)	40	470	2063

9 Tableau II separation vertical

(XBS,YBS)		FND	HNA	LND
((100,100))		1003	1521	2693
(0,0)		119	1009	2457
(250,250)	Value	40	470	2063

10 Exercise 1

$$x = y + z \tag{1}$$

$$f(x) = x^2 \tag{2}$$

$$f(x) = \sum_{k=1}^{n} xi \tag{3}$$

$$f(x) = \int_{1}^{n} xi \tag{4}$$

11 Exercice 2: Energy consumption model

$E_{Tx}(l, d) = \{ 1\ E_{elec} + 1\varepsilon_{\beta} d^2, \qquad d < d_0$

1E$_{elec} + 1\varepsilon_{mp} d^4, \qquad d \geq d_0$ (5)

$$E_{Tx}(1) = 1E_{elec}$$

(6)

$$d_0(1) = \sqrt{\frac{\epsilon_{fs}}{\epsilon_{mp}}} \tag{7}$$

12 Exercice 3: Matrice

$x\,y$
z f (8)

$(\,x\,)\,y$
z f (9)

x y
z f (10)

x y
z f (11)

x y
z f (12)

x y
z f (13)

a$_{11} \cdots\cdots a_{1n}$

$\vdots$

a$_{22} \cdots a_{2n}$

$\vdots$

$\cdots \ddots a_{nn}$ (14)

[width=8cm]logo.jpg

Figure 1: Logo ISNoT2018

[width=4cm]logo.jpg Logo ISNoT2018
[scale=0.05]logo.jpg [scale=0.1]logo.jpg [scale=0.2]logo.jpg *[bb=20 20 302 334,width=3.15cm,clip]logo.jpg *[bb=0 0 282 314 ,width=3.15cm,clip]logo.jpg

[width=12cm , height=5cm]logo.jpg

Figure 2: Logo ISNoT2018 12cm*5cm

[angle=45]logo.jpg

Figure 3: Logo ISNoT2018 angle=45

*[90,108][260,208]logo.jpg

Figure 4: [90,108][260,208]

[trim = 6cm 0cm 0cm 0cm, clip]logo.jpg

Figure 5: trim = 6cm 0cm 0cm 0cm