# Enhanced Clustering Protocol in Zonal-Stable Election Protocol for WSN

Ngaruyintwari Severin *, Marie Isabelle zuzuIragena

**Abstract:- Wireless sensors network is an environment where is deployed by wireless sensor nodes and base station, those sensor nodes are eligible to receive and transmit data to the base station. Base station is able to reconvert data from sensor nodes into readable data. This phenomenon of sensing data packet needs energy and the energy resource are limited thus reduce network lifetime, because of that, researcher arecontinue to invent the way to improve energy efficient in wireless sensor nodes. In this paper we proposed an enhanced clustering protocol, we based on clustered routing protocol where in network field there are normal nodes and advanced nodes, normal nodes send data directly to base station while advanced nodes use clustering technique to send data to base station. The residual energy in cluster election is also enhanced in order to increase the lifetime of network. In Z-SEP there are three zones, with three zones some of sensor nodes will be deployed far away from base station and during rounds at least two cluster head will work simultaneously, thus resulting with much energy consumption, we solved this problem by reducing zones and we design network field with two zones, this lengthen a little more network life time.**

***Keyword:-****Wireless Sensors Network, Residual Energy, Stability, Life-Time.*

## I. INTRODUCTION

The wireless sensors network (WSN) is one of the path economic pass through, the wireless sensors network play a big role in the development of the whole world with different domain, but still have some problem of energy, the sensor nodes consume energy supplied by batteries and those energy are limited, thus the time of network life still short. Researchers are continuing to study about this problem. The wireless sensors network comprise of sensors nodes and base station, those sensors nodes are able to obtain data aggregate them and transmit them to base station, the base station maybe place in the center of network field or other side according to the type or architecture. SEP [1] is a clustering algorithm protocol, SEP proposed in two levels of energy (levels of heterogeneous) where it designed to set different probability of the election of cluster head for nodes by considering their level of energy, the architecture of deployment of sensor node in SEP was not convenient in energy consumption. Faisal et al [2] developed the energy efficient of SEP by classing sensor nodes in three zones based on their level of initial energy. in Z-SEP the election of cluster head is not efficient, at least two cluster head are elected during rounds and work simultaneously, thus results much energy are consumed, to avoid this simultaneously, we proposed a two level heterogeneous protocol with two zones of sensor nodes class, one zones for advanced nodes and other zone for normal nodes. By our network architecture the network life time is lengthened more than Z-SEP. we also considered the residual energy applied during cluster election, M.J Handy et Al [3], proposed the equation which can take into the residual energy but they equation is not efficient, we also applied some modification of on threshold which is considering residual energy proposed by M.J Hand et Al [3], and the performance extended the lifetime of network.

## II. RELATED WORK

Many Researchers are working on the problem of energy conservation in network protocol, SEP [1] is a two levels heterogeneous protocol where sensor nodes have two classes, the first class is normal nodes the second class is advanced nodes which have more energy than normal nodes, SEP was proposed two probability of cluster election, Z-SEP [2] classified the sensor nodes in three different zones, where zone one and zone two are identical in type of nodes, the Z-SEP wireless protocol is not efficiency in energy consumption because cluster head election is made simultaneously. Az-SEP is an advanced Z-SEP proposed in [4], this also use simultaneous cluster head election, in AZ-SEP cluster head send data to neighbor cluster head and neighbor cluster head send data to the next cluster head and so on until data reach to the base station. Harshita Chaurasiya Et Al.[5] developed SEP by running evolutionarily SEP algorithm protocol and Cluster head selection is runned by performing genetic algorithm. Energy in SEP protocol can saved by arranging static and randomly distributed nodes in the heterogeneous field M.M. Islam et Al.[6],here the coordination of sink and dimension of sensor nodes are all known.

## III. PROPOSED SYSTEM

In our paper, the energy management is based to two behavior, The first one is the way network field is arranged, the second one is consideration of residual energy where we made some modification on residual formula in order to avoid network drops.

### *A. Network construction design*

In Z-SEP network field is divides into three regions, The sink nodes placed in center of network where normal nodes are deployed, by this network advanced nodes are placed far away from sink node and many of them are placed more and more far away from the sink node because of two zones, zone 1 and zone 2, Means that they are some sensor nodes which are placed far away from the sink nodes in zone 1 and others in zone 2, this makes network consume much energy because those sensor nodes placed more far away from the sink nodes will use too much energy to deliver data packet to the sink nodes. To avoid this much energy consumption we reduced

number of zones, one zone for normal nodes, other zone for advanced nodes, with this architecture, only few nodes which will be placed,more far away from the sink nodes(Base station). The sink nodes will be placed in the center of normal nodes zone, then all advanced nodes will be grouped in zone 1.

Let consider network field with X and Y co-ordination, we divide Y co-ordination into two zone, zone 0 and zone 1, in network of 100 co-ordination, The zone 0 is divided in 0<Y<=50 here normal nodes are randomly arranged and The sink node is placed in the center of this zone, means that sink nodes co-ordination is (50, 25), the 50<Y<=100 co-ordination is zone 1, here all advanced nodes will be randomly positioned in this zone. The fig.1 shows the network architecture of our designed network.

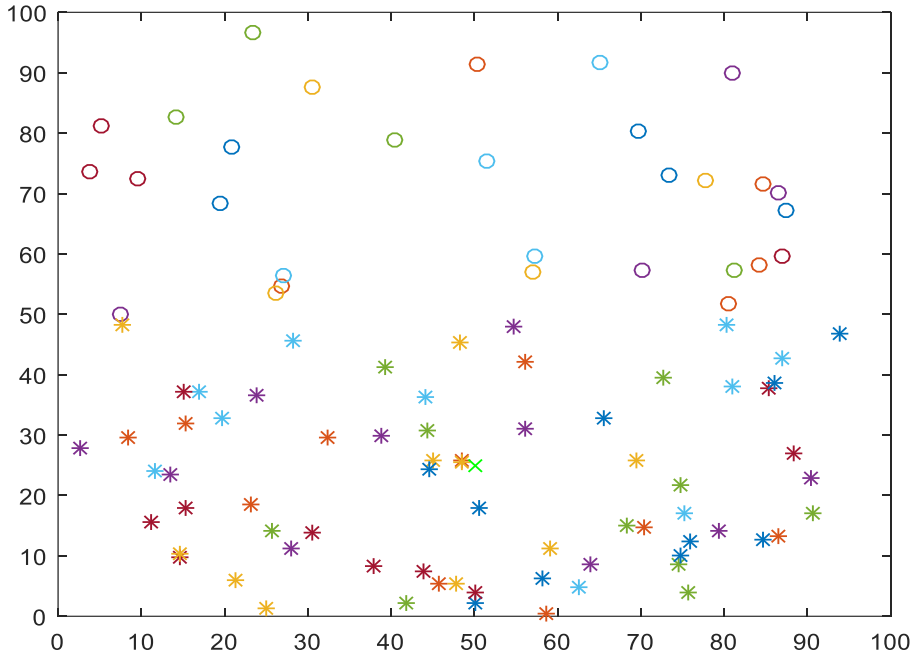


Fig.1. Network architecture

*B. Data Delivery and Cluster Head Election*

Our paper is a heterogeneous network algorithm based protocol, have two levels of heterogeneous, Normal nodes which sends data packet directly to the Base station, advanced nodes applies clustering algorithm to deliver data to base station. In our proposed system the cluster election use the threshold formula expressed as follow:

$$T(n)=\begin{cases}\dfrac{P_{ot}}{1-P_{ot}(r\times \mathrm{mod}(1/P_{ot}))} & if \quad n\in G\\ 0 & otherwise\end{cases}$$

(1)

Where $P_{ot}$ Is optimal probabilityof cluster head, G is a set of sensor nodes which have never been elected as cluster head in the $1/P_{ot}$ rounds. The optimal probability is explained in (1). During the network life, the advanced nodes are electing cluster head, the following probability formula is used:

$$P_{ad}=\frac{P_{ot}}{1+a\times m}\times(1+a)$$

(2)

Where α and m are explained in (1) of this paper, $P_{ad}$ is probability of advanced nodes to become cluster head in cluster head election. The cluster head are elected only in zone 1(advanced nodes), so the threshold for advanced nodes is:

$$T(ad)=\begin{cases}\dfrac{P_{ad}}{1-P_{ad}(r\times \mathrm{mod}(1/P_{ad}))} & if \quad n\in G\\ 0 & otherwise\end{cases}$$

(3)

Where $P_{ad}$ is explained in formula (2), our proposed system also considered the residual energy; M.J. Handy et Al in [3] proposed a formula taking into residual energy by multiplying the threshold by ration of current energy and maximal energy. As shown in equation (4)

T(n) x($E_n$Current/ $E_n$Max) (4)

This formula has some disadvantage because when the current energy of node is 0, the network will be dropped, and the network stability is not too long, to avoid this problem we made some modification on this formula as follow,

$$T(ad)_{new}=\frac{Pad}{1-Pad(r\mathrm{mod}\frac{1}{Pad})}\left[\frac{En-Current\times En-Current+1}{En-Max\times 1+1/Pad}\right] \quad (5)$$

Where $En - Current + 1$ is the current energy of next node, by applying this new formula the network has a good performance in network stability and stability period increased.

With this formula, when in the current round the nodes energy is 0,the network will check the next node if it have enough energy to become cluster head instead of dropping down the network, and it will continue like this until whole network's energy exhausted.

## IV. SIMULATION AND RESULTS

In Z-SEP, Two cluster head are elected in every rounds, this consumes much energy and many advanced nodes are placed far away from base station, so the energy saving is not efficient, to solve all those we reduced zones and we only have two zones, zone 0 and zone 1, the base station is positioned in center of zone 0 in which all normal nodes are randomly deployed. In our system every round only one cluster head will be elected, there is no simultaneous in cluster election. According to the residual energy, we made some modification of threshold formula in order to improve the network stability; however we set the same setting with Z-SEP and the same input. Fig 2 and Fig.3 shows the performance of our system while advanced nodes are set for a=2 and m=0.1 where m is a fraction of total nodes n, in which they have more energy than normal, this extended energy denoted by a. Those nodes are advanced nodes.

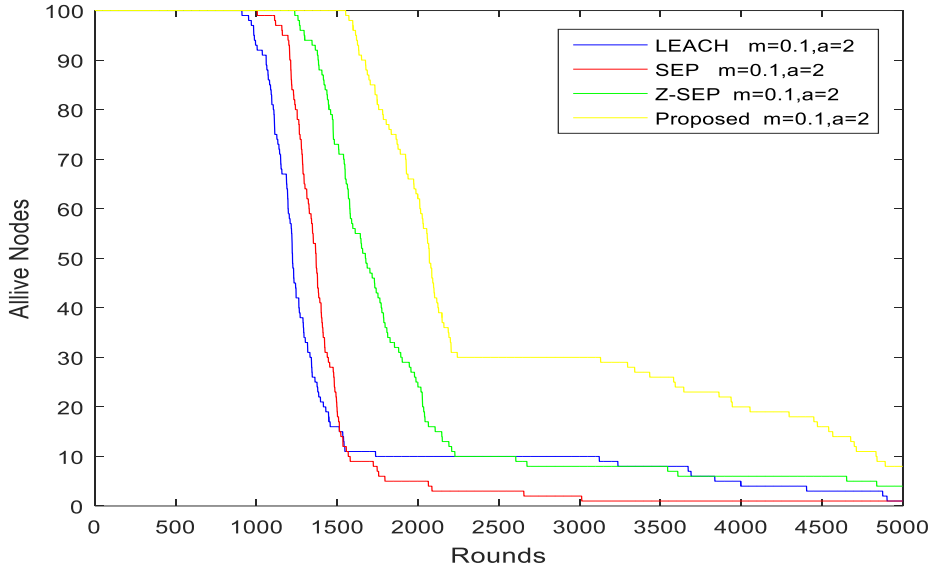


Fig.2. Alive nodes for a=2

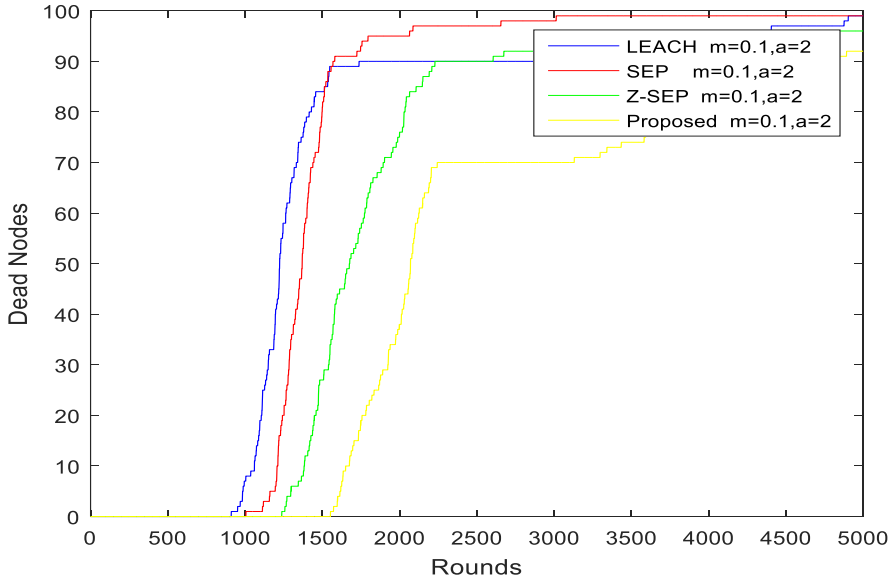


Fig.3. Dead nodes while a=2

As the legend shows, the performance compared with LEACH, SEP, and Z-SEP, finally our proposed system performs better than other protocols. We also simulated the same network but by setting advanced node to a=1 and m=0.2.

The Fig.4 and Fig.5 shows the performance for the last settings.

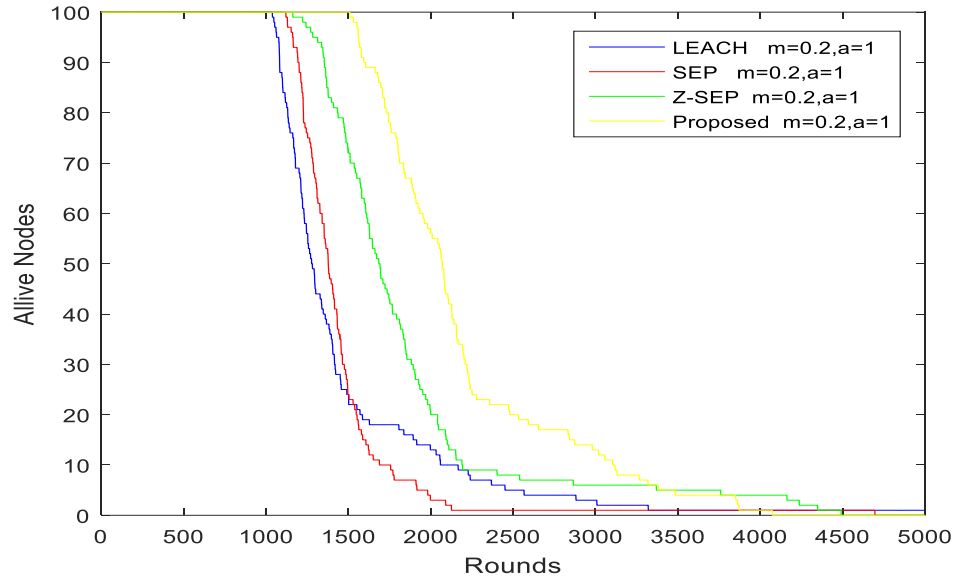


Fig.4. Alive nodes when a=1

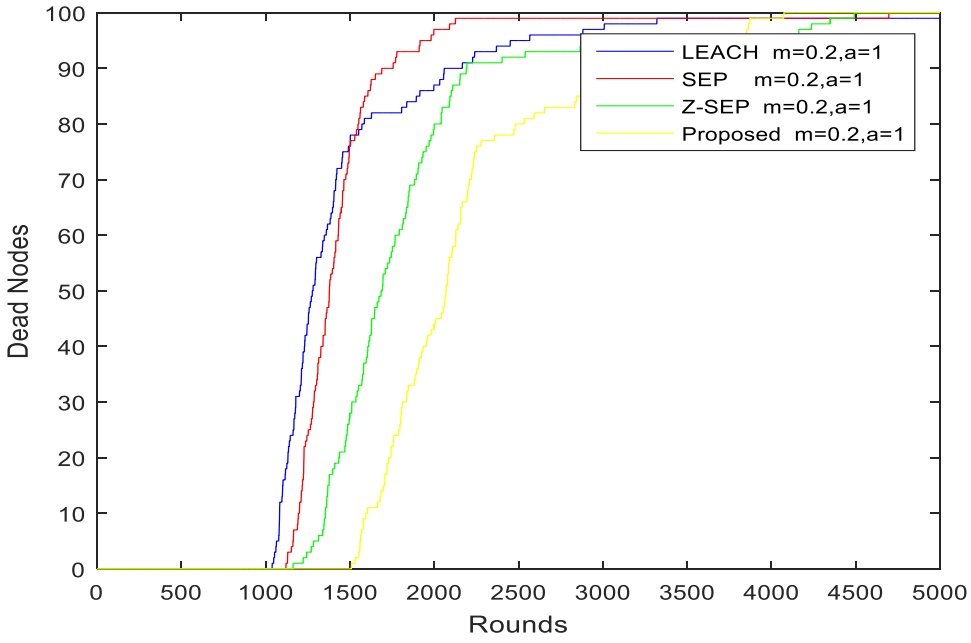


Fig.5. Dead nodes when a=1

We can see that when the advanced is configured as a=2, during the network life there is a time where nodes are stable and work stably, is because when advanced nodes are set for a=2, they die very slowly, at that point the graph is stable is the point where all normal nodes are dead and remains advanced nodes.

## V. CONCLUSION

In our system, we enhanced Z-SEP proposed in[2], we reduced the number of zones from three zones to two zones, one zone for normal nodes and other zone for advanced nodes, we also modified the threshold formula to take into the residual energy, the simulation results are compared to LEACH, SEP, and Z-SEP and graphics shows that our proposed system is performing better than others, and the network stability is good.

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