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Fuzzy Logic based Enhanced Zone Stable Election Protocol for Energy Efficient Cluster head election in WSN.

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ABSTRACT

The key issue in determining the lifetime of wireless sensor network (WSN) is the energy burning up of individual node. The cluster based routing improves the energy usage of WSN compared to other routing approach. In this paper, an effective multi-level cluster algorithm using link correlation is proposed for heterogeneous WSN.The heterogeneous nodes are adopted as level-k cluster heads and implementing network coding on those nodes increases network lifetime significantly. Meanwhile, implementing time division multiple access (TDMA) technique within a cluster creates an organized cluster architecture improving the energy efficiency. How to make efficient data routing in energy constrained wireless sensor networks (WSNs) is one of the key points. In order to find the optimal path of data transmission in the WSNs, a new routing algorithm based on ant colony algorithm is proposed. Using the improved heuristic function and considering the node communication transmission distance, transmission direction and residual energy, an optimal path from the source node to the destination node can be found. Thus the network energy consumption is reduced and the network lifetime is prolonged Simulation results show that new ant algorithm can effectively save the energy of nodes and prolong the network lifetime.

Keywords: Wireless sensor network (WSN); Link correlation; Network coding; TDMA, Routing algorithms; Ant colony optimization;

1. INTRODUCTION

Remote sensor systems are profoundly circulated systems with miniaturized scale sensor hubs sent in huge numbers to handle more perplexing capacities in information obtaining and preparing. WSN innovation has discovered an extensive variety of applications in military reconnaissance's, condition checking in misfortune inclined regions, observing remote fields, fire location, persistent observing in doctor's facility wards, atomic reactor control, and movement checking. Three noteworthy capacities performed by the sensors are condition detecting, the processor that performs calculation on the detected information and the communicator that performs data trade between neighboring hubs [6]. Vitality sparing answers for these hubs remain a basic issue. The sensor hubs can be deterministic ally or arbitrarily

sent and can be homogeneous or heterogeneous in nature. All together to screen the sensor zone for a more extended time frame, the vitality of the hubs must be utilized wisely since they can't be bolstered by outside battery. One approach to draw out organize lifetime is to present heterogeneity in hubs as far as connection, calculation and vitality. One of the most overwhelming heterogeneity is vitality

heterogeneity giving enhanced information dependability and diminished idleness in information transportation. To decrease vitality utilization and draw out system lifetime, just handled data must be conveyed to the base station (BS). Just a couple of parts of the hubs called as group heads total and impart with the base station through bunching. Despite the fact that bunching diminishes vitality utilization, group heads are depleted of vitality because of complex capacities.

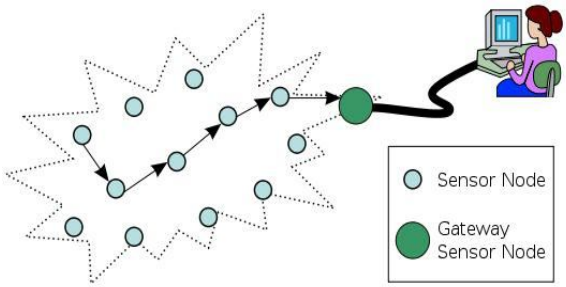

Figure 1: Regular multi-bounce remote sensor organize design

Filter utilizes same measure of vitality utilizing hubs called as the homogeneous hubs. The physical condition, working conditions, and the related assignments to be performed by the sensor hub change powerfully and they go up against particular parts or capacities without manual mediation. As the system and the hub properties change with time, arrangement and part assignments must be adjusted to the changes. Grouping is a typical procedure to enhance the effectiveness of the system and apportion part assignments [7– 13]. A few conventions have been proposed in the writing with the target of augmenting the system lifetime by utilizing bunch based system structures and dispense part assignments to the hubs. Different progressive energy aware steering conventions like LEACH [14], control proficient assembling in sensor data framework (PEGASIS) [15], High schooler [16], half and half vitality proficient circulated bunching (Regard) [17], and APTEEN [18] were presented as answers for stack adjusting and expanded system lifetime. The hubs more remote from the base station need to transmit parcels over long separations than the hubs closer to the base station. Accordingly, they devour more vitality [19]. Sorting out WSNs into groups empowers effective usage of the restricted vitality assets of the sensor hubs. Be that as it may, the issue of uneven vitality utilization exists, and it is firmly identified with the part and area of a specific hub in the system [20]. To diminish the vitality seepage of far-away hubs from the base station (BS), zone-based stable decision convention upgraded (ZSEP-E) was proposed with heterogeneous and homogeneous zones what's more, utilizes bunch based procedure to make nearby groups at the zones [21]. Propelled hubs were deterministic ally conveyed at pre-figured areas to diminish the system parceling and insecurity. Determination of group heads in the long run winds up complex and it influences the execution of the system. As the unpredictability of the framework increments, it turns out to be more troublesome and difficult to make exact proclamation about the conduct of the hubs and group head decision. There is a need to manage the vulnerability in the bunch head race. In any case, vulnerability in CH race must be considered. A perfect CH has high leftover vitality, the most extreme number of neighbors

(thickness), and the littlest separation to the BS. Concurrent thought of these criteria in CH choice is an exceptionally dull undertaking that can be explained utilizing various trait basic leadership (MADM) approaches. Various MADM approaches that select choices quantitatively in light of numerous properties/criteria have been proposed [22– 25]. In an ongoing issue, estimation of correct qualities for each of the three criteria is troublesome. Fluffy based approaches [26– 28] are viable and productive in such cases. Fluffy rationale is a type of multi-esteemed rationale to bargain with thinking that is rough as opposed to exact. In this paper, we have utilized fluffy rationale way to deal with consolidate also, assess differing parameters for group head decision in zone-based stable group head race improved convention. In view of the zone settings, a limit sweep has been ascertained. Just those chose CHs which are inside the ascertained limit sweep discuss specifically with the BS. Whatever remains of the CHs which are past the limit span convey through a hand-off hub. The proposed approach is known as the improved zone stable decision convention for group head decision (FZSEP-E). Reproduction comes about show generous change in the system lifetime of FZSEP-E with ZSEP-E and FSEP-E.

2. RELATED WORK:

To draw out the lifetime of remote sensor systems, steering conventions proposed can be sorted into location based, QoS-based, level based and progressive [29]. Area based conventions like ravenous against void directing [30], least vitality correspondence arrange [31], and topographical vitality mindful steering convention [32] utilize the position data of hubs in sending the information. The QoS-based steering conventions like successive task steering [33], stateless convention for ongoing correspondence in sensor systems [34], and vitality mindful steering [35]conventions utilize measurements, for example, vitality, deferral, and data transfer capacity to adjust the system among-st vitality and nature of information. The level based conventions, for example, arrangement [36], coordinated dispersion [37], and Rumor directing [38] utilize surge based exchanging plan to course the information. The various leveled conventions group the sensor hubs in two stages. The conventions group the hubs in the primary stage and information transmission happens in the second stage. Drain C, Filter M, LEACH-V [14– 19] bunch hubs in light of gotten flag quality and probabilistic ally choose group heads after some time.High schooler convention [16] was proposed by Manjeshwar and Agarwal for mission basic applications utilizing a physical parameter valuable to the client. PEGASIS [15] a moved forward rendition of LEACH examined by Lindsey and Raghavendra utilizes chains of sensor hubs to transmit the information to the group head. It isn't appropriate for extensive systems due to extreme deferral. Smaragdakis et al. examine SEP [39] that utilize various leveled bunching and two-level heterogeneity hubs. A hub turns into a group head in view of weighted race probabilities of every hub. DEEC [6] convention was talked about by Li et al. for multi-level heterogeneous WSNs. The hubs having high beginning and lingering energies are chosen as group heads. The hubs closer to the base station spend more vitality than those more distant due to the additional weight of the hubs inside the area of the base station. Along these lines, littler groups are framed utilizing the

closer hubs to adjust the heap among the bunch heads that fall in various areas and the other way around.

3. PROPOSED SYSTEM

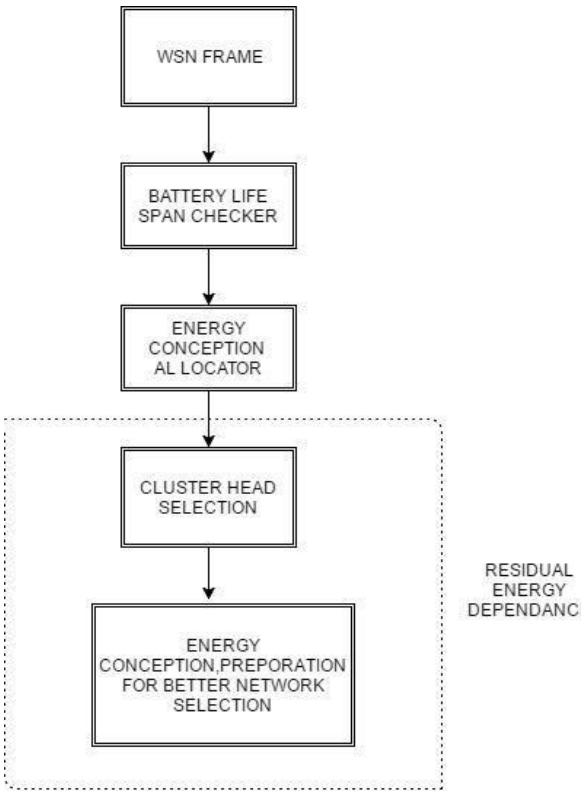

Figure2: Proposed System Architecture

a Wsn frame

Information unit containing data from a WSN layer convention and conceivably from upper layers.

The WSN is worked of "hubs" – from a couple to a few hundreds or even thousands, where every hub is associated with one (or once in a while a few) sensors. Each such sensor organize hub has regularly a few sections: a radio handset with an interior reception apparatus or association with an outer recieving wire, a microcontroller, an electronic circuit for interfacing with the sensors and a vitality source, as a rule a battery or an inserted type of vitality reaping. A sensor hub may fluctuate in estimate from that of a shoebox down to the measure of a grain of clean, albeit working "bits" of bona fide minuscule measurements presently can't seem to be made. The cost of sensor hubs is comparably factor, running from a couple to several dollars, contingent upon the multifaceted nature of the individual sensor hubs. Size and cost requirements on sensor hubs bring about comparing imperatives on assets, for example, vitality, memory, computational speed and correspondences data transfer capacity. The topology of the WSNs can shift from a straightforward star system to a progressed

multi-jump remote work arrange. The engendering system between the jumps of the system can be steering or flooding.

b Battery life span checker

Remote sensor hubs are intended to be low-control gadgets that can work for a considerable length of time in remote regions without human mediation. In this way, the methods through which they store and utilize vitality is an essential angle in WSN design. Power administration in remote sensor systems can be figured as a straightforward free market activity issue: given a constrained (and regularly factor) supply of vitality, the hub must adjust its utilization to fit the required power profile. Be

that as it may, the issue is once in a while this straightforward, as the type of vitality given by the power supply is infrequently ideal for the heap. It is a result of this reality that no single power supply framework is ideal for remote sensor hubs, despite the fact that they exist in a wide assortment. For our investigation, we concentrated on two noteworthy vitality sources accessible available. The first and prompt decision was to utilize regular electrochemical batteries. They have a limited supply of vitality, so the framework must be outlined to work such that its lifetime is augmented. The second approach is fairly non-customary and is in view of the idea of vitality gathering, that is, rummaging vitality from re generable sources that are all around accessible in the earth. At the point when these procedures are utilized, the power source ordinarily has a limited power constrain. In the event that power more prominent than this esteem is required at any time, some type of energy molding is required. This is frequently the case for remote sensor organize hubs, because of their low normal power yet moderately high pinnacle control necessities. Obviously, the cost and wastefulness of the optional stockpiling framework must be incorporated into the outline of the system hub.

c Energy conception allocator

The imperative regularly connected with sensor organize configuration is that sensor hubs work with restricted vitality holds (Energy reserves). Regularly, they are fueled through batteries, which must be either supplanted or revived when exhausted. A few hubs essentially are disposed of once their vitality source is exhausted. Regardless of whether the battery can be revived or not fundamentally influences the methodology connected to vitality utilization. Therefore, the essential plan challenge for a WSN is vitality proficiency. This prerequisite penetrates each part of sensor hub and system outline.

This calculation includes designation of Natural Energy to each sensor hub with the goal that it utilizes this outside vitality shrewdly as indicated by its present vitality save . This strategy permits the sensor hub to oversee proficiently utilization of accessible vitality in view of battery level. Outer vitality is variable so savvy distribution keeps up charge adjust. Particular vitality sums are dispensed taking present hub limit into thought. This support takes into account continuous arrange working. Current power level is contrasted and the sum required and adjust can be relegated. Sensor hub does not miss the mark regarding power. This strategy enables the sensor hub to deal with its vitality utilize productively and distributes accessible or collected vitality in view of hub vitality or battery level. Accessible or gathered vitality changes after some time so insightful assignment enables the sensor to keep up adjust of vitality save. Particular measures of vitality are assigned considering the present vitality save in the sensor. Since vitality is kept up this considers continuous system working. Every

hub is checked for battery level and contrasted and the required and accessible vitality and the adjust is assigned. This assigned sum can be utilized as a part of future by the sensor hub and it does not miss the mark concerning power. This technique permits the sensor hub to deal with its vitality utilize effectively.

d Residual energy dependence

The SEP-Enhanced Protocol consist of mainly two way of representation

1. We can pick the middle of the road hub by a relative separation of the propel hubs positions to the typical hubs position in the system, or

2. By a limit of vitality level between the propelled hubs and the ordinary hubs.

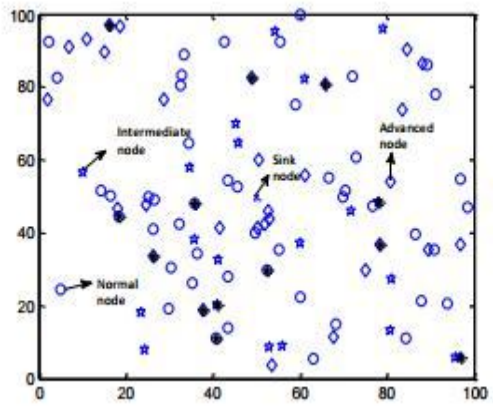

Figure3: Remote Sensor Network in groups

$$T(S)=\left\{\frac{Eo-p}{6*(Eo-p*\mathrm{mod}(r,round(1+a/Eo-p)*(\frac{n}{Eo-p\hat{}2})))}\right\}$$

This is the equation for selecting the cluster head in wireless sensor network

PROPOSEDCLUSTER ALGORITHM

The proposed clustering method follows the basic principle of the ZSEP-E protocol, and fuzzy logic is used to select the cluster head (CH) as it is combines and diverse parameter efficiently. The below algorithm is used to select the cluster head.

Input:

N: Total number of nodes in the network.
C1: List of clusters in Zone1 and Zone3.
C2: List of clusters in Zone2.
K1, K2,.. Kn: Cluster head of respective cluster.

Initialization:

Min_dis_CH_BS =0;
dtoBS=0;
isClusterhead(Node) =false;
Radius = (b1+b2)/2;

Main

1. For each cluster **'**C**'** in C1, populate the Cluster Head of **'**C**'** in K1 as below.
   For each node **'**a1**'** in a cluster **'**C**'**,
   if is ClusterHead (C,a1) == true
   then add the node **'**a1**'** to K1
   end.

2. For each cluster **'**C**'** in C2 , populate the Cluster Head of **'**C**'** in K2 as below.
   For each node **'**a2**'** in a cluster **'**C**'**
   if isClusterHead(C,a2) == true
   then add the node **'**a2**'** to K2
   end.

3. For each node **'**k1**'** in K1,
   dtoBS Distance(k1,BS)
   if dtoBS <= radius then
   Send(data,k1,BS)

```
    else
   Get relay node from K2
   k3 GetRelayNode( k1);
   Send(data,k1,k3);
  Send(data,k3,BS);
  endif.
```

Function:

function isClusterHead(Cluster, Node**)**
begin
energy ← fuzzy input value for energy ;
density← fuzzy input value for density ;
distance← fuzzy input value of the Node's distance to Base Station ;
Boolean← fuzzylogic (energy ,density ,distance);
end

function Send(data,Node1, Node2**)**
begin
aggregate and send the data from Node1 to Node2 ; end

function Distance(Node1 ,Node2**)**
begin
distance between Node1 and Node2;
end

function GetRelayNode (Node**)**
begin
for each node 'k2' in K2
min_dis_CH_BS Min(Distance(Node,k2) + Distance(k2,BS));
k3 GetNodeAt(Node,min_dis_CH_BS);
end

function GetNodeAt (Node ,distance)
begin
k3 Node from the given distance ;
end

CHs were chosen in Zone 1, Zone 2 and Zone 3 by utilizing the fluffy rationale parameters vitality, thickness, and separation of the hub to the BS. The CHs or the hubs in Zone 1 and Zone 3 which are further far from BS expend more vitality to transmit the information as a result of the separation [58]. We figured a limit sweep in view of the zonal settings in Figure in which the CHs, inside that esteem as it were, will speak with BS specifically. Here the sweep is taken as (b1 + b2) / 2 i.e., the most extreme sweep from the BS inside the focal point of Zone 1 or Zone 3. Different CHs in these zones will convey through the BS through the CHs in Zone 2. The CHs in Zone 2 for next bounce will be resolved by the separation of CHs in Zone 1 or Zone 3 to the CHs in Zone 2 and its separation to the BS. The CH in Zone 2 which is in less separation to the BS from the CH in Zone 1 or Zone 3 will be taken for next jump.

4. RESULT AND ANALYSIS

This segment depicts the usage of the proposed plot. MATLAB is utilized to execute and look at the proposed framework.

Number of nodes in 100*100grid

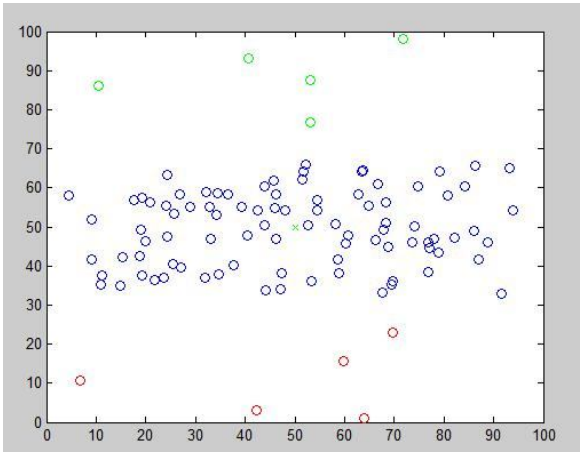

Figure 4: Total number of nodes

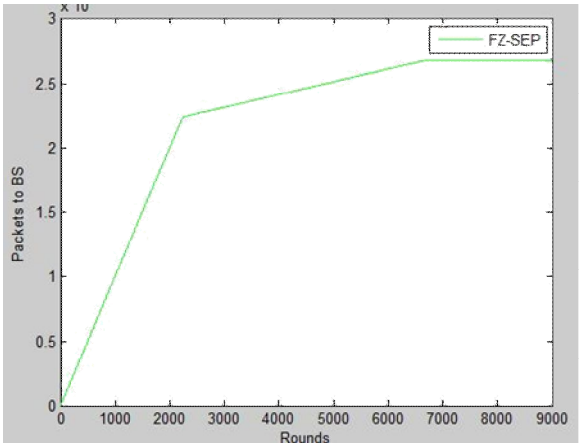

Figure 5: Throughput of the protocols

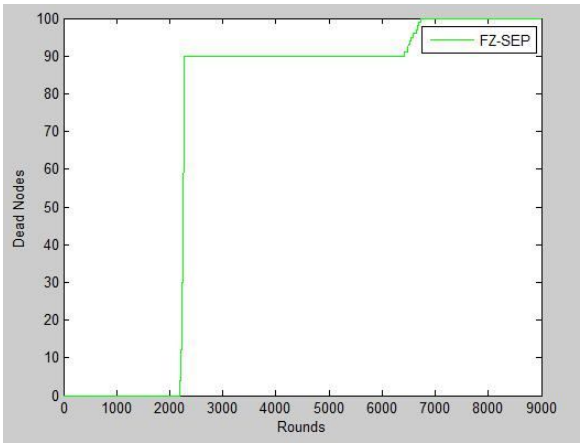

Figure 6: Number of dead nodes during rounds Alive nodes per Rounds

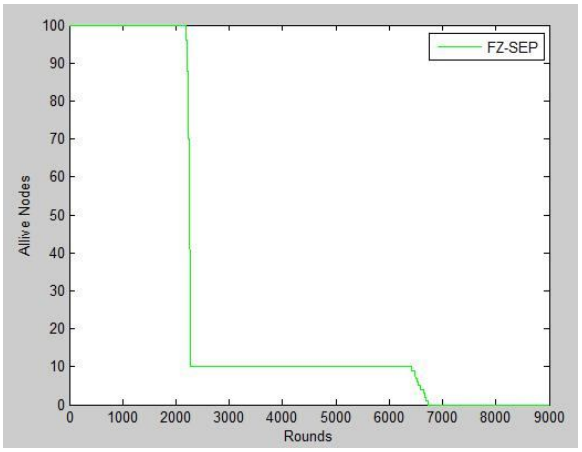

Figure 7 : Number Alive nodes per Rounds

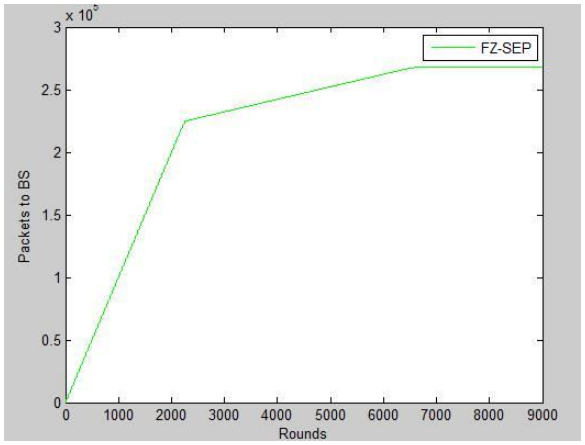

Figure 8 : Number of packets to BS

5. CONCLUSION

The Sensor Nodes can be related by remote means thusly making up the remote sensor frameworks. The Sensor Nodes are the central correspondence suggests. The imperativeness apportioning as showed by control content enables sensor centers to manage their essentialness utilize and revive their charge level satisfactorily. We show an enhanced SEP, count for WSNs with heterogeneity. Using a heterogeneous three-level center point setting in a bundling algorithmic approach, centers pick themselves as gathering heads in light of their essentialness levels, holding more reliably coursed imperativeness among sensor center points. Our result exhibits that the enhanced SEP is more solid in regards to framework life time and resource sharing. At last, we are at introduce investigating how we can best control the amount of related gathering people in each gathering, to achieve a relative load modify the extent that number of center points among all clusters confined. This would give better consistency in their individual imperativeness use, at last provoking furthermore drawn out effective mastermind life time.

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