International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 08 | Aug - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Method For Placing Bottom Stations in Different WSN Systems

Shiv Om Mishra[1], Hira Singh Yadav[2],

[1]*ScholarM.tech Computer Science & Engineering ,Babu Sunder Singh Institute of technology & management Lucknow*
[2]*Assitant professor Computer Science & Engineering ,Babu Sunder Singh Institute of technology & management Lucknow*

---***---

Abstract - We are mostly zeroing in issues connected with the base station situation in a remote sensor organization (WSN) field. The WSN model have multi groups approach has been examined. The goal is to limit the general energy utilization in a WSN during the information transmission over hubs by sorting out the use of group head and covering head hubs.

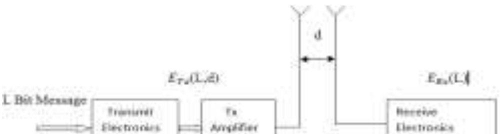
We demonstrate that the general energy utilization is limited at the centrefold of the hubs and proposed point of the hub as the think about of the base encasing circle of the focal point of the hubs. We realize that the greater part of the hubs are near the base station, while a couple of hubs are a long way from it. Consequently these far away sensors hubs utilize than closer ones. We have involved a centroid technique for observing the group head hub area and exploring how to observe the base station area related information transmission to diminish utilization consequently build network lifetime

***Key Words*:** Wsn,hubs, Energy, light,transmission ,

1.INTRODUCTION

Wireless sensor organization (WSN) is a thickly sent assortment of an enormous number of self-coordinating remote sensor hubs with restricted energy asset, and generally a base station to gather and handle the information from sensor hubs. A sensor hub consumes energy for occasion detecting, coding, balance, transmission, gathering and collection of information. information transmission has the most elevated offer in all out energy utilization. The necessary transmission force of a remote radio is relative to square or a much higher request example of distance within the sight of deterrents. Hence, the distance among transmitter and recipient is the fundamental measurement for energy

utilization in a WSN.



2.Objective

We demonstrate that the general energy utilization is limited at the centroid of the hubs and proposed point of the hub as the analyze of the base encasing circle of the focal point of the hubs. We realize that a large portion of the hubs are near the base station, while a couple of hubs are a long way from it. Consequently these far away sensors hubs utilize more energy than closer ones. We have involved a centroid strategy for observing the bunch head hub area and exploring how to observe the base station area related information transmission to decrease energy utilization and henceforth to expand network lifetime

3.Radio Model

We really want a radio model to appraise energy utilization during the time spent base station area streamlining. We have considered a similar radio model as utilized by Heinzelmanet al. [18]. The transmitter scatters energy to run the transmitter radio hardware and the power speaker, and the beneficiary disperses energy to run the collector radio gadgets. Assuming the distance between the transmitter and the collector is under an edge (d_0), the 'free space (fs) misfortune's model is utilized; in any case, the 'multipath (mp) misfortune's model is utilized. Here, we are expecting that a reasonable power control component exists to manage communicate power contingent upon the distance to the recipient.In a transmission speaker .we utilized way misfortune type, n= 2, with the expectation of complimentary space misfortune model and n = 4 for multi-way misfortune model. The consumed intensifier energy E_amp, of a sensor hub is E_fs.d^(2) or E_mp.d^4 relying upon the distance d among hub and base station[18]

.

Figure 1 : Radio Model

5.Energy consumption model

heads collect data from all the nodes inside the cluster, aggregate it and pass it to the base station. Let there be n nodes uniformly distributed in an M × M area and k number of clusters in the topology. There will be on an average (n/k) nodes per cluster. Out of these, there will be one cluster head node and (n/k - 1) non-cluster head nodes. Energy consumption for a single frame (one round) of transmission of data for topology will be as follows

The energy consumption E_{non-CH} for a single non-cluster head node only for transmission of L bits to cluster head is

$$E_{non-CH}=L.\ E_{elec}+LE_{fs}.\ d_{CH}^{2}$$

$$d_{CH}^{2}=\frac{M^2}{2\Pi K}$$

6.Method For Finding Base Station Location

Step 1: Find centroid (C_x ,C_y) of the nodes distributed in the field. This is the point, where Ed2 is minimised, and is given by

$$C_x \frac{\sum_{i=1}^{n} x_i}{n}$$

and

$$C_y=\frac{\sum_{i=1}^{n} y_i}{n}$$

Step 2: Find the nodes that are at less than d_0 distance from the centroid.

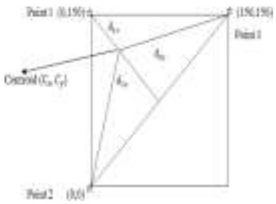
Step 3: Weights are calculated using centroid for all the nodes as

$$w_i=\begin{cases} 1\ if & d_{ic}<d_0 \\ \frac{d_{ic}^2}{d_0^2} & d_{ic}\geq d_0 \end{cases}$$

Here, diC is the distance between the ith node and the centroid. Justification for the above mentioned weights is as follows.

4.Calculation of weights for the proposed algorithm

We take weight w as 1 for the nodes, which are at less than d0 distance from the centroid, and something else for the other nodes, which are at equal or higher distance than d0 from the centroid. As the proposed point will be the weighted average of all points, the weights w for all the nodes will be 1, when all the nodes are closer than d0 from centroid



Calculations

Node Ratio $=\frac{N_{d_2}}{N_{d_4}}$

7.Optimal Location Of Base Station Analysis With An Example

consider a homogeneous network in which the position of the nodes these three nodes which are placed at positions (0, 150), (0, 0) and (150, 150) in a 150× 150 square metre area. We have assumed the values of E_{mp} = 1.3 × 10^{-15} J/bit/m^4 as multi-path loss constant and E_{fs} = 10^{-11} J/bit/m^2 as free space loss constant.

Step 1:-define the x and y co-ordinates of three nodes

x=[0, 0 ,150]

y=[150, 0, 150]

n=3(number of nodes)

RESULT

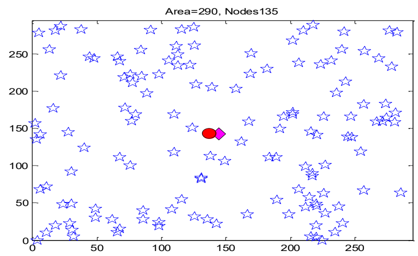
In this section we have depicted above WSN model plan utilizing the MATLAB. Utilizing this model we have decided the energy consume by sensors during the power of information transmission from WSN sensor to base station. We have investigated three different plan of deciding the area of base station regarding least energy consumption of a sensors organization.

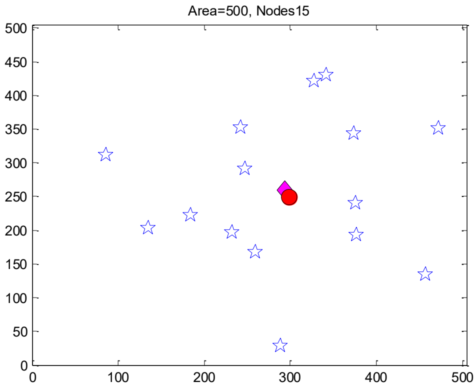
4.1 Design Of WSN Model:-

We have plan WSN model having huge number of remote sensor hubs with restricted energy assets model having a base station that can gather and handle the information got from sensor hubs. For this reason a calculation utilizing MATLAB 10 programming. İn this calculation we have produced arbitrarily circulated sensor hub in a given field having square region M×M meter square. The quantity of hubs are changed from 5 to 200 hubs for a given region .We have likewise considered field area of various aspects having length of square region 30 to 500 meters. Each time we have addition of 10 and hubs are augmentation of 10 too. İn this manner we have created around 48×20 arbitrary circulated WSN group with various regions and different number of hubs. Allow we to have N sensor hubs haphazardly circulated in a rectangular field at a location(Px, Py) where ;

Px=X1,X2,X3................Xn

Figure 1(a) shows the cluster of nodes (blue stars), centroid (mageta diamond) and proposed position of base station (red circle) for area field of length=120 and number of nodes=175 in this Figure. Here area is small hence centroid and proposed position are approximately same with centroid and proposed base





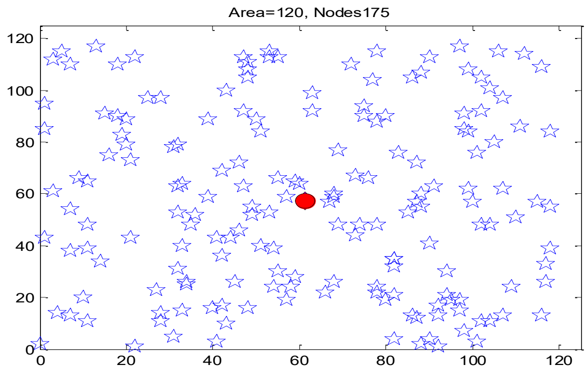


Figure 1a.WSN sensor node cluster for area =120 and node=175

Similarly Figure 1(b),(c) ,(d) shows the randomly picked WSN cluster field map for different areas and nodes. İn these figures we can see that our proposed base station location and centroid location are different.

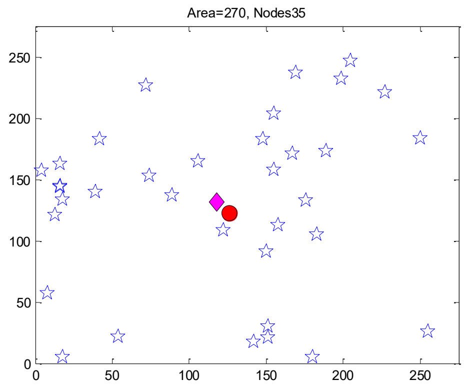


Figure 1(c) WSN sensor node cluster for area =290 and node=135

Consequently from over these Figures it has been exhibited that we can produce sequencely unique design of field length and region for WSN. As referenced above there are 48×20 WSN network are produced for multiple times and for each time we have determined base station area as indicated by centroid, focus of least encasing circle and our proposed area for all 48×20 WSN. İn this manner we have determined our outcomes for multiple times named as case C1 ,C2 and C3. For all cases we have determined the rate energy decrease , hub proportion and distance proportion to think about our outcome againsed the outcomes acquired because of centroid as the base station area and focus of the base encasing circle (MEC) as the base station area (BSL) results got for every one of the three cases depicted in after segments.

4.2 İn this segment we will talk about the energy utilization by WSN closes during the information transmission to base station for various calculation of base station situating.

4.2.1 Case C1:- we have determined the calculation results by taking normal of 20 emphasess for arbitrarily disseminated 48×20 WSN. İn every cycle we have gotten after outcomes:

a. %Ecp, %Emc, %Emp

b. Hub Ratio

c. Distance Ratio

we have shown the surface plot got from %Ecp, %Emc, %Emp in the 2(a),4(a),5(a) utilizing this surface plot we can envision how does rate energy Reduction varries with various setup of WSN hubs and field region. İn the surface plot the shade of the surface changes from red to blue shades where red shades addresses high qualities, yellow addresses medium qualities and blue addresses low qualities.

In Figure 2(a) we have shown %Ecp on the z-hub, hubs and region are on the x-pivot and y-hub. As we can see that x-hub varrying from 0-200 and

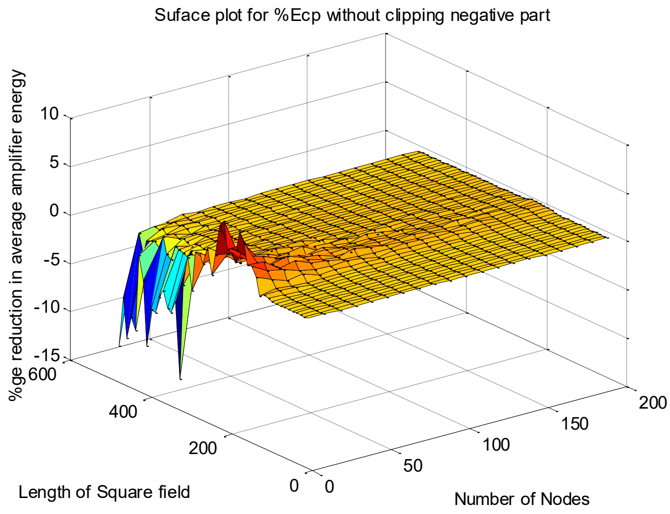


Figure.2(a) Percentage reduction in average amplifier energy for the proposed point compared with centroid without clipping negative part

y-axis varrying from 0-600 because we have changed nodes from 5-200 and area is chaged from 30- 500. The z-axis shows % Ecp having peak value of 6.07 at area=240 and node= 5(see Figure 2(b)) hence it shows that there is 6.07% of less energy is consumed by the sensor nodes during the data transmission if we place our base station at our proposed point instead of centroid.

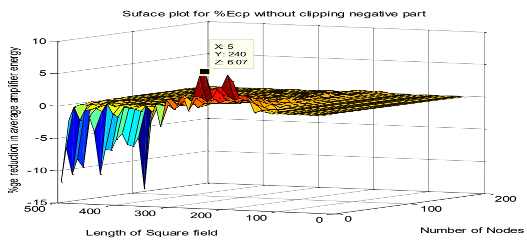


Figure 2(b) side view of Percentage reduction in average amplifier energy for the proposed point compared with centroid without clipping negative part

Same figure is again shown in the top view in Figure 2(c). Here we have in circle the portion where %Ecp is significantly larger than the other cluster.for more clearty we have clipped the negative part to zero such that the surface plot becomes blue in the regions having Ec=Ep.

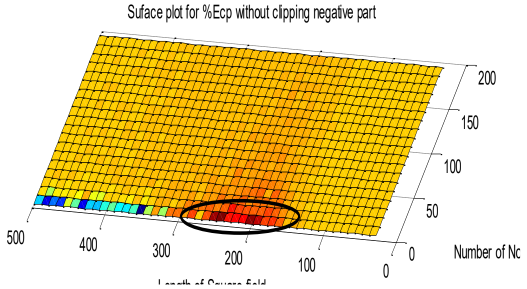
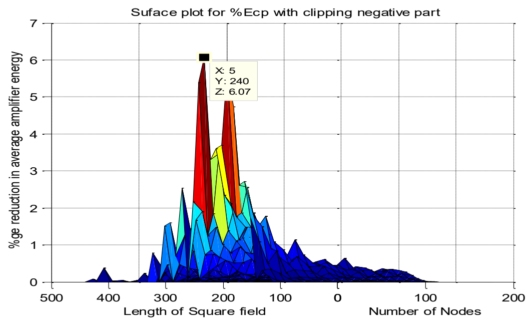
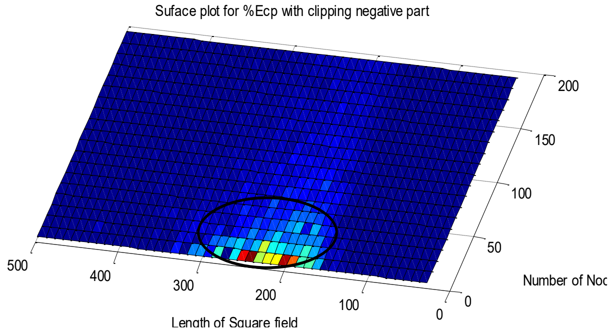


Figure 2(c) top view of Percentage reduction in average amplifier energy for the proposed point compared with centroid without clipping negative part

This is shown in Figure 3(a) having only those portion are shown where energy consumption by our proposed location is less than Ec.





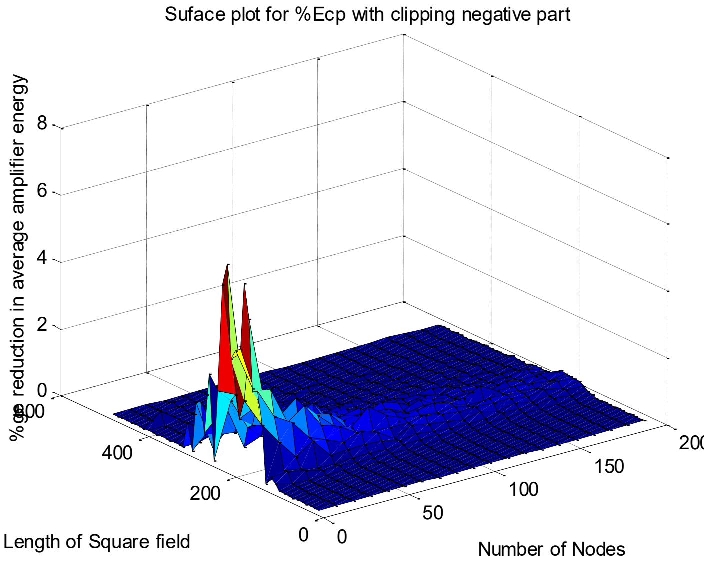


Figure3(a):- Percentage reduction in average amplifier energy for proposed point compared with centroid with clipping negative part

Figure 3(b) is the side view of above figure it is also showing that there is maximum %Ecp is 6.07 at area=240 node=5. Now the portion which above the surface are representing the range of area field and number of nodes for which our proposed algorithm prove itself better than the base station location as centroid. For this purpose we have taken the top view %Ecp with negative part clip to zero.

Figure 3(b) side view of Percentage reduction in average amplifier energy for proposed point compared with centroid with clipping negative part

Figure 3(c) top view of Percentage reduction in average amplifier energy for proposed point compared with centroid with clipping negative part

In the Figure 3(c) we can see that a yellow line is drawn in the portion having %Ecp as positive in this region area varries from 100 to 350 meter and number of nodes are varring from 5 to 180. It represents that for area less than 100 the performance of both algorithm are same . However since our thresold distance is 80 for area of length 100 all the nodes will be at a distance less than d_0.

So there will be no case of amlpifiaction loss there will be only the free path losses that is why for area less than 100 our proposed point and centroid point is similar. For large area above than 350 both algorithm are giving same performance. So we can say that our proposed base station location is good for area of field length less than 150 and for all combination of number of sensr nodes. We have also incircle the region where the surface value is significanly larger for %Ecp with black circle in figure 3(c). This region is under the range 150-300 meter field length with new nodes 5-50.

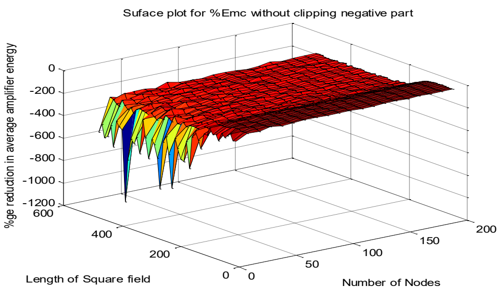


Figure4(a) Percentage reduction in average amplifier energy for the minimum enclosing circle compared with centroid without clipping negative parts

We also compared percentage energy reduction for considering centroid and minimum enclosing circle and the surface plot is shown in figure 4(a) where z-axis shows percentage energy reduction, x-axis and y-axis 4(b) shows the plot %Emp with respect to area and number of nodes. Ïn both the plots all the surface are below zero, if Ec or Ep is greater than Em that is why %Emc or %Emp will always result in negative value shown so we can conclude that both base station location points either centroid or proposed location gives lower energy consumption compare to minimum enclosing circle for all the combination of area and number of nodes.

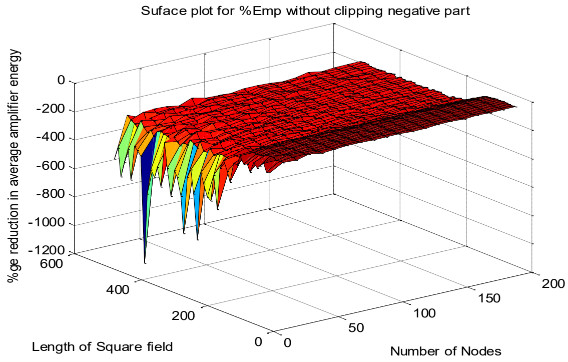


Figure 5(a):- Percentage reduction in average amplifier energy for minimum enclosing circle compared with proposed points without clipping negative parts

4.2.2 For case 2:-again we have shown the surface plot obtained from %Ecp, %Emp, %Emc in the 6(a), 8(a),9(a) using this surface plot we can visualise how does percentage energy reduction varries with different configuration of WSN nodes and field area. Ïn the surface plot the colour of the surface changes from red to blue shades where red shades represents high values, yellow represents medium values and blue represents low values.

In figure 6(a) we have shown %Ecp on the z-axis, nodes and area are on the x-axis and y-axis. As we can see that x-axis varrying from 0-200 and y-axis varrying from 0-600 because we have changed nodes from 5-200 and area is chaged from 30- 500. The z-axis shows % Ecp having peak value of 4.291 at area=230 and node= 5(see fig 6b) hence it shows that there is 4.291% of less energy is consumed by the sensor nodes during the data transmission if we place our base station at our proposed point instead of centroid.

CONCLUSION AND FUTURE WORK

in this proposition we have worked in tracking down ideal area of base station assessment examination with saving imperatives of least energy consumption for giving most extreme life time to the hubs of sensor organization

Numerous calculation connected with this work are dissected and configuration in this work and it had been observed that our proposed weighted centroid approach with considering least intensification misfortunes is giving most extreme decrease in rate energy utilization .we have contrasted our outcome with a regard with approach of situating base station utilizing least encasing circle and centroid of the group. The outcomes are above all else assessed for the remote sensor network having three hubs set in triangle as a consistently disseminated sensor organization. after this we explored energy utilization limited misfortunes for various plans with variety of region and number of hubs .for region we are viewed as field length of 30-500 meter and number of hubs 5-200.above multiple times we have run above calculation for 48 × 20 mix of region and hubs and the normal rate decrease in energy utilization for each characterized region and hubs assessed for multiple times

References

[1] Vinay Mishra, Madhuri Dubey, "Event Management System" ijtrd, Volume 3(6), November 2016. [2] Maryam Sayyed, Faiza Umatiya, "College Placemnet Management System" ijcrt, Volume 8, June2020. [3] Rupali B. Kale, Ruchika K. Balwade, "Online Food Ordering System for College Canteen" Samriddhi, Volume 12, Special Issue 2, August 2020. [4] Shweta Vijay Chinchane, Shweta Vijay Chinchane, "College Management System Android Application" irjmets, Volume:05/Issue:06, February 2023. [5] Vishwajeet

[2] Pandey and Aman Anand, "Student Profile Management System" irjet, Volume: 09 Issue: 03, March 2022. [6] Kalaimathi D, Priya R, "College Management System" ijrpr, Vol 4, no 4, pp 2374-2375, April 2023. [7] A.J. Kadam, Aradhana Singh, "Mobile Web Based Android Application for College Management System" ijecs, Volume:02 Issue:02, February 2017. [8] Kartiki Datarkar, Neha Hajare, "Online College Management System" ijcsmc, Volume:05 Issue: 04, April 2016. [9] Gaurav Thombare, Pavan Jadhav, "College Event Management: A Survey of Analytics" irjmets, Volume