Efficient Path Allocation for Heterogeneous WSN with Mobile Sink Approach

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Abstract:

In WSN, enhancing network lifetime and ensuring reliable data delivery is an important and crucial process. Data loss may occur in WSN due to minimum energy in network and some physical environment issues. Therefore efficient routing algorithm is needed for enhancing network lifetime and reliable data delivery. Therefore implementing this algorithm in heterogeneous environment is difficult issue. Similarly the information gathered from each cluster head will be delivered to BS and there is possibility for collision and data loss in network. In our proposed work, clustering concept has been implemented which reduces energy consumption and increases network lifetime. Multi hop graph based approach for an energy efficient routing (MH-GEER) with mobile sink approach is implemented. Cluster is formed based on distance and CH is selected depends on Energy level in node. Here mobile sink approach has been implemented to enhance the lifetime of the network instead of acting as a static sink mobile sink will circulate in a path and collects information from CH which reduces collision occurrence and reduction of data loss. Hence this approach attains better performance compared to LEACH and AODV.

Keywords: MH-GEER, cluster, mobile sink, network lifetime and data delivery.

I.INTRODUCTION

Wireless sensor networks, as a developing system innovations, have risen step by step as of late. They can acquire a great deal of point by point and dependable data in the system dispersed territory whenever and anyplace; in this way, they are generally utilized in military safeguard, industry, farming, development and urban administration, biomedical and ecological checking, fiasco alleviation, open wellbeing and antiterrorism, dangerous and destructive provincial remote control, etc which are quite accounted by numerous legislatures. Remote sensor systems have a significant logical and reasonable worth.

In heterogeneous sensor systems, commonly, countless sensibly valued hubs perform detecting, even as a couple of hubs having nearly more vitality perform information sifting, combination and transport. This escort to the examination on heterogeneous systems where at least two sorts of hubs are considered. Heterogeneity in remote sensor systems can be utilized to broaden the existence time and dependability of the system.

Type of Resource Heterogeneity:-

There are three general types of resource heterogeneity in sensor nodes:-

- Computational Heterogeneity
- Link Heterogeneity

- Energy Heterogeneity

Computational Heterogeneity:

Computational Heterogeneity, implies that the heterogeneous hub has an all the more impressive microchip, and more memory, than the typical hub. With the incredible computational assets, the heterogeneous hubs can manage the cost of complex information handling and longer-term stockpiling.

Link Heterogeneity:

Link Heterogeneity implies which the heterogeneous hub has high data transfer capacity and long separation organize handset than the ordinary hub. Connection heterogeneity can give a progressively predictable information transmission.

Energy Heterogeneity:

Energy Heterogeneity implies which the heterogeneous hub has high data transfer capacity and long separation organize handset than the ordinary hub. Connection heterogeneity can give a progressively predictable information transmission.

Method to increase network lifetime:

To make sensor arranges extra dependable, the focus to inquire about on heterogeneous remote sensor systems has been ascending in late past. A sensor system can be finished adaptable by amassing the sensor hubs into bunches for example bunch. Each bunch has a pioneer, regularly alluded to as the group head (CH). A Cluster Head might be chosen by the sensors in a group or pre-relegated by the system in vogue. The group relationship might be fixed or variable. Various grouping calculations have been exceptionally intended for Wireless Sensor Networks (WSNs) for versatility and efficient proclamation. Cluster based directing is additionally abused to show vitality productive steering in Ware less sensor systems (WSNs).

Clustering has many advantages: Some of these, which are presenting below:-

1. Clustering lessens the size of the steering table put away at the element hubs by confining the course set up inside the group.

2. Clustering can protect correspondence data transmission since it limitations the extent of entomb group collaborations to CHs and keeps away from unnecessary trade of messages among sensor hubs.

3. The Cluster Head (CH) can broaden the battery life of the individual sensors and the system lifetime too by executing advanced administration procedures.

4. Clustering cuts on topology safeguarding overhead. Sensors would think about associating with their Cluster Heads (CHs).

5. A CH can display information total in its bunch and decline the quantity of repetitive bundles.

6. A CH can decrease the pace of vitality utilization by booking exercises in the bunch.

Contribution of the paper:

- To increases network lifetime.
- To achieves reliability and packet delivery ratio.

- To selects shortest path and high energy nodes to attain minimum energy consumption.
- To avoid collision and reduces energy consumption and increases lifespan.

II.LITERATURE SURVEY

Sudarshan T V and Manjesh B N (2015), presents the past scarcely any years have seen an amplified enthusiasm for the planned use of remote sensor systems (WSNs) in various fields like: - catastrophe the board, fight ground reconnaissance, and outskirt security observation. In such applications, an immense number of sensor hubs are conveyed, which are oftentimes unattended and work independently. Bunching is a key procedure used to grow the lifetime of a sensor arrange by diminishing vitality utilization. It can likewise raise arrange adaptability. Scientists in all fields of remote sensor arrange feel that hubs are homogeneous, however a few hubs might be of different vitality to expand the lifetime of a WSN and its steadfastness. Right now, displayed heterogeneous model for Wireless Sensor Network and bunching calculations proposed in the writing for heterogeneous remote sensor systems (HWSNs).

Vikas Bhandary et.al (2016), describes the advancement of wireless sensor networks (WSNs) and technology, appropriateness of WSNs as a framework is contacting new statures. The advancement of sight and sound hubs has prompted the production of another insightful disseminated framework, which can move continuous media traffic, pervasively. Remote interactive media sensor systems (WMSNs) are appropriate in a wide scope of territories including region checking and video observation. In any case, because of questionable mistake inclined correspondence medium and application explicit nature of administration (QoS) necessities, steering of ongoing media traffic in WMSNs represents a difficult issue. The paper examines different existing directing techniques in WMSNs, with their properties and impediments which lead to open research issues.

Chun-Hsien Wu and Yeh-Ching Chung (2017), describes heterogeneous remote sensor arrange (heterogeneous WSN) comprises of sensor hubs with various capacity, for example, unique processing force and detecting range. Contrasted and homogeneous WSN, arrangement and topology control are progressively unpredictable in heterogeneous WSN. Right now, organization and topology control technique is introduced for heterogeneous sensor hubs with various correspondence and detecting range. It depends on the unpredictable sensor model used to inexact the conduct of sensor hubs. Moreover, a cost model is proposed to assess the organization cost of heterogeneous WSN. As indicated by explore results, the proposed strategy can accomplish higher inclusion rate and lower arrangement cost for the equivalent deployable sensor hubs.

Miriam Carlos-Mancilla et.al (2016), discusses a functioning examination territory wherein testing themes include vitality utilization, steering calculations, choice of sensors area as indicated by a given reason, heartiness, productivity, etc. In spite of the open issues in WSNs, there are as of now a high number of utilizations accessible. In all cases for the plan of any application, one of the principle goals is to keep the WSN alive and utilitarian to the extent that this would be possible. A key factor right now way the system is framed. This overview displays latest arrangement systems and components for the WSNs. Right now, looked into works are ordered into dispersed and incorporated methods. The examination is centered around whether a solitary or numerous sinks are utilized, hubs are static or versatile, the arrangement is occasion identification based or not, and organize spine is framed or not.

Hana Rhim et.al (2018), presents energy harvesting advances are improving, the vitality of sensors stays a rare asset when planning steering conventions between sensor hubs and base station. This paper proposes a multi-bounce chart based methodology for a vitality productive directing (MH-GEER) convention in remote sensor systems which intends to disperse vitality utilization between groups at a fair rate and in this manner broaden systems' life expectancies. MH-GEER manages hub bunching and between group multi-bounce steering determination. The grouping stage is based upon the incorporated development of bunches and the dispersed choice

of group makes a beeline for that of low-vitality versatile grouping chain of importance (LEACH). The steering stage fabricates a dynamic multi-jump way between group heads and the base station. Our technique is tied in with investigating the vitality levels in the whole system and utilizing these to choose the following jump in a probabilistic, astute way.

Li Qing et.al (2016), presents the grouping Algorithm is a sort of key system used to diminish vitality utilization. It can expand the adaptability and lifetime of the system. Vitality effective grouping conventions ought to be intended for the trait of heterogeneous remote sensor systems. We propose and assess another dispersed vitality proficient bunching plan for heterogeneous remote sensor systems, which is called DEEC. In DEEC, the bunch heads are chosen by a likelihood dependent on the proportion between lingering vitality of every hub and the normal vitality of the system. The ages of being group sets out toward hubs are diverse as indicated by their underlying and lingering vitality. The hubs with high starting and lingering vitality will have a greater number of opportunities to be the group heads than the hubs with low vitality.

III.PROPOSED METHODOLOGY

Improving system lifetime and expanding parcel conveyance proportion by guaranteeing solid bundle conveyance is the objective of our proposed work. Here, way determination has been done through multi-bounce chart based methodology for a vitality productive steering (MH-GEER) convention a dispersed directing convention dependent on multi-jump correspondence between CHs, demonstrated in a total diagram structure. A multipath directing procedure for the information was set up to assist with stretching out the system life expectancy and to deplete the hubs' batteries at a uniformly adjusted rate. All the more explicitly, our convention fabricates a various leveled association of hubs dependent on their good ways from one another, isolating the system into groups. At that point, it chooses and turns headers in these bunches, in view of the contrasting degrees of hubs' vitality, to limit vitality squander before the information steering stage to the BS. MH-GEER is a between bunch multi-jump dynamic steering convention, moving data starting with one CH then onto the next so as to arrive at the BS. Its primary objective is to guarantee the heap adjusting in the system and to give a durable availability for all the bunches regardless of how far they are situated from the BS. The fundamental issue looked in grouping is conveying information from bunch head to sink will prompts event of impact and information misfortune. To beat this issue portable sink approach has been actualized.

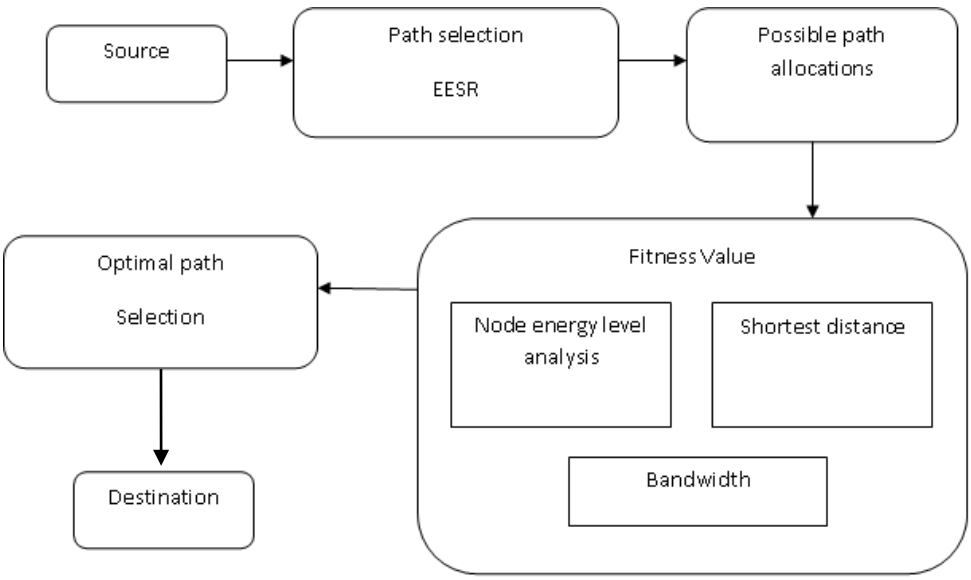

Figure 1: Working system of proposed work

All the hubs are haphazardly conveyed in the system region. Our system is a controlled system; hubs are allocated with portability (development). Source and goal hubs are characterized. Information moved from source hub to goal hub. Since we are working in remote system, hubs versatility is set i.e., hub move starting with one position then onto the next Adversary Model. The objective of the enemy is to forestall the sender(s) from speaking with all, or a subset of the planned beneficiaries.

To consider vitality utilization factor and vitality productive way development convention is chosen to transmit information in the system. Here, MH-GEER calculation is utilized to choose the way in organize which chooses way as for request of transmission and develop way in multi headings. Thus this guarantees information unwavering quality and accomplishes better most extreme parcel conveyance proportion. A multipath steering process for the information was built up to assist with stretching out the system life expectancy and to deplete the hubs' batteries at an equally adjusted rate. All the more explicitly, our convention fabricates a various leveled association of hubs dependent on their good ways from one another, partitioning the system into groups. At that point, it chooses and pivots headers in this cluster, in view of the varying degrees of hubs' vitality, to limit vitality squander before the information steering stage to the BS. It sets up vitality productive ways, thinking about, at each round, the vitality condition of the entire system.

Algorithm 1: MH-GEER

Initialization:

$i, j \in \{1, 2, ..., N\}$

x, r: integer

tab_k [ ]: vector

pth_k [ ]: vector

Begin a round r:

for each cluster head H_k where $1 \leq k \leq N - 1$ do

H_k creates an agent A_k

** data transmission to BS **

$tab_k[1] \leftarrow \{(H_k, e_k, \emptyset)\}$

$pth_k[1] \leftarrow k$

$i \leftarrow k$

$x \leftarrow 1$

repeat

A_k chooses a next-hop H_j with the probability rule $p_k(i, j)$

verifying $j \notin pth_k$

A_k transmits data to H_j

$x \leftarrow x + 1$

$tab_k[x] \leftarrow \{(H_j , e_j , e_{i,j})\}$

$pth_k[x] \leftarrow j$

$i \leftarrow j$

until i = N;

The BS is accountable for the system bunching. This is a concentrated procedure where the BS, toward the start of the calculation, isolates the system into (N − 1) gatherings and doles out the job of CH to the hub with the most elevated vitality level in each bunch. At that point, at each round, the job of CH is given to another hub inside each bunch. Right now, bunching is static and settled by a brought together K-implies calculation [28, 29] where framed groups stay fixed during the entire procedure. It is significant that the level of CHs in the system relies upon a few parameters picked at the organization of the system, the most significant of which are the system topology and the picked k esteem (for the K-implies calculation) that fulfills the properties mentioned by the application utilizing this WSN.

Path selection:

Path has been chosen from source to goal. To consider vitality utilization factor and vitality productive way development convention is chosen to transmit information in the system. Here, MH-GEER calculation is utilized to choose the way in organize which chooses way as for request of transmission and build way in multi headings. Henceforth this guarantees information unwavering quality and accomplishes better most extreme bundle conveyance proportion. A multipath steering process for the information was built up to assist with stretching out the system life expectancy and to deplete the hubs' batteries at an equitably adjusted rate. All the more explicitly, our convention fabricates a various leveled association of hubs dependent on their good ways from one another, partitioning the system into bunches. At that point, it chooses and pivots headers in these bunches, in view of the contrasting degrees of hubs' vitality, to limit vitality squander before the information directing stage to the BS. It sets up vitality productive ways, mulling over, at each round, the vitality condition of the entire system.

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CH selection:

At each node, if the Hi got from the BS relates to its own character, it perceives itself as the CH, makes a TDMA plan for information transmission coordination inside the bunch and communicates it to its part hubs. In the event that this isn't simply the situation, at that point the hub perceives as a non-CH, and sits tight for a postpone time D to guarantee that all the CHs in the system have gotten the data about their determination and are set up to get joining demands from different hubs in their bunch. At that point, this non-CH sends a JOIN message to the CH and hangs tight for the transmission plan. In the wake of finishing the CHs assertion inside each bunch, the part hubs transmit detected information just as their remaining vitality level to their CH as indicated by the timetable and afterward turn OFF their radios to diminish their vitality utilization. The job of CH is inspected so as to guarantee the most enduring hub starts to lead the pack for its group toward the start of the following round. Actually, each CH looks at the put away vitality estimations of its part hubs with its own and chooses the hub having the best outstanding vitality as the new CH. In the event that the current CH doesn't discover a hub with a more noteworthy vitality level than itself in the bunch, it remains the CH for the following round. Then, each CH aggregates the data

and the new CH identity Hk of its cluster k in one packet and sends it to the BS through the multi-hop inter-cluster routing backbone.

Mobile sink module:

At the point when a static sink gathers information, its neighbor hubs are answerable for information transmission; along these lines their vitality will diminish quicker than different hubs. Since the static sinks required many general interchanges to gather the whole information at a different endpoint, and so as to defeat the watched deficiencies of static sinks, the utilization of versatile sink was proposed. The utilization of a portable sink is powerful in expanding the lifetime of hubs that are close to the sink. A versatile sink can follow various kinds of portability designs in the sensor field, for example, irregular portability, unsurprising/fixed way versatility, or controlled portability. Here versatile sink moves in the bunched WSN to gather detected information from the CHs inside its region. Additionally during information gathering portable sinks accumulate data about the remaining vitality of the CHs. In view of the leftover vitality of CHs versatile sinks move to the CHs that have higher vitality. In the lopsided grouping calculation join with portable sink methodology and versatile sinks dependent on lopsided bunching calculation has been proposed. The portable sink hub will move at a specific speed along a foreordained way back and the development way is situated in the rectangular system.

IV.RESULT AND DISCUSSION

The objective of our work is to reduce energy consumption and to increase network lifetime. This has been achieved in our proposed work and its result has been shown in below graph. Our work has been compared with existing two algorithms such as LEACH and AODV.

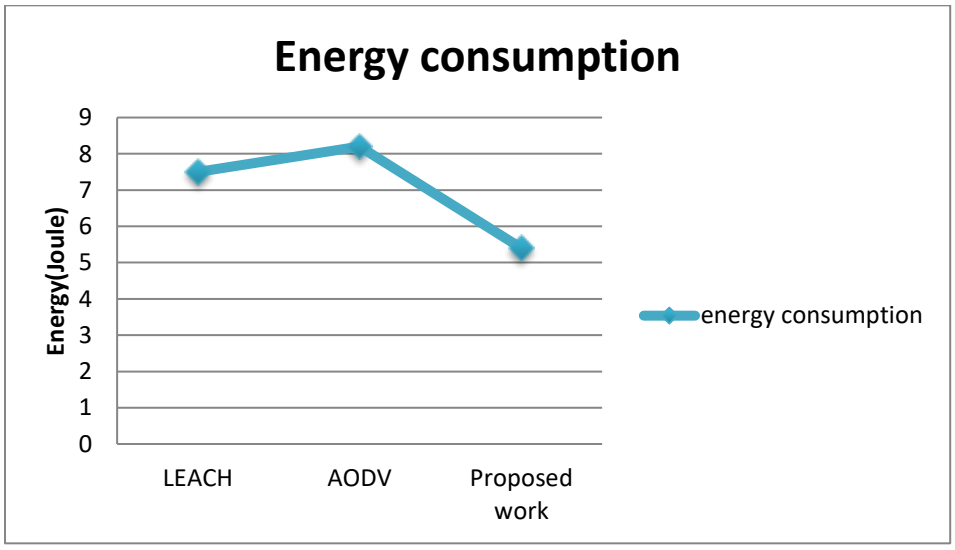

Figure 2: Energy consumption comparison graph

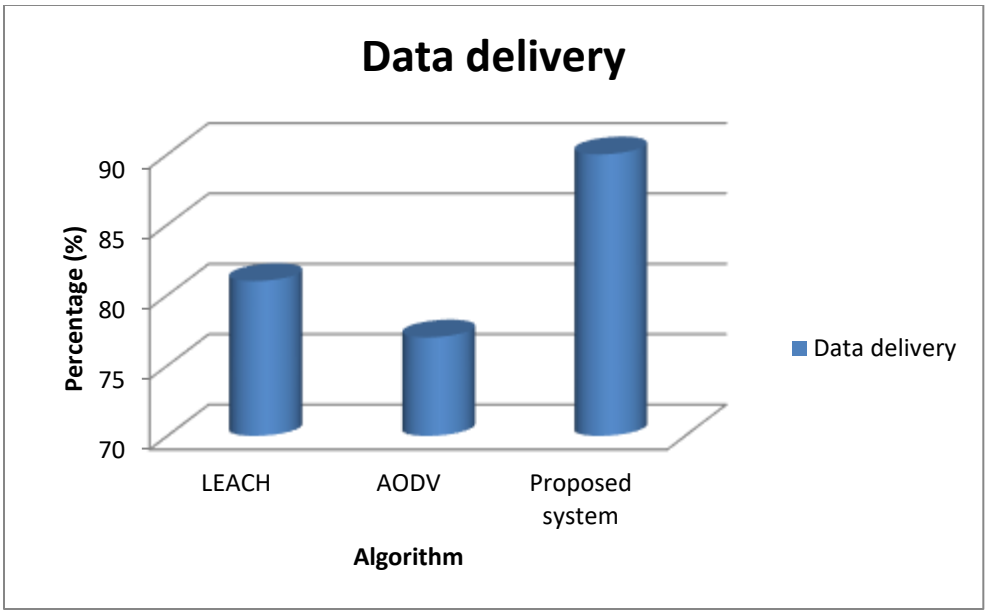

Figure 2: data delivery comparison

The above graph describes the data delivery between source and destination obtained by existing and proposed method. LEACH reduces energy consumption and increases network lifetime but in data delivery it achieves around 81% of data delivery. Similarly AODV achieves 78% percent of data delivery. Our proposed method achieves maximum delivery of 91% hence it shows compared to existing method our proposed achieves better results.

CONCLUSION

In WSN, enhancing network lifetime is a major research work currently processing on. In our work it considered as important objective and research has been proposed. Here, clustering is implemented because it has the nature in reducing energy consumption and increases network lifetime however there is small challenges in clustering which reduces its performance. Such as, data delivered by CH without proper schedule will leads to data loss and collision. Hence in our proposed work mobile sink concept has been implemented which makes a proper schedule in data delivery from CH to destination that reduces collision and data loss. Through this it achieves maximum data delivery and increases network lifetime. Compared to existing methods our system achieves optimal performance and it has been shown in result and discussion.

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