Maximization of Lifetime of WSN using two level and three level LEACH protocol with advance optimization techniques

Dissertation -II

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by

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CERTIFICATE

This is to certify that the Dissertation-II titled **"Maximization of life time of WSN using two level and three level LEACH protocol with advance optimization techniques"** that is being submitted by " **IRPHAN KHAN(11502601)**" is in fulfillment of the requirements for the award of MASTER OF TECHNOLOGY DEGREE, is a record of bonafide work done under my guidance. The contents of this Dissertation-II report, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University for award of any degree of the same is certified.

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This certified that the above statement made by the candidate is correct to the best of my knowledge.

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Mr. Bhaktapriya Mohapatra

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Examiner-II

DECLARATION

I am **Irphan Khan**, student of M.Tech (Regular) under Department of Electronics and communication Engineering Lovely Professional University Jalandhar, Punjab hereby declare that all the information furnished in this dissertation project report is based on my own intensive research and genuine. This dissertation does not contain part which is submitted in any other university for the award of any degree.

Date:

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ABSTRACT

The wireless sensor network is the type of Ad hoc network. Wireless sensor network is the self-configuring networks; any sensor node can join or leave the network when they want. In Wireless sensor network no central controller is present, wireless sensor node are responsible for data routing in the network. Wireless sensor network is used to monitor the environmental conditions like temperature, pressure etc. Wireless sensor network is deployed in the far places like forests, deserts etc. Wireless Sensor nodes are very small in size and have limited resources. In such far places it is very difficult to recharge or replace the battery of the sensor nodes. In such conditions, we focus to reduce the battery consumption of the sensor nodes. In this work, a new technique is proposed to reduce battery consumption. It will be based on the dynamic clustering using neural network. Before data transmission sensor nodes form the cluster dynamically using Boltzmann learning of the neural network and weights are adjust according to the situation and it also enhance the efficiency of the dynamic clustering. Experimental results show that new proposed technique is more efficient, reliable and provide more throughput as compare to the existing technique.

CHAPTER 1

INTRODUCTION

1.1. Wireless Sensor Network

The recent enhancements made in the technology involving wireless sensor networks has provided great innovations within the applications that involve it such as the mechanical monitoring, traffic monitoring, cropping, etc. advance creative and productive thoughts are to be generated within this area such that their usage can be more helpful. In the information routing, compression as well as network aggregation, various analyzed methods have been introduced in the recent years [1].

Within a wireless sensor network, there are numerous nodes spread across an area for monitoring the surroundings present. There is a sensor hub present within the network that comprises of sensors, actuators, memory, and a processor and facilitates communication amongst the nodes. The wireless mode of communication is utilized for transmitting the data across the sensor nodes with the help of radio frequencies, infrared etc. and does not include any wired connections within it. A random fashion is set across the nodes and the messages are transferred which thus provides an ad-hoc network environment within the networks [3].

It is not possible for a hub to communicate with the other hubs through any direct links. The range is out of reach and the information thus to be transferred is passed with the help of various nodes that lie within the path in the network. This process is known as multi-hoping communication [4]. For processing requests across the network, various nodes co-ordinate with each other and transfer the data to each other. There is a shared communication provided within the network and so they are not concentrated. One can add as well as remove the nodes within the network in the wireless sensor networks. This can also provide various changes to be made within the network topology. A hub within the network that gathers all the important information is known as sink. Within the time constraints the information can be utilized for certain purposes by exchanging the particular information with the outside world with the help of internet [5].

The battery present within the nodes of WSN is of smaller size. Also the nodes are located at really far distances where human is not able to reach. So the major concern within the WSNs is the usage of battery within them. This also affects the overall lifetime of the nodes and thus the deployment of the network. The sizes of various constraints such as battery size, processors,

information storing memory and so on are important within these networks. The consumption of energy is required to be advanced within the networks with the help of various optimization algorithms. Various time constraints are present within the detected and routing information sent across the WSNs. Before any alterations, the information can be utilized by the network. For communicating the information across the network, the energy consumed is more as compared to the other executions. Thus, it is very important to address the energy conservation issue in the WSNs [6].

Instead of the single sensor hubs placed within the network, the distributing sensing allows the sensing nodes to be positioned neared to each other. For locating the nodes in a prominent manner, proper sensing methodologies are to be utilized in cases where locations are not easy to be defined. Numerous sensor nodes are utilized here for the identification of various environmental problems arising within the surroundings of the network. There is no framework provided for the energy or communication within the surroundings that are to be monitored. There is limited amount of energy to be consumed and data to be transferred within the wireless channel. Some basic criteria are to be followed here for providing such facilities within the network [7]. Another important task for the WSNs is the ability of preparing distributed networks. The communication occurring within the network acquires energy and so this is of major concern within the network. Other operations however do not acquire much energy as compared to the communication. There is more energy depletion within the network once the sensor nodes communication over larger distances. Various operations are to be performed by these communications. The issue can be handled on the personal basis but the main goal here is no reduce the total number of bits that are being transmitted across this communication. This is to be handled through smarter operations [8].

The monitoring of sensor is done for examining the environmental conditions surrounding the nodes of the network. The information gathered is helpful for applications of various fields such as industries, commercials, public as well as consumer applications. There are various factors to be ensured such as the expansion of security, convenience etc. This helps in arranging the sensors for the utilization of clients.

The degrees of profits within the WSNS can be determined by the organizations through various factors such as [9]:

- Reduction of energy utilization

- Security enhancement
- Providing convenience
- Minimizing the cost expenses of labor

Energy consumption can be diminished by building automation framework, all things considered by somewhere around 5% and 15% more for which are inadequately kept up and more seasoned structures. To give great information resolution over the environment, better gadget integration and utilization of control systems, only an adequate number of sensors are required, beyond most wired building sensor networks can give. Energy consumption in a sensor node can be attributed to either “useful” or “wasteful” sources.

Valuable energy utilization can be due to [10]:

- Send and receiving the data
- The processing of requests generated
- The data is forwarded to the neighboring nodes

Extravagant energy consumption can be due to:

- Continuously hearing the media
- Sending the packets numerous times due to packet collision
- Overhearing
- Creating or managing the control packets

1.2. Characteristics

This incorporates the two sorts of the nodes:

- The sensor nodes with constrained energy can knowledge their own particular outstanding energy and have a similar design.
- A base Station (BS) with no energy restriction is a long way from the area of sensor nodes.

Taking the properties of sensor nodes:

- All sensor nodes are fixed. They utilize the immediate transmission to talk with the base station.
- Sensor nodes knowledge the condition at a settled rate and reliably have the data and it is send to the base station.
- Sensor nodes can modify the transmission energy of the wireless transmitter as

demonstrated by the separation.

- Cluster head execute data accumulation and BS gets packed data.
- The WSN existence is the general measure of time before the fundamental sensor nodes comes up short on power [11].

1.3. Sensor Network Architecture

There are large numbers of sensor nodes present within the architectural design of the sensor networks. The communication of sensor nodes is done through the sensor field across which the information related to their surroundings is transferred to each other. This is depicted in Figure 1. The data transmission can be easily done with the help of these nodes.

There are limited computational constraints to be provided for reducing the overall cost of the networks. Within the devices, the sensing abilities are to be provided. The applications in which the human cannot reach physically include the sensor nodes. This provides the sensor hub to be involved for providing such facilities. The battery power is utilized for deploying these nodes in locations where humans are not able to present. However, the battery life is limited for all such batteries. The usage of power should be in a proper manner such that there is no depletion of energy resources and the lifetime of the node increases. The sensor nodes are closed once they are not of any use within the network.

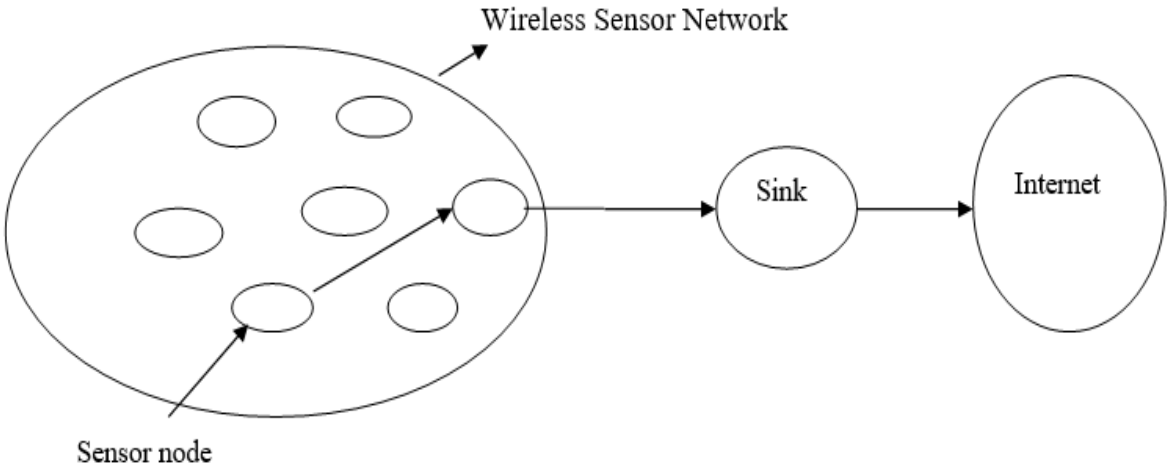


Figure 1: A Wireless Sensor Network

The capacities of sensor nodes are advanced in cases where more applications are to be involved. The applications involve sensor nodes which have advanced properties that are not

present in other methods. The sizes of the sensor nodes vary from millimeter-sized devices that are created in custom silicon to the PDA sized devices that have huge capacities. Figure 1.1 shows straightforward sensor network engineering. Within a sensor field, the constrained capacities are provided by the sensor nodes [12]. The communication is done towards the powerful base station present within the sensor nodes. Internet is used for linking the base station with the internet. The information gathered by the sensor nodes is handled by the control manager. The direct communication of sensor nodes to the base station is not possible by the entire nodes. The connection of nodes with each other is helpful in providing new forms of communication. Due to restricted communication, the sensor nodes are not within the range of the base station. Various applications provide different facilities for nodes present at different ranges from the base station or the gateway. Within the sensor node, the base station is more efficient [13].

1.4. Structure of a Wireless Sensor Node

Processing unit as appeared in Figure 2, inward design of a sensor nodes. It comprises of,

- Power management
- Sensing unit
- Processing unit
- Storage and timing sync
- Transceiver
- Medium access

The structure of a wireless sensor nodes are discussed below:

- **Power management unit:** The power consumption within the sensor nodes is to be managed through this unit. To the maximum limit it can be reduced, it should be done.
- **Transceiver:** Another name for this block is the communication unit as it provides communication channel in which the various ways are utilized for communication. It uses radio, laser, optical or infrared rays for communication.
- **Processing unit:** Along with the storage unit the processing unit works. The sensed data is computed with the help of sensing unit. There is an internal RAM present within the processing unit. The communication with the sensor nodes and the working of the sensor nodes all together is managed by the processing unit. There are other

components such as RAM and microcontroller present within it. There are various components such as operating system and timer that are responsible for storing, processing and executing the events.

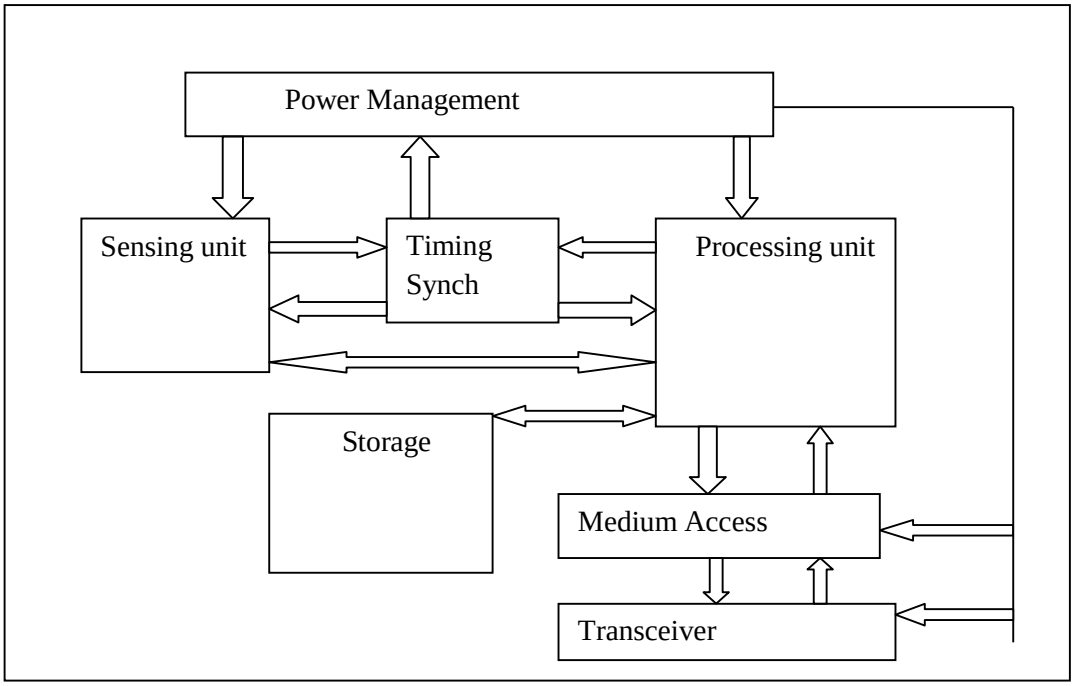


Figure 2: Schematic diagram of a sensor node

- **Sensing unit:** The environmental conditions like pressure, temperature and many other are sensed with the help of sensing unit. There are collections of signals that produce electrical signals which help in forming a block. They are further utilized for sensing the surrounding environments. The transformation of various signals is done through the Analog to Digital converter (ADC). It completely depends on the application regarding which type of sensor is to be involved here. There are numerous sensors to be used in the sensing unit [14].
- **Storage and time synchronization:** There are various components such as storage and time synchronization components. A flash memory is present within the sensor devices for storage purposes. For accessing the shared interfaces, a medium access control unit works with the transceiver. There are also many potential external sensing units present

along with the battery which helps is providing power to the sensor device. Other components such as antenna help in localizing the sensor within the network [15].

1.5. Features of Sensor Networks

1.5.1. Lifetime

In sensor network, sensor nodes have constrained battery power, so the life time of sensor nodes is less. Lifetime is more vital in some more basic applications. Despite the fact that it is frequently accepted that the transmit power connected with packet transmission represents the sensing, signal handling and even equipment operation in standby mode use a steady measure of power also. In a few applications, additional power is required for large scale actuation [16]. At the physical layer routing and channel access protocols could be advantage to trade the information. Lower radio obligation cycles and dynamic scaling can be helpful at physical layer for power expenditure. The failure of the sensor nodes because of battery reduction ought to stayed away from by utilizing energy-proficient routing.

1.5.2. Flexibility

The sensor networks are self-motivated in environment and they can adapt the adjustments in nodes thickness and topology. Sensor networks ought to be versatile. In observation applications, the majority nodes may stay tranquil as long as nothing fascinating happens. In any case, they should have the capacity to respond to exceptional occasions that the network expects to think about with some level of granularity [5]. In a self-recuperating minefield, various sensing mines may rest as long as none of their companions blasts, however need to rapidly get to be operational on account of a foe attack. In control application, respond time is exceptionally basic (sensor/actuator networks) where the network gives a delay-ensured service [17]. In sensor network, nodes are self-configured and nodes can without much of a stretch adopt the distinctive conditions. In sensor network, if there is a failure of character sensor node, the wireless sensor network is vigorous to alter in its topology. In wireless sensor network the connectivity as well as coverage in the sensor nodes are dependably to be ensured .The connectivity is accomplished if every node is linked to base station (BS) direct or not direct. To make sure the network coverage, to gauge the nature of services is given by network specifically zone. Complete coverage is especially critical for observation applications.

1.5.3. Maintenance

The maintenance in a sensor network is essential. The sensor network is upgraded finished or halfway above the wireless channel. The entire sensor nodes ought to be upgraded, and the limitations on the size of the fresh code ought to be the similar as on account of wired programming. Packet misfortune must be represented and ought not to obstruct right reprogramming [5]. The code which is continually running in the nodes, ought to uphold to reprogramming like a little impression, and upgrading systems ought to only aim the brief disturbance of the ordinary function of the node [5]. The failures can happen because of numerous reasons like battery depletion to flighty outside occasions, may either be autonomous or spatially related. Adaptation to internal failure is especially pivotal as ongoing maintenance is once in a while an alternative in wireless sensor network applications [18]. The configuring of self nodes ought to permit to employment procedure run easily with no human interaction, the nodes are put in given particular land territory. The nodes ought to have the capacity to survey the nature of the network deployment and show any issues that may emerge, and in addition adjust to changing environmental conditions via automatic recon-figuration [5]. Time synchronous is must to participating among nodes, for example, information fusion, channel entrance, synchronization of sleep mode, or security-related interaction.

1.5.4. Data Collection

The network connectivity as well as coverage is present within the data collection. The pervasive mobile agents which move around in a random manner provide a better solution for it. The data crossing is accumulated across various sensor nodes and access points. The data is present within the base station is known as the centralized type of data. However, the accumulation of data in such manner can affect the lifetime of the network [15]. The non-uniform power consumption designs are provided by the relaying data towards the data sink. This might result in providing burden within the sensing nodes. The nodes which provide end links to the base stations suffer more than the other nodes. The traffic that comes from each node can relay which might further result in providing limited throughput within the network. For the purpose of transferring information within the sensor networks, the classification technique can be utilized. The cluster head is the main point to which all the data is sent from each of the nodes present. The data received here is then sent to the sink. Within a cluster, there is single node which is denoted as the cluster head and the rest of the nodes form the clusters.

There are less number of packets transmitted and the energy consumption is in a uniform manner such that the periodic re-clustering can be given. The correlated measurements are changed with the help of aggregation process which further also helps in reducing the redundancy of data [19]. Towards the sensing nodes various applications are provided. With a specific area, the main goal for instance can be to provide data to particular location within the network which also has various other nodes. The gander at a sensor network as a database is given by the database within the sensor network. The data is protected by the sensor nodes from the external nodes. However, there are various situations in which the security of the network can be compromised due to the lower-end sensor node hardware [20].

1.6. Applications of Wireless Sensor Network

Here are numerous applications of Wireless sensor networks which have enlarged considerable fame because of their flexibility in taking think about of issues in different application fields Such as:

1.6.1. Military Applications

Since most of the common learning of sensor the network is basic to the military application to the beginning, for the most part the two fundamental tasks the DSN and the Sensor Information Technology (SenIT) structure the Defense Advanced Research Project Agency (DARPA), the sensor networks are joined effectively in the military detecting [21]. Presently wireless sensor network are more basic for military command, control, communication, enlisting, knowledge, observation, surveillance and concentrating on structures. WSN is moreover a part of military applications.

In the battle region setting, brisk sending, self-affiliation, adjustment to non-basic disappointment security of the framework ought to be required.

The sensor contraptions or nodes ought to give taking after organizations [22].

- Monitoring well-disposed military, equipment and explosives.
- Battleground supervision.
- Reconnaissance of inverse powers.
- Targeting.
- Battle harm appraisal.
- Nuclear, organic and concoction assault discovery observation.

1.6.2. Health applications

By and by Sensor systems are correspondingly used as an element of restorative administrations region. In specialist's office sensor systems are used to analyze calm physiological records, to deal with the prescription association track and monitor patients and authorities and inside a recuperating office. In spring 2004 a couple authority's office in Taiwan even utilize RFID essential of past named applications to get the conditions at first hand [23].

Long-standing nursing home: this application is concentrate on nursing of old individuals. In the town cultivate cameras, weight sensors, presentation sensors and sensors for acknowledgment of muscle advancement construct an unpredictable system. They strengthen fall recognizable proof, stupor like state acknowledgment, earnest symptom investigation and dietry/work on watching. These sort of utilizations decrease work quality cost and smart the response of rise condition [24].

1.6.3 Environmental Applications

Today a sensor network are also related in ecological applications like common surroundings observing, horticulture inquire about, flame identification and activity control. By using sensor network like a piece of natural zone, there is no interference to the earth sensor networks are not strict as in forefront.

Bush fire response: Natural screen and disaster reaction is negligible exertion circled sensor arrange. The sensors planned system uniting on the ground and these sensors observing neighborhood humidity levels, clamminess, wind speed and course, simultaneously with the satellite imagery and long haul meteorological gauging that will be enable the guarantee of flame risk levels in centered districts and what's more critical data on possible fire bearing. This is a system which will give noteworthy knowledge of hedge fire headway or more all help summoning voices in sorting out a composed disaster reaction that will keep lives and material goods by giving early advised to high danger areas [25] information accumulated through sensor systems may be immediate water system or gathering to improve excellence, giving winery proprietors and administrators a predominant profit for their investment [26].

1.6.4 Home Application

Today by rising business utilization of sensor systems, it is no so extraordinary to picture to support house application will wander into our run of the mill life in the future [27]. While you are come back to home, gateway sensors remembers you are at the front of the entryway, the

portal will routinely open and after you come in into the house the way will close itself. All the switches of the room in which you are sitting or standing will actually turned on like tube light, fan, cool. When you sit on lounge chair, the sensor which is passed on under the cushion distinguish your weight and on the table light and turned on TV. One sensor has watched that you are sitting before it [28]. The mid-year occasion in Asia is truly anguishing. You think and turn down the temperature of the ventilate. In the room the sensor can find out the room temperature [29]. There is also sensor inside the circulate air through and cool. Regardless, it can simply get the temperature by the edge of the machine not the genuine temperature inside the room. Thusly the sensors in the room will see the environment [30]. The ventilate will swing to rest mode until every one of the sensors find the exact temperature. The light on the antechamber, in the washing fortunate man and show are out and out exhibited through sensor and they can be turned on or turn out again and again. Undoubtedly, even the women are in like way appended with vibratory sensors joined to police to against cheat. You see to be restorative delegate and gatekeeper at the same time [31].

1.7 Challenges in WSN

The sensor network incorporate a considerable measure of specialized difficulties reasonable to different variables as given:

- **Ad hoc deployment:** A substantial bit of sensor nodes are sent there which have no infrastructure by any methods. An unmistakable technique for work in a wilderness would deploy the sensor nodes from an airplane. In such a circumstance, it is up to nodes to recognize its availability and distribution [31].
- **Unattended operation:** Inside the sensor network when sensor nodes are sent with no human interface this sort of sensor network can basically reconfigure itself and receive the adjustments in the environment, if a few changes are arise [32].
- **Untethered**: The sensor nodes are not allied with any power source. There is essentially a compelled resource of energy to a sensor node, which must be in a perfect world use for processing and communication like as the battery power. An alluring truth is that the communication overwhelms processing in power utilize. In this way, remembering the ultimate objective to make legitimate to usage of energy, communication must be limited as much as feasible [11].

- **Dynamic changes:** Sensor network is self-roused in nature. The nodes of sensor are configurable itself. Sensor nodes are effortlessly adopting the adjustments in the sensor network because of including of extra sensor nodes in the network and failure of any node.
- **Fault tolerance:** Adaptation to non-critical failure intends to keep up the network in a shape with the point of, in the event that one node dies then it can't affect alternate nodes. A versatile protocol are produced to keep up other network unchanged [33].
- **Security issues:** most of the dangers and assaults against security in wireless network are skirting on like their wired accomplices while some are exacerbated with the incorporation of wireless network. Really, sensor network are normally more powerless against various security dangers like the unguided communication medium is more helpless against security assaults than those of the guided communication medium.
- **Synchronization and Localization:** In a few applications the information obtained in all nodes makes sense whole and in this manner should be synchronized. Clock synchronization is a fundamental administration in sensor networks. And the Time Synchronization in a sensor network hopes to give a typical timescale to adjacent checks of nodes in the network. A worldwide in a sensor system will plan and separate the information effectively and anticipate future structure direct. This is not as unimportant as it could appear in light of the way that there are delay in transmission and there is no communicating clock to synchronize nodes. This is an essential test in WSN [35]. The localization of sensor nodes using just the relative places of the sensors is likewise an essential test in sensor systems. This is basic and explored area in which various procedures have been made, for example, abusing got sign quality markers, time of arrival, time contrast of entry, or angle of arrival .Distributed algorithm are assuming an extraordinary part in expanding precision [36].
- **Short Range Transmission:** In wireless sensor systems we need to consider the short Transmission go remembering the end goal to lessen the likelihood of being listened stealthily. As in long keeping in mind the end goal to reduce the likelihood of being listened in. And in the high range transmission we require high transmission control because of the indicate position transmission between the nodes to achieve the

destination which expands the chance of being eavesdropped [37].

- **Energy consumption:** The energy utilization is an imperative test in WSN. As the sensor nodes are little in size and outfitted with a foreordained number of energy source. The sensor nodes are subject to the battery which is greatly difficult to supplant in view of the physical limitations. In view of this reason a considerable a lot of analysts are concentrating on the formation of energy mindful protocol and algorithms. As the straightforwardness sending is one acclaimed preferred standpoint of sensor system. Limited processor data transmission and little memory are two suspicious requirements in sensor network, which will vanish with the headway of creation frameworks. Regardless, the vitality requirement is unreasonable to be understood soon in light of direct advance in making battery confine. The untended way of sensor nodes and unsafe detecting environments block battery substitution as an attainable arrangement. Then again the reconnaissance way of various sensor network applications needs an extended lifetime it is a basic research problem to give a kind of energy productive surveillance service for a geographic area.

1.8. Energy Consumption Issues in WSN

In WSN the primary issue is constrained battery existence utilized by sensor nodes. The sensor nodes are little in size so constraints are there similar to battery size, processors, stockpiling for data, these all are little as sensor nodes. Therefore the fundamental spotlight on upgrading energy expenditure in wireless sensor networks [38]. In wireless sensor network a considerable measure of detected data and the routing information must be sent which regularly have a little time constraints so that information can be used prior to any incident happens, e.g. industrialized monitoring, hardware monitoring, and so on. In WSN the energy expenditure is greatly higher in data communication than interior preparing. Therefore energy management in WSN is should be addressed [27].

WSN are prone to node breakdown because of power misfortune. Keeping in mind the end goal to give reliable service through the network, the network ought to act naturally adjust and should have flexible properties as essential from instant to instant [39]. A jam node may experience failure because of constrained battery existence. In this case the network protocol ought to be sufficiently clever to hold such failures and makes the network to operational.

Sensor nodes are for the most part depend on a battery with limited life span, and their substitution is impractical in view of physical requirements. The design and protocol of sensor systems ought to have the ability to degree up any number of sensor node [40]. Since the life time of batteries can be longer on the off chance that we figure out how to diminish the measure of communication, in part of the sensing subsystem power expenditure can be bargain by utilizing small power components.

1.9. Clustering of Sensor Nodes

Clustering is a methodology, used for sparing the energy of sensor nodes .Throughout productive network association every one of the nodes in wireless sensor network can be divided into little groups is known as clusters. The cluster has cluster head in every cluster and besides this all the nodes are individual from that cluster [40]. In the clustering there is two level of order in which nodes frame the lower level while cluster head shape makes higher level. The mechanism of clustering includes for grouping the nodes into clusters and choosing cluster heads from time to time such that individual's node from a cluster can talk with their cluster heads and these types of cluster heads send aggregated data reached from its individuals to a base station. So the cluster head regularly transmit data over longer separations, they drop more energy compared to part nodes [23]. The procedure of clustering is used to decrease the power utilization. Due to utilization of clustering, the packet collision reduces and channel argument increases the throughput of the network in higher load. The lifetime of the sensor networks is enhanced by the clustering. Lifetime is the essential element to assessing the execution of the sensor networks [41]. The approaches of the clustering can't apply directly to wireless sensor networks, in light of the fact that these networks has one of a kind deployment and operational qualities. WSN are sent in ad hoc way they have a bigger quantity of nodes. Nodes are unaware of their locations in ad hoc network [42]. Therefore, distributed clustering protocols that rely simply on neighborhood information are chosen for WSN [43].

We realize WSN, the nodes lying on battery power which has constrained energy. Because of the several surprising failure of node, the re-clustering is fundamental as the cluster needs like residual energy and node quantity, this kind of clustering is known as dynamic clustering. The procedure of the clustering is utilized to spare the energy of battery. At the point while utilizing clustering as a part of sensor network, the workload on the cluster head is in this manner bigger

than for non-cluster head .In the sensor network amid the lifetime due to change the cluster head, to circulate the work load and energy expenditure.

- **In heterogeneous sensor networks:** There are normally two kinds of sensors, the sensors which have a higher processing capacities and complex hardware. This kind of sensors is utilized to make some kind of backbone inside the wireless sensor network being preset as the cluster head nodes and furthermore fill in as information authorities and preparing communities for information assembled by other sensor nodes [43]. Regular sensors, with lower capacities, used to truly detect the coveted characteristics in the field. In homogeneous network, all nodes have similar qualities, hardware and get ready capacities i.e., this is the normal conditions when sensors are passed on in front lines. For this sort of conditions each sensor can turn into a cluster head [44].
- **In homogeneous sensor networks:** To acquire quick execution convergence and flexibility of the quantity of nodes in homogeneous sensor networks is to be finished by distributed cluster head [43]. There are additionally a couple approaches utilizing centralized or half and half methods, where one or more organizer nodes or the base station is capable to divide the complete network disconnected from the net and control the cluster participation. They are normally not appropriate for handy broadly useful substantial [43].

1.9.1. Clustering parameters

Before the formation of the clustering, the clustering algorithms fulfill every conditions designed for clustering which are essential for clustering in wireless sensor networks. Some parameters which are significant for entire clustering processor in WSNs, is mentioned below.

- **Number of clusters:** In nearly all new probabilistic and random clustering algorithms the cluster head selection and configuration process lead in nature to uneven number of clusters [45]. In various techniques, cluster heads are previously defined and number of the cluster are also fixed. For effectiveness of whole routing protocol the number of cluster is extremely serious parameter.
- **Intra-cluster communication:** Single-hope communication is utilized as a part of early clustering techniques wherever the cluster head and sensor nodes are imparting straight. For the communication between cluster head and the sensor node multi-hope

intra cluster communication is necessary in this huge number of sensor hubs and communication range is confined. So here cluster heads is encircled [46].

- **Nodes and cluster head mobility:** If we suppose that cluster head and the sensor nodes are fixed, there is a led to steady clusters through facilitated intra cluster and inter-cluster network organization. If the sensor node and the cluster head to be mobile, in this situation the member of cluster and cluster head are moveable. They can change their positions continuously [47].
- **Nodes types and roles:** In heterogeneous condition the cluster head has a larger number of abilities than different nodes like extra communication property and calculations. In homogeneous condition every one nodes have an identical abilities from cluster head.
- **Cluster formation methodology:** In recent methodologies, when cluster heads are quite recently customary sensors nodes and time effectiveness is an important outline foundation, clustering is being performed in a dispersed way without synchronization [48].In a centralized approach at least one sensor node are organizer node which are utilized for to control the cluster individuals and to parcel the entire system disconnected.
- **Cluster-head selection:** In heterogeneous condition the pioneer nodes of the cluster is pre-doled out. Pre-doled out node turn into the cluster head. In homogeneous conditions the CHs are selected from the sent arrangement of nodes either in a probabilistic or in an entirely random manner or in light of further more particular criteria [49].
- **Algorithm complexity:** The essential plan objective is the quick end of the executed protocol in latest algorithms. The time multifaceted nature or union rate of most cluster development methodology proposed these days is steady or quite recently subject to the quantity of CHs or the quantity of hops [3]. In some prior protocol, be that as it may, the many-sided quality time has been permitted to rely on upon the aggregate number of sensors in the system, centering in a totally extraordinary criteria first [50].
- **Multiple levels:** The thought regarding multi-level clustering hierarchy of command in some clustering methodologies is acquainted with accomplish even enhanced energy assignment and entire energy use rather than by means of just a single cluster level [51]. Particularly when there is an availability of huge networks and inter CH

communication effectiveness is of high significance so advancement are obtainable by multi-level clusters are in learn.

1.9.2. Classification of Clustering Techniques

In wireless sensor network the clustering algorithms calculations can be additionally isolated into two guideline orders relying upon cluster development criteria and parameters used for cluster head selection [53].

- Probabilistic (arbitrary or random) application: Low Energy Adaptive Clustering Hierarchy (LEACH), Energy-Efficient Hierarchical Clustering (EEHC), Hybrid Energy-Efficient Distributed Clustering (HEED), and so on.
- Non probabilistic clustering algorithms: Graph-Based Clustering Protocols node proximity, Biologically Inspired Clustering Approaches Weight-Based Clustering Protocols.
- In wireless sensor network the clustering process is involved for grouping of nodes forms cluster and selecting the cluster head such that [23].
    - The individuals from a cluster can communicate with their cluster head (CH) straightforwardly.
    - The cluster head can permote the amassed information to the central base station through different CHs.
- There are numerous strategies that are utilized as a part of clustering these are LEACH, and numerous more enhanced types of LEACH like E-LEACH, LEACH-SM, multi-hope LEACH, ENCM et cetera. LEACH protocols contains two stages [14].
    - **Cluster set up phase:** In this stage the every node portrays regardless of whether to wind up a cluster head for present round. Every one of the nodes pick an arbitrary number 0 or 1 for complete a decision. A threshold worth is setup, if the quantity of the node is not as much as threshold quality, at that time the node turns into a cluster head for present round.
    - **Steady phase:** The network will pierce the firm stage while the cluster head dole out time slots to its individuals for utilizing TDMA mode. Into frame, steady stage is isolated where nodes drive their information to the cluster head at most once per frame in the midst their allotted transmission slot [14].

In LEACH protocol the selection of cluster head node has some deficiencies such as:

- Some very small clusters and some very big clusters may be present in the network at the similar time.
- Awkward cluster head selection whereas the nodes have dissimilar energy.
- Member of cluster nodes deplete energy after the cluster head was dead.
- The algorithm does not consider the nodes location.
- Ignores remaining energy, geographic area and other data, which may effectively prompt cluster head node will quickly fail [16].

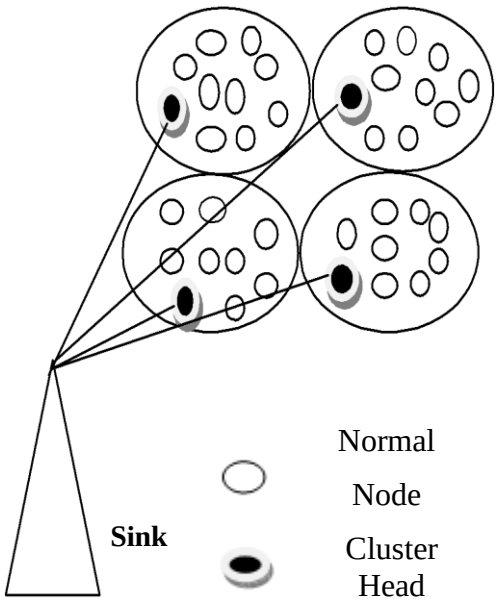


Figure 3: Single hop with clustering

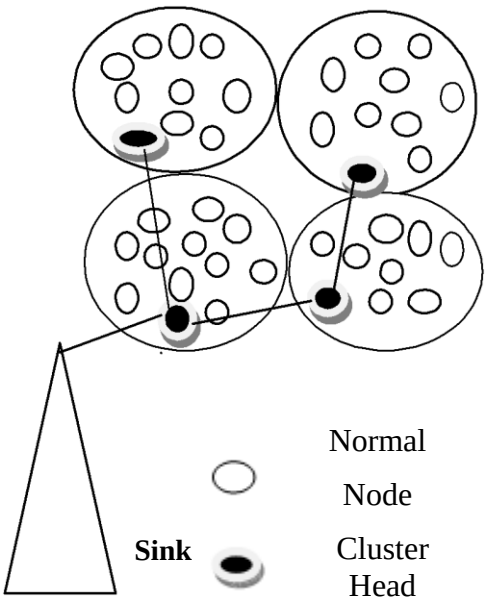


Figure 4: Multi hop with clustering

The clustering is appeared in above Figure 3 and Figure 4. Figure 3 demonstrates that clustering with single hop. Figure 4 shows the clustering with multi hop. In the above figure 3 and figure 4 the three cluster is performed by the LEACH. Dark node is the cluster head which mentioned in cluster. All white nodes are the individuals from the cluster these are not cluster head. In a cluster the cluster head is changed arbitrarily by any clustering protocol. To changing the cluster head between each cluster node is to disperse through the network load. Along these way the execution of the whole network is enhanced and can be accomplished lower energy utilization.

1.9.3. Disadvantages of the LEACH

LEACH protocol has a few issues rather than plane multi – hop routing and static routing, since it draws out the network lifetime. In this type of protocol the cluster head is chosen arbitrarily, so every one of the nodes can't be cluster head. The circulation of cluster heads can't be guaranteed. In the cluster every one of the node have same need to become a cluster head bunch with low or high energy. In this manner, those nodes with less residual energy might be picked as the cluster heads which will come about that these nodes may kick the bucket first[54]. LEACH can't be utilized as a part of huge scale wireless sensor networks for the point of confinement compelling correspondence range of the sensor nodes, on the grounds that the cluster heads communicate with the base station in single - hop mode [54].

1.9.4. Need of clustering

- **Load balancing**: The cluster heads needs broad energy consumption to receive total information from member nodes and to transmit the received information to base station. This can be situated a long way from the particular network. In this way, by rotating the part of cluster heads, load can be distributed similarly with all nodes in the network [6].
- **Optimal number of cluster heads:** In a few methods, the cluster head is resolved from the earlier. Accomplishing the ideal number of cluster heads guarantee the slightest energy dissemination in the network and subsequently, reduce power utilization with a specific end goal to delay arrange lifetime [6].
- **Maximum network lifetime:** Sensors are asset limitation and subject to their batteries as wellspring of energy, in this manner, the lifetime becomes noticeably essential thought in network sensor topology design [6].

1.10. RFID Protocol

RFID (Radio frequency Identification) is a contactless programmed identification mastery that depends on radio frequency. There are commonly two sorts of RFID as indicated by the power source: active RFID and passive RFID. Active RFID is less beneficial than passive RFID as far as its label cost, size, and battery administration, yet more focal points in term of detecting nature, its nature, detecting rate and detecting separation. RFID is delivered so that physical

data can be put away and identified for quite a while to upgrade nature of the structure what's more of essential capacities.

RFID is self-sorted out innovation. RFID is separated into two classifications:

1) Active RFID

2) Passive RFID

Active RFID/WSN will play out the openness of tag-to-tag communication. Active RFID is less advantages because of its tag size, cost, battery administration however less favorable position through detecting rate, security, and detecting separation. Active RFID spare the energy of label work on the label ID period and information gathering period. The active RFID tag uses the radio module to convey the put away physical data to the reader. RFID gives the indication of multipoint (P2MP) communication structure where the per user controls the labels. To decrease the energy utilization of the tag, the reader controls the energy that the radio module devours by making the tag work in the active and rest periods. The reader transmits a gathering charge to different labels, which convey the ID to the reader by methods for conflict. Information accumulation period, the reader assembles the information on the labels that are identified from the label ID gathering period utilizing their IDs, through the indicate point (P2P) strategy.

The active time frame is isolated into the label recognizable proof period and information accumulation period. The id time frame is called dispute period. A reader can transmit an order to various label which in like manner convey id to reader by methods for conflict. In the information accumulation period, the reader assembles the information on the labels that are recognized from the label ID gathering period utilizing their IDs, by methods for the indicate point (P2P) technique. At that point the rest summon slaughters the radio module of the tag from which the information have been assembled. This is known as the accumulation time frame (CP). The reader rehashes this technique until every one of the labels inside its correspondence reach.

These methods are hard to apply, in any case, in light of the way that their communication structures differentiate from those of the active RFID system. The MAC of the active RFID has a reader central communication structure, wherein the user controls the correspondence of the considerable number of tags. The MAC of WSN has a shared communication structure, wherein all nodes control their own communication frames. If each one of the nodes need to

control their own particular communication frames in WSN, the communication direct ought to reliably be in the carrier detecting and the medium must be involved through RTS/CTS. The control of the medium is just for the Tx and Rx nodes, and the rest can't pass on. In case the tags in the active RFID structure utilize conveyor detecting, every one of the tags must lead transporter detecting an indistinguishable number of times from the amount of tags to transmit their IDs. This makes label accumulation delay, which is an extra wellspring of energy utilization. This may prompt the loss of the principal typical for the RFID structure that accumulates tags.

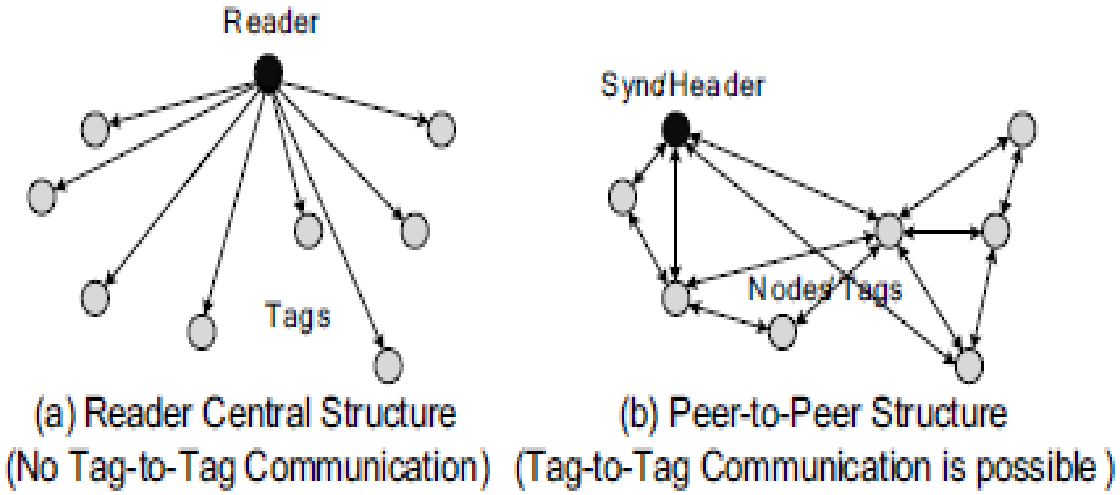


Figure 5: Communication structure of (a) RFID (b) WSN

CHAPTER 2

LITERATURE REVIEW

Chae-Seok Lee et al. [32], Purposed hesitance Aloha for No over hearing that is used to illuminate the tag of its feasible communication for expel over hearing issue .Extensive of energy is lessened because of over hearing is regularly greater than devoured effective communication .to wipe out this issue maker reason count (RANO). A tag has data about the time and term of communication progress since it keep up energetic mode for kept the rest mode because of other communication period. RANO protocol keep the 60 times energy than other protocol.

LI Jian-qi et al. [33], proposed upgraded clustering routing count which need to energy proficiency. In the first place, create cluster head by irregular rivalry in the nodes which have superior in energy; next decide the inward structure of clusters by ascertaining powerfully coziness coefficient of each cluster, from that point forward, update transmission way between cluster heads during improved multi-target molecule swarm figuring.

Yu Wang et al. [34], proposed energy productive and defer tolerant agreeable transmission figuring which show reproductions support that EDTCT beats the store-hold up forward route paying little respect to in E2E rest lethargy and E2E energy utilization. In particular, our arrangement is versatile to thick system and it works adequately in low-commitment cycled WSNs.

Degan Zhang et al. [35], proposed technique forward mindful part (FAF-EBRM).this procedure is used for the accompanying hope node picked by the forward energy thickness and connection weight .The FAF-EBRM contrasted with LEACH and EEUC. The proposed technique changes the energy decrease, work lifetime and give incredible nature of administration and diminishes the probability of active node breakdown.

Nicolas Gouvy et al. [36], proposed PAMAL (Path Merging Algorithm) new topographies routing computation for mobile node .the proposed first routing protocol which is found and

uses ways intersection to adjust the topology to decrease the system activity in this manner while still update energy effectiveness. The protocol makes the crossing point to move a long way from the goal, getting nearer to the sources, permitting higher information total and energy sparing. It improves the network life time 37% than existing.

Peyman Neamatollahi et al. [37], proposed a half and half clustring approach a cluster head diminish of its energy, it by implication advises each other nodes and clustering is usual to start of the forthcoming round. Clustering is performed on request. To expound the effectiveness of recommendation, the disseminated clustering protocol HEED (Hybrid Energy Efficient Distributed) half and half count is used as benchmark case. Through simulation comes about, it exhibits that HCA is around 30% more capable as far as network lifetime than the other protocol. The primary reason is that the clustering is executed on request.

Maciej Nikodem et al. [14], focuses on the theoretical portion of clustering in WSN organizes as plan to improve the lifetime of network. We explore whether clustering itself (with no data accumulation) can pick up network lifetime particularly application when contrasted with non-clustered systems. We use whole number linear programming to separate 1D and 2D networks, having into record capacities of genuine nodes. Our outcomes exhibit that clustering itself can't pick up network lifetime so additional methods and means are required to be utilized as a piece of joint effort with clustering.

Ewa Hansen, et al. [8], discussed that WSN getting to be noticeably basic for creating of energy feasible foundation. They found the base partition remove between cluster heads in a cluster based sensor network, delaying net-work lifetime by bringing down the energy utilization. They performed simulation to choose the measure of vitality is eaten up by sensor network in separating the cluster heads. Furthermore discussed the result of energy consumption for a given least partition separately between cluster heads. They exhibited that wireless sensor network could better performed when they presenting a base detachment separate between cluster heads. It is checked by taking the amount of information was gotten by the base station.

T. Shankar, et al. [28], discussed, in the wireless sensor network the determination of cluster head done by utilizing neural system for energy beneficially used by sensor node. In cluster based routing, excellent node known as cluster heads shape a wireless backbone to the sink. The cluster heads assemble the information from detecting nodes and promote the information to their sink. In homogeneous systems all node have similar capacities .The cluster nodes in heterogeneous network have a bigger number of resources than different node .The saving of the energy in these strategies can be acquired by cluster arrangement, cluster head selection, information accumulation at the cluster head node go to lessen information excess and in this manner save energy. In the cluster each node transformed into a cluster head temporarily period hence they saved energy of each node.

Matthias R. Brust, et al. [38], analyzed various leveled network is made by clustering strategies is called clusters. All the sensor nodes in a cluster choose the cluster head. For choosing of the cluster head in ad-hoc network and in WSN network is primary issue because of their dynamic nature. In this paper the researcher proposed a topological criteria for the robust cluster head candidate election,, flexible to sporadic node versatility and failure and moreover for productive data scattering. In this procedure is to go on a key partition from the periphery nodes to pick the cluster head since they can travel to other cluster whenever again re-clustering will happen and yet again pick another cluster head. This is absolutely depletion of time and extra energy expending. They directed analyses both for static topologies and also for cases in the presence.

Arun K. Somani, et al. [2], proposed in this paper that the clustering in wireless sensor networks can be done with the help of a distributed, light weight, scalable clustering computation. There are extremely exact clustering algorithms provided by the sensors that are sent randomly within the environment. The sizes of the nodes are not similar to each other. The quantity of nodes present is also not the same. The size is put by the radius of the radio signal reach. In the cluster configuration one node could connect the one cluster at a time. The cluster head can impart to other nodes direct or indirect. The cluster head can convey to the base station throughout an superimpose network and intermediates node in the middle. They examined that the clustering performance and calculation via simulation. Outcomes

demonstrate that not very many nodes (less than 5%) are not ready to link a cluster or remain stray, numerous are secluded because of accidental employment and the communication range limitation.

Ebin Deni Raj [7], proposed in this paper that the gateway of cluster head switch routing protocol (CGSR) uses the hierarchical network topology. Each node is placed within the clusters accordingly. Cluster head is selected by any calculation provided within the network. There are various algorithms that utilize advance power consumption for selecting the cluster head within the WSNs. They two deterministic algorithms are LEACH and LEACH with deterministic. There are various parameters also which help in providing the selection of appropriate cluster heads within the network. They are the power efficiency, threshold, density, load balancing, scalability as well as distance of nodes within the network. The communication cost of the network is minimized with the help of the load balancing based algorithms. A density and distance based cluster head is examined along with the many other mentioned algorithms. The simulation results derived propose the comparisons of all such algorithms. The results provided show the various proposed algorithms have their own limitations and a new calculation known as EDR LEACH is also proposed.

Vinay Kumar, et al. [30], proposed in this paper that the lifetime of WSN can be increased with the help of various enhancements made within the WSNs. A path that is chosen for transmitting the data across the network is selected on such basis that the energy consumption is to be the least. Clusters are created within the network with the help of grouping the sensor nodes. This further provides the higher scalability and enhanced data aggregation within the network. An efficient usage of the constrained resources is done by the sensor nodes within the hierarchical wireless sensor networks created by the clusters. Within the WSNs the energy efficient clustering algorithms are put forth. The related LEACH work is provided in this paper and the simulations results are compared.

Limin Meng, et al. [39], proposed in this paper that energy utilization is the most prominent factor within the wireless sensor networks. For increasing the lifetime of the network the clustering algorithms are proposed. To provide a better Quality of Service (QoS) for the

network, various parameters are set which have to be met. An energy aware QoS routing algorithm is proposed in this paper which provides best-effort traffic within the network. This proposed algorithm enhances the first order energy consumption model with the help of dynamic clustering. The multi-objective programming model is built in order to support the QoS of the network. The projected algorithm has provided robust and effective results in comparison to the other algorithms as per the simulation results.

Fan Xiangning and Song Yulin [9] proposed in this paper a detailed study on the LEACH protocol. There have been various enhancements made within the energy-LEACH and multi-hop LEACH protocols. The decision strategy of the cluster head is enhanced with the help of this energy-LEACH protocol. The nodes are selected as cluster heads which have additional energy in the previous round. The communication mode within the multi-hop LEACH protocol is enhanced from single hp to multi-hop within the cluster head and sink. Amongst the LEACH protocols, the energy-LEACH and multi-hop LEACH protocols have proven to be more efficient as per the results achieved by the simulation results. For the purpose of acquiring data from the network, the LEACH protocol has provided better results.

Bilal Abhu et .al. proposed [4] In this paper the LEACH-SM protocol. An ideal energy-saving is provided by this protocol for controlling the spare selections within the networks. The spare selection stage is added to the LEACH with the help of drain SM. There are comparisons made related to the energy consumption and WSN lifetime of both the protocols. The investigational outcome shows that the projected method has provided enhancements within the previous proposed works.

Maciej Nikodem and Bartosz Wojciechowski [14] explained on the theoretical parts of clustering, as an intend to enhance network lifetime. We study whether clustering its can enhance network lifetime specifically with it is application when compared to non-clustered networks. They utilize integration programming to break down 1D and 2D networks, captivating into record capacities of real-life nodes. Our outcomes demonstrate that clustering itself can't enhance the lifetime of network so additional systems and means are essential to be utilized as a part of synergy with clustering.

F.J. Atero, J.J. et al [10] In this paper proposed a new architecture known as HARP which stands for Hierarchical Adaptive and Reliable Routing Protocol. The inter-cluster and intra-cluster hierarchical trees are fabricated with the help of this clustering algorithm. This helps in minimizing the power utilization within the network. The homogenous as well as heterogeneous WSNs can both utilize this architecture as it is scalable. There is a much sorted link fault tolerance provided by the HARP algorithm. The node mobility is also handled through this process.

Dr. M.K Rai [13] proposed in this paper that the cooperative caching provides minimization of the various parameters within the network such as the non-accessibility of data, energy consumption and so on. The related information is stored within the cache memory of the nodes within this methodology. The benefits of caching on the basis of WSN sensor nodes require less power during the processing. This is less as compared to the data transmission mechanism.

D.G. Anand et.al [18] proposed in this paper an algorithm that is randomized which is runs locally at the sensor node for overseeing its function. There is various energy-efficient connected coverage issues which are to be mentioned related to this study. Various predictions and related formulations are provided within this paper which helps in determining the solutions related to all such issues. The three components sensor coverage, connectivity and the energy are required for providing QoS within the WSN applications. With the help of various NS2 simulators the experimental results have been derived. It has been seen that the energy utilization has been minimized along with the coverage of surrounding region. There have been various theoretical studies being proposed related to such sensor related coverage issues.

Maryam Soltan et.al [19] proposed in this paper a location-aware modulation plot. This technique helped in determining how the modulation selection can be straightened along with the adjustment of spatial distribution of energy dissipation over specific area. With respect to other various low-power systems, the network layers might present an execution within the conjunction with the lower power systems. The experimental results have shown that the network lifetime of the WSNs is increased with the help of this method.

CHPATER 3

PRESENT WORK

3.1. Problem Formulation

The degradation of network performance of a wireless sensor network is caused due to the energy depletion. This energy depletion causing in making energy holes in the network. Various energy models have been proposed by many researchers. These models provide different explanations but they also need to be improved. The stability period and lifetime of a network are the major key factors. These factors play an important role in routing protocols through clustering technique. The clustering technique prolongs these factors. The communication in the wireless sensor network through clustering technique is done from one cluster head to another. The reduction of battery consumption and increment of packet overhead is done through this technique. The network load can be divided equally between the cluster heads. This can increase the efficient working of the network. Whenever there is a load imbalancing observed in the network, the battery consumption of the cluster heads is seen to be increasing. This results in reducing the lifetime of the network. The factors such as optimal routing protocols, transmission distance and quantity of data to be transmitted are the key factors that affect the energy expenditure of the network. The requirements in the wireless sensor networks are met by the cluster heads. Similar neighboring sensors are grouped into a cluster. A problem is observed in the network when the data is to be transferred from source to destination. Due to battery failure sometimes, the cluster nodes become dead. Due to this problems such as degradation of network occur which result in decreasing the network performance. So, various techniques such as clustering, re-gridding etc. are used to reduce the energy expenditure. This results in the reduction of energy consumption gradually. The main idea of our work is to apply renovation of grid for WSN networks by neural network approach. Some algorithms can be used in neural networks which can easily adjust the weights. Our work can consider this as an important key point. The difference here is that we adjust the nodes instead of weights according to the capacity of nodes to send for communication. In a cluster, the node having the higher sending ability, is set as of cluster head of the cluster. Only single node can operate as a cluster head in a particular cluster. There are numerous cluster heads in

the network .The process of re-clustering is dynamic in practical which can be balanced by the circumstance.

3.2. Objectives of the Study

1. To study the energy proficient routing protocols in wireless sensor networks and to analyze them.
2. The implement LEACH protocol to provide energy efficient routing.
3. To propose advancement in LEACH protocol in order to take away fault in the sensor networks.
4. To provide implementation to the proposed and existing techniques along with their comparisons in terms of energy, throughput and packet loss.

CHAPTER 4

RESEARCH METHODOLOGY

Reclustering the grids with the help of neural networks in the main concern of our proposed work. In the existing technique the clustering of the grids is static while in our proposed work, the clustering of the grids is dynamic. The situations arising can change and adjust them accordingly. According to the condition and the calculations completed on the basis of battery utilization the node data sent is easily adjustable. The major concern here is to keep away the battery consumption. The selection of the cluster head is also done on the basis of lowest battery consumption through election algorithm.

For instance, let us consider a network which has number of batteries positioned in it each having the data send ability in the milliampere. Each battery available in the network forwards the data from source to destination with the help of AODV algorithm. There are three clusters and so their respective cluster heads are also present. The maximum sensing capacity and minimum battery consumption factors help in selecting the cluster heads. So the battery with both the mentioned factors is chosen as cluster head. Let us assume that the three batteries available in the network containing the ability of sending the data in order of 8 milliampere, 10 milliampere and 12 milliampere correspondingly. Now the cluster head is to be selected to send complete data after it is dead. If the battery of 12 milliampere is chosen as the cluster head, this will drive our data be successfully other than it is not sufficient for any other data transmission behind it and thus proves to be wastage there. If the 10 milliamapere battery is chosen, there is wastage of 2 milliampere and so it cannot be used for another data packet transmission. When we chose of the 8 milliampere battery as a cluster head, the data can be sent through it completely. There is no wastage in it. For choosing the best path or route the minimum battery wastage and minimum hop count factors are also to be kept in consideration. The battery will die after the data transmission. The reclustering of grid starts again in the network.

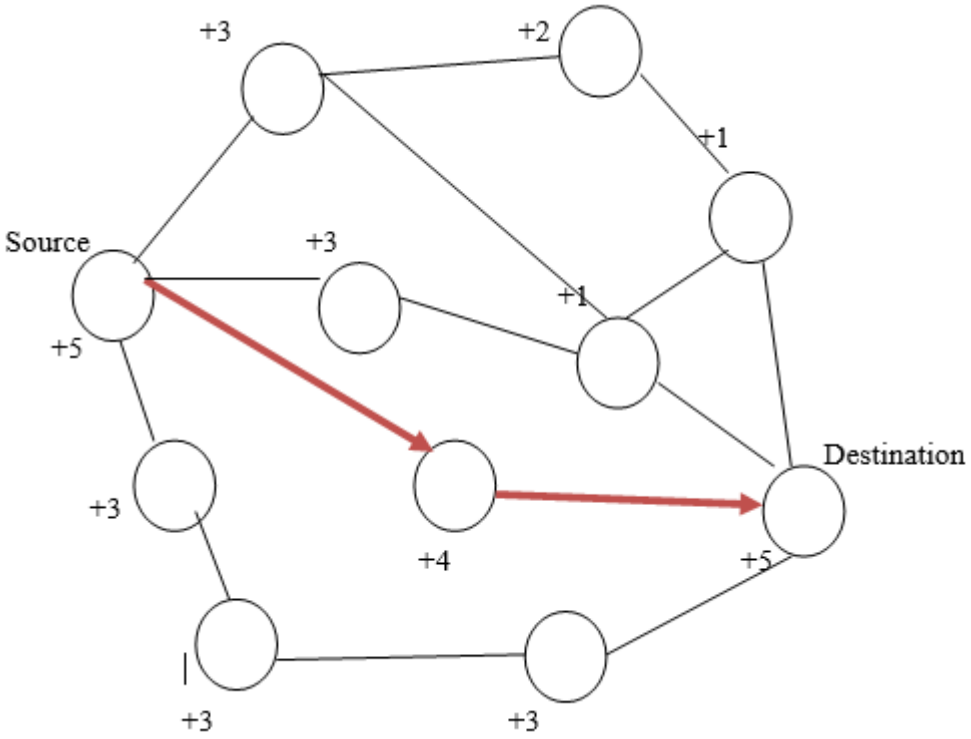


Figure 6: Higher battery nodes are participated for routing

4.1. Algorithm

START ()

1. Deploy sensor network with fixed number of sensor nodes
2. Apply location based clustering to cluster sensor nodes
3. Select cluster head in each cluster using LEACH protocol
4. If (link failure occurred in the network)

   {

   1. Weight=0,bais=0, input=0
   2. R=max(x)
   3. While the whole data get classified into two classes in the for loop do
   4. For i=1 to CS(n) do
   5. If $Y_i(<W_{i,}X_i > +bias)< 0$ then
   6. $W_{k+1}=W_k+Y_iX_i$
   7. K=k+1;
   8. End if
   9. End while
   10. Return Classified data K, The k is the number of classes and x is the data in the classes
   11. Recover path through sensor nodes which has higher rating

   }

   Else

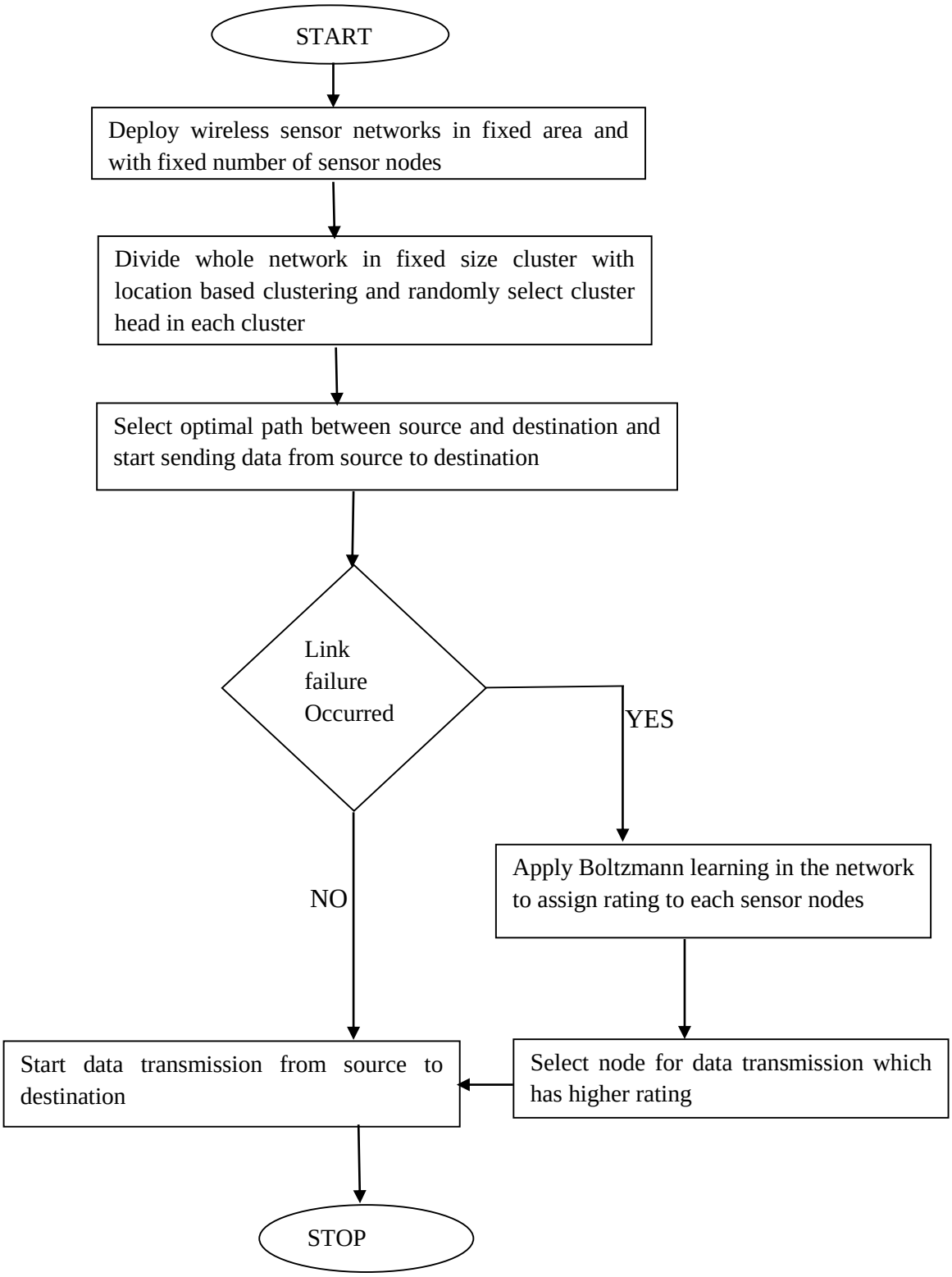
   {

   1. Start communication from source to destination

   }

STOP

4.2. Flowchart



CHAPTER 5

RESUTS AND DISCUSSION

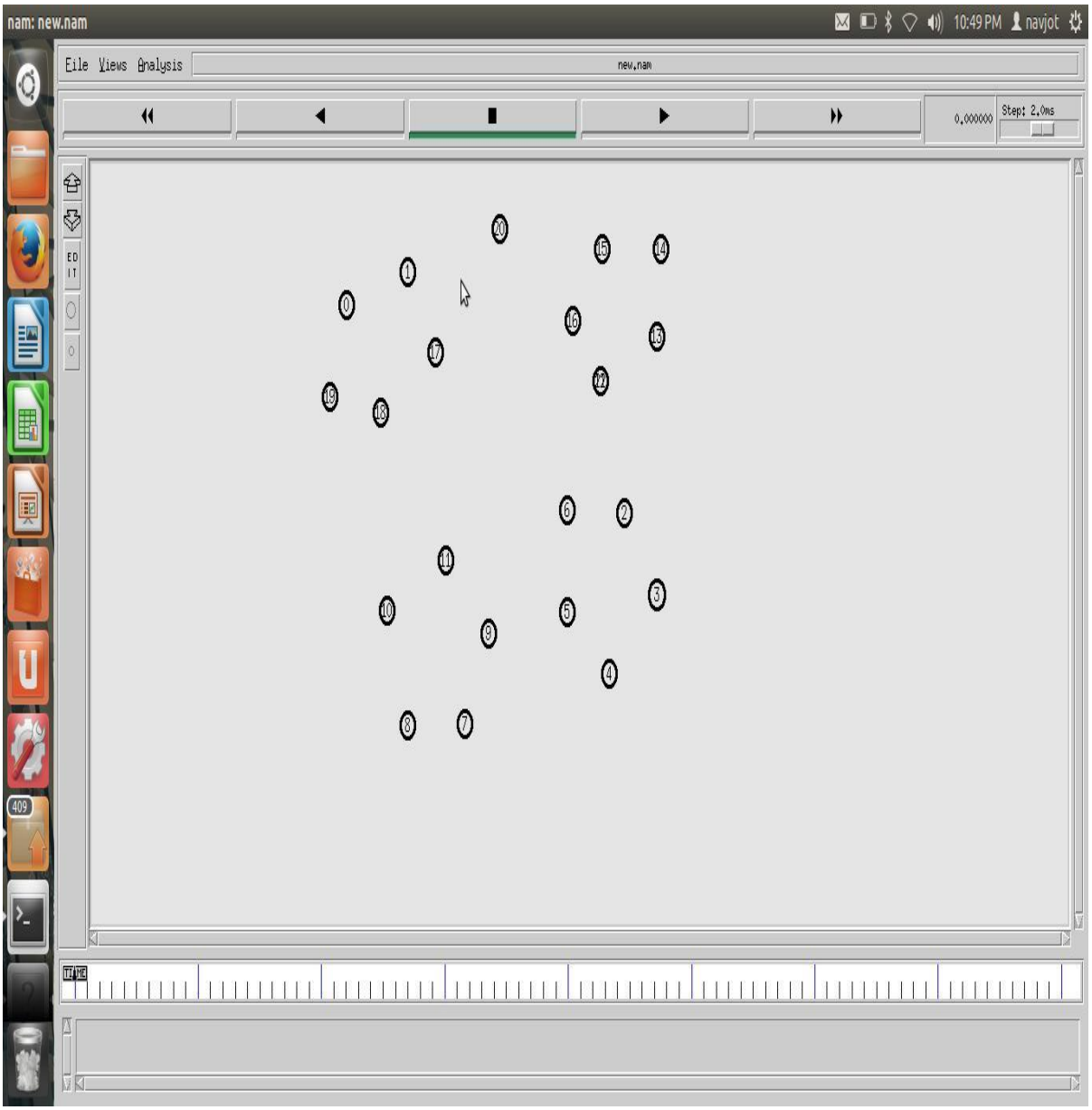


Figure 7: Network deployment

As shown in the Figure 7, limited number of sensor nodes is utilized to convey the wireless sensor network. These sensors nodes can detect the data and furthermore pass it to the sink.

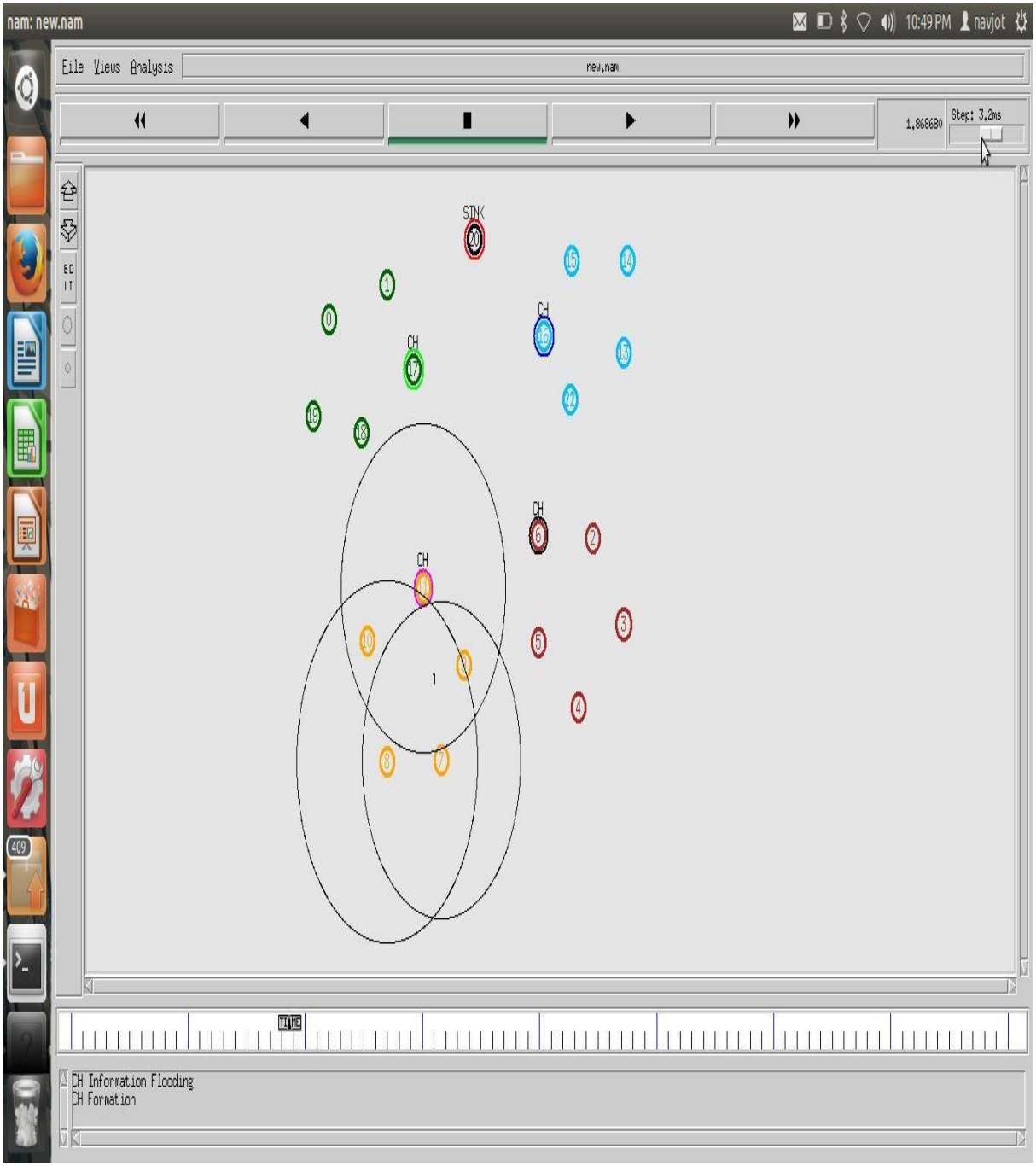


Figure 8: Clustering of nodes

As shown in Figure 8, finite numbers of sensor nodes deploy the wireless sensor network. These sensor nodes sense the information which is further passed to the required sink. Fixed size clusters are created in whole the network.

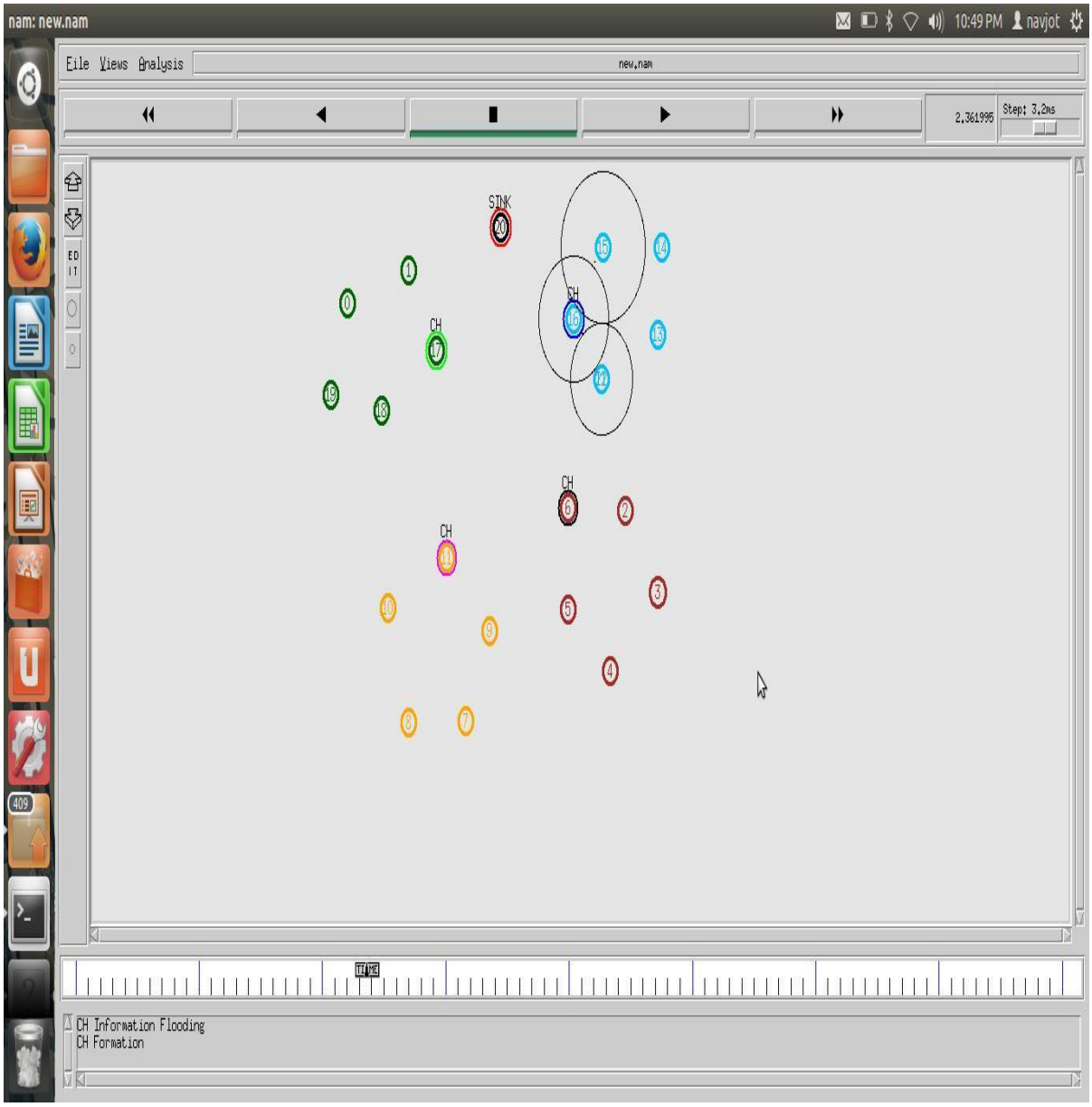


Figure 9: Clustering of nodes

As shown in the Figure 9, finite numbers of sensor nodes deploy the wireless sensor network. The working of these sensor nodes are to sense the information and which is further passed to the sink. In the whole network fixed sized of the clusters are formed. The fixed size clusters are formed in the whole network. The clustered data is aggregated to cluster head which is responsible to pass the information to sink.

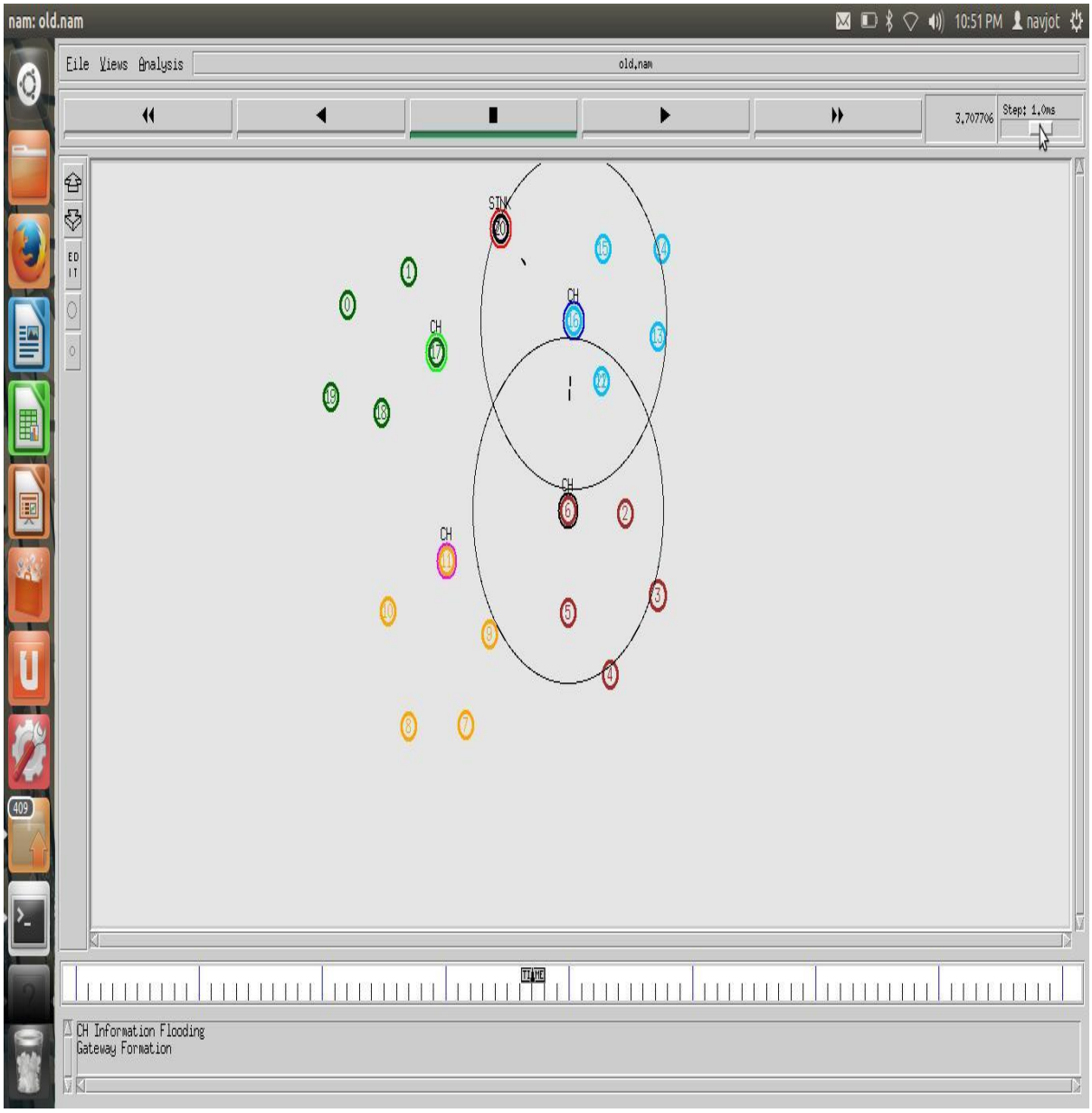


Figure 10: Cluster heads start communicating

As shown in Figure 10, finite numbers of sensor nodes deploy the wireless sensor network. These sensor nodes sense the information which is further passed to the sink. Clusters of fixed size are formed in whole the network. Cluster head is used to amassed the clustered data and this cluster head will pass the information to the sink. Although the communication initiate between the cluster heads and to the sink. The data which is received to the sink is performed by its near cluster head.

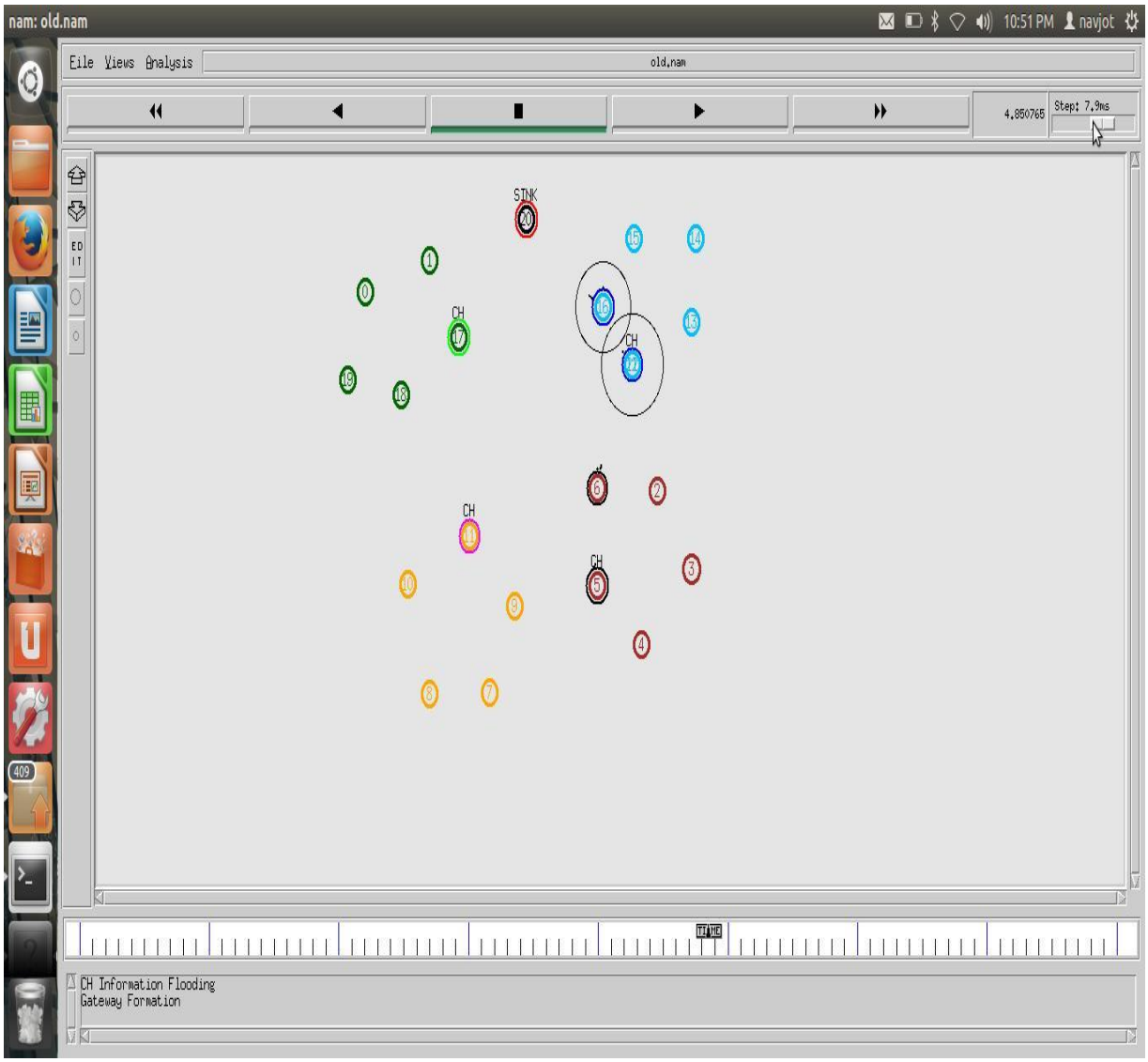


Figure 11: Communicating with cluster head

As illustrated in the Figure 11, deployment the sensor nodes are in limited numbers and is observed in wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The data is passed to the sink through the cluster head. And the data communication begins between the cluster heads. The information from its near cluster head is received by the sink. Further the changing in the cluster heads. After changing in the cluster head a new cluster head are selected, and cluster heads start communicating with each other.

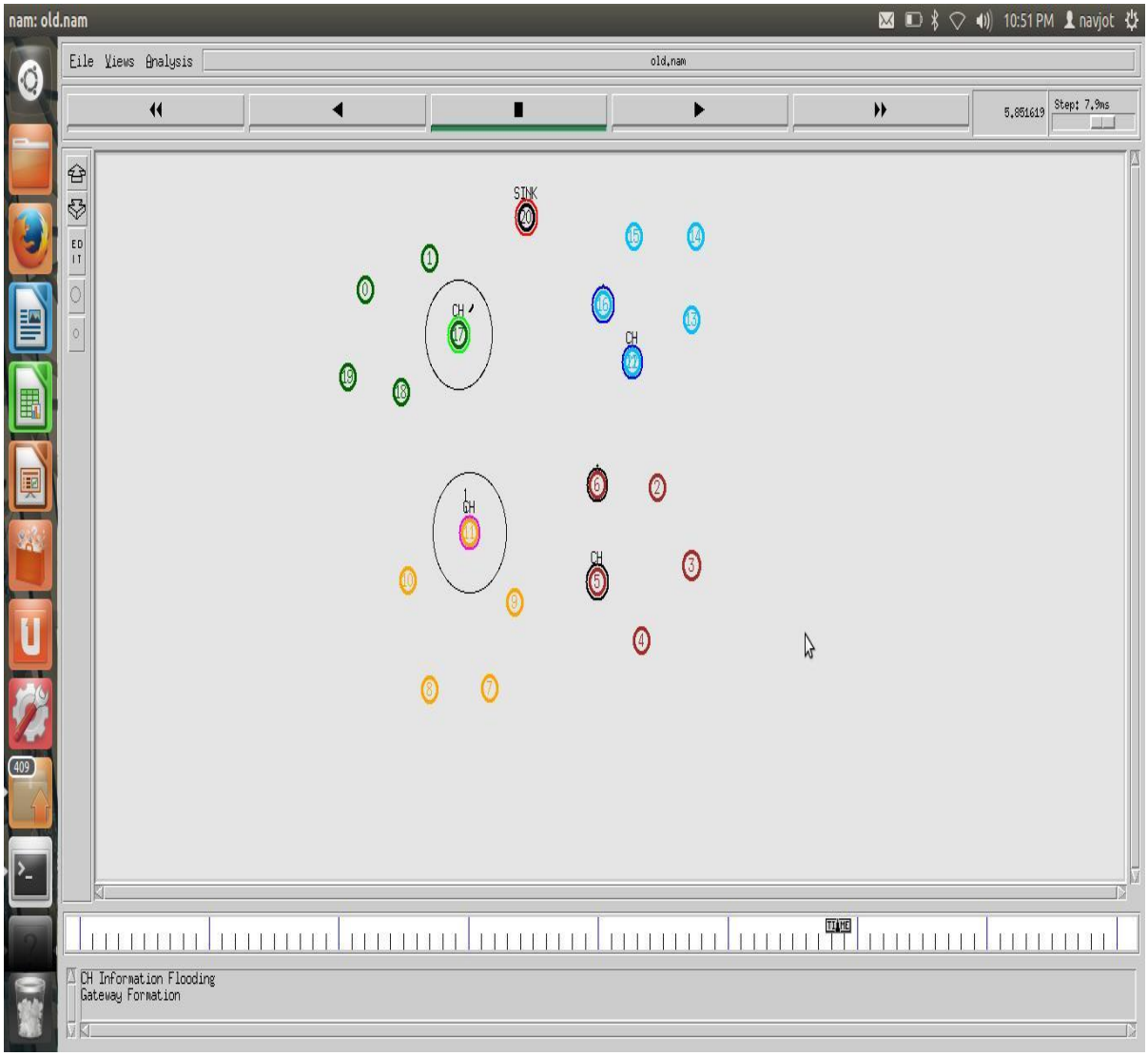


Figure 12: Cluster heads start communicating

As shown in the Figure 12, deployment of finite integer of sensor nodes is observed in the wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information is accepted to the sink through the cluster head and the data communication starts between the cluster heads. The information since its close to cluster head is received by the sink. Further changed the cluster head. And a fresh cluster heads are chosen, and the cluster heads start communicating with each other.

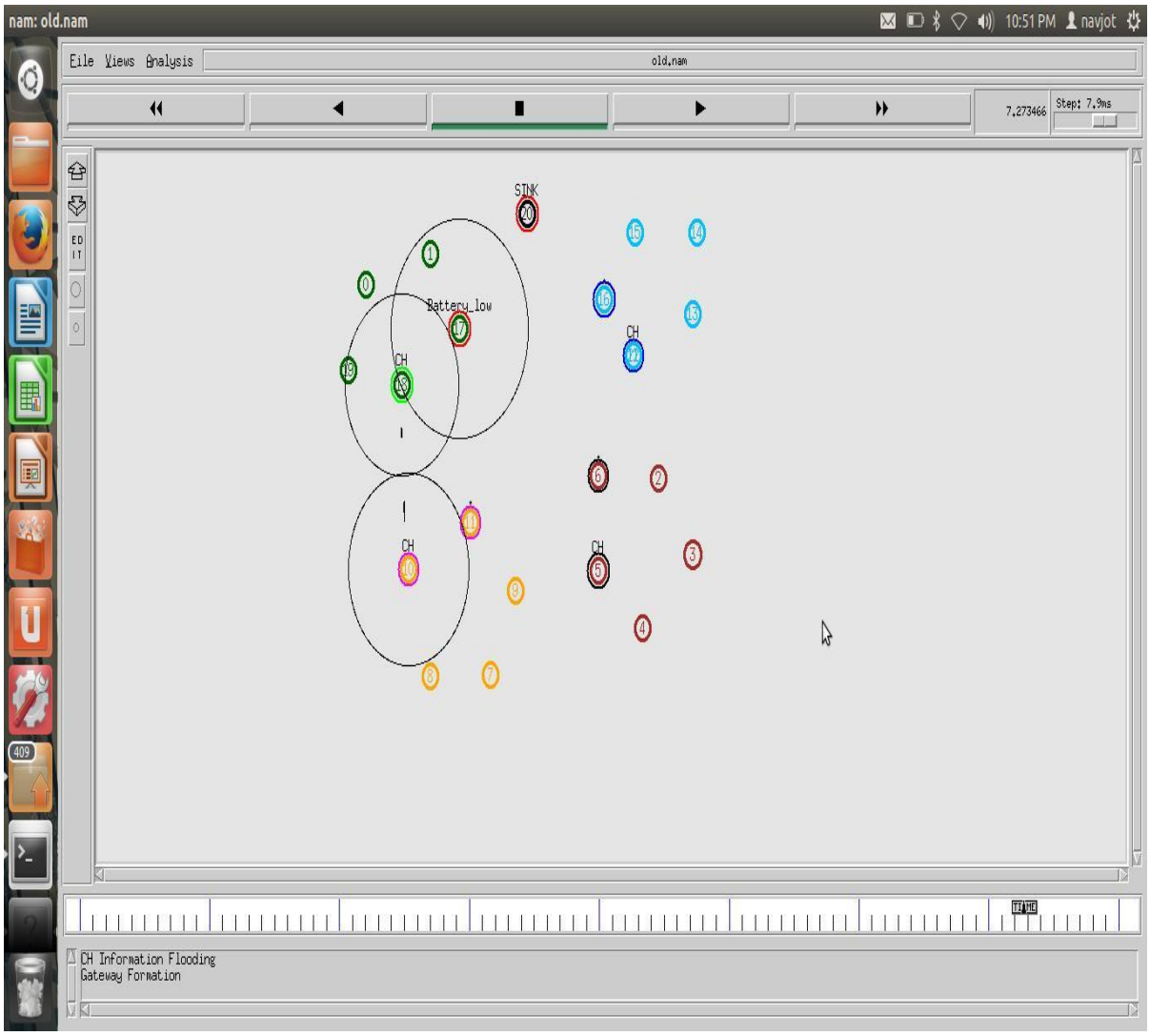


Figure 13: Fault occurrences

As illustrated in the Figure 13, deployment of finite sensor nodes is observed by the wireless sensor network and, the information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information which is received by the sink is done through the cluster head. The data communication starts between the cluster heads. The data from its close to cluster head is received by the sink. Further the cluster heads are changed. The fresh cluster heads are chosen, and cluster heads start communicating with each other. Fault occurrence is seen in the network when the data batteries of some cluster heads degrade.

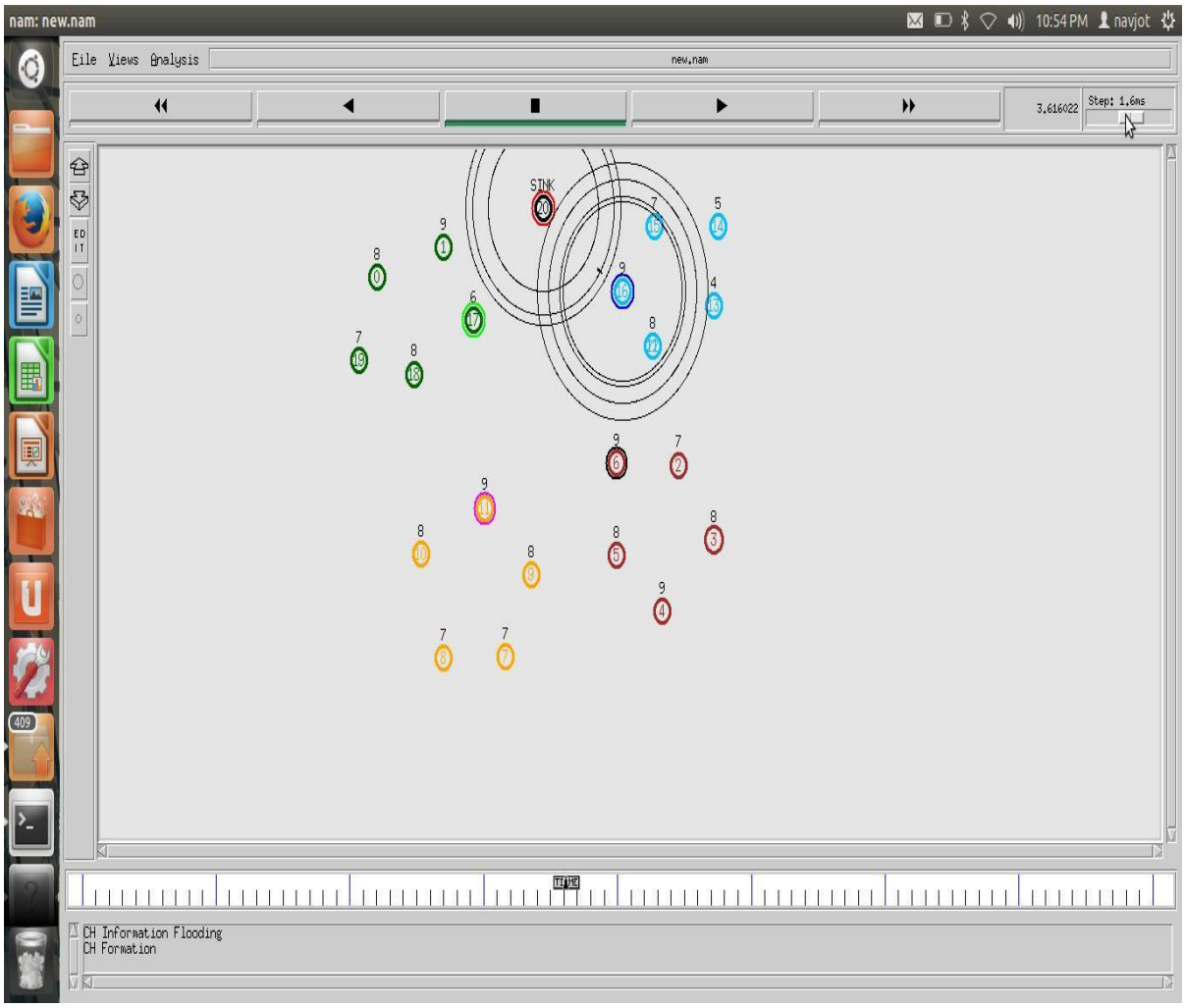


Figure 14: Apply the learning technique

As shown in the Figure14, deployment of finite integer of wireless sensor nodes and is observed in the wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information has reached to the sink through the cluster head. The process of the data communication starts between the cluster heads. The data from its close to the cluster head is received by the sink. Further the cluster heads are changed. The new cluster heads are elected, and cluster heads start communicating with each other. Fault occurrence is seen in the network when the data batteries of some cluster heads degrade. We applied a knowledge based learning technique in to reduce the chance of fault in the wireless sensor network.

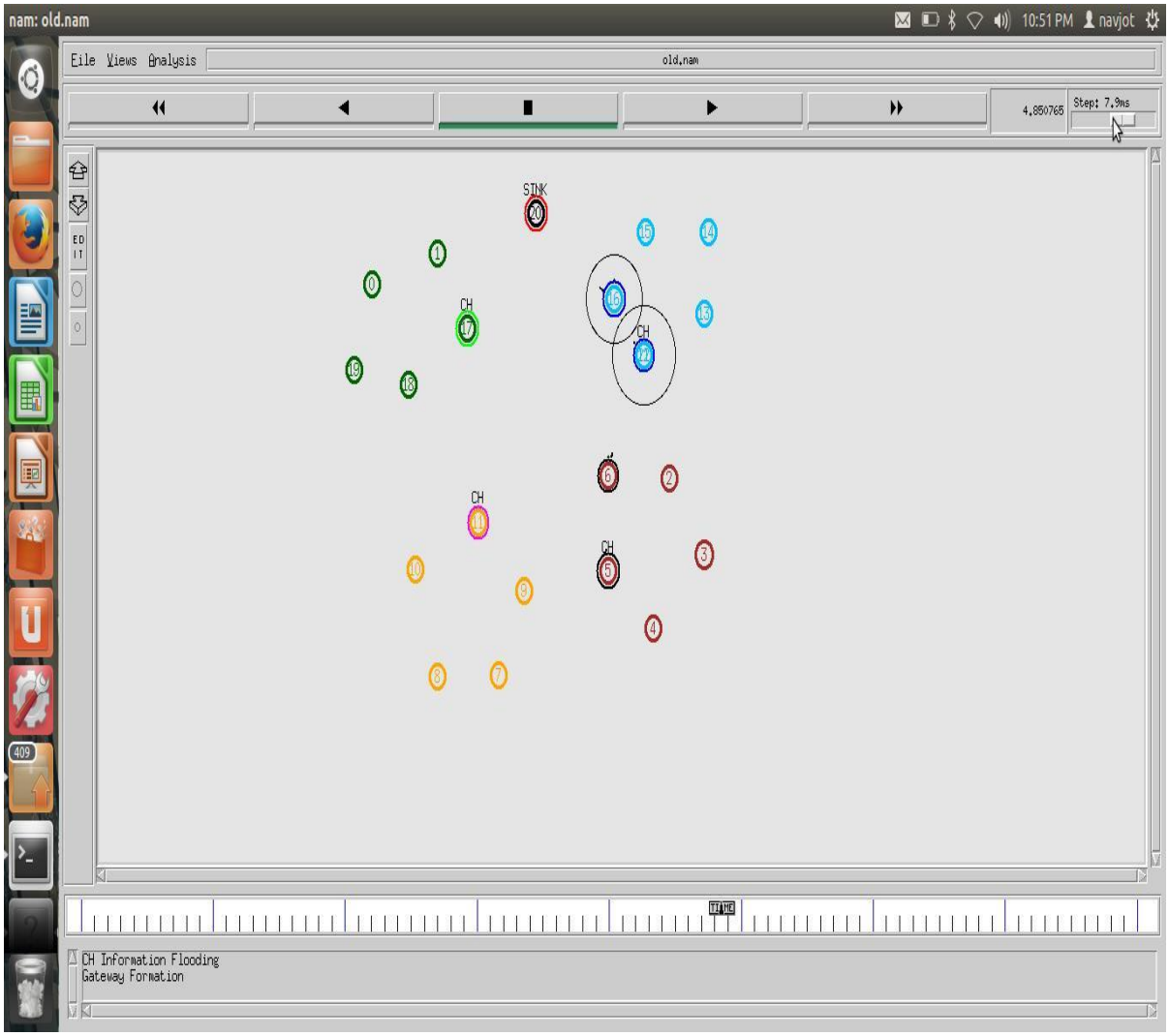


Figure 15: Cluster heads start communicating

As shown in the Figure 15, deployment of finite integer of sensor nodes is observed in the wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information is accepted to the sink through the cluster head and the data communication starts between the cluster heads. The information since its close to cluster head is received by the sink. Further changed the cluster head. A fresh cluster heads are chosen, and cluster heads start communicating with each other.

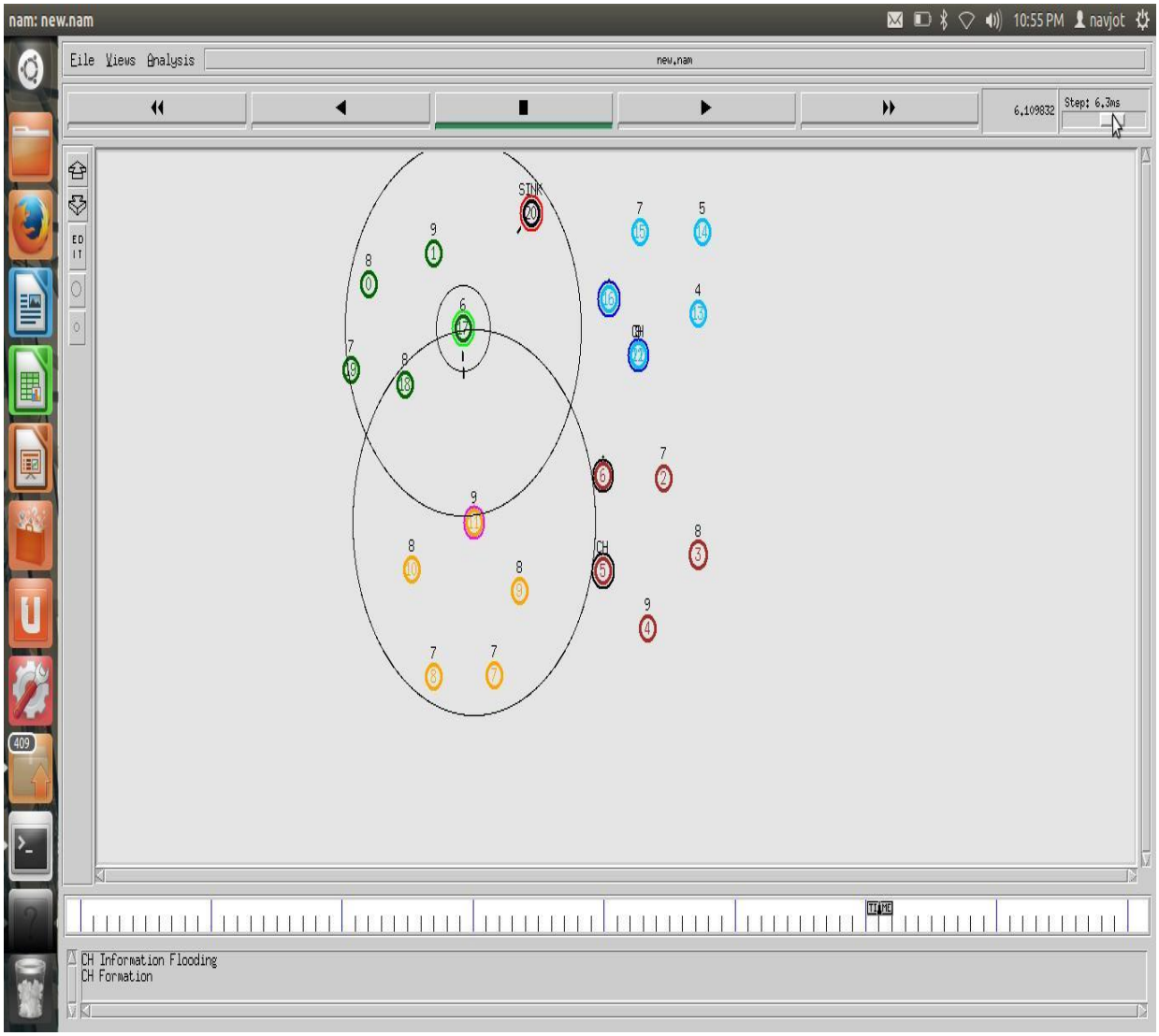


Figure 16: Cluster heads start communicating

As shown in the Figure 16, deployment of finite integer of sensor nodes is observed in the wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information is accepted to the sink through the cluster head and the communication begins between the cluster heads. The information since its close to cluster head is received by the sink. Further changed the cluster head. A fresh cluster heads is chosen, and cluster heads starts communicating with each other.

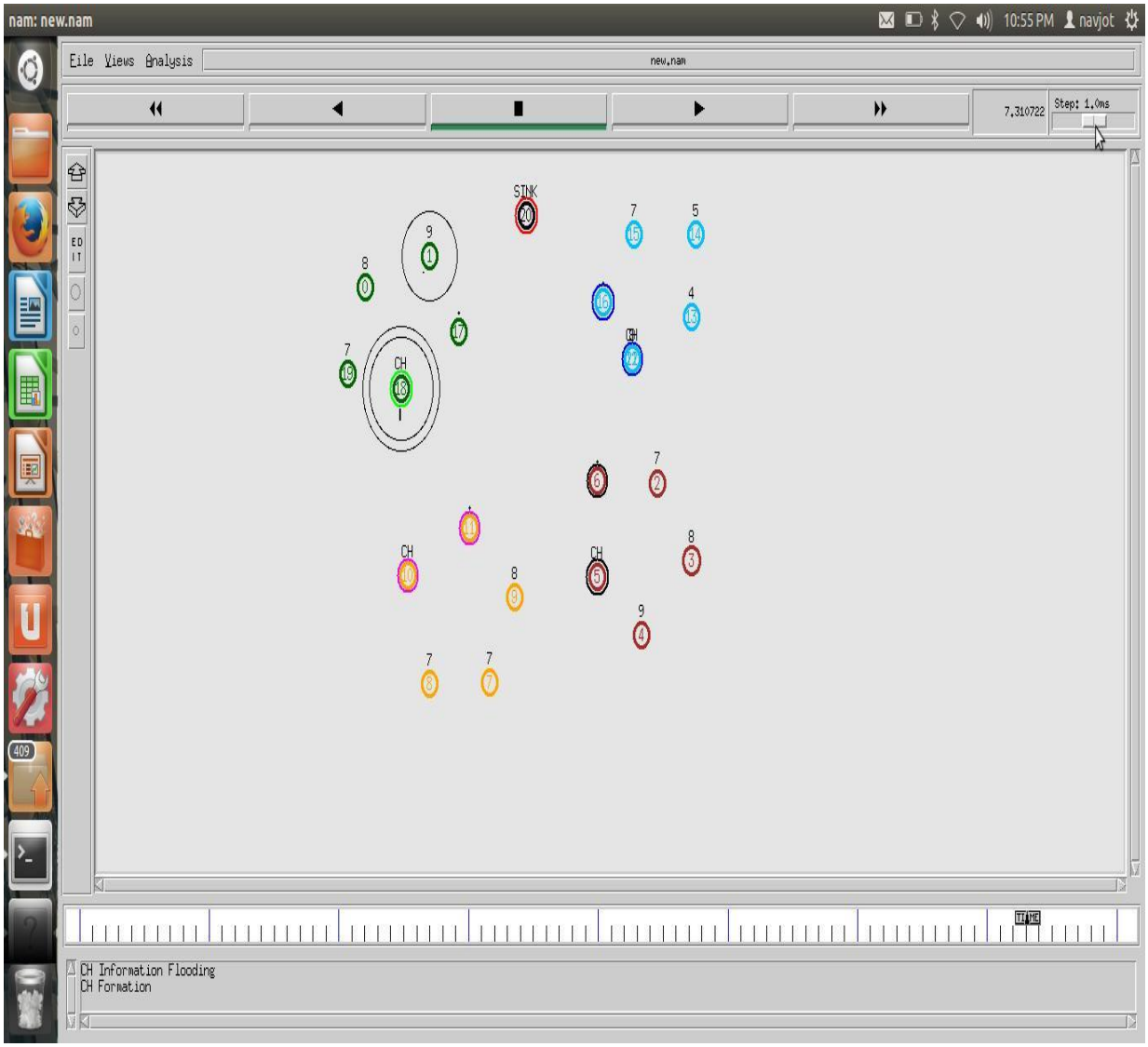


Figure 17: Cluster heads start communicating

As shown in the Figure 17, deployment of finite integer of sensor nodes is observed in the wireless sensor network. The information is sensed and passed to the sink by the sensor nodes. Fixed size clusters are formed in whole of the network and the clustered data will be aggregated to the cluster head. The information is accepted to the sink through the cluster head and the communication begins between the cluster heads. The information since its close to cluster head is received by the sink. Further changed the cluster head. A fresh cluster heads is chosen, and cluster heads starts communicating with each other.

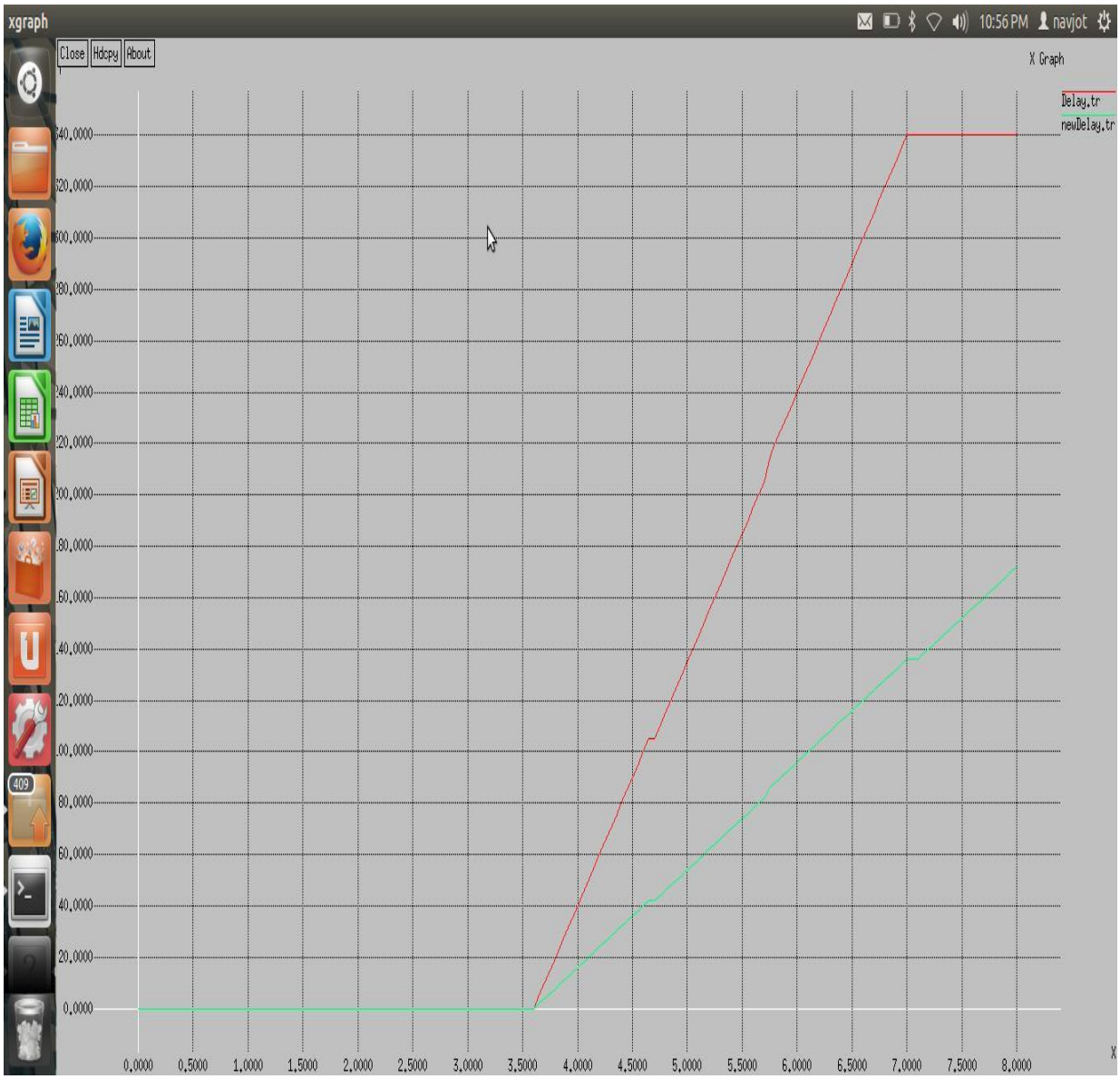


Figure 18: Delay graph

As shown in Figure 18, the Delay graph has been plotted. This graph demonstrates the delay of past technique and the delay seen in the new projected work. The exhibitions are thought about. The outcomes demonstrate delay in fresh projected work is decreased by 30% because of fault evacuation in the system.

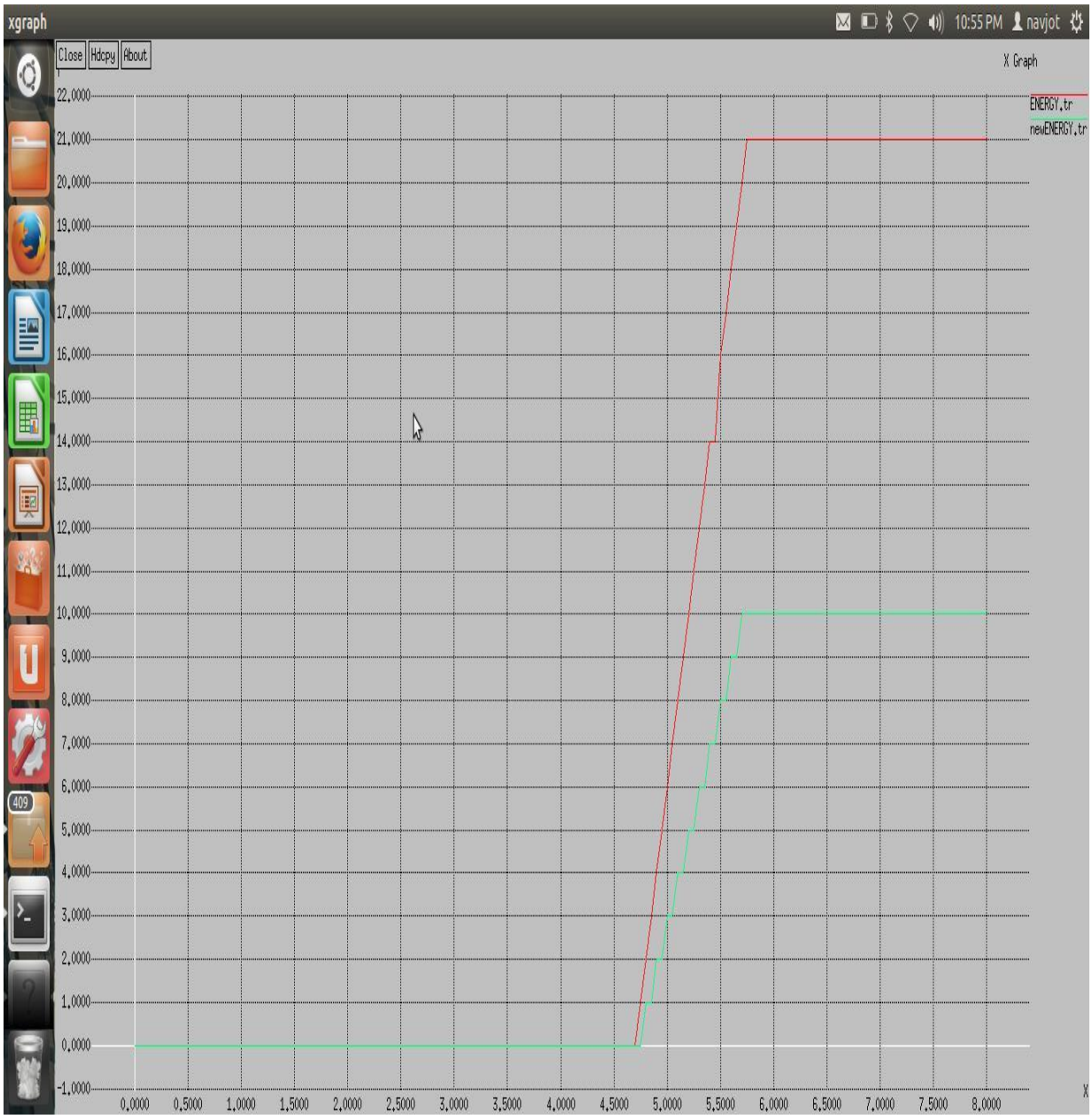


Figure 19: Energy Graph

As appeared in Figure 19, the energy expenditure of the past and new projected work is thought about. Because of additional fault in the network, the chart plainly demonstrates that the energy expenditure is more in the past network. At the point when fault is expelled from the network, energy expenditure is lessened from the network.

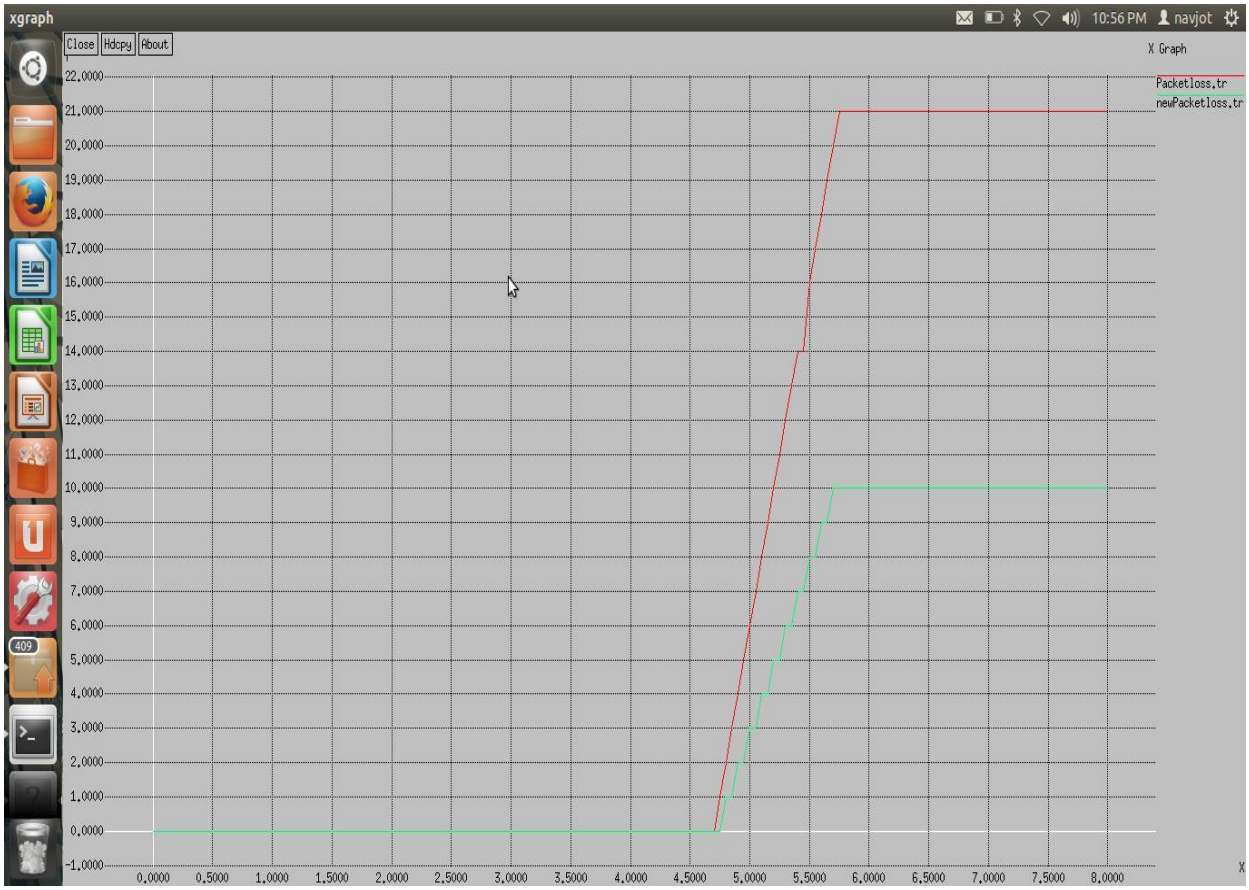


Figure 20: Packet loss Graph

As appeared in Figure 20, the packet loss of past and new projected work is looked at. It is unmistakably found in the graph that the packet loss in the past work is more. This is because of fault in network but when the learning technique applied the fault is expelled from the network and the packet loss gets diminished.

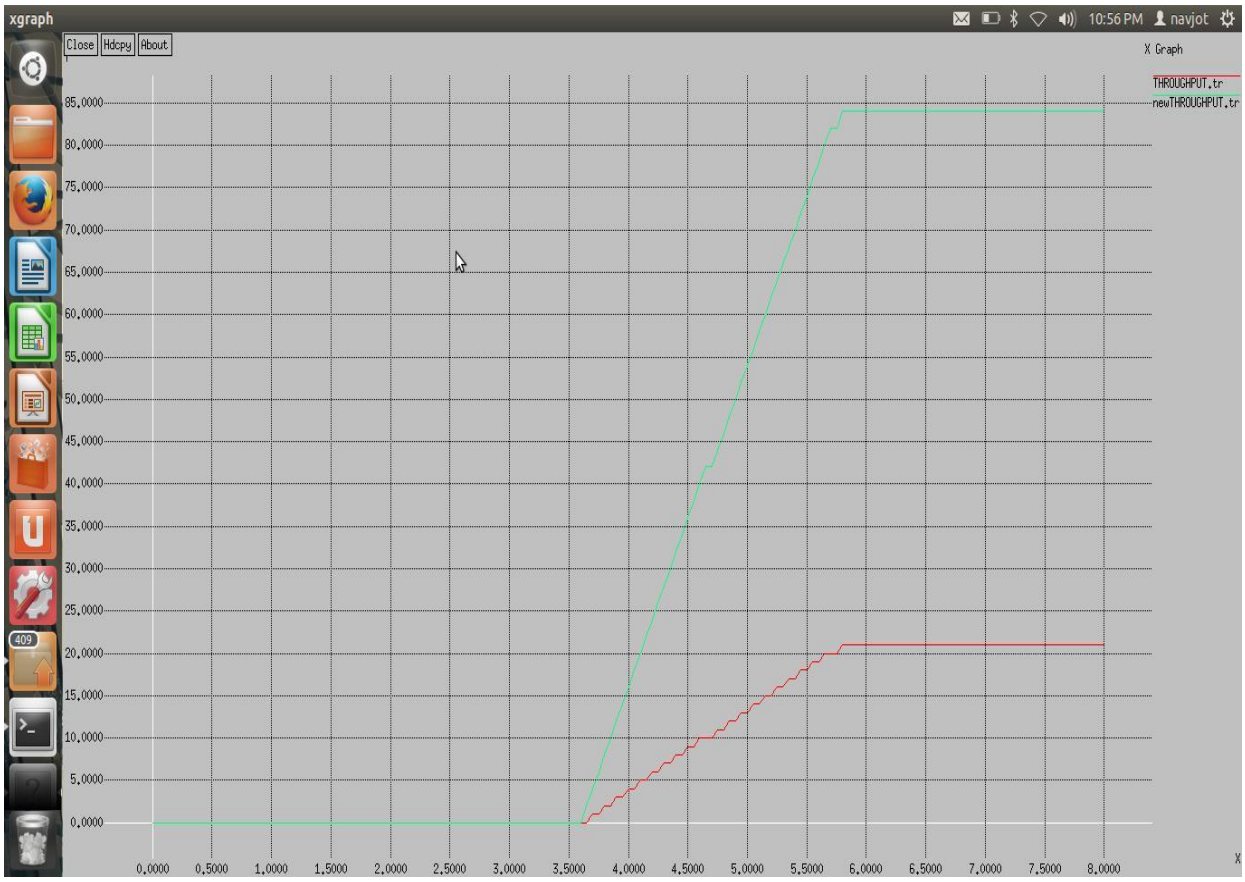


Figure 21: Throughput Graph

As appeared in the Figure 21, the throughput of new and past work is looked at. The throughput of older situation is lessened because of the fault in the network. On the off chance that the fault of the network is recuperated, the throughput of network increments as needs be.

CHAPTER 6

CONCLUSIONS AND FUTURE SCOPE

6.1. Conclusion

Wireless Sensor Network is one of the categories of structure less network. Wireless Sensor Network is an application based system. It is utilized to monitor the environmental conditions like temperature, moistness and etc. In this sort of network cab move freely. They can join or leave the network at any time. For the most part wireless sensor network is used to deploy at far places like seas, forests and deserts and so on. Sensors are having little in size. So they are very difficult to replace again and again. So there is a need of technique that will expend less battery in wireless sensor network. In this work, a novel method has been proposed which depends on neural network and other technique. To diminish the overhead in dynamic clustering and to expand lifetime of the sensor network, cluster heads are changed utilizing the approach of neural network strategy has connected like Knowledge Based Learning to reduction battery utilization of the network. In the past work, static clustering of grid had been utilized. In any case, in this examination work clustering of grid is dynamic. It can be movable and variable as indicated by the circumstance. In this node information which is send can be effortlessly adjustable as per the circumstance and calculation made on the premise of battery utilization. Here fundamental concern is to evade battery exhaustion. The cluster head is additionally picking as per the base battery utilization by applying election algorithms. Assume there is a network in which number of batteries a replaced. Every battery has the information send capacity in milliampere. It is viewed as that there are number of batteries accessible and every battery additionally forward information from source to destination. The routing algorithm which we have utilized as a part of this work is AODV. There are three cluster having three cluster head. Cluster heads are picked by the greatest sending capacity and least battery utilization of the node. The execution of this research work has done in Ns2 and simulation comes about demonstrate that novel procedure has expanded the system throughput and network lifetime.

6.2. Future scope

In future we can be connected Two-Layered Feed-Forward Neural Networks to enhance the execution of the system in term of energy consumption and packet loss.

REFERENCES

[1] Bharathidasan, A., & Ponduru, V. A. S. (2002). Sensor networks: An overview. Department of Computer Science, University of California, Davis, CA, 95616.

[2] Somani, A. K., Kher, S., Speck, P., & Chen, J. (2006). Distributed dynamic clustering algorithm in uneven distributed wireless sensor network. Technical Reports [DCNL-ON-2006-005], Iowa State University.

[3] Mamalis, B., Gavalas, D., Konstantopoulos, C., & Pantziou, G. (2009). Clustering in wireless sensor networks. RFID and Sensor Networks: Architectures, Protocols, Security and Integrations, Y. Zhang, LT Yang, J. Chen, eds, 324-353.

[4] Bakr, B. A., & Lilien, L. (2011, June). A quantitative comparison of energy consumption and WSN lifetime for LEACH and LEACH-SM. In Distributed Computing Systems Workshops (ICDCSW), 2011 31st International Conference on (pp. 182-191), IEEE.

[5] Puccinelli, D & Haenggi.M.(2005).Sensor Networks: applications and challenges of ubiquitous sensing.IEEE circuits and systems magazine.5(3).(pp.19-31,2005),IEEE.

[6] Dahnil, D. P., Singh, Y. P., & Ho, C. K. (2011, February). Energy-efficient cluster formation in heterogeneous Wireless Sensor Networks: A comparative study. In Advanced Communication Technology (ICACT), 2011 13th International Conference on (pp. 746-751), IEEE.

[7] Raj, E. D. (2012). An Efficient Cluster Head Selection Algorithm for Wireless Sensor Networks–Edrleach. IOSR Journal of Computer Engineering (IOSRJCE), 2(2), 39-44.

[8] Hansen, E., Neander, J., Nolin, M., & Björkman, M. (2006). Efficient cluster formation for sensor networks. The Online Publication Documentation System (OPUS), Mälardalen University.

[9] Xiangning, F & Yulin, S.(2007).Improvement on LEACH Protocol of Wireless Sensor Network.International Conference on Sensor Technologies and Applications.(pp. 260 -264), IEEE.

[10] Atero.F, Vinagre J, Morgado E &M.R. Wilby (2011). A Low Energy and Adaptive Architecture for Efficient Routing and Robust Mobility Management in Wireless Sensor Networks, (pp. 172 -181), IEEE.

[11] Akyildiz, I. F., Su, W., Sankarasubramaniam, Y., & Cayirci, E. (2002). Wireless sensor networks: a survey. Computer networks, 38(4), 393-422.

[12] Mendes, L. D., Rodrigues, J. J., Vasilakos, A. V., & Zhou, L. (2011, June). Lifetime analysis of a slotted ALOHA-based wireless sensor network using a cross-layer frame rate adaptation scheme. In Communications (ICC), 2011 IEEE International Conference on (pp. 1-5). IEEE

[13] Rai, M., K., D., (2013) "Dynamic Clustering in Wireless Sensor Network using Neural Network", International Journal for Advance Research in Engineering and Technology Vol. 1, Issue II , ISSN 2320-6802.

[14] Nikodem, M., & Wojciechowski, B. (2011, February). Upper Bounds on Network Lifetime for Clustered Wireless Sensor Networks. In New Technologies, Mobility and Security (NTMS), 2011 4th IFIP International Conference on (pp. 1-6). IEEE.

[15] Ying Miao (2005).Seminar Wireless Self-Organization Networks Application of sensor network.

[16] Pant, S., Chauhan, N., & Kumar, P. (2010). Effective cache based policies in wireless sensor networks: A survey. International Journal of Computer Applications (0975–8887) Volume, 11, 17-21.

[17] Anand, D., G., Chandrakanth, H., G., and Giriprasad, M., N., D., (2012) "An Energy Efficient Distributed Protocol For Ensuring Coverage And Connectivity (E3c2) Of Wireless Sensor Networks", International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC) Vol. 3, No.1.

[18] Soltan, M., and Hwang, I., (2007) "Modulation-Aware Energy Balancing in Hierarchical Wireless Sensor Networks", EURASIP Journal on Wireless Communications and Networking, pp. 355-359.

[19] Bharathidasan, A., & Ponduru, V. A. S. (2002). Sensor networks: An overview. Department of Computer Science, University of California, Davis, CA, 95616

[20] Akyildiz, I. F., Su, W., Sankarasubramaniam, Y., & Cayirci, E. (2002). Wireless sensor networks: a survey. Computer networks, 38(4), 393-422.

[21] Oyman, E. I., & Ersoy, C. (2004, June). Multiple sink network design problem in large scale wireless sensor networks. In Communications, 2004 IEEE International Conference on (Vol. 6, pp. 3663-3667), IEEE.

[22] Sohrabi, K., Gao, J., Ailawadhi, V., & Pottie, G. J. (2000). Protocols for self-organization of a wireless sensor network. IEEE personal communications, 7(5), 16-27.

[23] Cheng, Y., Li, H., Wan, P. J., & Wang, X. (2012). Wireless mesh network capacity achievable over the csma/ca mac. Vehicular Technology, IEEE Transactions on, 61(7), 3151-3165.

[24] Salzmann, J., Behnke, R., & Timmermann, D. (2011, March). Hex-MASCLE–hexagon based clustering with self healing abilities. In Wireless Communications and Networking Conference (WCNC), 2011 IEEE (pp. 528-533), IEEE.

[25] Xu, J., Jin, N., Lou, X., Peng, T., Zhou, Q., & Chen, Y. (2012, May). Improvement of LEACH protocol for WSN. In Fuzzy Systems and Knowledge Discovery (FSKD), 2012 9th International Conference on (pp. 2174-2177), IEEE.

[26] Younis, O., Krunz, M., & Ramasubramanian, S. (2006). Node clustering in wireless sensor networks: recent developments and deployment challenges. Network, IEEE, 20(3), 20-25.

[28] Sharma, S., & Kaur, B. (2010). Literature and Solution to packet collision in network in wireless communication Networks.

[29] Issariyakul, T., & Hossain, E. (2009). Transport Control Protocols Part 2–Transmission Control Protocol (TCP). In Introduction to Network Simulator NS2 (pp. 1-43). Springer US.

[30] Kumar, V., Jain, S., & Tiwari, S. (2011). Energy efficient clustering algorithms in wireless sensor networks: A survey. IJCSI International Journal of Computer Science Issues, 8(5).

[31] Gouvy, N., Hamouda, E., Mitton, N., & Zorbas, D. (2013, April). Energy efficient multi-flow routing in mobile Sensor Networks. In Wireless Communications and Networking Conference (WCNC), 2013 IEEE (pp. 1968-1973), IEEE.

[32] Kaur, K., & Kumari, N. Evaluation and Analysis of Active RFID Protocol in Wireless Sensor Networks.

[33] Jiang, L., Bing Fang, & Li. (May, 2013) Energy optimized approach based on clustering routing protocol for wireless sensor networks. CCD Conference, IEEE.

[34] Wang, Y., & Guo, S. (2013, August). Optimized energy-latency cooperative transmission in duty-cycled wireless sensor networks. In Mechatronics and Automation (ICMA), 2013IEEE International Conference on (pp. 185-190), IEEE.

[35] Zhang, D., Li, G., Zheng, K., Ming, X., & Pan, Z. H. (2014). An Energy-Balanced Routing Method Based on Forward-Aware Factor for Wireless Sensor Networks. Industrial Informatics, IEEE Transactions on, 10(1), 766-773.

[36] Gouvy, N., Hamouda, E., Mitton, N., & Zorbas, D. (2013, April). Energy efficient multi-flow routing in mobile Sensor Networks. In Wireless Communications and Networking Conference (WCNC), 2013 IEEE (pp. 1968-1973), IEEE.

[37] Neamatollahi, P., Taheri, H., Naghibzadeh, M., & Yaghmaee, M. (2011, February). A hybrid clustering approach for prolonging lifetime in wireless sensor networks. In Computer Networks and Distributed Systems (CNDS), 2011 International Symposium on (pp. 170-174), IEEE.

[38] R Matthias,Brust (June 2010). Topology-based Cluster head Candidate Selection in Wireless Ad-hoc and Sensor Networks.

[39] Ahmadi, E., Sabaei, M., & Ahmadi, M. H. (2011). A New Adaptive Method for Target Tracking in Wireless Sensor Networks. International Journal of Computer Applications, 22(9), 21-29.

[40] Eekhoff, E. L. (2004). Wireless sensor networks and personal area networks for data integration in a virtual reality environment (Doctoral dissertation, Iowa State University).

[41] Kumar, S. S., Kumar, M. N., Sheeba, V. S., & Kashwan, K. R. (2012). Power management of hybrid scheduling routing in cluster based wireless sensor networks. Journal of Information & Computational Science, 9(6), 1555-1575.

[42] Amutha, B., Ponnavaikko, M., Karthick, N., & Saravanan, M. (2010). Localization Algorithm Using Varying Speed Mobile Sink For Wireless Sensor Networks. International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC), 1(3).

[43] Chauhan, N. (2012). LK Awasthi Senior Member IEEE, Narottam Chand,"Cluster Based Efficient Caching Technique for Wireless Sensor Networks". In International Conference on Latest Computational Technologies (ICLCT'2012) March (pp. 17-18).

[44] Nieselt, K., Battke, F., Herbig, A., Bruheim, P., Wentzel, A., Jakobsen, Ø. M., & Wellington, E. M. (2010). The dynamic architecture of the metabolic switch in Streptomyces coelicolor. BMC genomics, 11(1), 10.

[44] Moser, C., Brunelli, D., Thiele, L., & Benini, L. (2007). Real-time scheduling for energy harvesting sensor nodes. Real-Time Systems, 37(3), 233-260.

[45] Somani, A. K., Kher, S., Speck, P., & Chen, J. (2006). Distributed dynamic clustering algorithm in uneven distributed wireless sensor network. Technical Reports [DCNL-ON-2006-005], Iowa State University.

[46] Shiri, A., Babaie, S., & Hasan-zadeh, J. (2012). New Active Caching Method to Guarantee Desired Communication Reliability in Wireless Sensor Networks. Journal of Basic and Applied Scientific Research, 2(5), 4880-4885.

[47] Rahman, M. A., & Hussain, S. (2007, May). Effective caching in wireless sensor network. In Advanced Information Networking and Applications Workshops, 2007, AINAW'07. 21st International Conference on (Vol. 1, pp. 43-47), IEEE.

[48] Isaac, S. J., Hancke, G. P., Madhoo, H., & Khatri, A. (2011, September). A survey of wireless sensor network applications from a power utility's distribution perspective. In AFRICON, 2011 (pp. 1-5), IEEE.

[49] Maraiya, K., Kant, K., & Gupta, N. (2011). Application based study on wireless sensor network. International Journal of Computer Applications (0975–8887) Volume, 21, 9-15.

[50] Sharma, P., & Rai, M. K. (2013). Review Paper on Cluster Based Caching Technique for Wireless Sensor Networks with multi-sink. International Journal for Advance Research in Engineering and Technology, 1(2), 23.

[51] Kakad, S., Sarode, P., & Bakal, J. W. Analysis and Implementation of Top k Query Response Time Optimization Approach for Reliable Data Communication in Wireless Sensor Networks.

[52] Dimokas, N., Katsaros, D., & Manolopoulos, Y. (2008). Cooperative caching in wireless multimedia sensor networks. Mobile Networks and Applications, 13(3-4), 337-356.

[53] Li, X., Nayak, A., & Stojmenovic, I. (2010). Sink mobility in wireless sensor networks. Wireless sensor and actuator networks, 153.

[54] Pant, S., Chauhan, N., & Kumar, P. (2010). Effective cache based policies in wireless sensor networks: A survey. International Journal of Computer Applications (0975–8887) Volume, 11, 17-21.