A survey of various data communication schemes in WSN

Amarpreet Kaur, Manwinder Singh

M.tech in Electronics and Communication Engineering, Rayat Institute of Engineering and Information Technology, Railmajra, India
Associate Prof in Electronics and Communication Engineering, Rayat Institute of Engineering and Information Technology, Railmajra, India

--***--

Abstract - *A Wireless Sensor Network (WSN) comprises of an extensive number of sensor hubs which are conveyed over a territory to perform neighborhood calculations in view of data accumulated from the environment. Some imperative parameters should be concern while playing out a directing calculation or methodology in the middle of the various hubs. A most extreme use of assets need to concern while we can expand the lifetime of a system directing hubs. In this paper we will review about the different conventions which are now utilized by various procedures in WSN. This review paper analyses and screen the execution of remote sensor arrange calculations, in light of various parameters, for example, organize lifetime, vitality utilization, delay, throughput, bundle conveyance proportion and drop proportion and so forth.*

Key Words: **WSN, Energy Efficiency, Data Clustering. Cluster Head, Energy Efficient protocols, fuzzy logic**

1. INTRODUCTION

With progress in innovation, sensor systems made out of little and practical detecting gadgets furnished with remote radio handset for condition observing have turned out to be doable. The key preferred standpoint of utilizing these little gadgets to screen the earth is that it doesn't require framework, for example, electric mains for power supply and wired lines for Internet associations with gather information, nor require human cooperation while conveying. [1] These sensor hubs can screen the earth by gathering data from their environment, and work helpfully to send the information to a base station, or sink, for examination.

Bunching in WSN [2]: The way toward gathering the sensor hubs in a thickly conveyed substantial scale sensor system is known as grouping. The insightful approach to join and pack the information having a place with a solitary group is known as information total in bunch based condition. There are a few issues required with the way toward grouping in a remote sensor arrange. Initially issue is, what number of groups ought to be framed that could improve some execution parameter. Second could be what number of hubs ought to be taken into a solitary bunch. Third vital issue is the determination system of bunch head in a group [3]. Another issue is that client can put some more intense hubs, as far as vitality, in the system which can go

about as a bunch head and other straightforward hub act as group part as it were.

Wireless Sensor Networks is a remote system comprising of little hubs with detecting, calculation, and remote correspondences abilities over short separations. Every sensor gathers information from the checked territory and after that it courses information back to the base station BS. The sensors can be set in the field arbitrarily or in a pre-decided way. [4] As remote sensor systems comprise of hundreds to thousands of low-power multi working sensor hubs, working in an unattended situation, with constrained computational and detecting capacities. Sensor hubs are outfitted with little, frequently fundamental batteries with constrained power capacity [5]. WSN comprise of hundreds or thousands of little, shoddy, battery-driven, spread-out hubs bearing a remote modem to fulfill a checking or control errand mutually.

1.1 Issues in WSN

The outline of WSNs is impacted by many testing elements. These elements must be beat so that productive correspondence can be accomplished in WSNs. Here, a portion of the directing difficulties and configuration issues that influence steering process in WSNs.

Security and Privacy: Sensor systems interface intimately with their physical condition and with individuals, representing extra security issues. Due to these reasons current security instruments are deficient for WSNs. These new limitations posture new research challenges on key foundation, mystery and confirmation, protection, vigor to refusal of-administration assaults, secure directing, and hub catch. To accomplish a safe framework, security must be coordinated into each segment, since parts planned without security can turn into a state of assault. Thus, security and protection ought to be given to each part of framework outline. One test is the means by which to secure remote correspondence joins against listening stealthily and altering. In general, security is a troublesome test for any framework. The extreme limitations and requesting conditions of WSN make PC security for these frameworks much all the more difficult [6].

Scope: In WSNs, every sensor hub gets a specific perspective of nature. A given sensor's perspective of nature is constrained both in range and in exactness; it can just cover

a restricted physical territory of the earth. Subsequently, region scope is likewise a critical plan parameter in WSNs [7].

Information Aggregation: Since sensor hubs may create noteworthy repetitive information, comparative bundles from various hubs can be totaled so that the quantity of transmissions is decreased. Information collection is the blend of information from deferent sources as indicated by a specific conglomeration work, e.g., copy concealment, minima, maxima and normal. This procedure has been utilized to accomplish vitality proficiency and information move advancement in various steering conventions [8].

Nature of Service: In a few applications, information ought to be conveyed inside a specific timeframe from the minute it is detected; generally the information will be futile. Along these lines limited latency for information conveyance is another condition for time constrained applications. Nonetheless, in numerous applications, preservation of vitality, which is straightforwardly identified with system lifetime, is considered generally more imperative than the nature of information sent [8].

Little Storage Size: The capacity size of a sensor hub is little when contrasted with those in conventional systems. This limitation of sensor hub makes the remote sensor systems unsatisfactory to be utilized in applications that require high information stockpiling limit. Further, the information handling and information correspondence winds up noticeably constrained because of little stockpiling size [9].

Adaptation to internal failure: Some sensor hubs may fall flat or be hindered because of absence of energy, physical harm, or natural obstruction. The disappointments of sensor hubs ought not to influence the general errand of the sensor organize. In the event that numerous hubs come up short, MAC and steering conventions must oblige development of new connections and courses to the information gathering base stations [10].

Vitality Efficiency: In remote sensor arrange, vitality is a principle requirement. The operations of a sensor hub, for example, information preparing and transmission are vitality expending; it is anything but difficult to deplete the vitality of the hub amid system operation. This issue winds up plainly exacerbated by the way that hubs in a few uses of remote sensor systems are left unattended. For instance, in a field reconnaissance application, sensor hubs are disseminated in an out of reach domain. Reviving or supplanting the hub batteries is inconceivable. Moreover, the substitution of all hub batteries in a substantial range is costlier and implausible. Consequently, restricted vitality of the hub is a urgent test for the outline of remote sensor systems [11].

A lot of research has centered to expand the lifetime of the system. A main consideration for the power utilization in a sensor hub in sensor system is expected to the transmit particle of electrons, which increments with the addition of (1) The measure of information to be transmitted (2) The separation between the transmitter and the beneficiary. (3) The crash between hubs. One side to mull over for vitality viability is that the correspondence conspires, in light of the fact that it is the fundamental vitality customer in WSNs [12]. It devours seventieth of system vitality. The vitality utilization is regularly diminished with effectiveness through right group head decision and message minimization in information reportage. WSNs region unit basically the social event of remote hubs having limited vitality abilities, zone unit conveyed discretionarily over a progressively powerful air, could likewise be versatile or stationary, for watching physical marvels like dampness, temperature, wellbeing perception, vibrations, precarious occasions and so forth [13]. Picking a directing methodology is that the center issue for get-together and conveying the sparing parcels of accommodating information to the required goal. So the steering technique should ensure the littlest sum vitality utilization prompting expanding the system's life [14]. The WSNs could likewise be used in the changeability of way of life exercises or administrations.

1.2 Energy Efficient protocols in WSN

LEACH stands for Low Energy Adaptive Clustering Hierarchy. Leach is a bunching directing convention utilizing probabilistic technique to choose channel leader of a hub utilizing vitality and threshold conditions. It circulates the vitality stack similarly among every one of the sensors in a system. Drain is a self-sorted out and versatile convention for systems. In LEACH, every one of the hubs contained in a neighborhood group and a solitary hub among the greater part of the hubs carries on like a bunch head or base station. On the off chance that the bunch heads were picked a settled all through the framework life time, as in ordinary grouping calculations, it is anything but difficult to see that the unfortunate sensors been group heads would kick the bucket rapidly, finishing the helpful lifetime of all hubs having a place with those groups.[15]

The primary point of LEACH is to make a group of sensor hubs relies on the quality of got flags and utilize nearby bunch heads to exchanges the information to the base stations. The fundamental components of LEACH are as per the following:

- Localized coordination and control for bunch set-up and operation.
- Randomized turn of the group "base stations" or "bunch heads" and the comparing bunches.
- Local pressure to diminish worldwide correspondence.

PEGASIS remains for Power-Efficient Gathering in Sensor Information Systems. It is a chain-based power successful calculation. It depends on taking after two parameters:

- Chaining,
- Data combination

In PEGASIS, every hub can go about as a pioneer of the chain and chain is likewise developed with the assistance of ravenous calculation and can introduce by the sensor hubs. PEGASIS depends on taking after suspicions [17]:

- Sensor hubs have worldwide information of the system,
- All the hubs are stationary
- Nodes know about the area of every single other hub.

PEGASIS performs information combination in chain yet information combination is not performed toward the finish of the chain. PEGASIS has leverage over LEACH that

- eliminates the utilization of dynamic groups,
- minimize the contrast between non-pioneer hubs and pioneer hubs,
- limited number of transmissions,
- One transmission to the base station inside a round.

PEGASIS additionally confront a few issues as LEACH endures. One of the primary burdens of PEGASIS is that it is not versatile so it can't be utilized as a part of instance of remote sensor arranges because of the absence of information with respect to the hubs as a result of vast number of hubs.

Regard remains for Hybrid Energy-Efficient Distributed Clustering. HEED mainly permits to figure Channel head in view of lingering energy. Here every one of the hubs should keep up same vitality at the beginning. HEED does not contain any correspondence overhead so it didn't encourage the productive conveyance of group head hubs over the system.[16] Drain C convention is use to beat this issue, it is a brought together approach yet adaptable to predetermined number of sensors as it were. Many bunching calculations are accessible which makes more uniform groups to the detriment of overhead in group arrangement. One of the methodologies is HEED which utilizes disseminated calculations which rush to change over. Regard utilizes a group development calculation, in which every hub is doled out with a bunch head likelihood which is the capacity of their remaining vitality and furthermore correspondence cost which is the capacity of neighbor vicinity. Group head likelihood is utilized to choose that whether the sensor hub is possibility for bunch set out toward this round or not. . In view of these ad messages, every sensor chooses the applicant group head with the most reduced "correspondence cost" (which could be simply the sensor) as its conditional bunch head [17][18]. This methodology proceed till every sensor builds its bunch head likelihood at every cycle until the group head likelihood is one and the sensor pronounces itself a "last bunch head" for this round. The benefit of HEED is that there is no need the worldwide information in regards to the hubs in a system, it ends the

handling at O(1) round or cycle, it considers that every hub is a piece of an a single bunch, group heads the conveyed in an appropriate way.

DEEC remains for appropriated vitality proficient grouping. It is utilized for heterogeneous remote sensor organizes. In this convention the proportion between the rest of the vitality on every hub and normal vitality on the system is figured and its likelihood proportion is utilized to choose the group heads. The quantity of revolution on every hub differs alongside the varieties in introductory and remaining vitality i.e. DEEC changes the revolution on every hub into vitality [18]. The hubs which have high measure of remaining vitality and high starting vitality is much reasonable for bunch head hopeful hub as contrast with the hubs with low vitality. In this way DEEC can amplify the lifetime of the system by utilizing heterogeneous mindful bunching calculations. DEEC can acquire successful messages as contrast with the traditional bunching calculations. DEEC is more reasonable for Multi-level heterogeneous systems [19].

Adolescent stands for Threshold touchy Energy Efficient sensor Network convention. It is utilized for responsive systems. It is an application which detects the temperature. It is more vitality effective convention as contrast with the customary conventions [17]. To conquer the confinements of LEACH convention the TEEN convention is produced. It is the upgraded variant of LEACH convention. Adolescent is not reasonable for extensive scale systems since it needs:

- Randomly picking bunch heads before the occasions happened. It makes the sensors out of the occasion area gathering into groups and transmitting information, causing pointless vitality utilization and unbalance bunches.
- Choosing the group heads without considering their leftover vitality. It might pick the sensors with less vitality as the bunch heads and after that cause them sudden passing.
- The group heads transmit information to the sink hub straightforwardly. In this manner one-bounce transmission mode may bring about the group heads far from the sink hub rapidly dead.

SEP is a convention which underpins the differences in two levels of system. Here differing qualities alludes to the underlying vitality designation to the sensor hubs. As per the suppositions of SEP convention progressively organize there are two sorts of vitality and thus it characterizes the hubs as propel hubs and ordinary hubs. The main distinction between propel hubs and typical hubs is that the propel hubs have more measure of vitality as analyzes to the ordinary hubs. On the premise of starting vitality it allocates the weighted likelihood to hubs. It likewise conquers the issue of bunch development which exists in LEACH convention.

1.3 Fuzzy Logic

Fuzzy logic is a type of numerous esteemed rationales in which reality estimations of factors might be any genuine number in the vicinity of 0 and 1. By differentiation, in Boolean rationale, reality estimations of factors may just be 0 or 1. Fluffy rationale has been stretched out to deal with the idea of halfway truth, where reality esteem may extend between totally genuine and totally false. Moreover, when phonetic factors are utilized, these degrees might be overseen by particular capacities. Fluffy rationale has been connected to many fields, from control hypothesis to counterfeit consciousness. [20]

Established rationale just allows recommendations having an estimation of truth or deception. The idea of whether 1+1=2 is an outright, changeless and numerical truth. Notwithstanding, there exist certain suggestions with variable answers, for example, requesting that different individuals recognize a shading. The idea of truth doesn't fall by the wayside, yet rather on methods for speaking to and thinking over fractional learning when managed, by amassing every single conceivable result into a dimensional range.

Both degrees of truth and probabilities go in the vicinity of 0 and 1 and thus may appear to be comparable at first. For instance, let a 100 ml glass contain 30 ml of water. At that point we may consider two ideas: unfilled and full. The significance of each of them can be spoken to by a specific fluffy set. At that point one may characterize the glass as being 0.7 voids and 0.3 full. Take note of that the idea of vacancy would be subjective and in this way would rely on upon the onlooker or creator. Another planner may, similarly well, outline a set participation work where the glass would be viewed as full for all esteems down to 50 ml. It is basic to understand that fluffy rationale utilizes truth degrees as a scientific model of the dubiousness marvel while likelihood is a numerical model of obliviousness.

A fundamental application may portray different sub-scopes of a ceaseless variable. For example, temperature estimation for automated stopping devices may have a few separate enrollment capacities characterizing specific temperature ranges expected to control the brakes appropriately. Each capacity maps a similar temperature incentive to truth esteem in the 0 to 1 territory. These truth esteems can then be utilized to decide how the brakes ought to be controlled.

2. RELATED WORK

1. Buyanjargal, "An Energy Efficient Clustering Algorithm for Event-Driven Wireless Sensor Networks (EECED)", In this paper creator portrays that, Wireless sensors systems are utilized as a part of numerous territory like natural reconnaissance, astute building, wellbeing observing, savvy transportations, and so forth. The WSN contains numerous little remote gadgets which have a restricted measure of vitality and memory and these little, independent gadgets are utilized to detect the information in its environment. It utilizes numerous vitality productive calculations so each all aspects of the system can work proficiently since it is a standout amongst the most difficult issues identified with the WSN. To conquer this issue or downside numerous analysts build up the Energy Efficient bunch based conventions like LEACH, DEEC etc. But nobody concentrated on occasion driven WSN conventions though their principle thought is on persistent systems. The creator likewise proposed a calculation LEACH (Low Energy Adaptive Clustering Hierarchy) which is a vitality productive convention utilized for WSN. The changed variant of this convention is named as ldquoenergy proficient bunching calculation for Event-Driven Wireless Sensor Networks (EECED). The principle point of this convention is to broaden the lifetime of the system and it circulates vitality similarly on every hub. In EECED the hub with the additionally remaining vitality is best competitor hub for bunch head. In this the Elector hub is likewise utilized for choosing bunch head, the part of balloter is to assemble the information vitality of closest hubs Simulation is use to contrast the execution of EECED calculation and the LEACH convention.

2. Yan Sun, "Vitality Efficient Routing Protocol in Event-Driven Wireless Sensor Networks", in this paper it is clarified by the creator that, to perform steering is a troublesome procedure if there should be an occurrence of WSN. In a decade ago colossal number of conventions was found. In any case, creator underline on Event-driven remote sensor systems. A calculation is utilized to enhance the nature of information and decline the power utilization of a system. In these calculations, number of hikes by sensor hubs when there is no undertaking to perform and number of testing recurrence created by sensor hubs is decreased to a degree and the positive input plan is utilized to caution the sensor hubs when an occasion happens. This calculation stores the information in parcels and utilizes negative-ACK to diminish the utilization of data transfer capacity.

3. Samer A. B. Awwad, "Bunch Based Routing Protocol for Mobile Nodes in Wireless Sensor Network", In this paper it is depicted by the creator that Strength of sensor hubs in WSN is an issue for transmission of bundles and dispersal of vitality. In some application both settled and portable hubs are utilized as a part of a similar system, while now and again just versatile hubs are utilized. Loss of information bundle is another issue if there should arise an occurrence of portable sensor hubs. To take care of this issue of lost information parcel a cross layer configuration is executed between medium get to control (MAC) and system layers. In this manner a bunch based steering convention is characterized particularly for portable sensor hubs (CBR-Mobile).This convention is versatility and movement control convention. The sensor hubs which moves out of the bunch or don't have any information bundle to transmit are assigned with a particular restricted schedule vacancy

reassigned to approaching sensor hubs inside the group. Two sorts of database are utilized to pick up the versatility and movement control productively. As indicated by this convention information depends on the quality of the signs. Information transmission is done in an appropriate productive way. In CBR-Mobile convention, bunch based directing and half breed MAC convention is joined together for portability of sensor hubs. Two time calendars are utilized as a part of this, first is Schedule timeslots which is for the transmission of information and another is conflict timeslots which is utilized for transmission of join enrollment messages. The execution assessment for this convention is performed in MATLAB it is watched that it enhances the proportion of bundle transmission, vitality utilization deferral and reasonableness in portable systems as contrast with LEACH-Mobile and AODV conventions.

4. R. Rajeshwari, "Towards Energy Efficient Cluster Based Approach in Wireless Sensor Networks Using Mobile Sink", in this paper creator passes on that Sensor systems are blend of numerous sensor hubs. These sensor hubs sense the information from its environment and send that gathered information to the base stations as information parcels. Since the lifetime of sensor hub depends on the vitality of battery, so it is compulsory to use the vitality utilization by these hubs. Also, to lessen the battery utilization it is obligatory to decrease the movement on every last hub alongside the limited number of transmitted information to the Base station. By utilizing bunching approach versatility, decreased vitality utilization and better execution of system can be acquired. In Clustering approach entire system is isolated into little groups and each bunch has its group head which is chosen from the groups itself. Group heads create the total type of information detected by sensors locally. This method diminishes the span of the information by era compacted type of information and this packed information is forward to the base station for an appropriate sink of the system.

5. Arun K. Kumar, "Vitality Efficient Mobile Data Collection in Wireless Sensor Networks with Delay Reduction utilizes Wireless Communication", in this creator characterizes that the lifetime of sensor hubs relies on the vitality devoured by them So it is must to limit the vitality utilization for longer presence of the hubs in the system. This additionally influences the availability and scope of the system. Vitality utilization can be diminished to a degree by utilizing Special Mobile Data authority to accumulate the data. The MDC assembles the information from the Sensor hubs and transmit it to the sink. There are different MDC accessible for different limitations and suppositions. In any case, in every one of the models proposed, because of moderate speed of versatile hubs, the information idleness is typically high. There is a model used to lessen the information inactivity for gathered versatile information. The postponement can be diminished without influencing the MDC by utilizing directing based grouping and information accumulation approach in an aggregate frame or way. In the wake of reproducing this approach it is acquired that the parcel postponement is diminished to the greater part of the deferral in a current approach.

6. Chu-Fu Wang, "A Network Lifetime Enhancement Method for Sink Relocation and Its Analysis in Wireless Sensor Networks", in this paper creator clarifies that with the progression in late patterns of miniaturized scale producing innovation likewise prompts the headway in the of ease, low-control, multifunctional sensor hubs for remote correspondence. Differing detecting applications have additionally turned into a reality accordingly. These incorporate ecological checking, interruption discovery, front line reconnaissance, et cetera. The most effective method to build the lifetime of the system, by dealing with the assets use in an ideal way alongside the way toward detecting is an essential issue in WSN. In a Wireless Sensor Network, multihoping is utilized to transmit the information to the base station. The lifetime of the system is influenced generally by those hubs which are close to the sinking point and these hubs devours more vitality and thusly the vitality of the system will depleted out before and it will prompts the abbreviate the lifetime of the system. To evade overabundance utilization of vitality Sink movement is utilized in light of the fact that it maintains a strategic distance from abundance utilization of vitality by the sensor hubs. A system known as EASR (Energy Awake Sink Location) is created for portable sinks in the system. This procedure (EASR) utilizes the data of residual battery vitality on every hub and deals with the scope of transmission for every last hub and migrates the plan of sink. Some hypothetical and numerical investigate are utilized to demonstrate that the EASR strategy can upgrade the system lifetime of the WSN fundamentally.

7. Shounak Chakraborty, "A Noble Approach for Self Leaming and Cluster based Routing Protocol with Power Efficiency in WSN", in this creator says that, Energy proficiency is the fundamental thought while creating steering convention for a WSN. For a self-learning, stable bunching power productive steering convention a measurable model is proposed. This model is known a measurable model since it utilizes different factual capacities like mean, change and standard deviation to pack the information for transmitting it to the base station and an edge an incentive to create a caution in the event of crisis. This strategy use the factual yield of gathered information and utilize it on account of crisis that it naturally produces the caution or alarm to the base station about it. The calculation likewise takes care of the issue of relating era of both occasional and occasion driven information. A recreation is done to finish the convention in which it is acquired that this convention prompts enhanced power productivity.

3. CONCLUSION

In this paper we show wireless sensor network is comprise an extensive number of sensor hub. Furthermore, these hubs are asset requirement. That is the reason lifetime of the system is constrained so the different methodologies or convention has been proposed for expanding the lifetime of the remote sensor arrange. In this paper we talk about the information collection is one of the critical methods for improving the life time of the system. Also, security issues is information trustworthiness with the assistance of uprightness we decrease the traded off sensor source hubs or aggregator hubs from altogether changing the last total esteem.

REFRENCES

[1]. Buyanjargal, "An Energy Efficient Clustering Algorithm for Event-Driven Wireless Sensor Networks (EECED)", IEEE, pp 1758 – 1763, August, 2009

[2]. Yan Sun, "Energy-Efficient Routing Protocol in Event-Driven Wireless Sensor Networks", IEEE, pp 1-5, May 2010

[3]. SamerA. B.Awwad, "Cluster Based Routing Protocol for Mobile Nodes in Wireless Sensor Network", Springer, DOI 10.1007, pp 251-281, May, 2010

[4]. R.Rajeshwari, "Towards Energy Efficient Cluster Based Approach In Wireless Sensor Networks Using Mobile Sink", IJETCSE, Volume 13 Issue 1, pp 183-186, MARCH 2015

[5]. Arun K. Kumar, "Energy-Efficient Mobile Data Collection in Wireless Sensor Networks with Delay Reduction using Wireless Communication", IEEE, 978-1-4244-5489-1

[6]. Chu-Fu Wang, "A Network Lifetime Enhancement Method for Sink Relocation and Its Analysis in Wireless Sensor Networks", IEEE SENSORS JOURNAL, VOL. 14, NO. 6, pp 1932-1943, JUNE 2014

[7]. Shounak Chakraborty, "A Noble Approach for Self Leaming and Cluster based Routing Protocol with Power Efficiency in WSN", IEEE, 978-1-4799-3358-7, pp 773-777, 2014

[8]. Rui Chen, "An Event and Rule-driven Immune Clustering Routing Algorithm of Wireless Sensor Network with Mobile Sink", IEEE, 978-1-4673-9323-2, pp 196-202, 2015

[9]. EZ-ZAIDI Asmaa, "Efficient data collection in wireless sensor networks using mobile sink", IEEE, 978-1-4799-7391-0, Vol:14, 2014

[10]. Priya Vyas, Manoj Chouhan," Survey on Clustering Techniques in Wireless Sensor Network", International Journal of Computer Science and Information Technologies, Vol. 5 (5) , 2014, 6614-661

[11]. Joshi, G. P., Nam, S. Y., Kim, S. W.: "Cognitive Radio Wireless Sensor Networks: Applications, Challenges and Research Trends", Sensors, ISSM: 1424-8220, Vol.13, No: 9, Aug 12, 2013, pp: 11196-11228.

[12]. Li, X, Merrett, G. V., White, N. M.: "Energy-efficient data acquisition for accurate signal estimation in wireless sensor networks", Journal on wireless Communications and Networking, Vol. 230, Issue.1, pp: 1-15, 2013.

[13]. Seada, K., Zuniga, M., Helmy, A., Krishnamachari, B.: "Energy Efficient Forwarding Strategies for Geographic Routing in Lossy Wireless Sensor Networks", Proceedings of the 2nd international conference on Embedded networked sensor systems, USA, ISBN:1-58113-879-2, 2004, pp: 108-121.

[14]. Mishra, N. K., Jain,V., Sahu, S.:"Survey on Recent Clustering Algorithms in Wireless Sensor Networks", International Journal of Scientific and Research Publications, ISSN 2250-3153, Vol. 3, Issue.4, April 2013, pp: 1-4.

[15]. Patil, P., Kulkarni, U. P.: "Energy Efficient Aggregation With Divergent Sink Placement For Wireless Sensor Networks", International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC), Vol.4, No.2, pp: 47-58, April 2013.

[16]. Gawali, S. E., Mantri, D. S.: "Lifetime Energy Efficient Optimization for WSN", 2nd International Conference, Computer Technology and Development, E-ISBN: 978-1-4244-8845-2, Print ISBN:978-1-4244-8844-5, 2010, pp: 235-239

[17]. Kumar, N., Kumar, M., Patel, R. B.: "A Secure and Energy Efficient Data Dissemination Protocol for Wireless Sensor Networks", International Journal of Network Security, Vol.15, No.6, pp.490-500,2012

[18]. Akilandeswari, N., Santhi B., Baranidharan, B.: "A Survey on Energy Conservation Techniques In Wireless Sensor Networks", ARPN Journal of Engineering and Applied Sciences, ISSN 1819-6608, Vol. 8, No. 4, pp: 265-269 ,April 2013.

[19]. Saini, M., Saini, R. K.: "Solution of Energy-Efficiency of sensor nodes in Wireless sensor Networks", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X, Vol. 3, Issue 5, pp: 353-357, May 2013.

[20]. Khan, A. W., Abdullah, A. H., Razzaque, M. A., Bangash, J. I.: "VGDRA: A Virtual Grid-Based Dynamic Routes Adjustment Scheme for Mobile Sink-Based Wireless Sensor Networks", IEEE Sensors Journal, Vol. 15, Issue: 1, January 2015, pp: 526-534