International Journal of Engineering and Technical Research (IJETR)
ISSN: 2321-0869 (O) 2454-4698 (P), Volume-5, Issue-1, May 2016

# Review - An Energy Efficient Data Compression & Security Mechanism in Clustered Wireless Sensor Network to Avoid Redundancy using ACO and Leach Algorithm

**Manjeet kaur, Er. Mandeep kaur**

***Abstract*— In this paper, Wireless detector Networks contains nodes that area unit deployed over the sector to collect helpful data and send the specified information to the bottom station for additional process. In WSNs, nodes have restricted power and shorter life therefore, it's crucial to gather the knowledge in associate energy economical manner and enhance the life of the network. hymenopteron Colony optimisation, a Swarm Intelligence primarily based routing technique is wide utilized in network routing. LEACH (Low Energy adjustive bunch Hierarchy) is one in every of the foremost widespread bunch algorithms. a set of asynchronous agents or ants produces partial solutions moving through totally different states of the matter. there's path and also the energy loss optimisation drawback. Energy economical information Compression & Security Mechanism in Clustered Wireless detector Network to avoid redundancy victimisation ACO & Leach formula. To implement the ACO-IBOOS in WSN routing with energy and their node degree.**

***Index Terms*— ACO, LEACH, Network etc.**

## I. INTRODUCTION

Wireless Sensor Network is used for monitoring and observing the physical conditions with a number of sensor nodes. Those sensors/actor nodes have limited resources in terms of power, processing and computing, also the size must be small as possible so those nodes can adequate many particular applications. They are used to observe many physical conditions like temperature, sound, pressure and motion, etc. The main activities of those sensors nodes can be summarize as follows: Sense the environment, Gather information of environment. The focus of the research is around the improved quality of communication through Wireless Sensor Networks. The goal is to achieve the minimum consumption of energy and its optimal use. The WSN has got much attention from various applications, because, it operates on its own without any human intervention. These sensor nodes communicate over short distance via a wireless medium and collaborate to accomplish a common task, for example, environment monitoring, military surveillance, industrial process control, warehouses, malls, tunnels etc. These nodes have limited amount of initial energy that are consumed at different rates, depending on the power level. Wireless sensor networks present a series of serious issues that still need research effort. Challenges faced by WSNs are Network lifetime, Scalability, Interconnectivity, Reliability, Heterogeneity, Privacy and Security. To balance the traffic load and reduces the number of data transmissions throughout networks Compressive Sensing CS plays major role(1) (2). However, by using pure compressive sensing the total number of transmissions for data is large. To minimize the number of transmissions in sensor networks the hybrid method of using Compressive Sensing CS is used. In research (1) proposed a Hybrid CS a clustering method for sensor networks. The cluster is formed with the combination of sensor nodes, in each cluster, sensor nodes transmit sensed data to the cluster head CH. Data gatherings is done in tree structure and sends data to CHs and transmit data to the sink using Compressive Sensing CS. For determining how big cluster size should be is an important issue for the hybrid method. If suppose the cluster size is too big then the number of transmissions required to gather data from sensor nodes within a cluster to the CH will be high.100-1000 of tiny battery operated, wireless sensors that are dispersed throughout the geographical area [10]. They are self organized and coordinate among themselves but sensor nodes have limited storage and power, limited computational ability, and wireless radios on these devices are short-range and have a lower rate of data. It comprises of four parts namely: transceiver, processor, battery and most importantly a sensor also known as motes. The Sensor senses the environment in which it is deployed and processor changes the information fetched from analog to digital format. Wireless sensors may also perform simple calculations and communicate over a small area. They can be used in detection of volcanic eruptions, vehicle tracking, and vibration sensing, monitoring patients. But the typical work is to collect and report data to base stations. Although WSNs are widely used in various domains, they have several limitations such as limited energy and restricted computation and communication abilities. To provide maximum network lifetime, minimization of energy consumption is considered as a major performance criterion in sensor networks. A. ANT COLONY OPTIMIZATION Routing is defined as the way of finding the shortest path between two nodes. For many years ants have had successfully applied routing to find the shortest paths between the food sources and their nest by means of a pheromone trail laid by the other ants? This is known as stigmergy and Ant Colony Optimization (ACO) routing [2]. The process of optimizing the network parameters of WSN routing process to provide maximum network lifetime can be considered as a combinatorial optimization problem. An ant in a colony uses a volatile chemical substance called pheromone to converge over the shortest path among multiple paths which connect their nest to the food source. While moving, ants

**Manjeet kaur,** M.Tech Research Scholars, Guru Kashi University
**Er. Mandeep kaur,** Assist Guru Kashi University, Talwandi Sabo assistant Professor

release pheromone on the ground, and they follow the path with maximum pheromone concentration.[2] This mechanism provides an optimum way to mark paths which guide other ants, and generate good paths from the overall behavior of the ant colony. The principle objective is to provide maximum network life time, while finding the shortest paths between source nodes and the base station using ACO which is swarm intelligence based optimization technique. It includes a collection of asynchronous agents or ants that produces partial solutions while moving through different problem states. While moving they follow a decision policy which is based over two parameters namely trail information and attractiveness. Each ant while moving incrementally produces a solution[9]. When final solution is generated, the trail information of the components is modified by evaluating the solution which will help in directing the further mechanism of the future ants. Furthermore, there are two more mechanisms in an ACO algorithm: trail evaporation and daemon actions. Trail evaporation leads to decrease in trail values with time. To avoid unlimited accretion of trails over some component, trail evaporation is used which decreases the trail value. WSNs have multiple nodes called sensors which are installed and set up in a particular area. A node consists of mainly of these parts: transceiver, processor, sensor, energy unit. The nodes are self-organized, coordinated and work together to collects several kinds of information from the environment and send required data to the base station (BS) for further processing which delivers this data to the sink node. WSNs applications: vehicle tracking, environmental traffic control, military surveillance, patient monitoring, area monitoring, air pollution monitoring, temperature monitoring, humidity monitoring, event detection, soil makeup, flood detection, drug administrations in hospitals, managing, etc [1] [3]

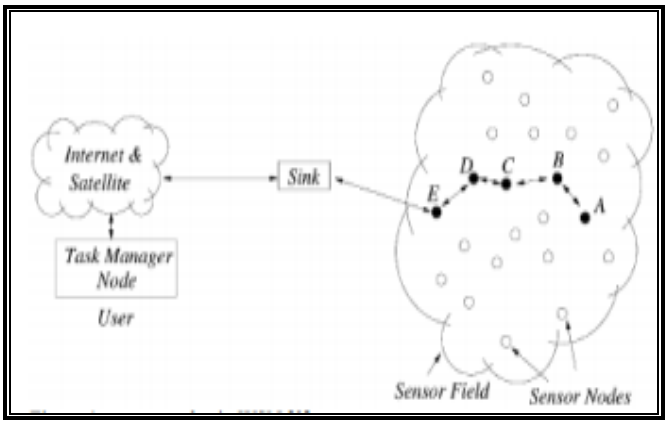



Figure 1: sensor nodes in WSN [3]

WSNs have various limitations like limited power, computation and communication. The battery power of the nodes decides the lifetime of the network. All sensor nodes process and transmit data to the BS (sink) (BS). But the nodes have limited battery power and small life span. So using of this energy in an efficient manner and increasing the lifespan of nodes is the major problem [1]. Latest work in WSNs is regarding energy efficiency as it is the major issue affecting the lifetime of the network. Different energy aware protocols are designed to increase network lifetime.

**Energy Efficiency in WSNs**

A sensor node is no longer in use when its battery dies. So minimizing energy consumption is considered the major issue to enhance the network lifetime [2]. Every aspect of the node must be designed to be energy efficient. This enhances the overall usefulness of the network. In multi hop ad hoc networks, each node process data and then route it. So failure of some nodes leads the entire network to re-organize. For these reasons the primary consideration of the researchers is designing power aware protocols for WSNs [3]. For this, the concept of clustering was introduced; in which based on certain criteria few nodes are elected as cluster head (CH). All the sensor nodes are grouped into clusters and the CH manage every other node in the cluster [9]. CH collects data from sensor nodes and delivers it to the sink. These CHs keep on rotating to maintain a stable network [1]. In a WSN, there is a greater load on a CH as compared to other sensor nodes. So there energy depletes at a greater rate and CHs die soon. This make designing of energy efficient clustering techniques critical. For this, various protocols has been introduced.

**LEACH (Low Energy Adaptive Clustering Hierarchy):**

It is a hierarchical based protocol that is energy efficient as compared to traditional protocols. It's the first network protocol which adopted hierarchical structure. In LEACH network is divided into clusters based on the signal strength of sensors. CH selection is done randomly and they die quickly. All the nodes in LEACH have same energy level. It operates in two phases: first is setup phase in which CHs are created; second phase is steady phase in which CHs collects data from the sensor nodes in their respective clusters and delivers this data to the sink. The major drawback of LEACH is that no consideration is given to the energy consumption while selecting a node as a CH. A node with small residual energy can become a CH, which will lead to early death of the CH and shorten the network lifetime. It is not suitable for large size networks [1][4].

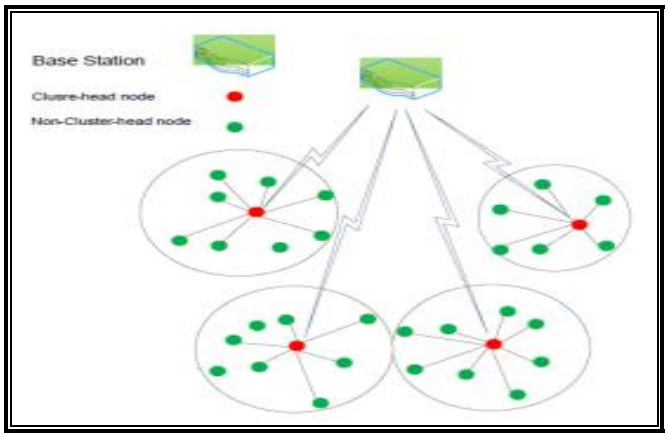



**Figure 2: LEACH protocol illustration**

## II. LITERATURESURVEY

**Mr. Akshay S. Nagdive** in 2015 "An Implementation of Energy Efficient Data Compression & Security Mechanism in Clustered Wireless Sensor Network" In WSN the amount of data transmission has become an important issue. New technology of compressive sensing (CS) in sensor networks new idea for data collection and target localization are research areas in sensor networks. Compressive Sensing (CS) minimize the number of data transmissions and balance of the

traffic load throughout networks. After all, by using pure compressive sensing the total number of transmissions for data
collection is still high. To minimize the number of transmissions in sensor networks, hybrid method of Compressive Sensing (CS) issued. Further to provide data compression in WSN a light weight Enhanced Lossless Entropy Compression (LEC) algorithm will be
used for reducing size of data in the Sensor Network. Security is the major issue in the Sensor Network and to make the data secure the Advance Secured and Efficient Transmission-Identity SET-IBS protocol will be used. It is a light weight algorithm which consumes less energy while encrypting and decrypting the data. This encryption takes less energy and therefore it is helpful to make the WSN efficient. In this the main focus is on optimization of energy in terms of lightweight security and compression techniques
which reduces the complexity of Wireless Sensor Network the Advance SET-IBS protocol for encrypting the data on the sensor node is proposed.[5]

**Tripti Sharma** in 2015," Ant Based Cluster Head Election Algorithm in Wireless Sensor Network to avoid redundancy", In this paper, Wireless Sensor Networks consist of nodes which are deployed over the field to gather useful information and send the required data to the base station for further processing. In WSNs, nodes have limited power and shorter lifetime so, it is critical to collect the information in an energy efficient manner and enhance the lifetime of the network. Ant Colony Optimization, a Swarm Intelligence based routing technique is widely used in network routing. LEACH (Low Energy Adaptive Clustering Hierarchy) is one of the most popular clustering algorithms. In this paper we have proposed a novel routing approach based on ACO algorithm in Wireless Sensor Networks on which LEACH protocol is applied, to route the data packets in sensor networks to maximize energy efficiency and to increase the network lifetime. Along with this we try to reduce the efforts used in sending the redundant data sent by the sensors which are very much close to each other in the sensor network. The performance of our proposed algorithm has been compared with the LEACH protocol and the simulation results shows that the proposed approach provides optimized solutions in terms of efficient energy utilization and enhanced network lifetime. [1]

**Jaspreet Kaur** in 2015, "Design of Improved LEACH using ACO for WSN", In this paper, Wireless sensor networks are becoming popular in real life applications. Because of the features of the resource-constrained and battery-aware sensors; in WSNs energy utilization has found to become a major interesting subject of research. WSNs compose battery-powered nodes which are associated with the bottom station to for certain action or task. As sensor nodes are battery-powered i.e. can become dead following the consumption of the battery that is also called duration of WSNs. Ant Colony Optimization ACO is being widely found in optimizing the network routing protocols. Ant Based Routing can play an important role in the enhancement of network life time. The general goal is to locate the effectiveness of the iLEACH when ACO intercluster data aggregation is applied on it. [2].

**Koteswararao Seelam in 2015 "An Efficient Hybrid BAT-Optimized Clustering for Wireless Sensor Networks"** This work describes Cluster-based routing protocols offer advantages such as improved power control, reduced control messages, enhanced resource allocation and bandwidth re-usability. Low Energy Adaptive Clustering Hierarchy (LEACH) a cluster-based protocol includes distributed cluster formation. LEACH randomly selects sensor nodes as cluster-heads and rotates them to distribute energy load uniformly among network sensors. LEACH is ambiguous sensor nodes position and network Cluster Head (CH) numbers. This study proposes a hybrid BAT algorithm (HBA) with Differential Evolution (DE) to improve the efficiency and to overcome disadvantages of LEACH Simulation study revealed that the HBA achieved improved throughput, lowered delay and packets retransmission and better data dropped than LEACH. [3]

**Rupendra Ralhan** in 2015," Review On Various LEACH Variants" due to limited battery of sensor nodes, energy efficiency becomes weak side of the WSNs. This paper has focused on energy efficient protocols of WSNs. Since no replacement and charging are available for sensor nodes, so utilizing them in optimized manner has open research for sensor researchers. Many energy efficient protocols have been introduced so far and this paper has focused on some wellknown energy efficient protocols. The review has shown that the Ant Colony Optimization based energy efficient protocols have proficient results over the existing ones. [4]

## III. PROBLEM FORMULATION

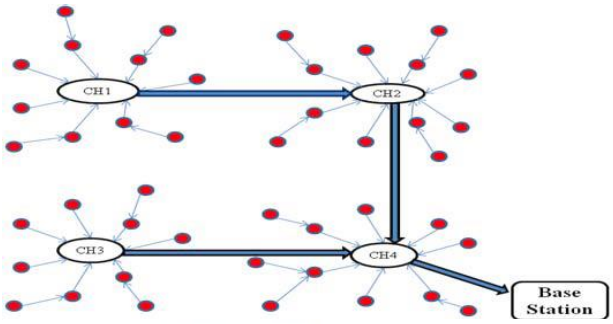
There are different types of problems are faced that is studied in the previous research work these are given below:

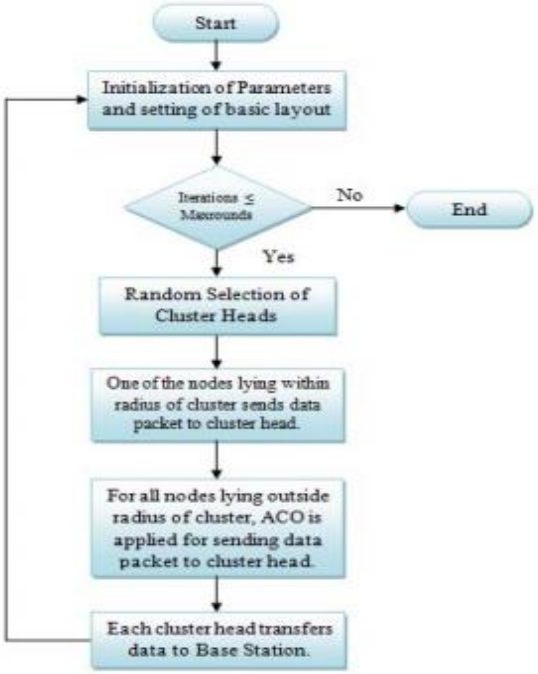
- A collection of asynchronous agents or ants produces partial solutions moving through different states of the problem.
- There is path and the energy loss optimization problem.
- There is node degree calculation and the cluster head selection based on their degree problem.
- There is a path selection problem during the processing of ANT on WSNs.

## IV. METHODOLOGY

ACO algorithms have been applied in solving various optimization problems effectively. In ACO algorithm Ant agents are placed on the source node which iteratively produces the solution by using probabilistic approach and the pheromone value (which defines the goodness of path) of optimum path from source to sink. This process continues until the final termination condition is achieved, i.e. all the nodes are dead in the system. Algorithm for the procedure of ACO is shown. The proposed approach is processed in two phase the setup phase and the steady state phase as in LEACH [8]. In WSN routing algorithm the packets has been send from source node to the base station i.e. source to sink. In the proposed Ant based approach the nodes are placed as Ant agents. The cluster head is chosen randomly as in the setup phase of LEACH [1] . Basic layout of the sensor system is built and initialization of parameters is performed. To reduce

the number of data transmission the hybrid compressive sensing CS is used in which the sensors are divided
into clusters, each cluster contains a cluster head CH which is selected according to the maximum energy present in the batteries of sensor nodes and also the second maximum node is ready for further Cluster Head Selection. Here the sensed data is collected through the sensor nodes, each sensor sends the sensed data to the cluster head in the form of tree topology and gather all the data to the cluster Head.




## V. CONCLUSION

In this paper totally different issues ar studied within the literature survey. There ar totally different issues in IBOOS algorithms. thus we've to get rid of these issues with the assistance of ACO-LEACH and IBOOS algorithmic rule. In ACO algorithmic rule hymenopteran agents ar placed on the supply node that iteratively produces the answer by victimisation probabilistic approach and therefore the secretion price (which defines the goodness of path) of optimum path from supply to sink. In WSN routing algorithmic rule the packets has been send from supply node to the bottom station i.e. supply to sink. within the planned hymenopteran primarily based approach the nodes ar placed as hymenopteran agents. The cluster head is chosen arbitrarily as within the setup section of LEACH.

## REFERENCES

[1] Tripti Sharma et.al., 'Ant Based Cluster Head Election Algorithm in Wireless Sensor Network to avoid redundancy', Fourth International Conference on Communication Systems and Network Technologies, 2014.

[2] Koteswararao Seelam 'An Efficient Hybrid BAT-Optimized Clustering for Wireless Sensor Networks'Journal of Wireless Sensor Networks ISSN: 2001-6417,2015

[3] Jaspreet Kaur, 'Design of Improved iLEACH using ACO for WSN', International Journal of Engineering and Innovative Technology (IJEIT) Volume 4, Issue 11, May 2015

[4] Rupendra Ralhan 'Review On Various LEACH Variants'Research Cell : An International Journal of Engineering Sciences, Issue December 2014, Vol. 1.

[5] Mr. Akshay S. Nagdive et. al. "An Implementation of Energy Efficient Data Compression & Security Mechanism in Clustered Wireless Sensor Network" International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India, 2015.

[6] Nitin Mittal, Davinder Pal Singh,Amanjeet Panghal, R.S. Chauhan,"Improved Leach Communication Protocol for WSN", NCCI 2010 -National Conference on Computational Instrumentation CSIO Chandigarh, INDIA,2010.

[7] Varnika Bains, Kanchan Sharma "Ant colony based routing in wireless sensor networks", International Journal of Electronics and Computer Science Engineering.

[8] Dorigo, M., Stützle, T., "Ant Colony Optimization", ISBN 0262042193, MIT Press, 2004

[9] K. Li, C.E. Torres, K. Thomas, L.F. Rossi, and C.-C. Shen, "Slime mold inspired routing protocols for wireless sensor networks", Swarm Intelligence, vol. 5, pp. 183-223, 2011.Computational Instrumentation CSIO Chandigarh, INDIA,2010.

[10] T. Camilo, C. Carreto, J.S. Silva, F. Boavida, An energyefficient ant-based routing algorithm for wireless sensor networks, in: Proceedings of the 5th International Workshop on Ant Colony Optimization and Swarm Intelligence (ANTS), LNCS, vol. 4150, Springer, Berlin, Germany, 2006, pp. 49– 59.

[11] R. Ghasemaghaei, M.A. Rahman, W. Gueaieb, A. El Saddik, Ant colony-based many-to-one sensory data routing in wireless sensor networks, in: Proceedings of the IEEE International Conference on Computer Systems and Applications.

G S Tomar & S Verma "Dynamic Multi Level Hierarchical Clustering Approach For Sensor Networks", IJSSST Vol.10 No.4, pp 32-37, 2010