

# A Survey: Compressing of the Data Packet using Protocols in Wireless Sensor Network

Sandeep M Gundale <sup>#1</sup>

*M.Tech in CSE as a Assistant Professor in Information Technology Department,  
PGMCOE, University Pune - Maharashtra, India*

**Abstract-** The Wireless Sensor Network (WSN) is progress technology we provide different techniques, topologies and protocols for overall aggregation function in the wireless sensor networks (WSN). There are different types of aggregation functions to be performed in the wireless sensor networking environmental area with different protocols, topologies and techniques have been planned to routing the packets for overall data compression in the WSN network. Generally the users need only resourceful aggregate functions. In a WSN sensor network may build of more than hundreds or thousands of low-cost sensors in wireless sensor network. Each sensor node to be performed the work as performing an information source, sensing and collecting the overall data or information management from the surroundings area for a given process.

**Index Terms –** Compressing Data Packets, Cluster Head, Data Aggregation, Overall Data, Central Location, Data Assembling, Aggregation Tree, Routing Protocols, Base Station

## 1. INTRODUCTION

A Wireless Sensor Network is a group of sensor nodes that are used for observe and record the surrounding area of physical conditions like Humidity, Pressure, Temperature, Sound Pollution, Wind Speed etc.

The organizing data assembling at some central locations in the Wireless Sensor Network using gateway node or base station i) A group distribution sensor nodes ii) A communication network iii) A centralized location for assembling the data collected iv) A group of resources sensor nodes at the central locations in the WSN surrounding area.

Wireless Sensor Network are broadcasting and increasing area of which combines a number of problems in the distributed computing and embedded systems [1]. The Sensor networks are most commonly used for applications such as Wild life Habitat monitoring, forest fire avoidance and military surveillance etc [2][3][4]. A WSN has very small area and has no infrastructure. WSN consists of

number of sensor nodes which was working together to observe area to find a data surrounding WSN area. There are two types of WSNs are i) Structured WSN and ii) Unstructured WSN. Sensor networks are mostly communication based systems that are different from usual communication network in several ways: Wireless sensor networks have energy limitation unnecessary data rate and many-to-one connection in WSN. The overall information compression or aggregation is the combination of information from the different source nodes in WSN the surrounding networks area. The information from the different source nodes can be collected in a number of different ways in the WSN area. The data aggregation function is to remove the duplicate data from the source nodes in WSN network. The Duplicate data control is completed, if the sources node 1 and source node 2 both sends the same information to the nearest node in WSN network, the next source node 3 will accept only one data from the source node in WSN network area. It is a simplest connection of overall data in the WSN wireless sensor network environmental area.

## 2. TROUBLE AND TOPICS

In the WSN all the wireless source nodes is use the battery power in WSN environmental area. The battery power uses, the more data are being transmitted on the networks, this reason the more battery power use to the wireless source nodes. The solution of this problem is to decrease the bit transmission rate in the WSN. The bit transmission rate can be decrease by overall the sensor data [5]. It can be useful for sensing some sensor properties like Min, Max, and Temperature in the WSN network area.

### 3. ROUTING TECHNIQUES

The Routing Techniques are as follows:

Such as direction finding using Flooding Techniques:

- i) Flooding in data communication network
- ii) Flooding traffic handle problem
- iii) Flooding traffic overlapping problem

#### 3.1 Flooding in data communication network

The flooding protocol as the name says, flood the sensor network with data and messages. In flooding each sensor nodes broadcast the packet that it receives to the neighbouring nodes until the maximum hop count is reached. After transmission packet follows all possible transmission path. It helps in data dissemination across the network.

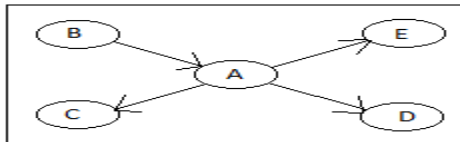


Figure. Flooding In data communication network

#### 3.2 Flooding traffic implosion problem

In flooding traffic implosion technique all nodes pass on the packet or request it receives to the neighbor nodes, it may results in duplicate message being send to the same node. This is called traffic implosion shows traffic implosion problem in figure.

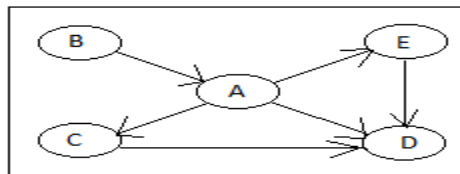


Figure1. Flooding traffic implosion problem

#### 3.3 Flooding traffic overlapping problem

In this approach many redundant transmission occur when using flooding. The flooding does not take into account the available energy at sensor nodes. This wastes a lot of networks resources and decrease the life time of the network significantly.

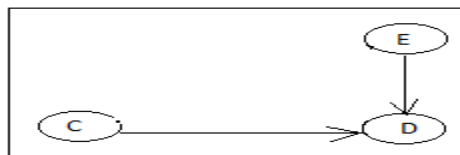


Figure2. Flooding traffic overlapping problem

### 4. BASIC WIRELESS NETWORK

In WSN the sensed data must be gathered and transmitted to a Base Station (BS). Then the sensed data further processed for end user queries. By using the aggregation and data combination technique the total energy, power utilization per node can be balanced. Sensor nodes are the collection of sensor nodes which are co-operatively collect and send data to base station.

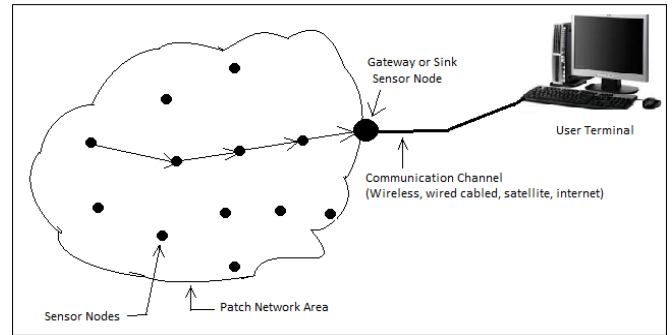


Figure3. Basic wireless network

All intermediate nodes in the network cache the data during the entire process to enhance the performance and improve the efficiency for the next request of the similar type. Figure shows the sensor network for the data dissemination.

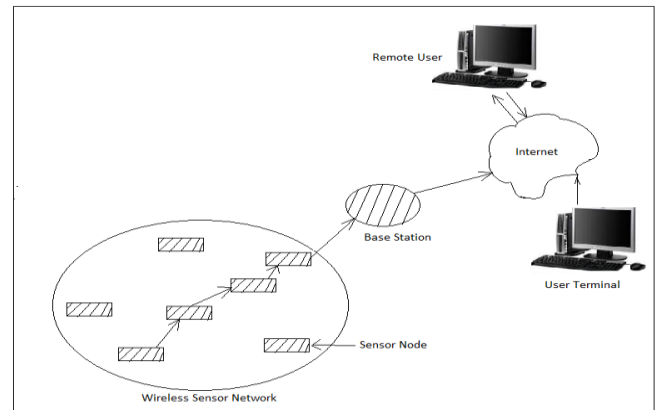


Figure4. Data forwarding from sensors

#### 4.1 Sensor network arrangement

The area or region in which the sensor nodes are scattered called as a sensor field or a patch network. Each and every sensor in that sensor network fields collects the data from the sensor nodes, analyzes and processing the data through the different routers to the Gateway(sink point). Below to shows the sensor network arrangement.

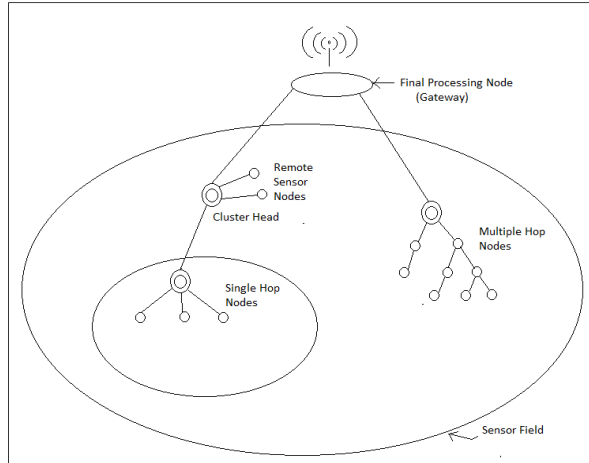


Figure6. Sensor network arrangement

### 5. FUNDAMENTAL OF DATA COMPRESSING IN WSN NETWORK

In WSN the sensed data must be collected and transmitted to a Base Station. Then the sensed data further processed for end user queries. By using the aggregation and data combination technique the total energy, power use as per node can be balanced. Sensor nodes are the group of sensor nodes in WSN fields to be collected and send data to base station. The main feature of data aggregation is to collect and aggregate data in energy resourceful. So, that the network lifetime is increases in the WSN network.

The overall sensing aggregating data is a technique of compressing the transmitted packet to the base station, in the sense the packet is has only the required information. The overall data or aggregation of data was primarily used in DSP (Digital Signal Processing) applications [6]. In detail, an error free and scalable aggregation framework is called *Synopsis distribution*. It has been proposed for computing aggregation values such as COUNT, AVERAGE, UNIFORM SAMPLE and MOST FREQUENT ITEMS [7][8]. Good aggregation functions for Wireless Sensor networks need to have some additional requirements such as, they should take care of energy capabilities of the sensor devices, energy resources and computational capabilities. It is based on the topology of the network the aggregation function can be constructed and used by the sensor nodes. In wireless sensor networks, a possibility to reduce the amount of data to be transmitted, and therefore to save energy, is to combine several sensor readings in intermediate nodes along the way towards the requester in WSN network field. This process is known as overall data of this area of WSN securely transmission during two nodes.

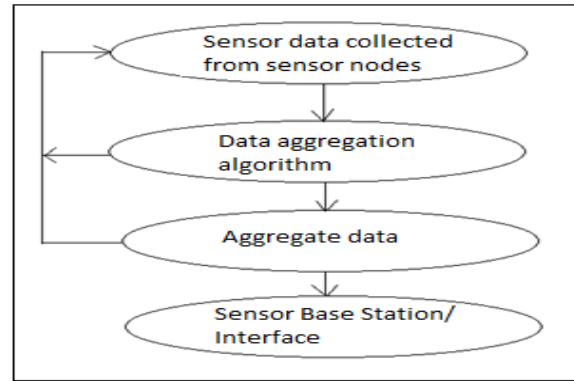


Figure7. The architecture of the data aggregation process

### 6. PACKET FORMATTING AND ARQ PROTOCOLS

The data link layer at the transmitter accepts the User Data from upper layer. The data link layer pretend a Header 'H' to the User data 'U'. This user data U or packet holds to control and address information. The address requirement required because: i) Wireless channels are broadcast channels by types and ii) A packet can theoretically be obtained by all neighbors in coverage range or area.

The address information is differentiates the desired receivers and the transmitters. The control information can contain sequence numbers of the flags depending on the type of ARQ protocols.

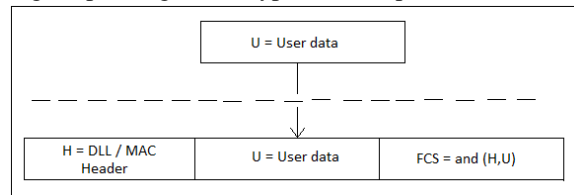


Figure8. Packet formatting at the DLL

#### 6.1 ARQ Protocols in WSN

In WSN three standards protocols are:

- 1) Alternating Bit Protocol
- 2) Go back N Protocol
- 3) Selective Repeat/Selective Reject Protocol

### 7. WSN PROTOCOL STACK ARCHITECTURE AND STANDARDS

In WSN researchers are aiming to develop a low data rate standards for WSN that has feature like reliability, low power consumption and ensures system security. The different sensor network algorithms and protocols developed must have self-

organizing capabilities. The WSN architecture is similar to the 7 layers OSI model in computer network. In WSN there are four layers in the bottom namely physical layer, data link layer, network layer and transport layer. The function of this layer is to transfer to the data from one node/system to another. And upper layer are three cross plane such as task management plane, mobility management plane and power management plane. All these together manage the network and the sensor nodes in such manner so as to increase the overall efficiency of the WSN system.

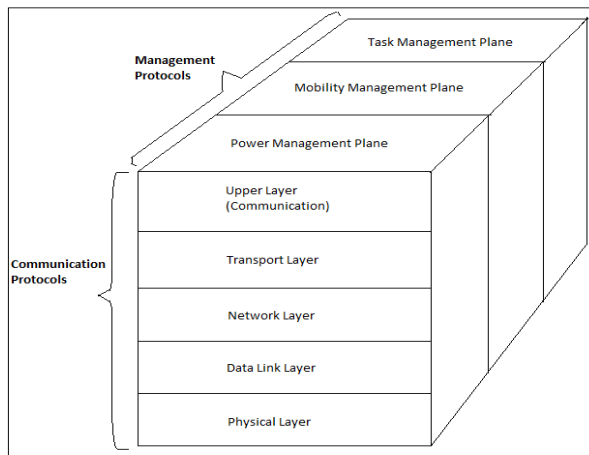


Figure9. WSN protocol stack architecture

### 7.1. WSN STANDARDS

The sensor nodes can be similar or dissimilar the sensor have specification to the used for different applications. The sensor nodes have different processing power have different roles. The special routing protocols are used in the wireless sensor networks then computer network protocols, for the development of such WSN the radio architecture correctly located. The researchers is carried on how energy or power must be efficiently utilized i.e. measurement of the energy efficiency. The sensor devices manufactures were thinking of the introducing methods of the standardization. The WSN standards as W-WAN, W-LAN, W-MAN, W-PAN and also there sub standards of each WSN networks.

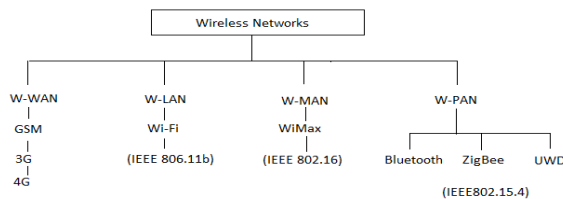


Figure10. Wireless networks standards

### 8. TYPES OF AGGREGATION DATA PACKET PROTOCOLS

The overall data compression protocols are used to reduce the communication cost and extending the lifetime of WSN sensor networks. There are four basic types of aggregation functions are types i) Cluster based protocol ii) Tree based protocol iii) Centralized based protocol and iv) In-WSN network aggregate protocol.

#### 8.1 Clustering in the WSN Source Node

Grouping of similar data are known as *Clusters*. The Process of collecting similar data are known as *Clustering* [10]. In cluster based function the whole network is divided into several clusters. Some of the issues involving in clustering in wireless sensor networks are how many sensor nodes are used in a single cluster, which sensor node act as a cluster head in the network and selection of procedure. LEACH protocol it is based on data cluster formation and is designed to collect and deliver the data to the base station. In clustering some nodes of the network plays a role of cluster head. The cluster head is the responsible for aggregating the data from other nodes in the network and sending the aggregate to the Base Station.

#### 8.2 Cluster based protocols in WSN

In [11], Heinzelman et al. proposes the LEACH protocol. Low-energy adaptive clustering hierarchy (LEACH) protocol it is based on data cluster formation and is designed to collect and deliver the data to the base station. This protocol used to group sensor nodes and works with cluster heads to aggregate data. This protocol work and communicate with the base station directly using high transmission power in LEACH the cluster –heads are randomly selected in each round of the node operation. LEACH is a routing algorithm used to collect the data and deliver it into the sink or base station. Mainly it is used to reduce the lifetime of the communication and reduce energy consumption of the each node in the network. In LEACH each cluster in the network was operated by the cluster head. The objectives of LEACH are: i) Reduce the number of communication messages by using the data aggregation. ii) Increase the network lifetime. iii) Reduce the energy consumption by each sensor nodes in the network.

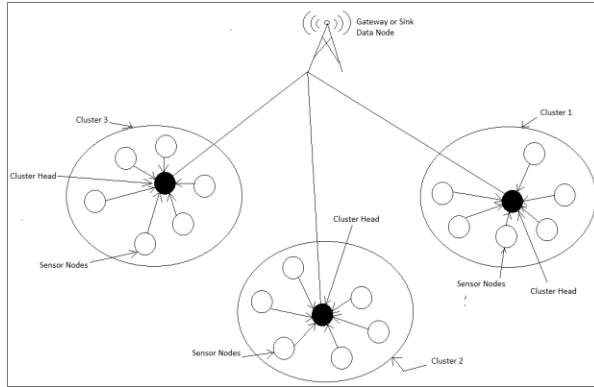


Figure 11. LEACH network model

The LEACH Network Model to compress the data arrival from nodes that belongs to respective cluster. Send an aggregated packet to the base station thereby reducing the amount of information that must be transmitted to the base station. The transmitted to the aggregated data is achieved over a single hop. To create a TDMA-based schedule where by each node of the cluster is assigned a time slot that can be used for transmission. The LEACH operation can be categorized into two phases one is Setup Phase and second is Steady Phase. In setup phase is divided into two parts the first part is cluster head is selected and the second part is cluster information is done. The second phase is steady phase the data is collected, aggregated and is transferred to the base station. To the minimum overhead the duration of the steady state phase is longer that the duration of setup phase. The Frame in given slot for the each nodes in steady phase, the actual data be forwarded in the frame slots. The setup phase and steady state phase are both to perform the operation onto the every frame as a sequentially.

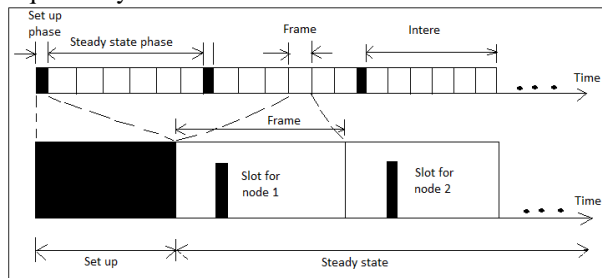


Figure 12. LEACH Phase

In Cluster based protocol the ISDQ is the cluster leader type distributed processing protocol. We assume that only one carrier node is active at one time i.e. one sensor node is capable of sensing one target at a time. The cluster head of C1 sensor such that every sensor is labeled. The cluster head can be formed with the detection from the different sensors

that are above the threshold value. The detection are updated as the sensor moves. Depending on the detection time or measurement scale we can select a leader node. We develop an ISDQ algorithm using Bayesian filtering and information criteria for selecting a sensor node in WSN area and algorithm for this method for every sensor nodes in WSN network.

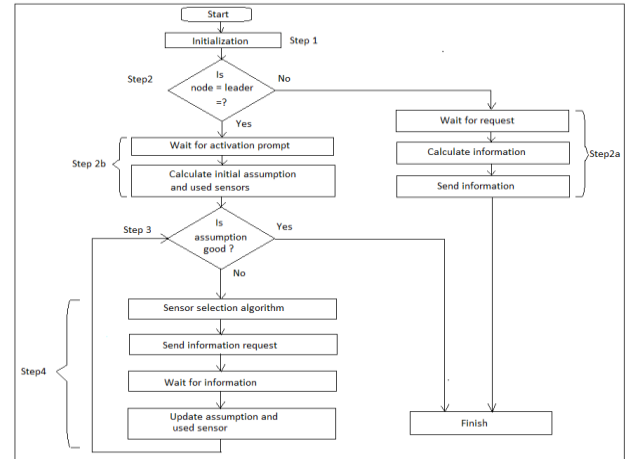


Figure 13. Flowchart of ISDQ algorithm for every sensor

In [12], Lindsey and Raghavendra propose the PEGASIS protocol. Power- Efficient Gathering in Sensor information Systems (PEGASIS) is a Chain based routing protocol used in the Wireless Sensor Networks. This protocol organizes all the nodes in a chain and play role of head in turn to save more energy. The protocol structure nodes are only communicated with their closest node. The chain starts with the extreme node in the base station. After that network nodes are added progressively within the chain. Based on LEACH and PEGASIS Culpepper et al. propose HIT [13] protocol. Hybrid Indirect Transmission (HIT) protocol is still uses LEACH like clustering operations. But LEACH allows multi-hop routes between cluster heads and non cluster head nodes. HIT protocol can have high energy transmission aspects. HIT protocol is highly used to reduce delay in the process of collecting and overall information from the sensor nodes in WSN. O. Younis and S.Fahmy proposes a protocol HEED [14]. A Hybrid, Energy-Efficient, Distributed Clustering approach (HEED) is a distributed clustering protocol that considers a hybrid of energy and communication cost when selecting Cluster heads. Only sensors that have a high residual energy can become Cluster heads. In HEED each node is mapped to exactly one cluster and can directly communicate with its Cluster head in WSN network.



### 8.3 Tree based protocols

Building an aggregation tree, a minimum spanning tree rooted at base station and source nodes are considered as leaves. In [15] [16] C. Intanagonwiwat et al. propose GIT protocol. Greedy Incremental Tree (GIT) is a tree based protocol that is used to establish an energy able path based on Directed Distribution [17] [18]. It is popular to the compression of aggregation scheme for sensor network is Directed Distribution (DD) [17] [20] is a data centric architecture. DD overall data from the paths of the network to reduce the quantity of data transmitted across the network. GIT protocol builds an overall tree sequentially to merge path and give many overall opportunities. At the first step the overall tree consists of only the shortest path network and the nearest source node. Then the next source node closest to the current tree is connected to the overall tree. In [22] [23] Madden et al. propose Tiny Aggregation Service (TAG) protocol. It is also a tree based protocol used in the Wireless Sensor Networks. It uses shortest path tree method and improves interfere based and suggestion testing based optimization. Zhang and Cao propose Dynamic Convey Tree based Collaboration (DCTC) [25] protocol. Power resourceful Data Gathering and Aggregation Protocol (PEDAP) [24] is quite better than LEACH and PEGASIS protocols. This protocol improves the lifetime of the system. Basic scheme of data compression include Center of the nearest Source (CNS) node [15] in this protocol the data are overall at the source node which is nearest to the destination source node. In Shortest Path Tree the data are sent through the shortest path from the source node to the destination node in WSN area.

#### 8.3.1 WSN Tree based technology

In WSN tree based technology has some nodes such as WSN Sensing Nodes, in [22] [23] Madden et al WSN Router and WSN Gateway (sink) node.

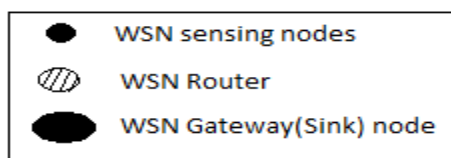


Figure14. WSN topology nodes

Gateway is the root of the Tree and router act like of the branches of the tree that are connecting to the sensing / end nodes in (DD) [17] [20].

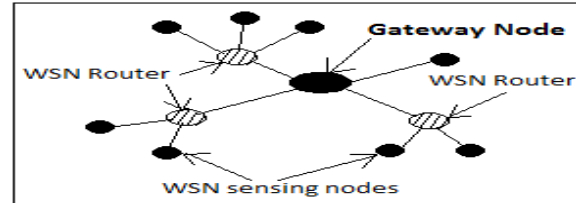


Figure15. Tree topology based protocols

### 8.4 Centralize based protocols

This is an address centric approach in this approach each node sends the data to the central node through the suitable shortest path using multi-hop environment. In WSN the sensed data must be gathered and transmitted to a Base Station (BS). In [22] [23] Madden et al The main feature of data aggregation is to collect and aggregate data in an energy resourceful manner. So, that the network lifetime is increases quietly. Central node acts as header and the header aggregates the information from the different nodes. In figure Shoes the star topology gateway (sink node) is the central device. The end or sensing nodes sense data and pass it on to the gateway it look likes as star, hence name of star topology. In Wireless Sensor

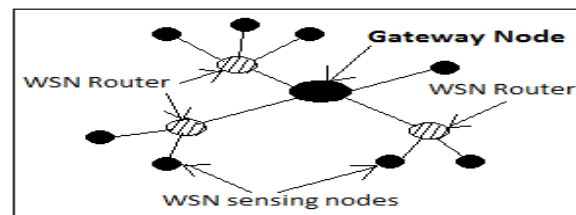


Figure13. Star topology of centralized protocols

### 8.5 In WSN network aggregate protocols

In-network function [25] is the global process of assembling and aggregating the information. There are two functions are used i) reduction with size ii) reduction without size. The Data compression or aggregation protocols are used to reduce the communication cost and extending the lifetime of WSN sensor networks. The aggregating data or information is a technique of compressing the transmitted packet, in the sense the packet is has only the required information. Adaptive Application Independent Data Aggregation in Wireless Sensor Networks (AIDA) uses feedback control based on network traffic condition when making aggregation decisions to adaptively optimize bandwidth while minimizing system energy use which is under broken in the traditional schemes [16] [26] [22] [27] [28].

## 9. CONCLUSION

The compressing of the data packet uses aggregation techniques in Wireless Sensor Networks and overall techniques such as compressing packets, reducing the data bits of transmission and different network protocols and their functions in the wireless sensor network. We have analysed the different algorithms, protocols, functions and techniques in overall data in Wireless Sensor networking (WSN) area. There are still many topics to be determined around WSN applications such as communication architectures, topology, phases, security, techniques, network model, wireless network standards, routing techniques, protocols and management. By solving these topics, close the space between technology and application.

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## AUTHORS

**First Author – Sandeep M. Gundale** received her M.Tech Degree from JNTU university Hyderabad. He is currently working as Assistant Professor CSE Department in PGMCOE, University of Pune, (Maharashtra) India.

