

# Hierarchical Agglomerative Clustering Based Routing Algorithm for Overall Efficiency of Wireless Sensor Network

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**Abstract :** Wireless sensor networks, also called as wireless sensor and actuator networks, consist of individual sensors distributed in space according to a particular criteria and are designed to monitor physical or environmental conditions, such as temperature, sound, pressure and many more. These sensors collectively pass their data through the network to a main location, mostly a base station. A critical regard with respect to applications of wireless sensor networks is its network lifetime. Battery-powered sensors are deployable provided they can communicate the gathered data to a central node or a processing node. Sensing and communication processes consume energy; therefore sophisticated power management and scheduling can successfully extend the operational time. Sensors that are more distant from base station deplete greater energy. Hence the cluster head is deployed for processing and sending the information while other nodes can be used to achieve sensing in proximity of the target. Transmitting data from the cluster head to the base station requires more energy than the transmission from sensor node to the cluster head, particularly if the base station is located away cluster head. This causes the cluster head to deplete their energy much faster. In this paper propose a method to address these factors. With the help of centrality based CH election and the Gateway nodes, the simulation results prove the efficiency of this method.

**Index Terms** –precision agriculture, wireless sensor network, NS2 simulation, Optimization of sensor node energy, energy Efficient wireless sensor network

## I. INTRODUCTION

A wireless sensor network (WSN) is a collection of specialized transducer and communication infrastructure for recording and monitoring the condition at different remote location. Generally observed parameters are atmospheric temperature, humidity, chemical concentrations, wind pressure, wind direction, wind speed, light intensity, PH level pollutant levels and vital body functions. A sensor network is made up of several portable detecting stations called as sensor nodes that are lightweight, small in size. Every sensor node is portable detecting stations called as sensor nodes that are lightweight, small in size.

Every sensor node is provide with a transducer that generates electrical signals based on physically sensed parameters and phenomena, a microcomputer that processes and stores the sensed output, a transceiver that receives commands from a central control system and transmits data to that system and power source. The energy for all sensor nodes is provided by a battery source

## II. LITERATURE SURVEY

Geetha [1] recent developments in the area of micro-sensor devices have accelerated advances in the sensor networks field leading to many new protocol specifically designed for wireless sensor networks (WSNs). Wireless sensor networks with hundreds to thousands of sensor nodes can gather information from an unattended location and transmit the gathered data to a particular user, depending on the application.

TejinderKaur[2] A key factor while designing any wireless sensor network is lifetime of that network that depends on the nodes energy that is very restricted by the battery of the node. Wireless sensor network consist of clustering which is believed to be the most energy efficient scheme.

S.chen, S.Tang, M.Huang, and Y.Wang,[3] data collection is a fundamental function provided by WSN how to efficiently collect sensing data from all sensor nodes in critical to the performance of sensor networks.

K.Akkaya and M.younis[4] recent advances in wireless sensor networks This paper surveys recent routing protocols for sensor networks and presents a classification for the various approaches pursued. The three main categories explored in this this paper are data-centric, hierarchical and location-based.

### III. PROPOSED SCHEME

According to routing respective clustering is the methodology in which grouping of sensor nodes are done. In clustering, data transmission is divided into intra-cluster and inter-cluster leading to significant energy saving as most of the energy is consumed in the sensor node. In cluster based routing technique it is the responsibility of the cluster head to send data to base station. Cluster is an energy efficient communication protocol, and the main aim is, that the total transmission power dissipated

a) cluster formation b) cluster head selection c) data communication.

Operation is divided into rounds; each round consists of setup phase and steady phase. Every cluster is controlled by a specific sensor node, called cluster head (CH) that is responsible for managing the data transmission. The cluster head is used to handle various tasks for interworking between different sensor nodes in the network; information aggregation in the cluster, fusion of collected data, transmission. Selection of the cluster head has a vital role in the procedures of cluster algorithm.

#### 3.1 Cluster formation

The cluster format is the step after a cluster head selection. The main aim of optimal clustering is to vary the area of the clusters according to the required application and data transmission or to minimize and balance the energy expenditure in the network due to factors like residual energy, data correlation and relay traffic. In the proposed algorithm forming of cluster is done in order to minimize the energy consumption.

#### 3.2 Cluster head selection

The distance from one node to every other node is calculated and node equidistant from the other node is selected as cluster head. The energy required by the member node to transmit the data to the respective cluster head is minimized by choosing an equidistant cluster head.

#### 3.3 Data communication

The transmission from sensor nodes of packet to CH and from CH to Base station is done through direct transmission or by multi hop.

### IV. RESULTS AND DISCUSSION

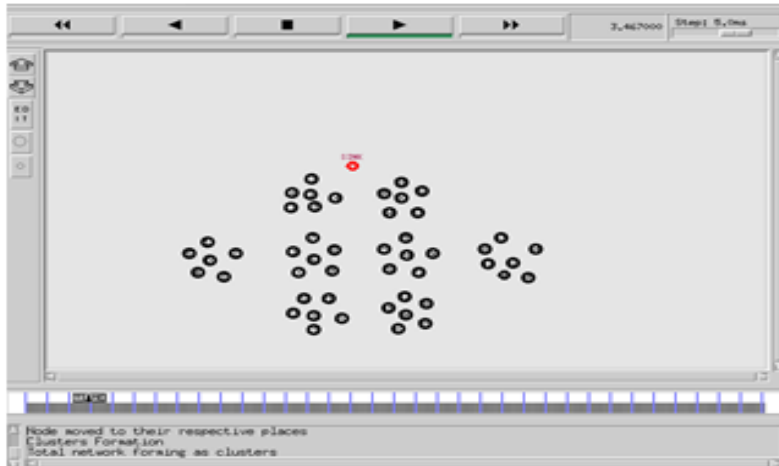
#### 4.1 Results of Descriptive Statics of Study Variables

Table 4.1: Descriptive Statics

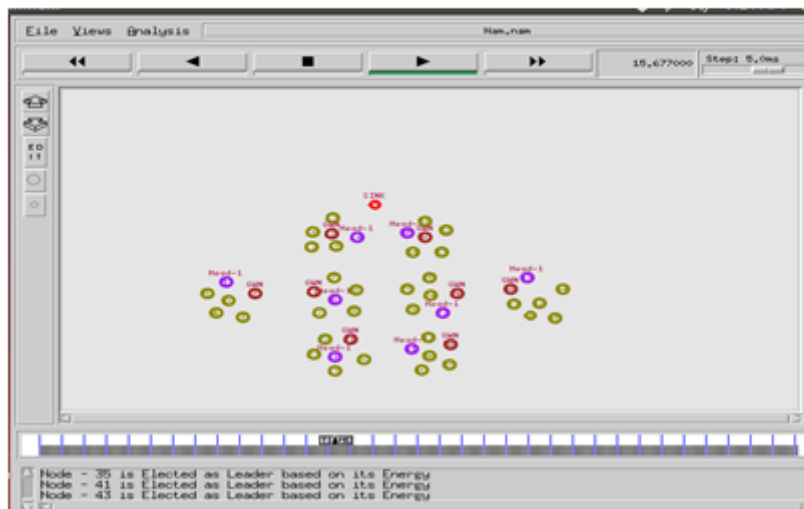
Parameter	Minimum	Maximum
THROUPUT	703.60Kbs	755.95kbs
PDF	0.6452%	0.8796%
OVERHEAD	4.053	3.230
DELAY	1093.69ms	259.616ms
ENERGY	24.8964jule	21.7399jule

In the proposed system, here we use NH2 to implement the proposed system. We first consider a 100mx100m area and we deploy 100 sensors at random position inside the given area as shown in the figure given below. In the next step we divide the entire area into nine equal area clusters and deploy a base station at the center of the considered area. Then we deploy four gateway nodes at the intersection of these clusters.

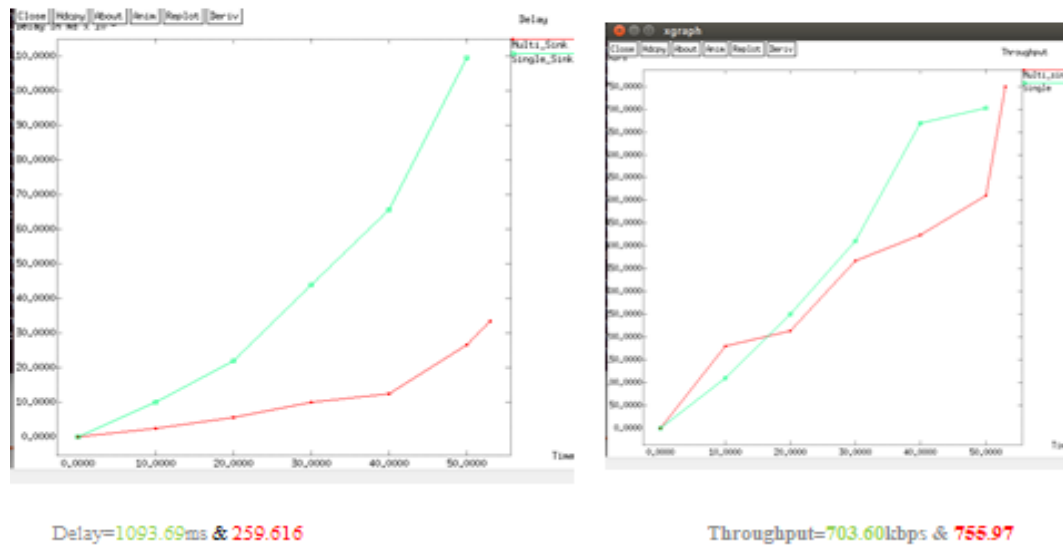
# CLUSTER FORMATION



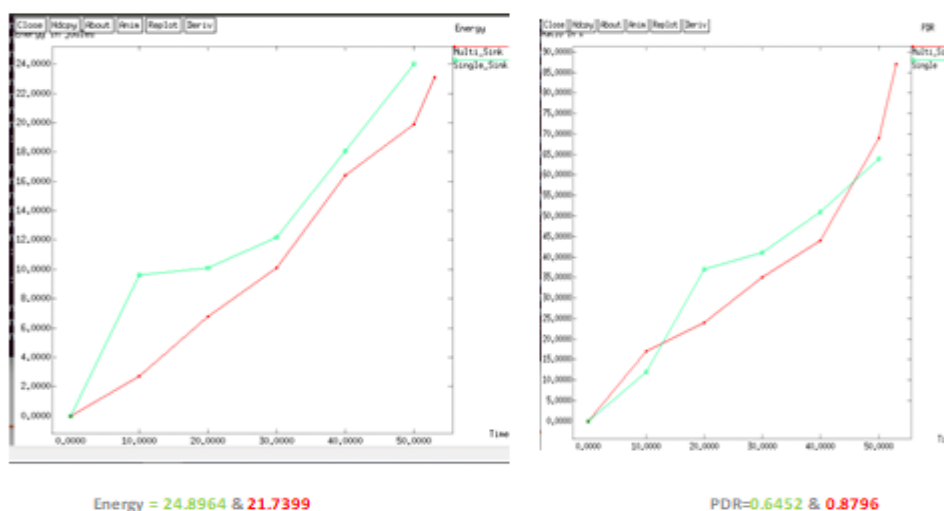
# CLUSTER HEAD SELECTION



## GRAPH



Continued..



## V. CONCLUSION

Wireless sensor network communicate with each other by transmitting data between them and elect the head of the cluster group by using centrality based approach. This is the major feature of this technique that helps in energy conservation. Prolonging the network lifetime has been of a great interest due to resource limitations in wireless sensor networks. For enhancing lifetime of the wireless sensor network a new algorithm using mobility and energy proficient clustering technique is used. After each round there is selection of cluster head. The selection of cluster head is such that there should be balanced amount of the energy consumption in wireless sensor network, as the metrics considered are residual energy and distance of sensor nodes from the gateway nodes. Gateway nodes and base station are considered to be fixed. This consideration is only to simplify the system. The overall system helps in reducing the energy consumption of each node and has greater lifetime.

## VI. ACKNOWLEDGMENT

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