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Development of Cross Layer Protocol to Enhance Wireless Sensor Network's Performance

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Abstract - *Main constraint for any WSN (Wireless sensor network) is Energy. Many research work is dedicated towards energy awareness and communication reliability of WSNs to enhance Network lifespan. This is two way problem of enhancing network efficiency and improving network quality. Dealing with both the problems is a challenging task. Research shows the solution to these problems can be achieved by using either of the two layers protocol, that is data link layer or network layer protocol. The work here is mainly focused in the development of cross layer protocol, so as to enhance WSN's performance. The algorithm used here is greedy algorithm that enables each sensor to choose different transmission paths using our algorithm that is optimized greedy algorithm. Multiple Simulation has been done using MATLAB tool and several results has been obtained, Which clearly shows that the complex problem of obtaining higher efficiency and reliability of WSN is resolved using the cross layer protocol developed using optimized Greedy algorithm.*

Keywords—Wireless sensor networks, Energy, power consumption, MATLAB, AODV, AOMDV, Node deployment Algorithm, Greedy algorithm.

1. INTRODUCTION

A Wireless sensor system fig.1 is a collection of nodes composed into an agreeable system. These nodes are made up of a typical antenna i.e. RF device, microcontrollers, Microprocessors, powered with battery and consists of different type of memories and sensors. These nodes are built in such a way that they are operated in a very convenient and systematic manner. Required number of nodes are aligned according to the requirement. These type of structures will alter the way of our life.

Wireless sensor networks is growing in such a way that in coming period of time the world will be revived by its pace and will take internet by storm and will transform the internet. This new development is invigorating with endless potential for different beneficial zones including biological, restorative, military, transportation, redirection, crisis organization, nation resistance, and sharp spaces.

Since a wireless sensor system fig.2 is an appropriated continuous framework, a characteristic inquiry is what number of arrangements from disseminated and constant frameworks can be utilized as a part of these new frameworks? Since a wireless sensor system is a dispersed ongoing framework a characteristic inquiry is, what number of arrangements from appropriated and continuous frameworks can be utilized as a part of these new frameworks? Lamentably, almost no earlier work can be connected and new arrangements are important in every aspect of the framework. The principle reason is that the arrangement of suppositions fundamental past work has changed drastically. Most past circulated frameworks research has accepted that the frameworks are wired, have boundless force, are not constant, have client interfaces, for example, screens and mice, have an altered arrangement of assets, treat every hub in the framework as essential and are area autonomous

Fig -1: Wireless sensor Network

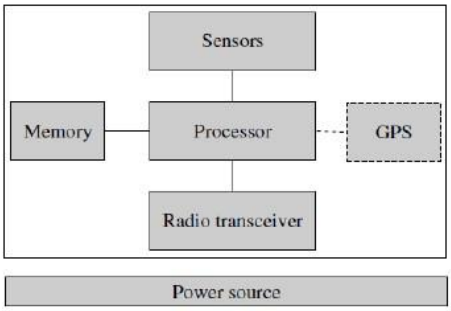

Fig -2: Architecture of Sensor node

2. DESIGN OF THE ALGORITHM

Configuration is a standout amongst the most vital periods of programming advancement. The arrangement is an innovative methodology in which a system affiliation is developed that will satisfy the utilitarian and non-down to earth structure requirements. Colossal Systems are constantly are decayed into sub-structures that give some related course of action of organizations. Sub-structures that give some related game plan of organizations. The output of the design process is shown in the below figure 3.

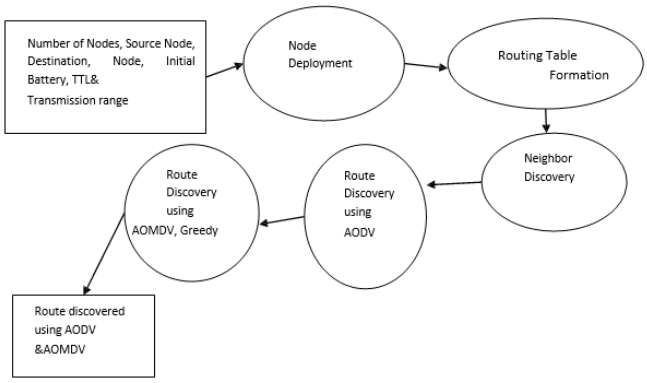

Fig -3: Design of the algorithm process

2.1 NODE DEPLOYMENT ALORITHM

Random Topology Distribution algorithm is responsible for deploying the nodes randomly in the given area for the limits xmin , xmax , ymin & ymax .This algorithm is responsible for distributing the nodes randomly in the network in a given area is shown in figure 4.

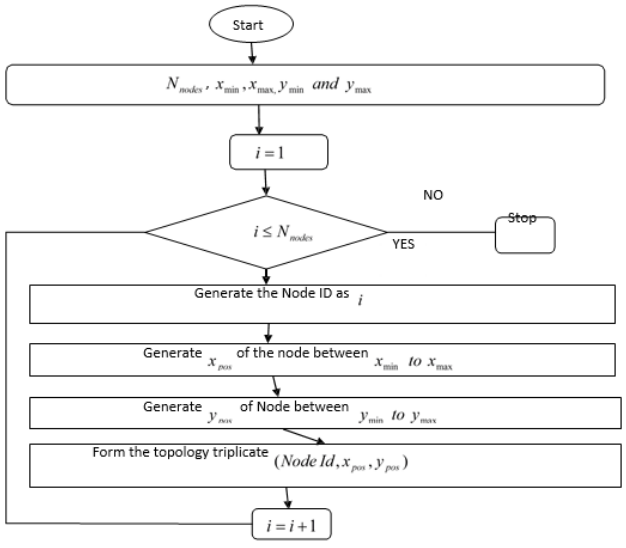

Fig -4: Node deployment algorithm

2. 2 AODV ALGORITHM

AODV algorithm finds multiple routes from the source node to the destination node. The number of routes that are discovered will be equal to the number of nodes within the transmission range. On each of the route the AODV algorithm will find the overall energy consumed. The routes are sorted in the ascending order of the overall energy consumption and the route with lowest energy consumption acts like the best route.

The flowchart for AODV algorithm can be divided into multiple route discovery and individual route discovery as shown in figure 5 and figure 6.

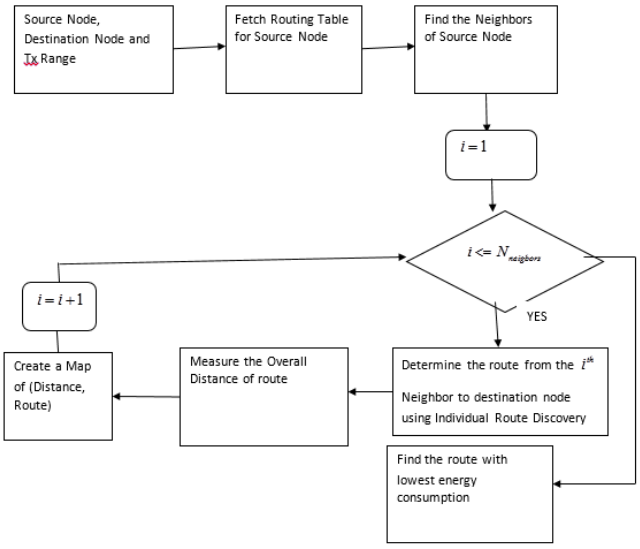

Fig -5: AODV Multiple route discovery

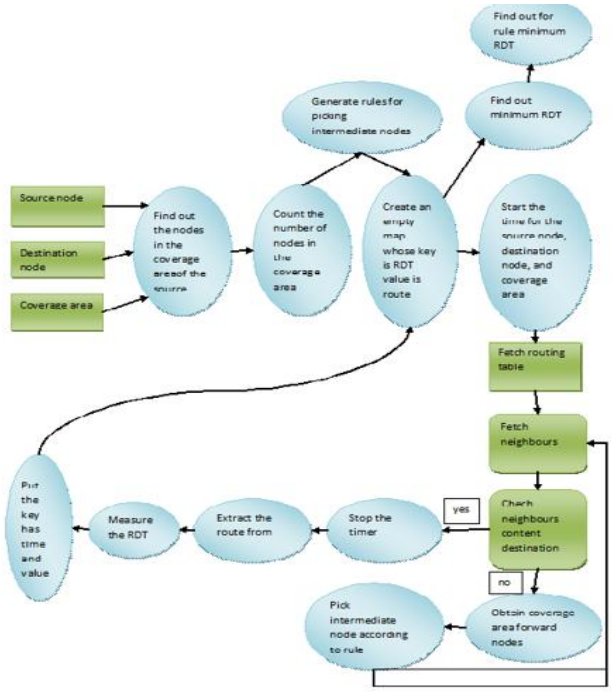

Fig -6: AODV Individual route discovery

2. 3 AOMDV ALGORITHM

AOMDV (Ad-hoc on-demand multipath distance vector) is a proactive steering convention.

AOMDV algorithm as shown in fig 7 is to enhance dynamic system sustenance for the above basic issues, and it is a delineation for the vitality control component by proposing Synchronous Mindful Vitality Steering Convention (AOMDV).The adjustment of this convention is to for all intents and purposes address on correspondence vitality for each bundle, in light of its restriction that can deal with force sparing and minimum use without excluding any parcel confinements and spreads the adaptability, Data transmission and memory impediment requirements.

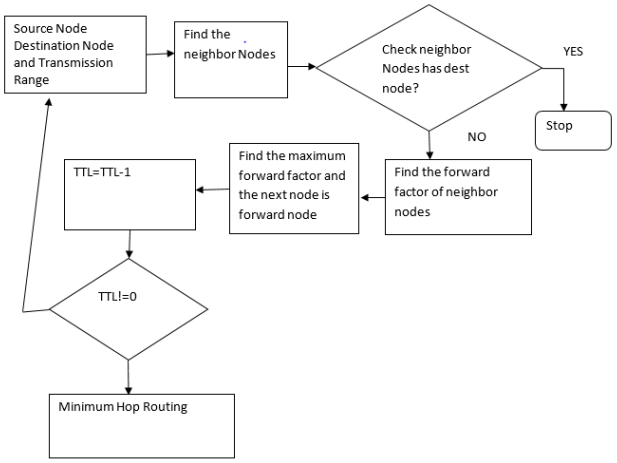

Fig -7: AOMDV Algorithm

2. 4 GREEDY ALGORITHM

Greedy routing algorithm is a novel cross-layer framework including a multipath routing protocol.

By distributing the sensed data to multiple paths, the energy consumption of each sensor node can be balanced to prolong network lifetime. The greedy algorithm shown in fig 8 and fig 9 is of assigning data chunks to different paths. The employment of Reed- Solomon code also ensures the communication reliability to avoid packet retransmission. The mechanism of optimal link-disjoint paths for availability .The paths generated by our protocol have disjoint nodes to balance the energy consumption. In addition, we also avoid using the long paths because each packet relay causes energy consumption.

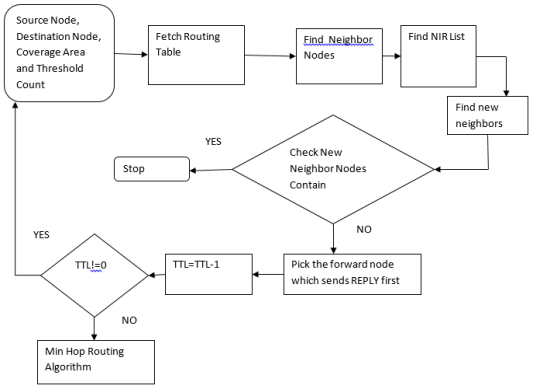

Fig -8: Individual greedy Algorithm

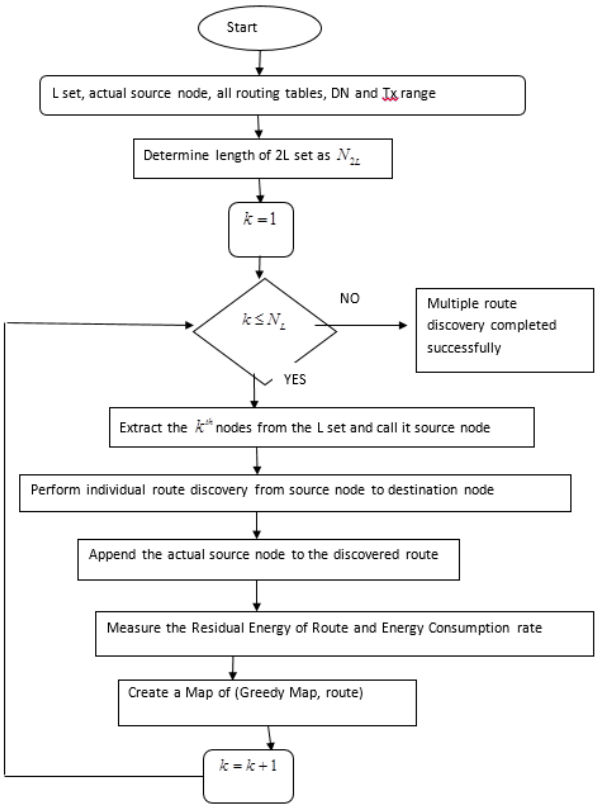

Fig -9: Multipath greedy Algorithm

3. PROPOSED METHODOLOGY

The Methodology or the overall end to end flow can be shown below in figure 10.

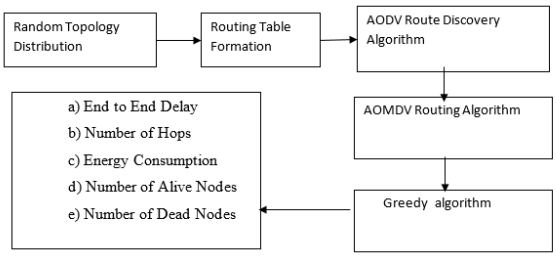

Fig-10: Proposed Methodology

4. RESULTS AND ANALYSIS

Functional requirements are given in figure 11.

Parameter name	Parameter Description	Value
Number of nodes	This is the number of nodes deployed in the network	50-100
Transmission range	This is the range required for neighbour discovery	Depends on the area chosen
Transmission energy	This is the energy required for data packet transmission	10mj-20mj
Packet generation energy	This is the energy required for generating control packets	1mj-10mj
Attenuation factor	Depends on the type of environment chosen	0.1<=att<1
Type of network	Non-hierarchical network	All nodes are spread in the single area
Routing table	No of routing tables = No of nodes in the network	No of routing tables = No of nodes in the network

Fig 11-: Functional requirements

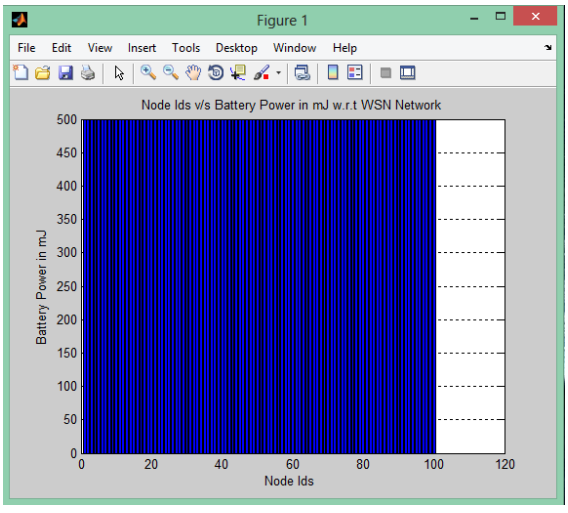

Fig- 11: Node IDs v/s battery power in mJ w.r.t WSN network

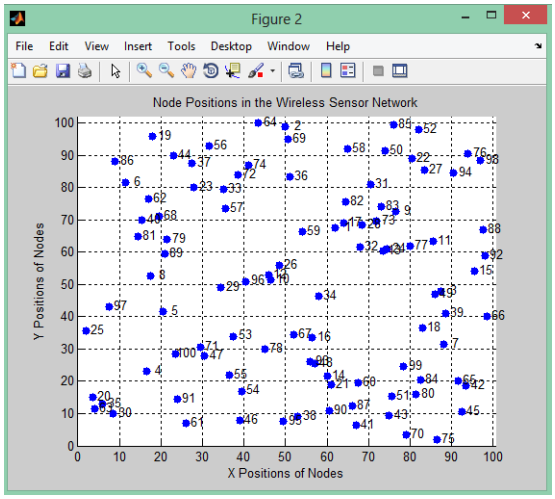

Fig- 12: Random node positions in Wireless Sensor Networks

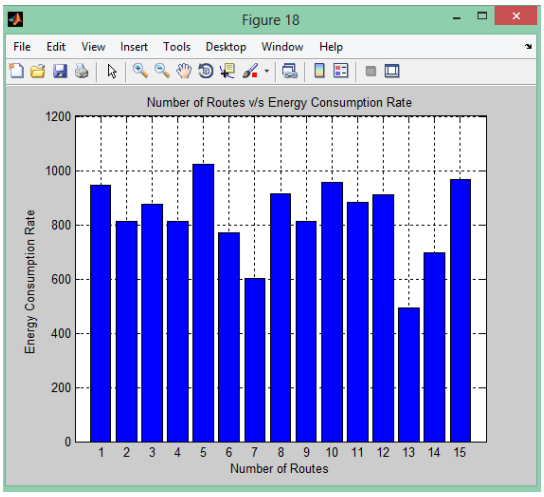

Fig-13: Number of routes v/s Energy consumption rate

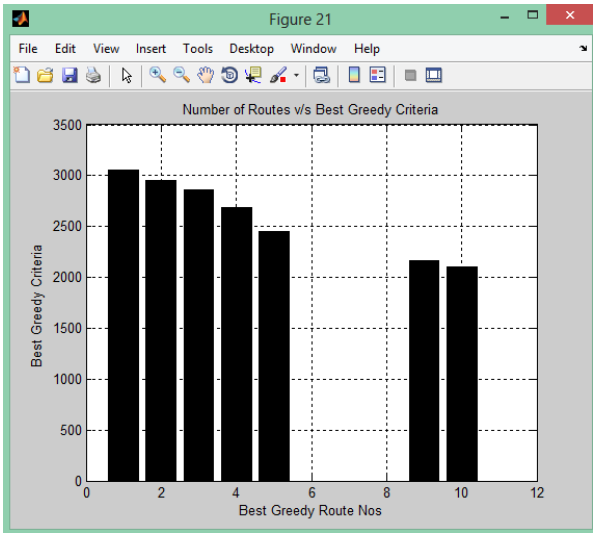

Fig-14: Number of routes v/s Best Greedy Criteria

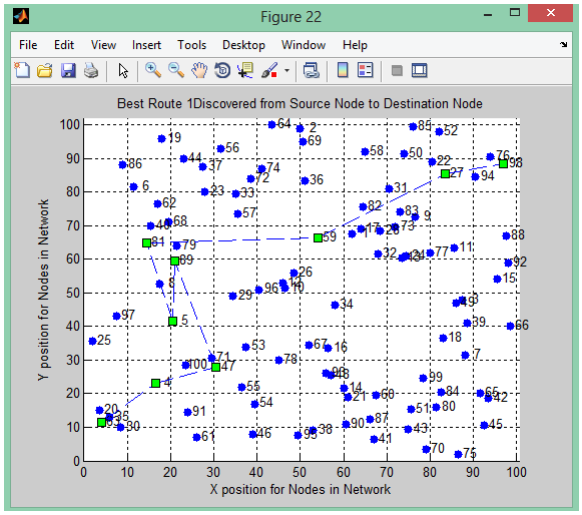

Fig- 15: Example of one of the best route discovered from source node to destination node.

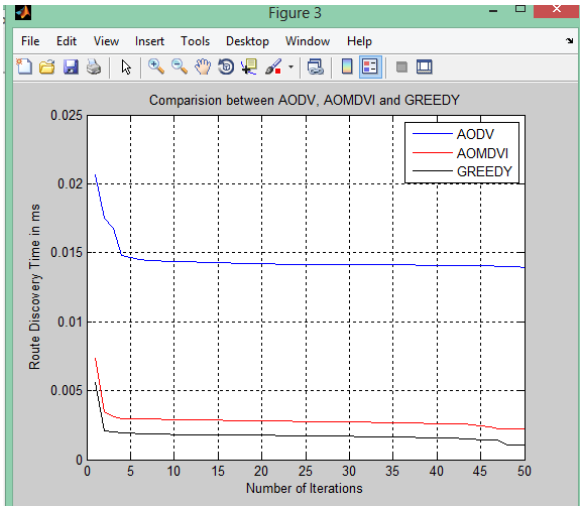

Fig- 16: Route discovery time in ms

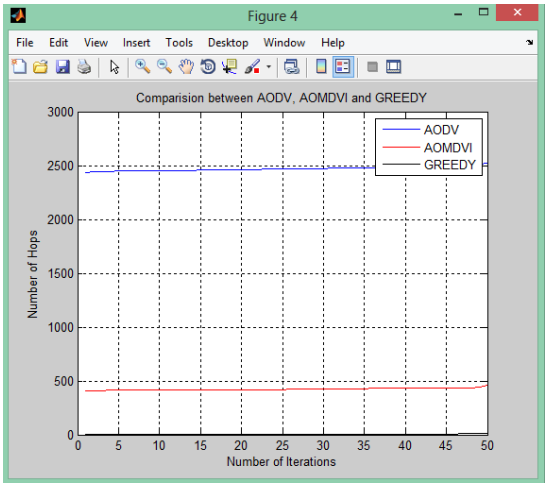

Fig-17: Number of Hops

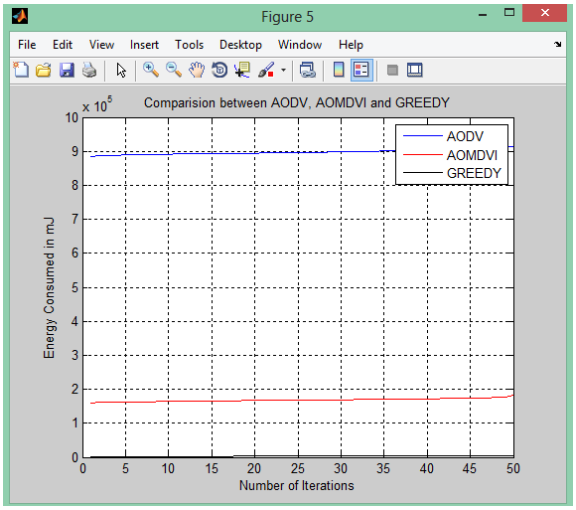

Fig18: Energy consumed in mj

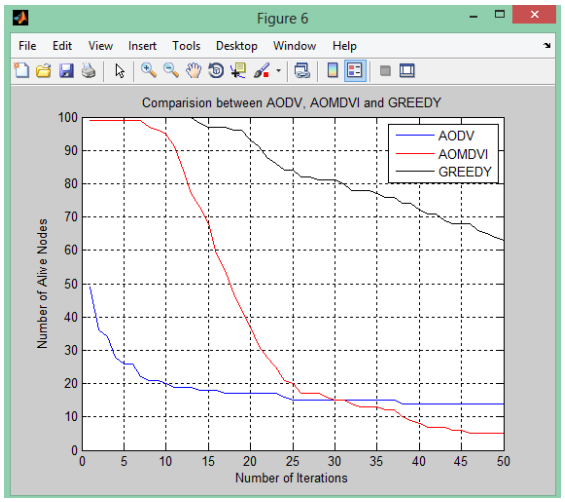

Fig- 19: Number of alive nodes

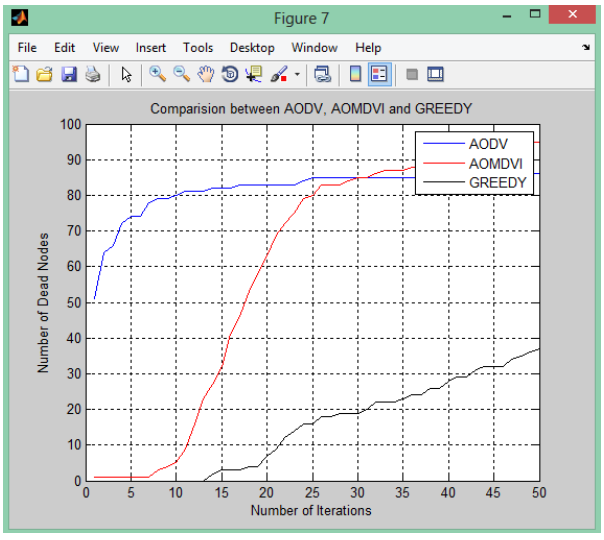

Fig-20: Number of Dead nodes

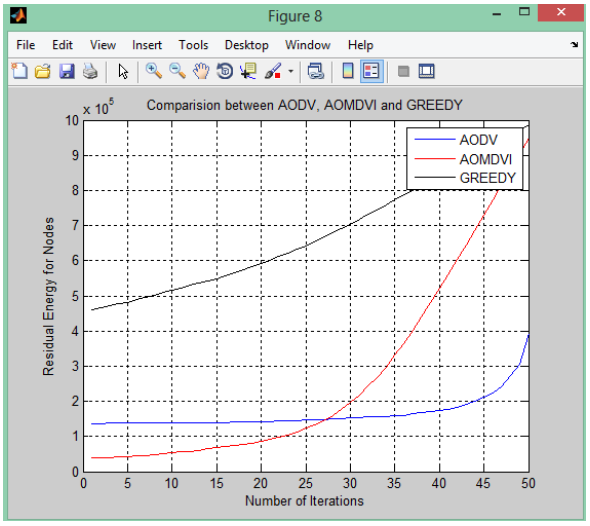

Fig-21: Residual energy of nodes

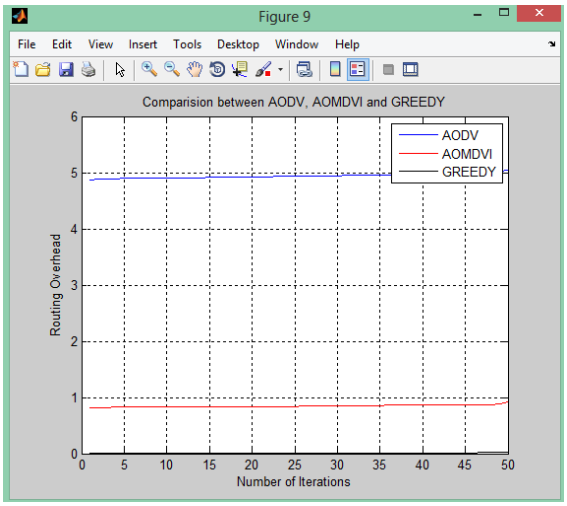

Fig-22: Routing overhead

5. CONCLUSION

The main objective of this paper is to Study the Wireless Sensor Networks, Use of Node Deployment Algorithm to place the nodes in the given area, to apply Routing Table Formation algorithm to form routing tables for various nodes in the network, design & Simulation of **AODV algorithm** which is used to find the route from source hub to destination hub with respect to overall distance reduction, design & Simulation of **AOMDV algorithm** which is used to find the route from source node to destination node with respect to overall energy reduction, design & Simulation of **Greedy algorithm** which is used to find the route from source node to destination node with respect to overall energy reduction with improved data rates and Comparison of AODV, AOMDV and Greedy algorithm with respect to following parameters: a) End to End Delay b) Number of Hops c) Energy Consumption d) Number of Alive Nodes e) Number of Dead Nodes. In future work, we will jointly consider TDMA schedule to enhance overall energy efficiency of a Wireless sensor network.

6. ACKNOWLEDGMENT

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BIOGRAPHY

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