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# An Advance Method Of Minimizing Movement For Target Coverage and Network Connectivity in Mobile Ad Hoc Networks

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**Abstract—***The salient features of a wireless sensor network is an arrangement of autonomous and well distributed nodes which may or may not have an additional facility of mobility. Due to the mobility of sensors, the nodes are deployed and relocated on their own. Similarly, sensors also get their own location and get placed at the target area deployment of mobile sensors. The main issue of redeployment is coverage and connectivity. There are also some additional factors we need to take care about. They are: sensor relocation, energy efficient movements of sensors, obstacle adaptability, lifetime of network, fault tolerance, etc. This project basically works to get best network coverage and connectivity by having minimum or zero movement of the sensors.*

***Keywords—*** *Mobile Sensor Deployment(MSD), Zone routing protocol(ZRP), Mobile ad hoc networks(MANETs), Network Connectivity(NCON), Routing.*

## I.INTRODUCTION

MANET is an infrastructure less IP based network of mobile and wireless machine nodes connected with radio. In operation, the nodes of a MANET do not have a centralized administration mechanism. It is known for its route able network properties where each node act as a router to forward the traffic to other specified node in the network. And it's an self determining system in which mobile hosts associated by wireless links are unpaid to be dynamically and some time act as routers at the same time. All nodes in a wireless ad hoc network perform as a router and host as well as the network topology is in dynamically, since the connectivity among the nodes may vary with time due to some of the node escape and new node appearance. The main point of Mobile Ad Hoc Network (MANET) bring this technology great moment together with severe challenges. All the nodes or devices constrained to manage themselves dynamically the connection between the each other and to provide the necessary network functionality in the adsence of fixed infrastructure or we can call it ventral administration, It involves that routing, maintenance and management, etc. have to be done between all the nodes. This case Called Peer level Multi Hopping and i.e. the main building block for Ad Hoc Network.

With the advances in wireless technologies and improvements of mobile resources, ad hoc networks will play an primary role in enabling present and future communication. Whereas both video and data communication, mobile radio technologies has experienced a fast production. A MANET is a dynamic wireless network designed by a set of mobile hosts which transmit between themselves by means of the air without any previous framework. Each node in the MANET can perform as a router as well as host. In order to sustain connectivity in a mobile ad-hoc network all performing nodes have to observe routing of organization influx.
As shown in Figure 1.1 an ad hoc network might contain of several home-computing devices, including laptops, cellular phones, and so on. Each node will be able to relate directly with any another node that lie within its transmission field. For interacting with nodes that stay beyond this field, the node needs to use intermediate nodes to relay the messages hop by hop.

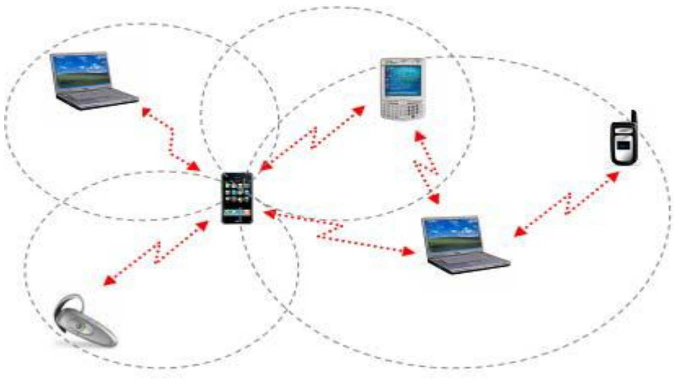

**Figure 1.1: A Typical Mobile Ad Hoc Network**

 

Mobile ad hoc network is a combination of autonomous and mobile elements such as laptop, tablet PC, smart phone etc. The mobile nodes can dynamically self-organize in arbitrary temporary network topology. There is no preset framework and does not have the clear boundary. Some characteristics of MANET are: 1. Infrastructure less**:** MANET is Infrastructure less network which as no central server, or appropriate hardware and fixed routers. All connections among the nodes are implemented only by wireless connectivity. 2. Wireless Links**:** Wireless links make Mobile Ad Hoc Network unreliable and susceptible to various kinds of attacks. Because of limited power supply of wireless nodes and mobility of nodes, the wireless links between those nodes in the mobile ad hoc network are not consistent for communication participants. 3. Node Movement**:** Mobile nodes are autonomous units in network which continuously change their position and topology independently. Due to continuous motion of nodes the topology changes frequently which mean tracking down of particular node become difficult. The nodes can easily released of or into the radio circle of several another nodes. The routing information of nodes changes continuously as their movement becomes random. 4. Power limitation**:** The mobile hosts are cramped and light weight. They are supplied by limited power resources such as small batteries. This constraints purpose susceptibility namely when attackers may mark some node batteries to disconnect them, that may lead to network partition. Some attacks may try to engage the mobile nodes un-necessarily, so that they keep on using their battery for early drainage. 5. Dynamic topologies**:** Nodes are free to move arbitrarily, thus the network topology may change randomly and rapidly at unpredictable times, and may consist of both bidirectional and unidirectional links. 6. Self-Configuring**:** MANET has decentralized infrastructure, with all mobile nodes functioning as routers and all wireless devices being interconnected to one another. MANET is a self-configuring network in which network activities, including the discovery of the topology and delivery of messages, are executed by the nodes themselves. 7. Bandwidth-constrained and variable capacity links**:** Wireless links have significantly lower capacity then their hardwired counterparts. Due to the response of fading interference conditions, multiple access and noise, the range of a wireless network can be debased over time and the valid throughput may be low than the radio's maximum transmission range.

## II. LITERATURE REVIEW

**D.Prasad, [2016],** This paper presented scope of interest focuses and network connectivity are two principle testing and for all intents and purposes vital issues of wireless Sensor Systems (WSNs). Albeit numerous studies have abused the portability of sensors to enhance the nature of scope and availability, little consideration has been paid to the mobility of sensors development, which frequently devours most of the constrained vitality of sensors and along these lines abbreviates the network lifetime essentially. Target coverage and Network connectivity are two main challenging issues of mobile sensor networks. Target coverage covers a set of specified points of interest in the randomly deployed MSNs. Target coverage is usually interpreted as how well a sensor network will cover an area of interest. Network Connectivity is defined as the ability of the sensor nodes to collect data and report data to the sink node. Target Coverage and Network Connectivity may also affect the quality of network. In this paper, for target coverage, two algorithms i.e. Basic algorithm based on clique partitions and TV Greedy algorithm based on voronoi diagrams of target are proposed. [1]

**Atul Tiwari, [2016],** Acc. To this the majority of the clustering support protocols utilize a single-hop communication to send data commencing the cluster-heads to the base station. In detail, they assume that every sensor nodes can converse straight with every other or with the base station. This develops into impracticable when the size of the region of interest enlarge. The anticipated protocol uses a multi-hop communication among the cluster-heads to preserve energy and cover up a huge area of interest. To diminish the quantity of information to be sent to the base station, we incorporated data aggregation. Furthermore, the rotation of cluster-heads and the utilize of the low-power sleep mode by the sensor nodes that do not contribute in routing permit to balance the load and reduce energy utilization considerably. To confirm the proposed design, comprehensive simulation has been approved out Simulation tool MATLAB[2]

**Shamshad Begum, B. Bala Chandrudu, [2015],** this describes that the Mobile Sensor Deployment(MSD) find the problems and investigates how to deploy mobile sensors with minimum movement to form a WSN that provides both target coverage and network connectivity. For the MSD problem is decomposed into two sub-problems: the Target coverage (TCOV)problem and the Network connectivity (NCON)problem. We then solve TCOV and NCON one by one and combine their solutions to address the MSD problem. The NP-hardness of TCOV is proved. For a special case of TCOV where target disperse from each other farther than double of the coverage radius, an exact algorithm based on the Hungarian method is proposed to find the optimal solution.[2]

**Navjot singh, Amandeep singh, [2015]**, In this research Network connectivity, throughput, load balancing and energy conservation are the primary requirements in a Wireless Sensor Networks (WSN's) whenever sensors are deployed in a dense and harsh environment. As these sensors are battery- operated, so it is very crucial to use this limited energy in an efficient way for data sensing, processing and communication across the network. Some mobile nodes having higher energy must be placed & relocated in a suitable way to prolong the network lifetime and connectivity. In the same sense, sink or base stations can also act as mobile nodes. Several mobility & communication algorithms and network architectures are developed so far. This paper points out some researches made in the field of WSN's, which had contributed in prolonging overall network lifetime and effective energy utilization.[3]

**Sonali Karegaonkar, Archana Raut,[ 2015]**, Acc. to this research Target Coverage and Network Connectivity may also affect the quality of network. The target coverage is based on two algorithms i.e. Basic algorithm based on clique partitions and TV Greedy algorithm based on voronoi diagrams of target are proposed. For network Connectivity, an optimal solution based on Steiner tree concept is proposed. In addition, LZW compression algorithm is used to compress data, due to which energy consumption is minimized.[4]

**H. Mahboubi, K. Moezzi, A. G. Aghdam, and K. S. Pour, [2014],** This research describes that Voronoi diagrams are used to detect coverage holes. After that, sensors are dispatched to cover these holes. As a result, the area coverage ratio is improved. Further, a multiplicatives weighted Voronoi diagram is used to discover the coverage holes corresponding to different sensors with different sensing ranges.[5]

**Enrico natalizio and Valeria Loscr, [2011],** Acc. to this author wireless self-organizing networks are attracting a lot of interest in the research community. Moreover, in the last decade many mobile devices have appeared in the market. Exploiting mobility in a wireless environment, instead of considering it as a kind of disturbance, is a fundamental concept that the research community is beginning to appreciate now. Of course, the advantages obtainable through the use of the mobility imply the knowledge of the different types of mobility and the way to include it in the management architecture of the wireless networks. In this work we claim that mobility and wireless sensor networks can be considered as two synergetic elements of the same reality. For this purpose, we sketch a macro-classification of the different objectives which can be pursued by controlled mobility. Moreover, we identify and highlight the interactions between this specific type of mobility and the layers of the control stack. Lastly, this paper reports a case study in which we show how controlled mobility can be exploited practically.[6]

**Raymond Mulligan, Habib M. Ammari, [2010],** In this research Wireless sensor networks are used to monitor a given field of interest for changes in the environment. They are very useful for military, environmental, and scientific applications to name a few. One of the most active areas of research in wireless sensor networks is that of coverage. Coverage in wireless sensor networks is usually defined as a measure of how well and for how long the sensors are able to observe the physical space.[7]

## III. METHODOLOGY

1. We will start by deploying sensor nodes randomly in a described area.
2. Now, since our aim is to provide a better information transfer between source and destination with less usage of energy, we prefer to have static nodes.
3. We will divide the complete area in zones.
4. Each zone will have a zone header.
5. Now, we will select a source and a destination.
6. Information will transfer from sub-nodes to headers and then from headers to headers, finally to the destination.
7. In this process, a lot of energy will be saved, thus increasing network lifetime of our network.

## IV. RESULT AND DISCUSSION

The proposed technique is applied using MATLAB which is developed by Math Works, allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran. The MATLAB software gives connections for control and manipulation of virtual reality objects using MATLAB objects

**1. Deployment area with its length & breadth**

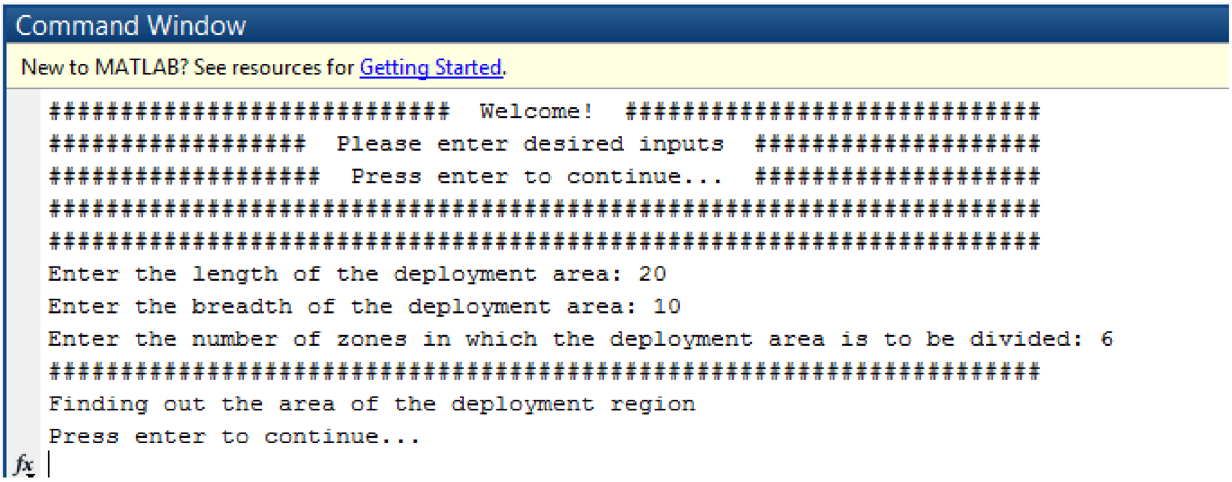


**Figure 1: Deployment area with its length & breadth**

Above fig show the codes for the deploy the deployment area across the length 20, breadth 10, this is known as the deployment area or the total area for routing the information from one of one region to another zones of different region. The deployment area divided into different 6 zones.

**2 Deployment Area**

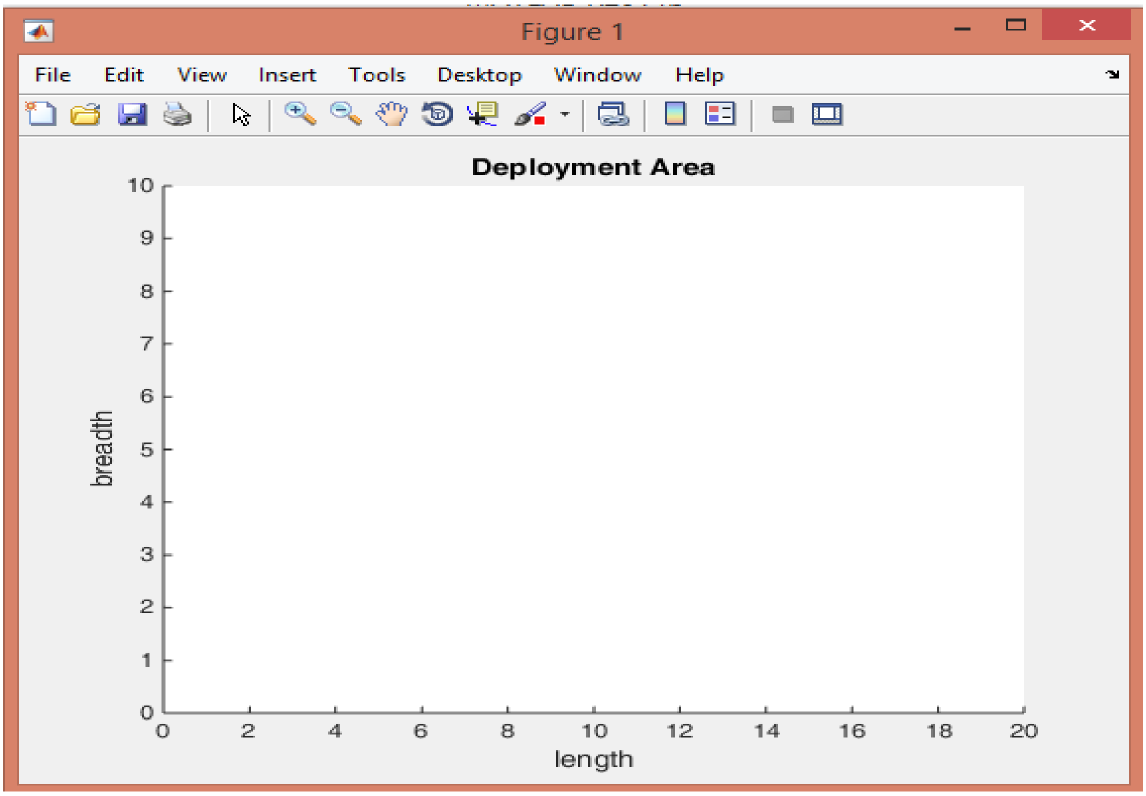


**Figure 2: Deployment area**

**3 Division of Zones**

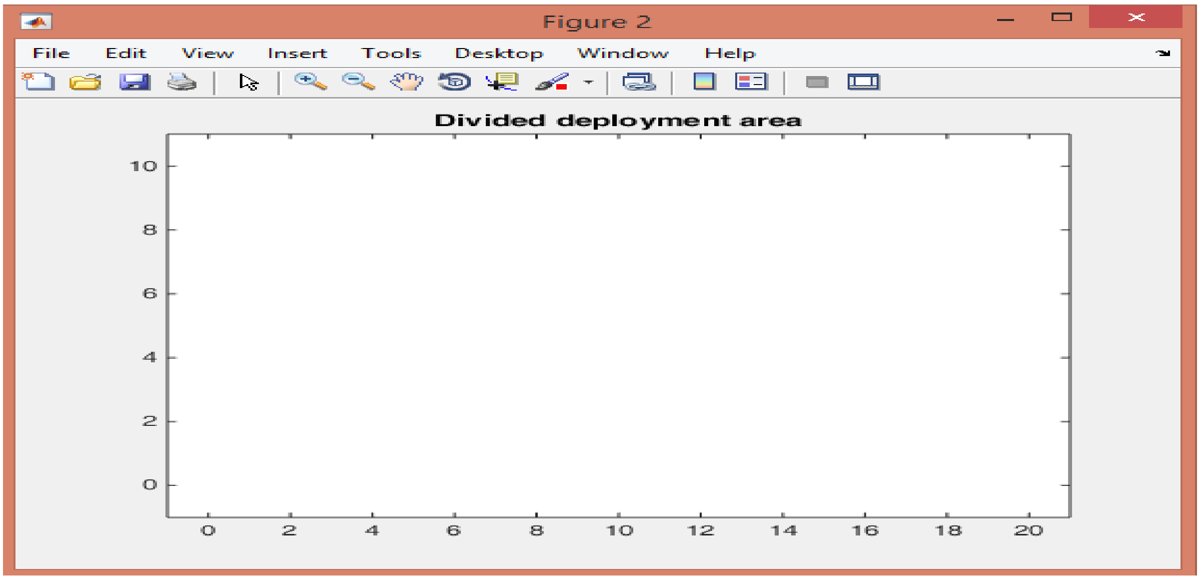


**Figure 3: Divide deployment area**

In above figure, the area is divided into zones. The nodes are transfer information through zone header or cluster. Each zone has a zone header, it is contained information of sub nodes. The deployment area is divide across x-axis and y-axis.

**4 Number of sensor nodes in each zone**

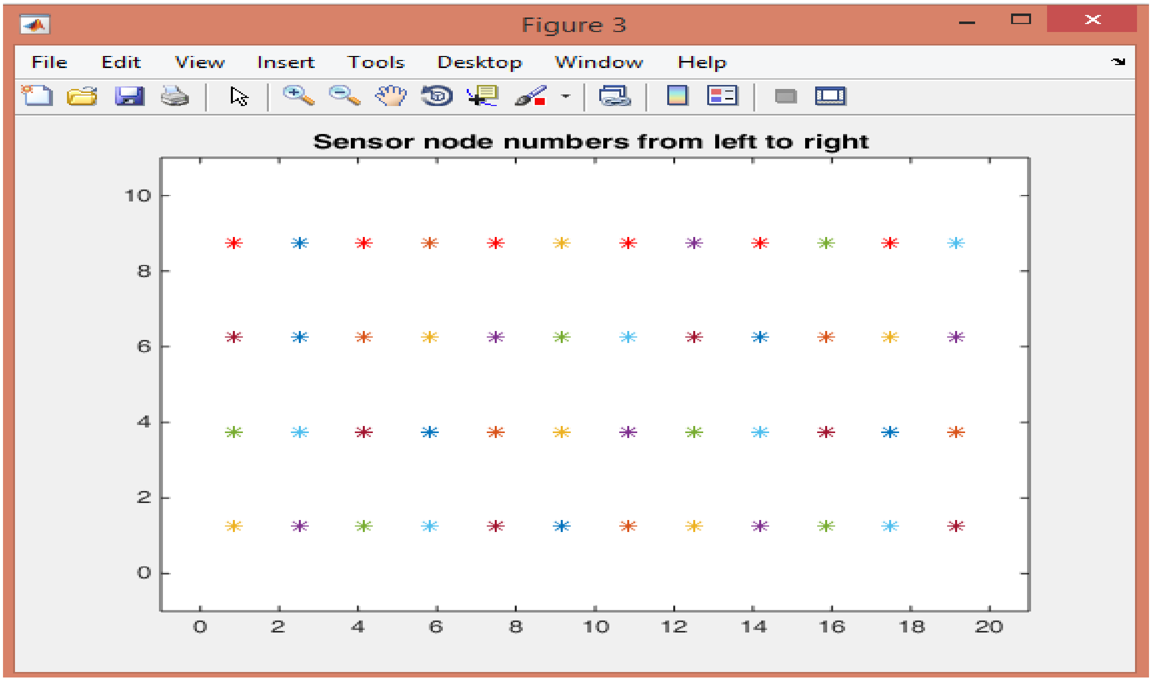


**Figure 4: Number of sensor nodes in each zone**

Here the sensors nodes will be placed in each zone. All zones contain same number of sensor nodes. In each zone there is a one zone header or representative that contains the whole information of that zone. In above fig the Red node is the zone header & the blue nodes is the sensor nodes.

**5 : Path from sender to the receiver**

 

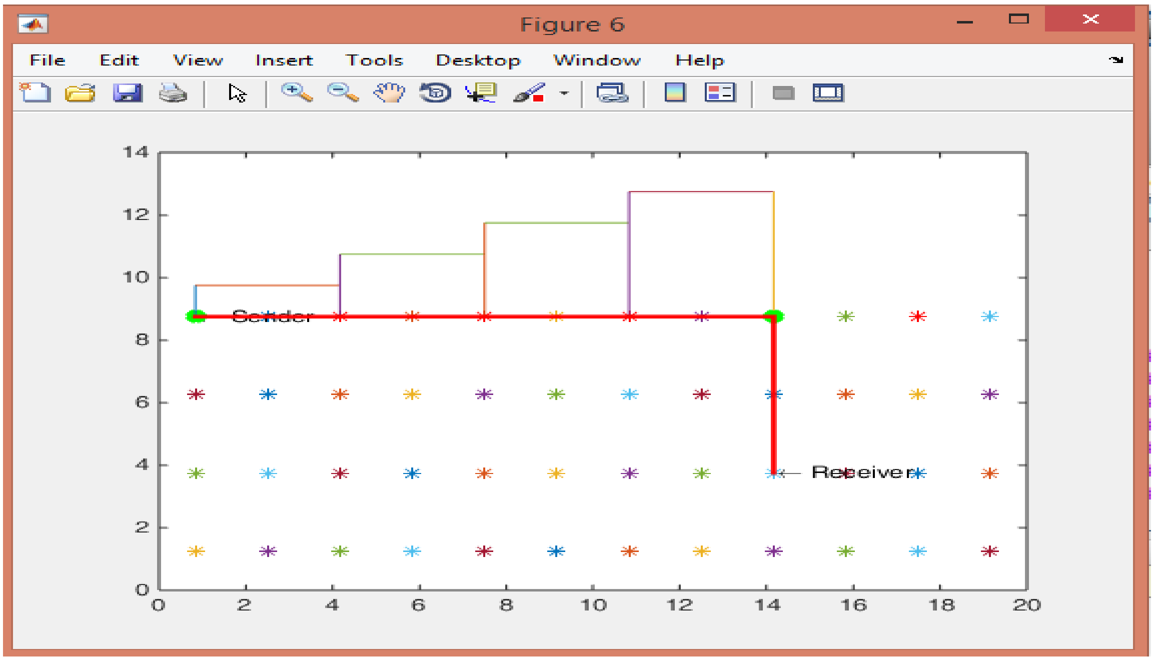


**Figure 5 : Formation of path from sender to the receiver**

In the above fig the sender node first go to that zone header because the each zone header contain information of that zone's sensor node. Each zone header will communicate with each other to identify the receiver node & through the internal zonal information the sender send the information to the destination node via zone headers

## 6 Energies at Each Node

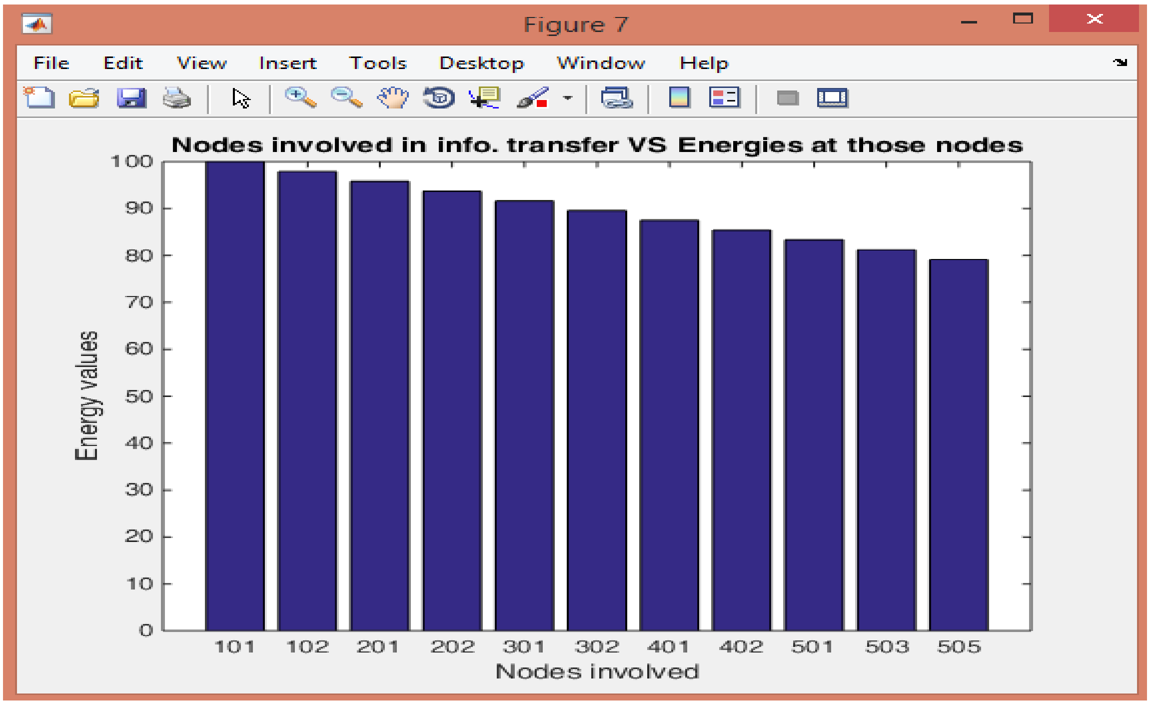


**Figure 6 : Nodes involved in information Vs Energies at those nodes**

In above fig the energy loss is decreases at every node till the information is received. The overall distribution is finding at each node how much energy is loss.

 

**Table 2: Number of Nodes with Its Energy Loss percentage**

| Sender node | Destination node | Number of nodes | % of Energy lost |
|---|---|---|---|
| 102 | 604 | 14 | 20.3125 |
| 101 | 602 | 12 | 17.1875 |
| 103 | 502 | 11 | 15.6256 |
| 201 | 505 | 9 | 12.5000 |
| 301 | 406 | 6 | 7.8125 |
| 302 | 401 | 4 | 4.6875 |

In above table as well as number of nodes decreases the percentage of energy loss will also decrease. The energy lost at each node may be loss 100% or may be less.

## V CONCLUSIONS

In this research, we have studied the Mobile Sensor Deployment (MSD) problem in Mobile Ad Hoc Networks (MANETs), purposing at deploying mobile sensors to provide target coverage and network connectivity with conditions of moving sensors. Because sensors are generally powered by energy limited batteries and thus extremely power-constrained, energy consumption should be the main consideration in mobile ad hoc networks. Specially, movement of sensors should be minimized to protect the network lifetime. The sensor movement consumes much more energy when they transfer the data from one point to another point. However, most of the existing studies calculated at improving the quality of target coverage, e.g., detecting targets with high detection probability, lowering false alarm rate and detection delay. Little attention has been paid to minimizing sensor movement. To fill in this gap, this research target on moving sensors to cover distinct targets and form a connected network with minimum movement and energy consumption.

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