Scheduling Based energy Efficient Mobile Node Communication in Wireless Sensor Network using Unmanned Aieral Vehicle (UAV)

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Abstract **- Current research proposes the Scheduling Based Energy Efficient Mobile Node Communication in Wireless Sensor Networks Unmanned Aerial Vehicle. In this work, hybrid network consists of two types of nodes one is static nodes and other are moving nodes. We will consider these mobile nodes as mobile sink. Each static sensor has fixed or low energy. They have limited memory buffer. According the size of the buffer we will fixes the interval of movement of the mobile sink. After each time interval mobile sink go at fixed location and send the signal to static nodes. Such that will represent their arrival. Immediately static sensor will start transmitting to the mobile sink. We will subdivide the total network into equal sized grid. Various grid cells will collectively be considered as cluster. Each cluster has equal geometry. Such that mobile sink movement cluster by cluster is having equals amount of energy dissipation. Each mobile sink burn energy in movement and transmission. Now we will schedule the movement of the mobile sink such that they can be energy efficient. At base location this mobile sink will collectively transmit the signal to UAV. It will save the time and energy of UAV and in result total network.**

Keywords **- UAV, WSN, Sink**

I. INTRODUCTION

In today environment various wireless sensor nodes moves there data from one node to another node finally to the sink node. Main aim is to build a network such a way energy should be not wasted. So that wireless sensor nodes sense the environment and monitor the diversified factors like temperature, humidity etc. there are abundance number of applications in today's where man power is costly affair. The wireless device is attaches with large number of sensors, memory and communication with radio system devices which sends and receives the data. One microchip performs all these operations. It also has memory elements which stores the data from specific interval of time. Most important thing is of wireless devices are very flexible as long as the power supply, usually a battery, provides lot of energy to generate the signal to send and receive the data. These devices works on radio signals have Omni directional. As they are light weight signal has less harm for the environment. They can send and receive the signal at same time.

Classification of Wireless Sensor Networks

Terrestrial: In this type of sensor networks, hundreds to thousands of sensors deployed randomly or pre-deployed on a given area. This type of WSNs is mainly used in the field of environmental monitoring and presents a challenge to the sustainability of the network in terms of management of energy [Ado Adamou ABBA ARI , Abdelhak GUEROUI , Nabila LABRAOUI and Blaise Omer YENKE, 2015].

Underground: These very special sensor nodes are known for their high cost and the required logistics for maintenance and pre-planned deployment. Sensors are installed in the soil for agriculture or in the walls of a mine to monitor conditions in the soil. However, in this type of network, there is land node which has role of relaying sensed information by the underground nodes to the base station [Ado Adamou ABBA ARI , Abdelhak GUEROUI , Nabila LABRAOUI and Blaise Omer YENKE, 2015].

Underwater: This type of WSNs are still a great research challenge because of fact that environment in which the nodes are deployed is hostile and usually used for exploration[33]. It's only possible to deploy a few nodes, these nodes are more expensive than terrestrial sensors, wireless communication is acoustic, the bandwidth is limited, the loss of signal is recurrent, propagation delays and synchronization problems are high.

Multimedia: This type of WSNs allows monitoring of a tracker in real-time events such as images, videos and sound. These sensors are equipped with cameras and microphones. Importance is given for: good bandwidth which implies a high energy consumption; processing and data compression; good QoS. Advance planning is necessary for the deployment of these sensors.

Homogeneous & Heterogeneous Network According to the capabilities the sensor network can be homogenous and heterogeneous. The homogeneous networks are those in which all the sensor nodes having same features in terms of energy utilization, processing and communication. In heterogeneous network there are some advanced sensor nodes which are having more processing as well as communication capabilities than other normal sensor nodes. In this case the network can assign the tasks to these special nodes by which the network lifetime can be prolonged.

Applications of Wireless Sensor Networks

Wireless sensor networks have remarkable advantages over traditional wired sensor networks. These networks minimize the cost and reduce the delay in deployment. Wireless networks can be applied to environment where it is impossible to deploy wired networks such as deep oceans, battle-field surveillance, outer space and inhospitable terrains. Wireless sensor networks were originally encouraged from military applications these systems range from large systems like acoustic surveillance for ocean checking to small systems like unattended ground areas for ground detection [Curt Schurgers, Mani B. Srivastava, 2001]. The availability of inexpensive sensor nodes and wireless communication leads to the application of WSN in both civilian and military applications.

Sensors are mainly used to detect various kinds of physical parameters as following:

- Light
- Sound
- Humility
- Pressure
- Temperature
- Soil composition
- Air/water quality
- Attributes of object like direction, size, position, weight and speed.

The following section will explain about applications of wireless sensor networks.

Environmental Monitoring

In environmental monitoring the sensor nodes are used to detect the environmental parameters.

Habitat monitoring Sensor are utilize to detect the wild animal conditions, plants and trees in wild habitat etc. also the environmental parameters of wild habitat.

Monitoring of air and water quality Sensors can be positioned to the ground surface or underground to measure the quality of water and air.

Hazard Monitoring Sensor networks are used to detect the chemical and biological hazards in particular area such as battlefield and chemical plant.

Disaster Monitoring Sensor nodes can be deployed in region of interest to measure natural disaster as well as non-natural disaster. For example to detect magnitude of earthquake, flood and forest fires.

Military Applications

WSN becomes an important part of C31 system of military that is command, control and communication with sensors can be localized to battlefield.

Objects Protection Sensor nodes can also be deployed near to the sensitive objects like atomic plants, oil/gas pipelines, military headquarters for protection.

Intelligent Guiding Sensors can be attached to the tanks, submarines, missiles and fighter planes to guide them to difficult situations and co-ordinate with each other for proper completion of a particular task.

Remote Sensing Sensors are used to remote sensing of biological, chemical or nuclear weapons, to detect potential terrorist attacks and for investigation. In this way WSN have numerous applications in area of military.

Challenges to WSN

The unique network characteristics, design issues, application specific requirements, sensor network architecture and physical conditions of targeted region etc. lead to many challenges for a wireless sensor network, which involves the many crucial aspects. Network lifetime and performance metrics are get significantly affected by these challenges.

Limited Battery Power Sensor nodes are battery powered and thus has very limited energy capacity. This crucial constraint presents many new challenges in the development of hardware and software, the design of network architectures and numerous protocols for WSNs such as routing, communication and data aggregation etc. to prolong the overall operational lifetime of network. Any sensor node can perform the desired tasks till it has the optimum level of remaining battery power. To use this limited amount of battery power in an efficient way is a biggest challenge to prolong the network lifetime and target monitoring. Communication leads to the application of WSN in both civilian and military applications. Sensors are mainly used to detect various kinds of physical parameters as following:

- Light
- Sound
- Humility
- Pressure
- Temperature
- Soil composition
- Air/water quality
- Attributes of object like direction, size, position, weight and speed.

II. LITERATURE REVIEW

[1]Say Sotheara et al. (2014) presented -Effective Data Gathering and Energy Efficient Communication Protocol in WSN employing UAV- Author propose the process of gathering the data from stationary WSN nodes. It is the frameworks provide the

ability to make system energy efficient [1].

[2] Nichalos N.Karekwaivanane et al. (2014) presented -Reliability in MAC Protocols for Wireless Sensor Networks – The system of providing wireless sensor network type of network and also provide the applications of this type of network [2].

[3]Nilesh Kumar et al. (2014) design -Energy Efficient Routing Protocol for improving Lifetime of Wide Area Wireless Sensor Networks- Ability to send and receive the signals with high efficiency. It is one of the network has transmit the data with less battery power consumption [3].

III. PROPOSED WORK

According to our research work we will keep hybrid type of sensor network. This hybrid network consists of two types of nodes one is static nodes and other are moving nodes. We will consider these mobile nodes as mobile sink. Each static sensor has fixed or low energy. They have limited memory buffer. According the size of the buffer we will fixes the interval of movement of the mobile sink. After each time interval mobile sink go at fixed location and send the signal to static nodes. Such that will represents their arrival immediately static sensor will starts transmitting to the mobile sink. We will subdivide the total network into equal sized grid. Various grid cells will collectively be considered as cluster. Each cluster has equal geometry. Such that mobile sink movement cluster by cluster is having equals amount of energy dissipation. Each mobile sink burn energy in movement and transmission. Now we will schedule the movement of the mobile sink such that they can be energy efficient. At base location this mobile sink will collectively transmit the signal to UAV. It will save the time and energy of UAV and in result total network

Current research will be having UAV as one of the receiving node. Whose basic work is to collect the data from the w ireless sensor nodes. This process is done only to increase the energy efficiency. As UAV can be represented as base sink can be shown moving. This type of network is for those networks where wireless sensor nodes are stationary. They do not move. Also they have less power. Compare to the base node. Also there be energy harvesting scheme of the UAV. At regular interval it can go on to the specific path. And collect the data. And returns back to the original position in the base paper they have considered this UAV as mobile node moves on to the fixed path.

Parameters and functions used in simulation for WSN Table

ZEROS:- Zeros array.	ZEROS (N) is an N-by-N matrix of zeros. ZEROS (M, N) or ZEROS ([M, N]) is an M-by-N matrix of zeros.
SQRT:- Square root.	SQRT(X) is the square root of the elements of X. Complex Results are produced if X is not positive.
RAND:-Uniformly distributed pseudorandom numbers.	R = RAND(N) returns an N-by-N matrix containing pseudorandom values drawn From the standard uniform distribution on the open interval (0, 1). RAND(M,N) Or RAND ([M, N]) returns an M-by-N matrix. RAND(M,N,P,...) or RAND ([M, N, P...]) returns an M-by-N-by-P-by-... array. RAND returns a Scalar. RAND (SIZE (A)) returns an array the same size as A.
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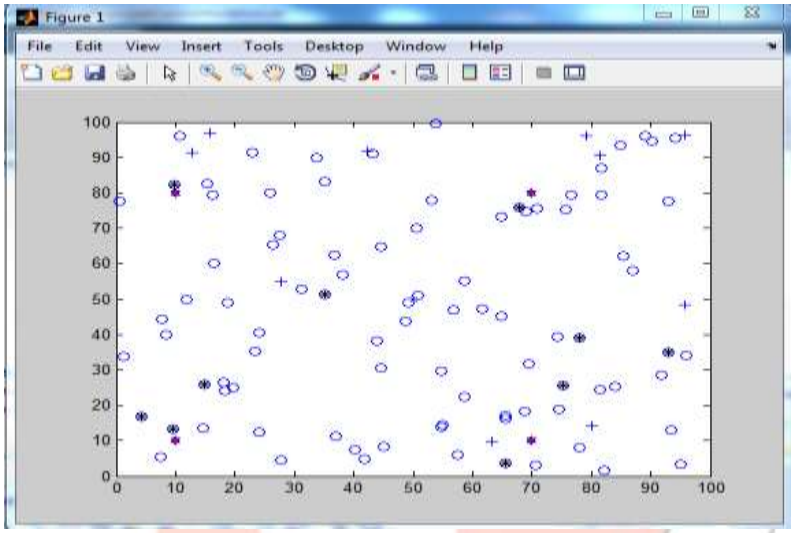
ROUND:-Round towards nearest integer.	ROUND(X) rounds the elements of X to the nearest integers.
MOD Modulus after division.	MOD(x,y) is x - n.*y where n = floor(x./y) if y ~= 0. If y is not an integer and the quotient x./y is within round of error of an integer, Then n is that integer. The inputs x and y must be real arrays of the Same size or real scalars.
function y = linspace(d1, d2, n)	LINSPACE Linearly spaced vector. LINSPACE(X1, X2) generates a row vector of 100 linearly Equally spaced points between X1 and X2.
PLOT Linear plot.	PLOT(X, Y) plots vector Y versus vector X. If X or Y is a matrix, then the vector is plotted versus the rows or columns of the matrix, Whichever line up? If X is a scalar and Y is a vector, disconnected line objects are created and plotted as discrete points vertically at

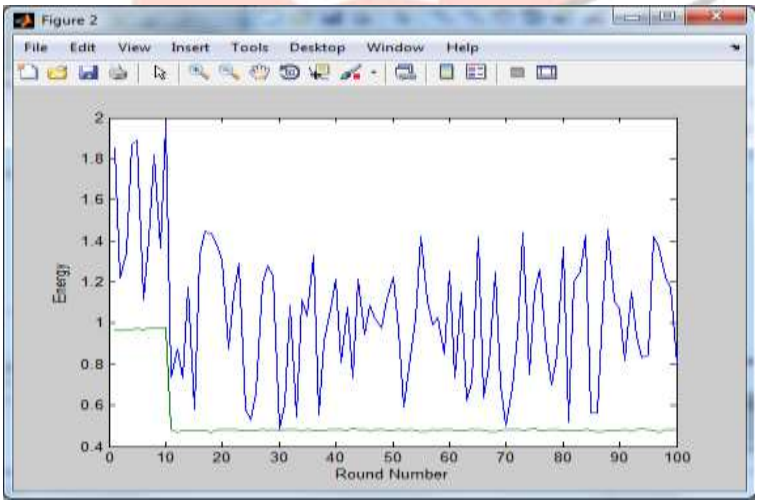
	X.
PACKETS_TO_CH	Is used for sending the data from sensor node to the wireless cluster head.
. energy	Is used for evaluating the energy of the wireless sensor nodes for transmission and receipt and ideal time.
. min_dis_cluster	is used for evaluating the minimum distance between the cluster head and the sensor nodes.

IV. RESULTS

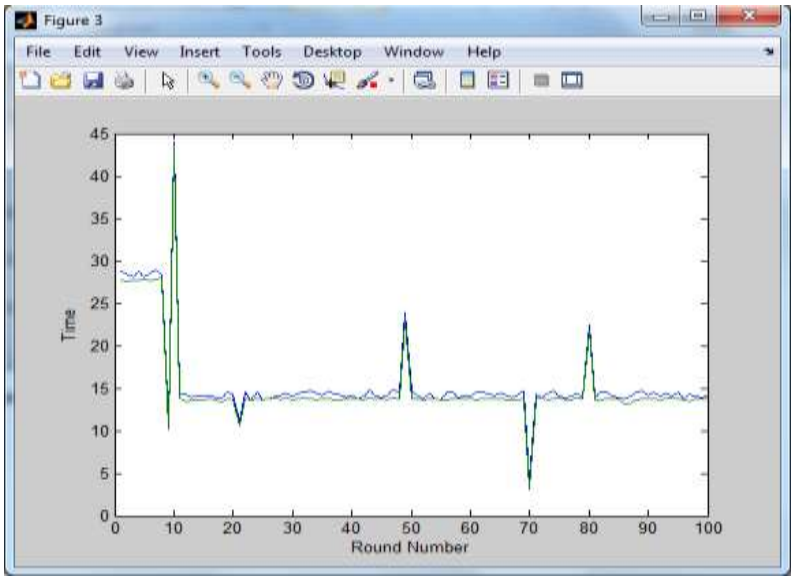
Network Layout of WSN



Energy Graph

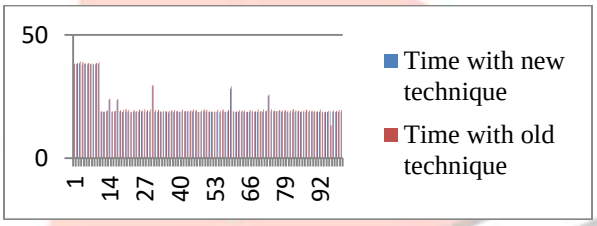


Time Graph



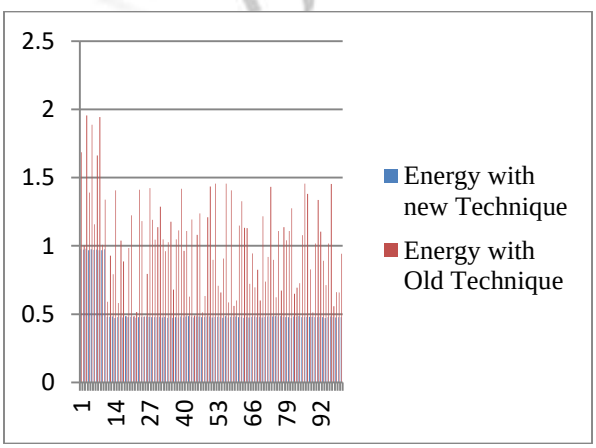
Time Comparison of Old and New Technique at each node

Average Time With Old Technique	Average Time With New Technique
21.9123493	20.01304332



Energy Comparison of Old and New Technique at each node

Average Energy with Old Technique	Average Energy With New Technique
1.01490416	0.528639113



V. CONCLUSION

Current Research proposes the Scheduling Based Energy Efficient Mobile Node Communication in Wireless Sensor Networks Unmanned Aerial Vehicle. In this work, hybrid network consists of two types of nodes one is static nodes and other are moving

nodes. We will consider these mobile nodes as mobile sink. Each static sensor has fixed or low energy. They have limited memory buffer. According the size of the buffer we will fixes the interval of movement of the mobile sink. After each time interval mobile sink go at fixed location and send the signal to static nodes. Such that will represent their arrival immediately static sensor will start transmitting to the mobile sink. We will subdivide the total network into equal sized grid. Various grid cells will collectively be considered as cluster. Each cluster has equal geometry. Such that mobile sink movement cluster by cluster is having equals amount of energy dissipation. Each mobile sink burn energy in movement and transmission.

VI. FUTURE WORK

In future work while having scheduling of the mobile sink node and setting up of stationary sensor nodes malicious node can also be taken place.

VII. ACKNOWLEDGMENT

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VIII. REFERENCES

1. Say Sotheara, Kento Aso, Naoto Aomi, and Shigeru Shimamoto, " Effective Data Gathering and Energy Efficient Communication Protocol in Wireless Sensor Networks employing UAV", IEEE WCNC'14 Track 3,2014.
2. Nicholas N. Karekwaivanane, Wilson Bakasa, Kudakwashe Zvarevashe, "Reliability in MAC Protocols for Wireless Sensor Networks: A Survey", IJIRCCE Vol. 2, Issue 7, July 2014.
3. Nilesh Kumar, Mamta Katiyar, "An Energy Efficiency Routing Protocol for Improving Lifetime of Wide Area Wireless Sensor Networks", IJETT Volume 11 Number 2 - May 2014.
4. Eleftherios, Amoiralis, Marina A.Tsili, Vassilios Spathopoulos, and Antonios Hatziefremidis , "Energy Efficiency Optimization in UAVs", Materials Science Forum Vol. 792, pp 281-286,2014.
5. Sandhya Rachamalla, Dr. Anitha Sheela Kancharla," A Survey of Real-Time Routing Protocols For Wireless Sensor Networks", IJCSES Vol.4, No.3, June 2013.
6. Monjur Ahmed , " Wireless Sensor Network: An Emerging Technology", ISSN volume 2,pp 01-04 october 2012.