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AVOIDANCE OF DATA REDUNDANCY IN WIRELESS SENSOR NETWORKS

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ABSTRACT

Sensor nodes are mobile in nature in some Wireless Sensor Networks (WSN). Due to this nature there is no guarantee of reliable data reception. To ensure this, sensor nodes are deployed densely in monitoring environment. The node in the particular region senses the same kind of information and then forwards it to the sink or base station. This redundant information provides reliability with the power and memory constraints. The main goal of this paper is to avoid the data redundancy and to reduce the energy consumption and memory space. It uses the match detection technique to avoid the redundancy problem. Through analysis and simulation, this paper demonstrates that the proposed technique is effective and efficient for avoiding redundancy in sensor networks.

Keywords:* *WSN, Data Redundancy

I. INTRODUCTION

A Wireless Sensor Networks has large number of self organised sensor node they are located in different places or in same location. These nodes are resource constraint in nature. Sensor networks are used where it is difficult to monitor the physical world. Examples of sensor networks are target tracking, wild life monitoring etc.

WSN usually produces large amount of redundant information. All this information is routed to the same sink node. So sink node have to process the same information.

Sensor nodes are energy constraints. Each sensor node has three main parts. They are,

1. Sensing Subsystem
2. Computing Subsystem
3. Communicating Subsystem.

Among this 60% of energy is consumed by communication subsystem and around 30% is used bt sensing system. Transmission of same or redundant information consumes more amount of energy in sensor networks and it causes the network to shut down quickly.

So this paper exploits the data replication avoidance in efficient manner to avoid the redundant data to save the energy and memory space in the sensor nodes.

This paper is organized as follows. Section II presents the reasons of avoiding data redundancy. Section III reviews the related work of data redundancy. Section IV Discuss about proposed solution and Simulation results. Section V gives performance analysis and Section VI concludes this work.

II. NEED FOR AVOIDING DATA REDUNDANCY INWIRELESS SENSOR NETWORKS

Sensor nodes are resource constraint devices. Particularly energy and memory space are the important constraints. More energy is used when the nodes are communicating with neighbouring nodes. A solution to this problem is replacement of battery in periodic manner. But this solution not feasible in all applications, examples is military and forest applications.

Due to the high density of nodes, sensor systems may sense similar data event and then it is sent to the sink by each node to the same sink. Therefore it causes higher energy usage occurred by the transmission and sensing of the redundant data. Sink node receives the same information more than one time and then process that data. So it consumes wastage of memory also.

For these two reasons, data redundancy avoidance technique is very important to save the resources for sensor nodes and for reliable communication. This approach increases the lifetime of the network.

III. RELATED WORK

The adaptive sampling algorithm (ASA) [5] allows sensors to identify the minimal sampling frequency online, which guarantees the reconstruction of the sampled signal. Thus, it reduces the power consumption of the measurement phase by adapting the sampling frequency to the real needs of the physical phenomena under observation. By decreasing the number of samples, ASA reduces the amount of data transmission and, as a consequence, the energy that the radio consumed. It shows that ASA can reduce the number of acquired samples up to 79% with respect to the fixed sampling frequency. ASA exploits temporal correlation among successive data samples thus, it provide message reliability (message delivery ratio) close to 100%.main drawback of this method are they provide energy efficiency only in highly correlated scenarios and it is very complex to implement in tiny devices.

In this work [6] Benazir Fatah and Manimaran Govindarasu addressed runtime slack allocation to nodes in a WSN with the objective of minimizing the overall energy consumption of the network. They showed that temporal correlation in sensor data can be exploited in a lightweight manner to generate runtime slack that can be traded off to minimize energy consumption. This work also propose four algorithms for real-time message rescheduling to perform smart slack distribution amongst nodes by allocating dynamic slack to the set of contending nodes that lower the energy expenditure in an effective manner. Determination of the data

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correlation at each node by way of local computation and avoiding transmission of significantly similar data reduces transmission energy. This can lead to unused time slots at runtime (dynamic slack) which can be traded off for energy savings. This is achieved by using techniques namely Dynamic Voltage Scaling (DVS) and Dynamic Modulation Scaling (DMS). This method efficiently reduces the transmitter power but it introduces synchronization overhead for transmitter and receiver, during its modulation changes.

III. PROPOSED SOLUTION

Data Gathering and Data Processing

Data gathering is the process of collecting different data packets from different intermediate nodes. Data processing means manipulation of received packets to avoid the redundant data. Data Processing in this paper is very useful to reduce byte transmission which in turn reduces the power consumption and storage of the node.

System Model

WSN has N number of nodes. The configuration of the network is uni directional tree.

In this model the members in the network sense the data and then it transmits those data to tha header. It receives and the checks the data to determine the redundancy by using the replication avoidance algorithm. After checking , if it is not a redundant data means it accepts all information from all sensors otherwise it avoid other nodes.

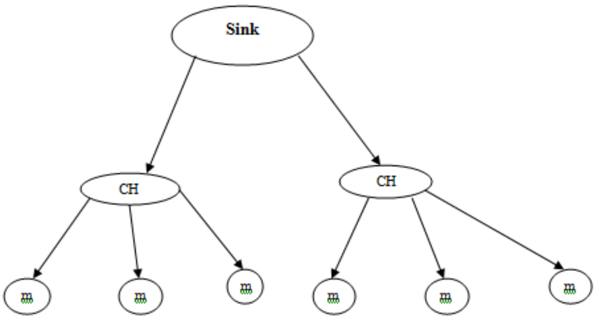

Figure 1. System model

This algorithm considers an input tree which has one parent node and one gateway node. All parent nodes are connected to gateway node. Whenever a sensor node receives data packet first time, the node from which it gets the packet will acts as parent node. If the same node receives same packet from some other node that node will acts as backup parent node and all the similar messages are ignored. In this way Data Aggregation Tree (DAT) is formed [8]. The Support Vector Machine (SVM) is applied on DAT to eliminate redundancy. SVM Performs two functions one is classification and other is correlated data elimination. It uses linear classifier method to represent the classification of redundant data. This method divides the hyper plane in two classes, redundant

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(no) and not redundant (yes). This protocol keeps the redundancy at adequate level so as to provide reliability and reduces the average energy consumption and memory space of the sensor.

In cooperative data replication avoidance, a node cooperates with each other and sends their data to CH the CH collects and save data with memory. Among several nodes from a network one may send requests to other nodes for some specific data items. Here every CH node creates and maintains replica's in its memory. For this reasons the CH storage full with junk files. In our Cooperative Data Replication avoidance Technique used to avoid the same data gather from sensor node and check the message integrity same data or not. In cooperative data replication reduce the duplicate message stored in CH. So that we can improve and increasing data access probability from other nodes.

In this proposed system, every node present in the same locations sense the same event at a time and the immediately it transmit that information to the sink through some intermediate nodes. In this scenario, it consumes large amount of energy and space. To avoid this, data replication avoidance technique is used.In this technique, intermediate sensors or nodes after receiving the packets it checks the data content type. If it determines the same data it selects any of the nodes to transmit and rejects it.

V. SIMULATION RESULTS

Simulation results shows how the proposed system is implemented in ns2. This simulation is dsubdivided into four modules. They are,

1. Node Creation
2. Cluster formation
3. Redundancy checking algorithm
4. Performance evaluation

A) Node Creation

In this module, initially 50 nodes are created. Among these one node is fixed as a base station. These nodes are like sensor nodes located in same or different areas. When one event happened it sense that event then transmit it to the base station.

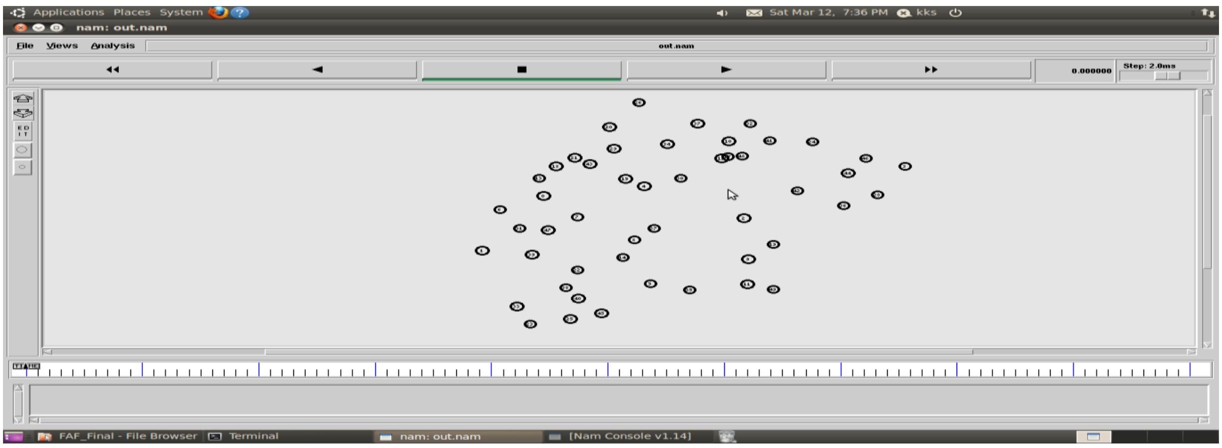

Figure 2. Node creation

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B) Cluster Formation and Data Transmission

In cluster formation, the created 50 nodes are subdivided into five groups. Each group has its own cluster heads for authentication purpose and it behaves as a gateway. When the sensor node has data to transmit it only sends it to that cluster head only. This cluster head is responsible for sending it to the other node presents in the network.

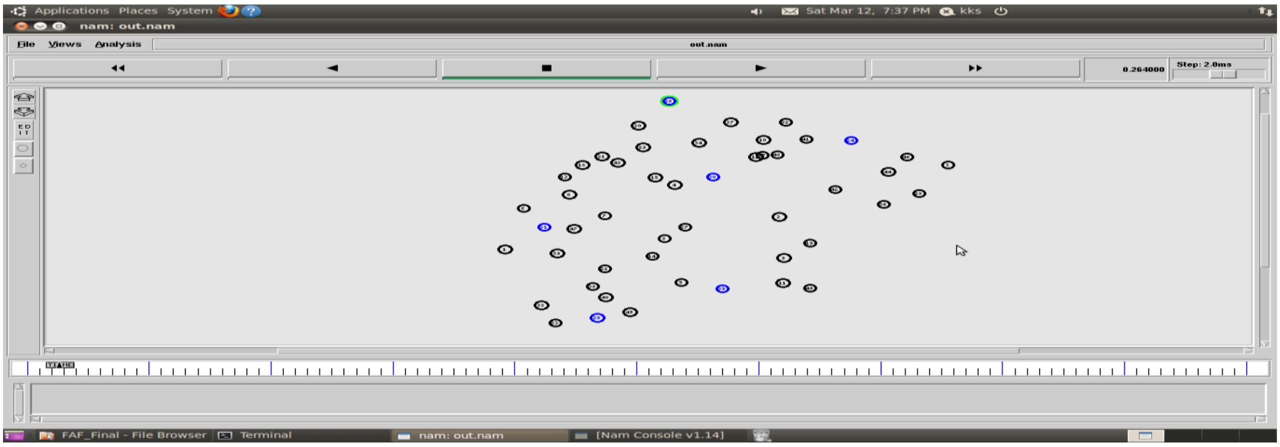

Figure 3. Cluster Formation

C) Redundancy Checking Algorithm

Data replication avoidance technique is used in this module. Upon receiving the same data from various sensors, the receiving node correlates these data. If the same node receives the same data it ignores the multiple copies of the same data by using the redundancy avoidance algorithm. It matches all the received information. If it found the data with the same file size, it also be rejected by the sink node. All these operations are done by the cluster head in the clusters. After that this data is sent to the base station via other intermediate nodes.

It keeps the redundancy in adequate level to provide the reliable communication. It reduces the average energy and memory space of the sensor.

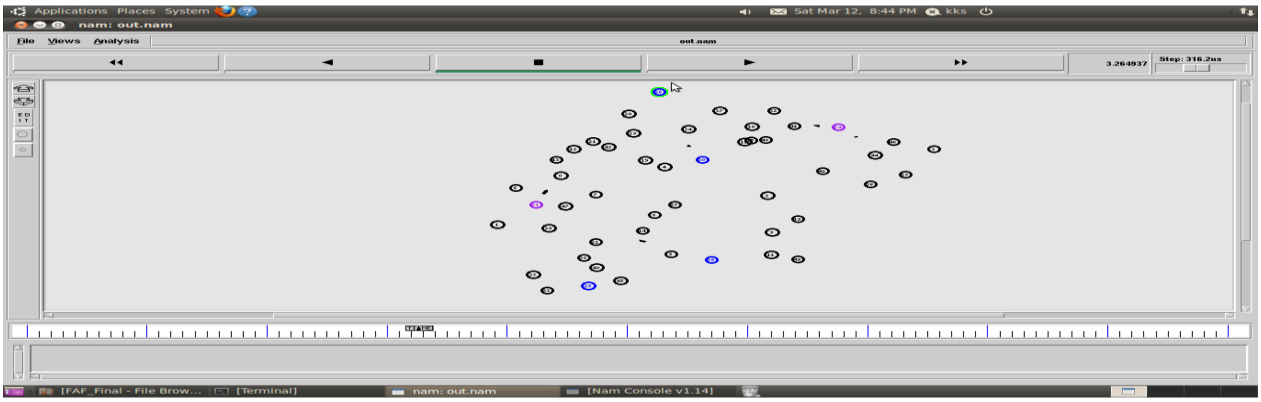

Figure 4.Data transmission

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In Fig 4, data is transmitted without any algorithm. It simply broadcast to the network.

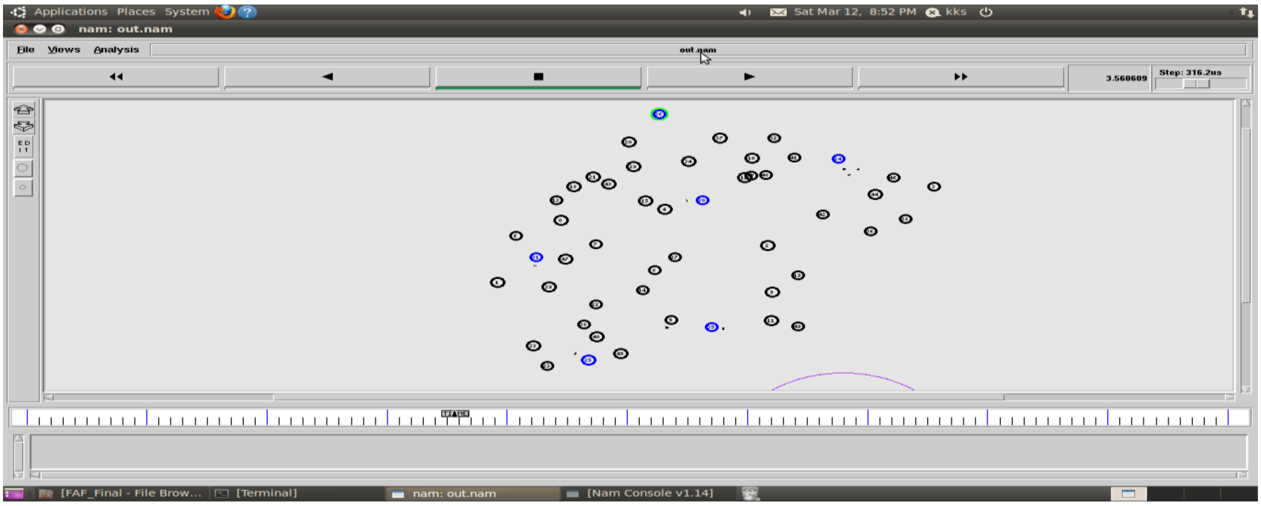

Figure 5.Redundancy checking

In fig 5, it uses replication avoidance technique to avoid the same data reception through different nodes. In one cluster, if it receives same data from more than one node means it accepts data from only one node and then rejects rest of the nodes. If it receives the different data from different sensor means it accepts all data reception.

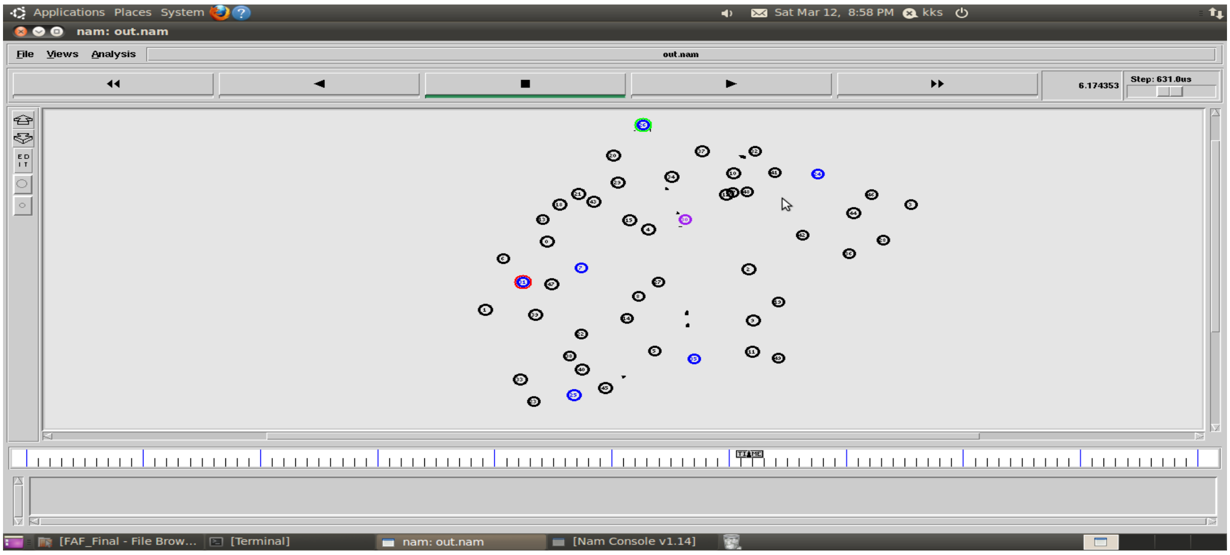

Figure 6. Cluster head selection

After some simulation time, there is energy drain in the chosen cluster head. Then it selects another cluster head randomly for further operation.

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VI. PERFORMANCE ANALYSIS

By comparing this data replication reduction algorithm with other energy minimization techniques, our scheme gives better results than others. The performance can be measured by network parameters such as energy, throughput and overhead.

In this technique the overall packets received is increased and at the same time the overhead is reduced with minimum energy usage.

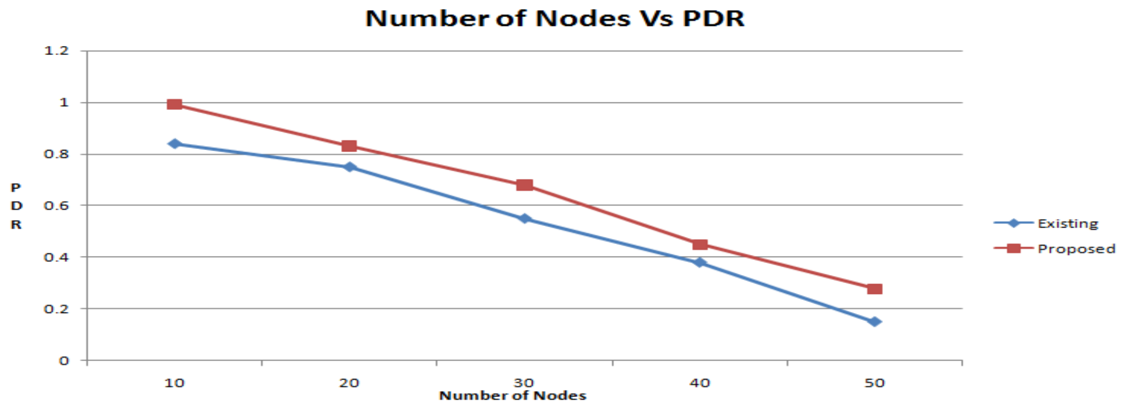

Figure 7. PDR Analysis

In Fig 7, the overall packets received increases in proposed scheme compared to the existing approach. Because in our scheme, the other unwanted packets are rejected. Therefore collision will not occur.

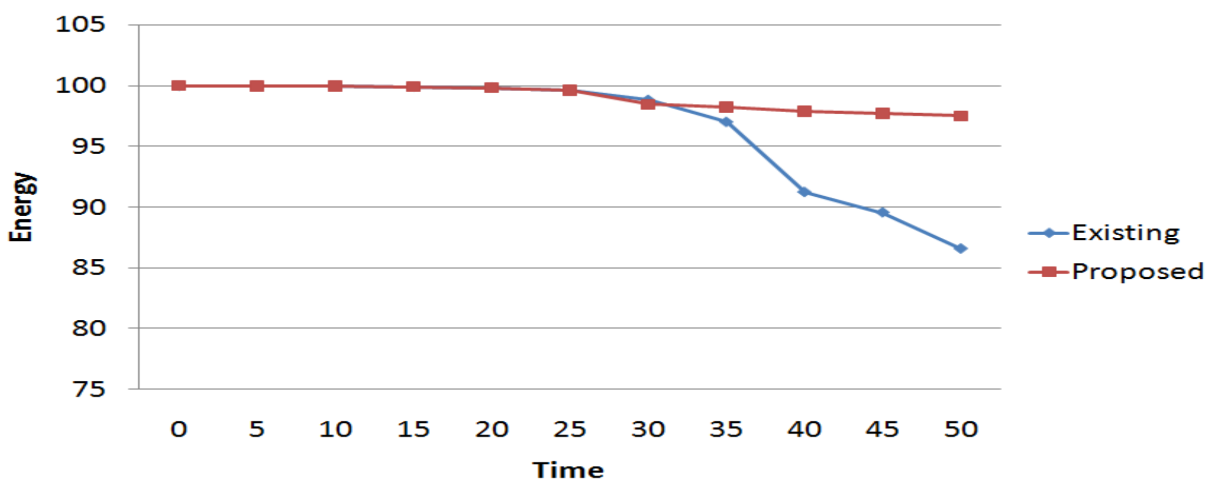

Figure 8. Energy Analysis

In Fig 8, energy usage of our data replication reduction algorithm is minimized. Because it greatly avoids the transmission of replicated data packets so that it reduces the energy usage of sending and processing of same packets

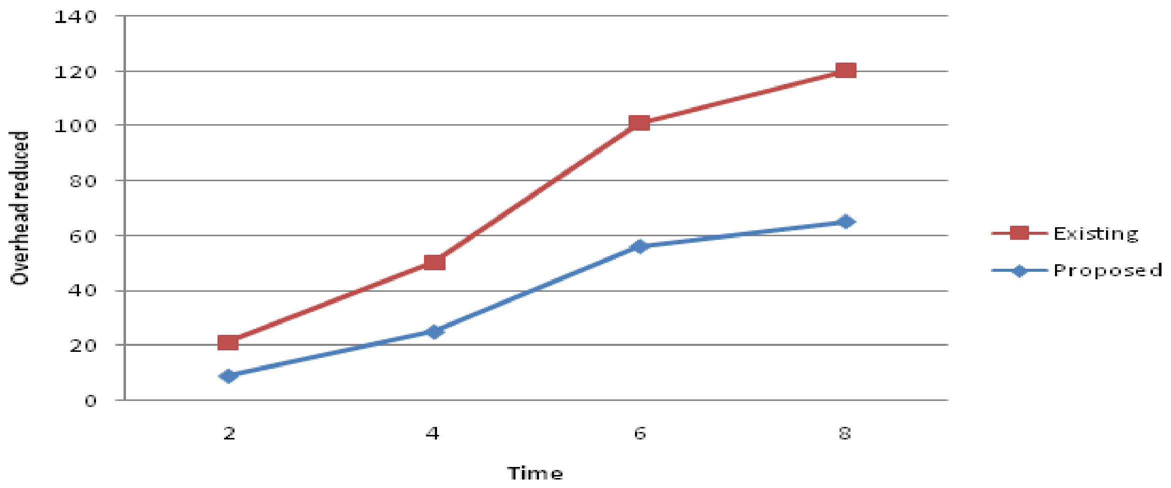

Figure 9. Overhead Reduction

In fig 9, the overall overhead occurred by the transmission is reduced in data replication reduction scheme compared to existing technique.

VII. CONCLUSION

In this paper, we implement the data replication reduction scheme. In this scheme, it avoids the redundant data transmission from various sources. This redundant data transmission is identified by match detection algorithm. Match detection algorithm checks all packets from different sources. If those packets are same means it rejects all other packets except that one packet. Instead of sending all packets of same data it sends only one packet to the appropriate destination. Therefore overhead due to the large packet transmission is reduced which in turn decreases the energy usage of the nodes for data transmission. Delivery of packets will be increased by reducing the overhead. However there is a small delay due to the time taken by the match detection scheme for checking the packets of same data.

REFERENCES

[1] Shabna ve, Jamshid K, S.Manoj Kumar " Energy Minimization by removing data redundancy in Wireless Sensor Networks" *IEEE transactions on Communication and signal processing April 3 2014*

[2] Leandro Aperecido villas, Azzedine Boukerche, Heiler soaresromos etc al., " DRINA: A Lightweight and Reliable Routing Approach for In-Network Aggregation in Wireless Sensor Networks" *IEEE Transactions on Computers vol 2, April 2013*

[3] Antonio A.F. Louriro, *Regina Borges de Aroujo*. " An Energy Aware Spatio-Temporal Correlation mechanism to perform efficient data collection in wireless sensor networks." *Computer Communication 36-2013*

[4] Ghalib A. Shah and Muslim Bozigit, " Exploiting Energy Aware Spatial Correlation in Wireless Sensor Networks." *1-4244-0614-5/07 2010 IEEE*

[5] Cesare Alippi, Giuseppe Anastasi et al.,. " An Adaptive Sampling Algorithm for Effective Energy Management in Wireless Sensor Networks with Energy-Hungry sensors" *IEEE Transactions On Instruments and Measurements, Vol. 59, No. 2, Feb 2010*

[6] Benazir Fateh,Manimaran Govindarasu " Energy minimization by exploiting data redundancy in real-time wireless sensor networks" *Ad Hoc Networks II (2013) 1715-17*

[7] S. Yoon, C. Shahabi, "Exploiting spatial correlation towards an energy efficient clustered aggregation technique(cag) wireless sensor network applications": *IEEE International Conference on Communications, ICC 2005,vol. 5,pp.3307-3313.*

[8] C.Tharinil and P. Vanaja Ranjan, "An Energy Efficient Spatial Correlation Based Data Gathering Algorithm For Wireless Sensor Networks" *International Journal of Distributed and Parallel Systems (IJDPS) Vol.2, No.3, May 2011*

[9] G. Anastasi and M. Conti et al.," Energy Conservation in Wireless Sensor Networks." *Ad-Hoc Networks vol 7 no 3, May 2009*

[10 J. Y. Zhang, and J. Meratnia Teo, "Outlier Detection Techniques for Wireless Sensor Networks", *IEEE Communications . -2010.*

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