# Energy Minimization Using Modified Least Mean Square Algorithm Calculation in Wireless Sensor Network

Mahesh More[1], Nishant Kumar[2], Yadnesh Doke[3] , Om Papinwar[4] and Pramod Ganjewar[5]

[1,2,3,4,5] Computer Science Engineering, SPPU, MIT AOE Pune India.
[1]maheshmore667@gmail.com, [2]kumar.nishant183@gmail.com, [3]yadneshdoke@gmail.com,
ompapinwar@gmail.com[4] ,pdganjewar@comp.maepune.ac.in[5]

* Corresponding Author: Mahesh More

Manuscript Received: Manuscript Accepted:

***Abstract***

*Wireless communication expends the most measure of vitality inWSN, to lessen the vitality utilization we have to to lessen the quantity of radio transmissions. By using various data reduction strategies, which can be utilized to decrease the measure of information sent by anticipating the deliberate qualities both at the source and the sink hub, requiring if a certain reading differs by a given margin from the predicted values which provide on the off chance that a specific perusing contrasts by a given edge from the anticipated qualities great energy saving.*

*Using Least Mean Square Algorithm (LMS), it is possible to save great energy while taking out the need of previous knowledge. variable step size (LMS-VSS) parameter is one way to achieve this target.*

***Keywords:*** *Wireless communication, Wireless Sensor Network.*

## I. INTRODUCTION

In WSNs sensor nodes are distributed in large area for sensing,processing and monitoring various parameters of en- vironment to report at the sink node.This sensor nodes trans- mitting information from sensor hub to sink node for analysis of data.Throttling techniques are used to reduce size of data and transmission of that data to sink node.In this,Controlled Duty Cycle Scheme is used to minimize vitality utilization in remote sensor in wireless sensor network. The principle objective of information decrease with CDC strategy is to build the life of Wireless sensor organize by devouring least energy.[1] Energy utilization is effectively a standout amongst the most basic and critical components deciding the achievement of sensors and remote sensor arranges because of numerous few requirements, for example, the sensors estimate, constraint of intensity source, treatment of sensor. gadgets are counteracted after they are sent.

There are various data reduction strategies which reduce the amount of data by the deliberate qualities both at the source and the sink node . Utilizing Least Mean Square Algorithm (LMS), it is conceivable to spare incredible vitality while dispensing with the need of previous learning .[2] Conservation of vitality is a standout amongst the most packed research region in remote sensor systems. Sensor hubs sent on extensive scale which is utilized for natural checking. Since sensor hubs chip away at intensity of battery and consequently they are vitality imperative gadgets. In such situation, vitality protection of hubs should be possible by decreasing number of transmissions happening from sensor hubs to base station or middle of the road hubs. Least mean square calculation is utilized to decrease vitality utilization with self-versatile advance size. This work accomplishes improved advance size and an information decrease .It can be utilized to expand lifetime of each hub in the remote sensors network.[3] Wireless body sensors are utilized in human services applications. Since they are embedded into human body, these sensors are extremely little in size . The vitality preservation transforms into a top of the line configuration issue for body sensor systems (BSNs).A expectation based information transmission approach reasonable for BSNs which combines a dual prediction framework and a advantage of PID (propor- tional integral- derivative) control is taken by low prediction algorithm.[4] In energy consumption radio communication and sensing activities consumes most of enegy in Wireless Sensor Networks(WSNs).Diminishing the quantity of gathered information utilizing versatile testing methods or decreasing the quantity of information transmitted over the system utilizing the expectation models over the WSNs can be utilized to lessen vitality consumption.[5] Wireless correspondence itself expends the most measure of 2 sent information by anticipating the deliberate qualities both at the source and the sink hub, requiring if a specific perusing contrasts by a given edge from the anticipated qualities which give extraordinary vitality sparing.

## II. OBJECTIVE

1. To reduce energy consumption of sensor nodes in WSN.
2. To increase life period of sensor nodes.

## III. RELATED WORK

Replication of data to multiple locations is a common tech- nique for performance improvement and reliability in Wireless Sensor Network . It has likewise been a generally utilized sys- tem for upgrading information unwavering quality . Recreating information acquires capacity overhead while accomplishing higher unwavering quality; encoding techniques[4][8] lessen capacity overhead while not performing admirably when hubs are not solid, e.g., in unique networks[1]. To find the hubs in the system and structure a remote topology. In this discovery we collect the information required to form the topology from all the nodes and send it to the server to make the nodes in the network topology aware. LMS algorithm uses the category of adaptive filter used to impersonate a desired filter by finding the filter coefficients that itemize to generating the least mean square of the error signal. Data-reduction techniques aim to reduce the data to be delivered to the sink. These procedures can be isolated into three fundamental gatherings : information pressure, information forecast and in-arrange preparing [1]. Information pressure is connected to decrease the measure of data sent by source hubs. This plan includes coding procedure used to speak to information paying little respect to their semantics.

## IV. ALGORITHMS

*Least Mean Square Algorithm*

In this section, we present a brief explanation of the least mean square algorithm.

1. A straight versatile channel tests an information stream/input motion at a moment n, which we will mean as u[n] and figures an expectation i.e., the yield of the channel as y[n] =wT[n]·u[n]
2. Direct mix of the past N tests of the information stream (meant as the vector u which is of length M), weighed by the relating weight vector w[n] (additionally of length M). M is a whole number parameter that the flter uses and it decides the "memory" of the flter i.e., what number of past info test it will utilize. 3. The yield y[n] is then contrasted with the info flag or the example of the information stream the flter attempts to adjust to, indicated as d[n].
3. The output y[n] is then compared to the input signal or the sample of the data stream the filter tries to adapt to.
4. The prediction error e[n] is then computed as: e[n]= y[n] - d[n] and fed into the adaptation algorithm, so the filter weights can be updated.
5. The vector w[n] i.e., the weights are modified at each time step n in order to minimize the mean square error.

## V. MATHEMATICAL MODEL

Let S be the system,

S ={ I, O, P} where,

I is the set of inputs to the system.

O is the set of outputs of the system.

P is the set of Running Processes on client machine.

I ={ D, T} where,

D are set of data inputs to the system and T are set of tasks to be executed.

D = {d1, d2, d3, , dn}

T = {t1, t2, t3, , tn} such that ti requires data di $\forall$ $1 \leq i \leq n$

O = {set of ouput generated by the tasks} P = p1, p2, p3, .... , pn where,

p1 , p2 , p3 , , pn are processes present in the system, and

{p1 , p2 , p3 , , pn}∈ P

Consider a wireless sensor network with N nodes denoted by a set E = { $E_1$, $E_2$, ..., $E_N$ } We assume nodes are time synchronized. For convenience, we will use i and $E_i$ interchangeably hereafter. The model is as a graph G = (E, $E_t$), where $E_t$ is a energy associated with every trasfer of data bitwise. And E is a set of nodes in wireless sensor network. Each node has an associated failure probability.

Energy associated with per bit = Ep
Energy required to transfer = Et

$$\text{Total Energy(TE)} = \sum_{i=1}^{T} n\,(Ep * Et)$$

Total transmission = Tn
Energy required for process = Epr
Total energy required for process :

$$TE = Epr + \sum_{i=1}^{n} (Ep * Et)$$

Energy required for each node =E1,E2...En
Hence,Total energy required by WSN:

$$TEWSN = E_1 + E_2 + \ldots + E_n \quad (i=1 \text{ to } n)$$

$$TEWSN = \sum_{i=1}^{n} Ei$$


## ACKNOWLEDGMENT

We might want to express our profound feeling of appre- ciation and regard towards our guide Prof.Pramod Ganjewar, Department of Computer Engineering, MIT Academy of Engi- neering.we have gotten from him while gathering information on this paper and all through our investigations.. we whole- heartedly thank to our Dean Dr. Shital Kumar Jain for their guidance. we also indebted to all Sr. Engineers and others who gave us their valuable time and guidance. The various information and sources we used during my report completion find place in our report


## CONCLUSION

The main aim to propose this research paper is to lighten the methods and algorithms to reduce data in data prediction in wireless sensor networking.It also gives information about the energy minimization in WSN.

## REFERENCES


[1] Manisha P. Mashere, Sunita S. Barve, Pramod D. Ganjewar, "Data Reduction in Wireless Sensor Network for Energy Minimization" , International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 6, June 2016

[2] Ss. Cyril and Methodius, Skopje, Macedonia, "Data Prediction in WSN using Variable Step Size LMS Algorithm" Biljana Stojkoska, Dimitar Solev, Danco Davcev Faculty of Electrical Engineering and Information Technologies, University

[3] A. Chunawale and S. Sirsikar, "Minimization of average energy consump- tion to prolong lifetime of Wireless Sensor Network," 2014 IEEE Global Conference on Wireless Computing Networking (GCWCN), Lonavala, 2014, pp. 244-248.

[4] Gaby Bou Tayeh, Abdallah Makhoul, David Laiymani, Jacques Demer- jian, "A Distributed Real-Time Data Prediction and Adaptive Sensing Approach for Wireless Sensor Networks."

[5] P. D. Ganjewar, S. J. Wagh and Barani S., "Threshold based data reduction technique (TBDRT) for minimization of energy consumption in WSN," 2015 International Conference on Energy Systems and Applications, Pune, 2015, pp. 617-621.

[6] Sudhir Chowdary.N, Siva Rama Krishna.Ch,"Energy Minimization for Wireless Sensor Networks using Opportunistic Routing", International Journal of Engineering Research Applications (IJERA) Vol. 2, Issue 4, July-August 2012, pp.345-348

[7] Delia Ciullo , Guner D. Celik , Eytan Modiano,"Minimizing Transmission Energy in Sensor Networks", Massachusetts Institute of Technology (MIT)

[8] V.Boitier1,2, P.Tajan1, and J.M.Dilhac1, "WSN Nodes: Design Consid- erations and Energy Management" 1 CNRS, LAAS, 7 Ave du colonel Roche, F-31400 Toulouse, France 2 Univ de Toulouse, UPS, LAAS, 3Univ de Toulouse, INSA, LAAS

[9] B. E. Far, S. Alirezaee and S. V. Makki, "Wireless sensor network energy minimization using the mobile sink," 7'th International Symposium on Telecommunications (IST'2014), Tehran, 2014, pp. 1184-1188.

[10] S.Sangeethapriya and Dr.R.Amutha, "Minimization of energy consump- tion using various mechanisms in WSN." 2014 IJEDR — Conference Proceeding (NCETSE-2014) — ISSN: 2321-9939 ECE Department, SSN College of Engineering, Chennai, India