ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE)
Vol 3, Issue 7, July 2016

Efficient Algorithm for Energy Reduction in WSN: Binary to Gray Technique

[1]Swati P. More, [2] M. S. Borse,
[1] Department of E&TC Engineering, [2] Assistant Professor, Department of E&TC Engineering,
Late G. N. Sapkal college of engineering, Nashik
[1]swati8more@gmail.coml, [2]manjhusha.borse19@gmail.com

***Abstract*- a wireless sensor network consist of many sensor nodes for doing some tasks like collecting and doing process so that information which is gained by sensor used for communication by means of transmitting and receiving with other sensor nodes in another in WSN. In WSN the sensor nodes are self organized or spatially distributed to monitor physical or environmental conditions such as temperature, pressure and sound etc. And transmit their data through wireless network to the desired location. As a WSN consists of multiple sensor nodes of hundreds of thousands number these sensor nodes have to perform their task without failure like reduction in battery. And in WSN it is very difficult to charge or replace the usable batteries. So for doing their transmission and receiving processes efficiently the sensor nodes should have efficient energy to perform their communication. And for this reason the energy reduction while communicating is to be developed. In this paper, by using gray code technique a new data transmission mechanism is developed to save transmission energy. The power drain in WSN is mainly because of communication, energy efficient communication protocols that can be implemented with low hardware and software cost are thus of paramount importance in WSN stored the device recharging cycle period and hence provide connectivity for longer durations.**

***Index Terms*—communication system, wireless sensor network, gray encoding, binary to gray code conversion**

I. INTRODUCTION

In Wireless sensor networks, multiple sensor nodes are present that are capable of performing some processing sensor information for communication. Wireless sensor networks (WSNs) typically utilize highly energy constrained, low cost sensor devices that are deployed in areas that are difficult to access and with little or no network infrastructure. In most scenarios, such battery powered sensor devices are expected to operate over prolonged periods of time. Most WSNs have disadvantage like limited amount of energy, limited processing capabilities, short range of communication and limited memory size. Out of these constraints, especially for battery-operated sensors the primary concern is energy; because when a sensor node have deficiency of energy, it would be useless for the network. And hence energy saving in WSN is become necessary task. For communication is WSN, the energy required is calculated by number bits. In WSN, for transmitting one it will require 4000nJ of energy. So for this reason the number of one's should be reduced to reduce amount of transmission energy. In gray code there are less number of one's as compared to binary code. In this proposed system the energy reduction in WSN is done by an encoding technique which employs conversion of binary to gray code. So in this proposed system data is transmitted in the form of gray code instead being transmitted in the form of binary code because number of 1 obtain in the gray code is less than the number of 1 obtain in the binary code hence energy used for the data transmission is less than the binary code transmission system. Hence today, in most of the communication system this system can be efficiently employed.

Fig.1. shows block diagram of sensor node which consists of sensing unit, processing unit, the trans-receiver system and power unit for all these units. The power unit is required to provide power to all processing blocks.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE)
Vol 3, Issue 7, July 2016

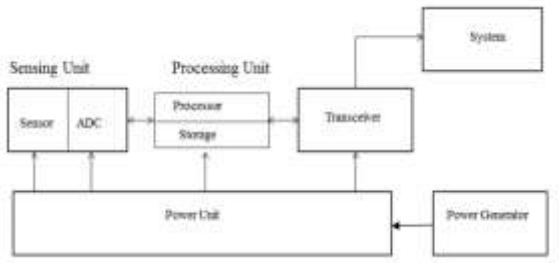

Fig -1 Block Diagram For Sensor Node

A major source of power drain in such networks is the scheme used for communication, energy efficient communication protocols that may be implemented with low hardware and software complexity are thus of importance in WSN. Hence WSN stored the device recharging cycle periods and hence provide connectivity for longer durations at a stretch.

II. RELATED WORK

Wireless sensor networks typically implemented using low cost devices and low power operations [1]. Hence, usually such networks can be employed with simple modulation techniques such as ASK, OOK and FSK [10] in radio signals. We propose a new energy efficient communication scheme for wireless sensor networks that is based on the ternary number system encoding of data. An efficient algorithm implementation for conversion of binary to ternary and vice versa is used that does not involve complicated operations like multiplication or division but only addition. In [1]-[3] RBNSiZeComm protocol developed which is similar to Ternary with Silent Symbol (TSS) communication scheme concept. However, in contrast to RBNSiZeComm, due to shortening of the transmission duration in TSS it simultaneously saves energy at both the transmitter and receiver. In most existing scheme silent and busy channels cannot be compared by using only 0 and 1 but they keep both transmitter and receiver switched on for the entire duration of transmission of data. An energy based transmission (EbT) scheme is that type of communication strategy as explained above.

In EbT scheme if energy required for 1 bit data transmission is x then energy required for n bit data transmission is n*x. Communication through silence (CtS) [4] was proposed in which is completely differs from EbT communication scheme. A CtS scheme use silent periods for the transmission of a data frame. But CtS suffers from some disadvantages such as exponential in communication time.

III. PROPOSED WORK

The sensor data frames are transferred by using Wireless sensor network from the sensor unit over a radio interface to the main i.e. central node. If a radio link can be established between these modules for peer-to-peer communication, the radio modules are used to put each sensor data frame into a radio message, send the message over the radio link, and extract the sensor data frame from the received radio message. This proposed system involves WSN communication, which is energy efficient communication system which is able to save consumed energy at transmitter and receiver. This proposed employed the system which involves the conversion of binary to gray at transmitter and vice versa at receiver effectively reducing the transmission energy. In the system, in wireless sensor network data is transmitted in the form of binary code. Energy required when we transmit data from one node to another node for the data transmission it is in the proportion of no of 1's in the data frame. This proposed system is able to save 50-60% energy at transmitter and same amount of energy at receiver. This system is very efficient because it does not involve any multiplication or division, instead it only involves addition.

2.1 Block Diagram of Proposed System

The below figures shows block diagram proposed system. The fig. 1 shows the transmitter system. Besides, sensors are not just limited to environment sensing. Any application involving sensing of physical parameters like sound, humidity, pressure, temperature, *etc*., might use sensor network. The physical data is collected from the sensor which is taken by Arduino module. Instead of processing the binary data, it is converted into gray code which is transmitted by using trans-receiver module.

The transmitter system involves sensor module, Arduino module, processing unit for conversion of binary to gray code conversion, USB to

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE)
Vol 3, Issue 7, July 2016

TTL conversion module and trans-receiver module. At the transmitter the conversion is takes place and gray code is transmitted while at receiver the reconversion takes place.

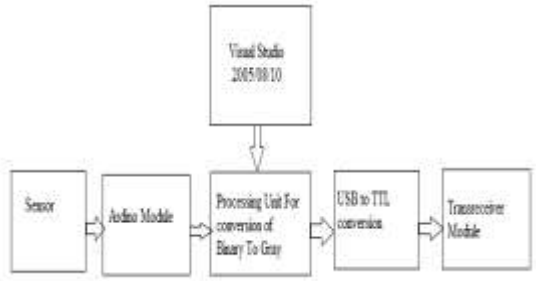

Fig-2: Transmitter of System

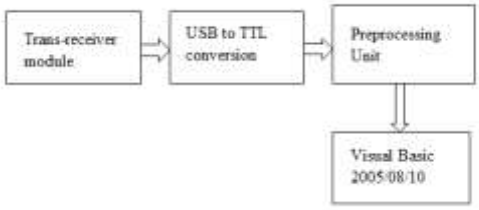

Fig-3: Receiver of System

Fig. 2 shows the receiver system. This can save energy at transmitter and receiver; and this algorithm can be implemented efficiently.

2.1.1 Algorithm Of System

A. Algorithm for Binary to Gray Code Conversion

a) The MSB of gray code is exactly equal to the MSB of the binary code.
b) Now, the second bit of the gray code will be exclusive or of the first and second bit of the binary code. If both bits are equal then result will be 0 and if bits are different result will be 1.
c) The gray code third bit will be equal to the exclusive or of the second and third bit of the given binary number. Thus the binary to the gray code conversion goes on.

B. Algorithm for Gray to Binary Code Conversion

a) The MSB of the binary code is exactly same as that of the MSB of the gray code.
b) Now, the second gray bit is 0 the second binary bit will be same as the first or previous bit. If the gray bit is 1 the second binary bit will alter. If it was 1 it will be 0 and if it was 0 it will be C.
c) This step is continued till we will get conversion of gray code to binary code.

C. Algorithm for the proposed system

Step 1: Firstly, check decimal value from sensor information is empty or not, if not empty then proceed further.
Step 2: Extract analog input signal into digital (decimal) output by using ADC.
Step 3: And convert these decimal values into binary values.
Step 4: Define 8-bit length array & then check in that array if value is greater than or equal to 8, if answer is yes then exit the function else proceed further.
Step 5: Declare the local variable=”0” and extract the 1st location of array string & store it to the variable for ex. Y and assume it as a default MSB bit simultaneously assign variable value.
Step 6: Increment the value by 1 of local variable and then store that variable to x1 as another local variable.
Step 7: Increment another local variable and then store variable to y1.
Step 8: Compare the x1 & y1 variables, if they are equal then add “0” to the previously stored MSB bit (X) which is explained (extracted) in step no 6.
Step 9: If they are not equal then append “1” to the MSB bit (X) defined (extracted) in step no 6.
Step 10: Repeat the above steps till you will get array which is not greater than 8.When array is above 8 then stop the process.

IV. RESULTS

This implemented system, represents a new energy efficient communication scheme that can reduce energy consumption at both the transmitter and receiver. Gray code method is based on encoding the source data in gray code number system, coupled with the use of silent periods for communicating the 0’s in the encoded message and transmission is done in gray code format. This will result in reduction of the device recharging cycle period. Efficiently, our proposed implementation can extend the battery life of devices from about 50% to 60%. We can use this system in much communication system or in 3G cellular network system. This system is easy to implement and can successfully saves the energy.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE)
Vol 3, Issue 7, July 2016

Fig.4. Decimal value by Arduino

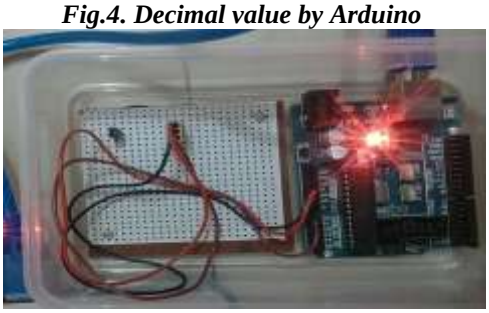

Fig.5. Arduino sending data

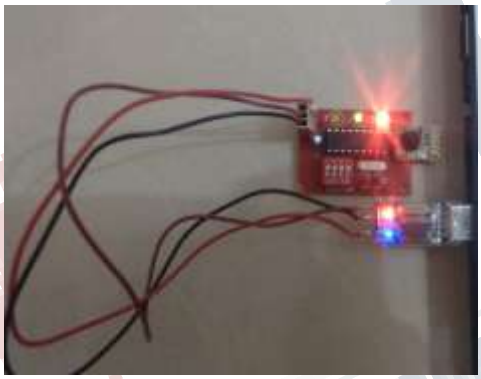

Fig.6. CC2500 transmitting data

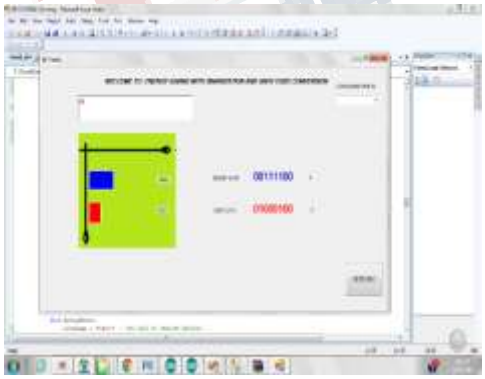

Fig.7. Binary to gray code convesrion

Fig.8. Received data

V. CONCLUSION

The efficient energy reduction at transmitter and at receiver on WSN helps to reduce complexity in communication. These collected data in this system could help the network designer by providing useful information. This proposed method is easy to implement for low powered sensor nodes in WSN. And this data used to modify node locations to ensure adequate coverage for users in the largest target area service. Gray code method based on encoding the source data in gray code number system, coupled with the use of silent periods for communicating the 0's in the encoded message and transmission is done in gray code format. Hence this implemented system can reduces energy consumption by using gray code technique.

Acknowledgment

I wish my sincere gratitude towards Principal, Late G. N. COE for providing a platform to develop my skill. I sincerely thank my guide Prof. M. S. Borse for their guidance and encouragement in carrying out this work. I would also like to thanks to all those who helped us directly or indirectly. I hereby take this opportunity to express my heartfelt gratitude towards the people whose help is very useful to complete our project.

REFERENCES

[1] Rabindranath Gosh, Koushik Sinha, Debashish Dtta, Bhubani P. Sinha, "TSS: An Energy Efficient Communication Scheme for Low Power Wireless Networks".

[2] K. Sinha, "An energy efficient communication scheme for applications based on low power

wireless networks," to appear in Proc. 6th IEEE Consumer Communications and Networking Conference (CCNC), Las Vegas, USA, Jan. 10–13, 2009.

[3] K. Sinha,"A new energy efficient MAC protocol based on redundant radix for wireless networks," Proc. Recent Trends in Information Systems (RETIS), Calcutta, pp. 167–172, 2008.

[4] Y. Zhu and R. Sivakumar,"Challenges: communication through silence in wireless sensor networks," Proc. Intl. Conf. on Mobile Comp. and Networking (MobiCom), pp. 140–147, 2005.

[5] Y. P. Chen, D. Wang and J. Zhang, "Variable-base tacit communication: a new energy efficient communication scheme for sensor networks," Proc. 1st Int. Conf. on Integrated Internet Adhoc and Sensor Networks (InterSense), Nice, France, 2006.

[6] D. Jea, J. Liu, T. Schmid and M. Srivastava, "Hassle free fitness monitoring," Intl.Workshop on Sys. And Networking Support for Healthcare and Assisted Living Environments (HealthNet), June, 2008.

[7] J. Burrell, T. Brooke and R. Beckwith, "Vineyard computing: sensor networks in agricultural production," IEEE Per. Comp., vol. 3(1), pp. 38–45, 2004.

[8] R. Beckwith, D. Teibel and P. Bowen, "Report from the field: results from an agricultural wireless sensor network," Proc. IEEE Intl. Conf. Local Comp. Networks, 2004.

[9] P. Mestre, E. Peres and C. Serˆodio, "Agricultural monitoring and control system using low-cost wireless sensors networks," Proc. 5th EFITA/WCCA, pp. 837–844, 2005.

[10] J. Polastre, R. Szewczyk and D. Culler, "Telos: enabling ultralow power wireless research," Proc. Intl. Symp. on Inf. Processing in Sensor Networks, pp. 364–369, 2005.

[11] Demirkol, C. Ersoy and F. Alagoz, "Mac protocols for wireless sensor networks, a survey," IEEE Comm. Mag., 2005.

[12] W. B. Heinzelman, A. Chandrakasan and H. Balakrishnan, "Energy efficient communication protocol for wireless microsensor networks," Proc. Intl. Conf. on Sys. Sc., 2000. [13] K. Sinha, S. Ghose and P. K. Srimani, "Fast deterministic broadcast and gossiping algorithms for mobile ad hoc networks," J. of Par. & Dist. Comp. (JPDC), vol. 68(7), pp. 922–938, 2008.

[13] M. Cagalj, J.-P. Hubaux and C. C. Enz,"Energy-efficient broadcasting in all-wireless networks," Wireless Networks, vol. 11, nos. 1/2, pp. 177–188, 2005.

[14] I.F. Akyilidiz, W. Su, Y. Sankara subramaniam and E. Cayirci,"Wireless sensor networks: a survey," Computer Networks, vol. 38, no. 4, pp. 393–422, March 2002.

[15] J. N. Al-Karaki and A. E. Kamal,"Routing techniques in wireless sensor networks: a survey," IEEE Wireless Communications, vol. 11, no. 6, December 2004.

★★★