

A Review of An Energy Efficient Communication Scheme for Low Power Wireless Network

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Abstract— In this paper we are going to develop of a new energy efficient communication scheme for wireless sensor network (WSN) which is based on the gray code technique. Gray code technique simultaneously saves energy at both the transmitter as well as receiver because time required for the transmission of is minimum. Wireless sensor networks typically require low cost devices and low power operations. We propose a new energy efficient communication scheme for wireless sensor networks that is based on the ternary number system encoding of data. 0 and 1 bit values are known as *energy based transmission* scheme. In wireless sensor network it is very difficult to charge or replace the usable batteries. So, to maximize node or network life span is very important. Thus energy efficient communication is main objective of WSN. This energy efficient communication technique can be used in many sectors such as remote healthcare, wireless sensor network for agricultures, industrial process monitoring and environmental monitoring.

Keywords—, *Technology Energy-efficient communication, Gray encoding, Silent communication, Wireless Sensor Network. sensor networks*

I. INTRODUCTION

Today Wireless Sensor Networks (WSNs) are used in many industries. WSN consist of a large number of sensor nodes. These sensor nodes are self-organized

with sensing, computation and wireless communication capabilities these are used to provide information about the status of a specific system . Physical or environment parameter such as temperature, pressure, vibration could be measured by using these sensors. The information is sent wirelessly and received by central location for further analysis and usage. Maximizing node or network lifetime is primary objective in WSN because it is very difficult to charge or replace exhausted batteries. Thus energy efficient communication is very important part in WSN to reduce the device recharging cycle period and hence provide connectivity for longer duration. A major source of power drain in such networks is communication, energy efficient communication protocols that can be implemented with low hardware and software cost/complexity are thus of paramount importance in WSN stored the device recharging cycle periods and hence provide connectivity for longer durations at a stretch.

In this paper, a new data transmission mechanism is proposed to save data transmission energy and time by using gray code. By using this technique it will save energy and time both at transmitting end and receiving end due to shortening of the transmission duration.

II. REVIEW OF RELATED WORK

Energy based Transmission (EbT) scheme was proposed in [4], not only utilize non-zero voltage level for both 0 and 1. They keep both transmitter and receiver switched on for the entire duration of transmission of data. To reduce energy consumption researches focus on the MAC layer design [5], [6], [7], optimizing data transmission through intelligent selection of paths.

A new communication scheme called Communication through Silence (CtS) [8], involves the use of silent periods opposed to EbT. In CtS a minimal amount of energy is used to deliver information between sensors along with use of silence. There are some disadvantages in CtS like exponential in communication time. So an alternative strategy, Variable Based Tactic Communication (VarBaTac) was design in [10], that uses a variable coding base to control the trade-off between network throughput and energy is saving. VarBaTac is used to minimize the delay introduced by CtS. But there is no idea about the energy saved by CtS and VarBaTac for noisy channels.

New strategy RBNSizeComm [9], [11], which combines the concept of CtS and VarBaTac. RBNSizeComm recodes binary coded data using a redundant radix based number representation and then use silent periods for communicating the digit zero. By using the redundant binary number system (RBNS) that utilizes the digit from the set- 1, 0, 1 to represent a number with radix 2, significantly reduce the number of non zero that need to be transmitted. Low-Energy Adaptive Clustering Hierarchy (LEACH) [12], uses localized coordination to provide scalability and robustness for dynamic network and incorporates data DATA fusion for the routing protocol to reduce the amount of information that must be transferred to the base station.

To improve the performance ternary number system encoding of data called as Ternary with Silent

Symbol (TSS) is design in [16]. In this system data is converted from binary to ternary by using silent symbol strategy. Aim of this strategy is save the energy simultaneously both at transmitter and receiver. An efficient algorithm for conversion from binary to ternary and vice versa is used that does not involve any division or multiplication but only addition. Spatial correlation model was developed in [13] are based on the locations of sensor nodes or statistical features of sensor nodes data. To detect the damage occurs gradually, a semantic clustering model was design in [14], this model was based on fuzzy systems which find out the semantic neighbourhood relationship. This type of spatial correlation model is not accurate to pinpoint the location of sensor node. New model [15], resolve the drawbacks of spatial correlation model. In this model Pearson Correlation Coefficient was used to measure the correlation between sensor node data.

III. PROPOSED ENERGY EFFICIENT DATA TRANSMISSION METHOD

A new method for energy efficient transmission of data are design which is gray code method. In this techniques energy required for the data transmission is minimized as well as time required for data transmission is also less than the available systems.

A. Gray Code Technique:

In gray code techniques data is transmitted using silent periods means energy is used only at the time of transmission of 1 and at the transmission of 0 energy is not used. In the previous system to transmit the data, it is transmitted in the form of binary number. But in the proposed system data is transmitted in the form of gray code because number of 1 obtain in the gray code is less than the number of 1 obtain in the binary code so energy used for the data transmission is less than the previous system. The Number of transmission of the 1 in a binary code system

in binary number is 3 and number of 1 in gray code is 2, therefore energy consumed for binary code is greater than the gray code. At the receiving end also data is received in the form of gray code so at this end also energy is consumed

B. Algorithm:

Binary to Gray Conversion algorithm:

- 1) The M.S.B of the gray code is equal to the first bit of the given binary number.
- 2)) Now the second bit of the code is exclusive-or of the first and second bit of the given binary number i.e. if both the bits are same the result obtain is 0 and if they are different the result is 1
- 3) . The third bit of gray code is exclusively equal of the second and third bit of the given binary number. Thus the binary to the gray code conversion is performed.

Gray to Binary Conversion algorithm:

- 1) The M.S.B of the binary number is equal to the M.S.B of the given gray code.
- 2) Now if the second gray bit is 0 the second binary bit is similar as the previous or the first bit. If the gray bit is 1the second binary bit is 0.
- 3) This step is repeated for all the bits to do gray code to binary

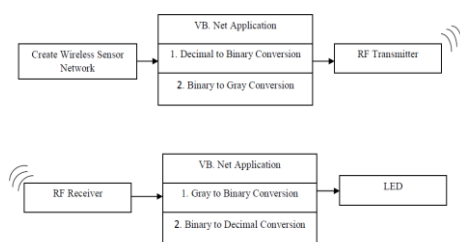


Figure 1: Block Diagram Of Gray code system

IV. SYSTEM ARCHTECTURE

- 1) To create WSN it need to configure some sensor (eg. Temp sensor) can be used to collect data from as like many sensors can be used. Data obtain is converted into digital signal by 10 bit internal ADC which generate decimal output up to 1024 decimal value. As

it collects data from surrounding it is also called as sensor node.

- 2) Decimal number is directly given to a conversion centre (PC or server) where an algorithm or function will convert decimal number into binary signal. i.e. either using any of the three techniques. The decimal (base ten) number system has 10 possible values (0, 1, 2, 3, 4, 5, 6, 7, 8 or 9) for each place value. In contrast, the binary number system has two possible value represented as 0 or 1 for each place value. Since the binary system is the internal language of electronic computer, serious computer programs should understand how to convert from decimal to binary. Following are the simple steps how to convert these numbers.

- Short division by two with remainder.
- Write the integer answer (quotient) under the long division symbol, and write the remainder (0 or 1) to the right of the dividend.
- Continue the divided until you reach 0.

- 3) Once the number is obtain then that no is needed to be convert into gray as per our energy save technique for data transmission. For to convert it into gray it need to compare each MSB with nearest binary bit of data using X-OR logic. Then fill that data to an array and then once it get a final number to store the string.

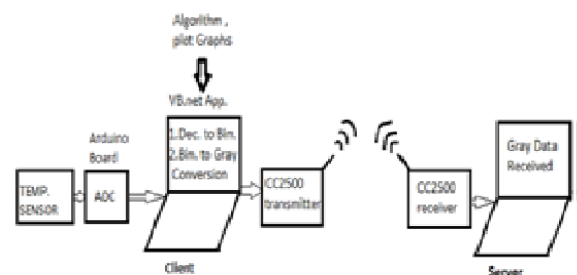


Figure 2: Proposed System

4) Stored number is then given to transmitter node connected immediately to server using a microcontroller and CC2500 transceiver via a USB port to start serial communication.

5) CC2500 will receive the data obtained and then it shall be converted into a string, thus generate a complete sensor node.

6) Again at receiver side data is converted from gray to binary using a C++ function and a direct decimal value is obtained.

7) Decimal value obtained is display as temperature output on either on a LED or a computer

Table 1. Comparison of TSS, RBNSiZeComm, and Proposed system

Sr. NO	Method Name	Energy Received At	Energy Saved In %
1	TSS	Transmitter and Receiver	20% -36.9%
2	RBNSiZe Comm	Transmitter	33% - 62%
3	Proposed	Transmitter and Receiver	50% - 70%

V. SYSTEM REQUIREMENT SPECIFICATION

i. Software Requirements

- a) Visual Studio 2005/8/10
- b) .net Frame Work 2.0 and above
- c) OS Xp Service pack 2 and above

ii. Hardware Requirements

- a) 512 MB RAM
- b) 40 GB HDD
- c) Pentium processor with 1GHz processing Speed
- d) RF transmitter
- e) Microcontroller ARDINO board

V. CONCLUSION

In this paper we represent the new energy efficient communication scheme that can saves energy simultaneously at the transmitter as well as receiver

side. The basic of gray code method is, encoding the source data in gray code number system, coupled with use of silent periods for communicating the 0's in the encoded message and the transmission is possible in gray code format. This reduces the device recharging period. Our proposed implementation can saves the energy and extend the battery life device.

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