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Development of Data Transmission Mechanism in WSN using Gray Code Technique

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Abstract— In wireless sensor network it is very difficult to charge or replace batteries. So, maximizing node or network lifetime is primary objective in wireless sensor network. Since communication of sensor node will be more energy consuming than their computation. In wireless communications each bit transmitted by a node consumes one unit of energy. Communication through silence scheme use silent periods to convey information. In this paper, by using communication through silence scheme we propose gray code technique for data transmission. This technique saves transmission energy at both transmitting end and receiving end due to minimum energy consumption. About 60-70% energy is saved by using gray code technique. This energy efficient communication scheme is used for various application such as industrial processing, agricultures, environmental monitoring and water monitoring applications such industrial processing, agricultures, environmental monitoring and water monitoring.

Keywords— Energy-efficient communication, wireless sensor network, silent symbol communication, Gray encoding.

I. INTRODUCTION

Wireless sensor network consist of multiple sensor node that is capable of performing some processing, gathering sensor information and communicating with other connected node in the network [1,10]. WSN are spatially distributed self organized sensor to monitor physical or environmental conditions such as temperature, pressure and sound etc. and pass their data through wireless network to the main location.

Typically wireless sensor network consist of hundreds of thousands of sensor nodes. The sensor node can communicate with each other using radio signals. Figure1 show the block diagram for sensor node.

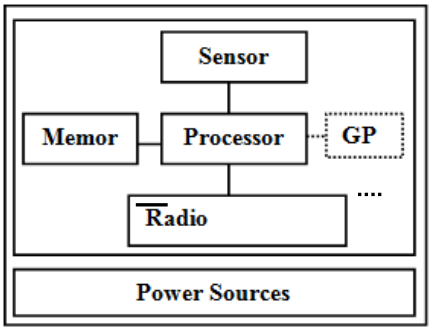

Fig 1. Block diagram for Sensor node

In wireless sensor network it is very difficult to charge or replace the usable batteries. So, maximizing node or network lifetime is very important. Thus energy efficient communication is main objective of WSN. In this paper, a new data transmission mechanism is developed to save transmission energy using gray code technique [11].

II. LITERATURE SURVEY

In most existing scheme silent and busy channels are not distinguished by using 0 and 1 but they keep both transmitter and receiver switched on for the entire duration of transmission of data. This type of communication strategy is known as energy based transmission (EbT) scheme. In EbT scheme if energy required for 1 bit data transmission is x then energy required for n bit data transmission is n*x [7].

Communication through silence (CtS) was proposed in [3] which is completely in contrast to EbT communication scheme. CtS scheme use silent periods for the transmission of a data frame. CtS suffer from some disadvantages such as exponential in communication time. So, new alternative strategy Variable based Tactic Communication (VarBaTac) was proposed in[5]. VarBaTac used variable radix based information coupled with CtS for communication.

RBNSizeComm scheme was proposed in [2,4,6] for wireless sensor network which utilize low cost devices. In RBNSizeComm binary number is converted into its equivalent redundant binary number (RBN) with the help of silent periods for communicating the digit zero.

Many aggregation techniques are also developed to save the transmission energy in WSN. One of the data aggregation techniques is concealed data aggregation (CDA) in which the aggregators aggregate the encrypted sensor readings without decrypting them. So it saves the energy spend for decryption and encryption operations at the intermediate aggregator nodes. In CDA, Intermediate aggregator nodes need not want to store secret information hence it provides end to end privacy between sensor nodes and sink. CDA provides secure data aggregation without delay [8].

Virtual Energy Based Encryption and Keying (VEBEK) was proposed in [9], where encryption and keying concept is used to save the transmission energy. VEBEK is a secure communication where sensor data is encoded using a scheme based on permutation code. The VEBEK framework consists of two operational modes (VEBEK-I and VEBEK-II), each of which is optimal for different scenarios. In VEBEK-I, each node monitors its one-hop neighbours where VEBEK-II statistically monitors downstream nodes.

III. BASIC IDEA AND ALGORITHM

In the previous system, in wireless sensor network data is transmitted in the form of binary code. When we transmit data from one node to another node energy required for the data transmission is in the proportion of no of 1's in the data frame. For example if we have to transmit 10011011 data frame then energy used for this transmission is in the proportion of 5 because number f 1 bits in the frame are 5.

But if we reduce this number of 1 bit available in the data frame then energy used for this transmission is also reduced. For this purpose we use gray code technique. When we convert binary code into gray code then no of 1's are reduced most of times and if we transmit this gray code in case of binary code then energy used for the data transmission is reduced. For example if binary number is 11101111 then energy consumed for the transmission is in the proportion of 7 because number of 1's in the frame are 7. But if we convert this binary number into gray code then we get data frame 10011000 and when we transmit these gray code data frame energy require is in the proportion of 3 because number of 1's are 3.

A. Algorithm for Binary to Gray Code Conversion

1. The MSB of gray code is exactly equal to the MSB of the binary code.
2. 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 same then result will be 0 and if bits are different result will be 1.
3. The third bit of gray code 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

1. The MSB of the binary code is exactly equal to the MSB of the gray code.
2. Now, if the second gray bit is 0 the second binary bit will be same as the previous or the first 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 1.
3. This step is continued for all the bits to do gray code to binary conversion.

IV. SYSTEM DESIGN

1. We first create WSN for this we need to configure some sensor which is used to collect data. Data obtain is converted into decimal number by using analog to digital converter.
2. This decimal number is given to the conversion center which convert this decimal number into binary signal
3. Once we get binary number we need to convert this binary number into gray code as per our energy saving technique.
4. Stored number is then given to transmitter node connected immediately to server using microcontroller and CC2500 transceiver via a USB port to start serial communication as shown in fig 2.
5. CC2500 will receive the data obtain and then convert it into string. Again at receiver side data obtain is converted into binary code using c++ and a direct decimal value is obtained.
6. Obtained decimal value is display as temperature on LED or a computer.Title and Author Details

V. RESULT

With the help of previous energy saving technique we can save about 50% of energy but by using our gray code technique we can save about 70% of energy. By using gray code technique we can save energy both at the transmitting end and the receiving end. Fig 3 shows the result of our gray code technique in which we can see the energy used when

Fig 2: Connection of CC2500 and server

we use binary number and the energy used when we use gray number. If we have to send data 67 to the another node then energy used by using binary number is in the proportion of 3 and when we use gray number energy used is in the proportion of 2 because number of 1's in the gray code are 2.

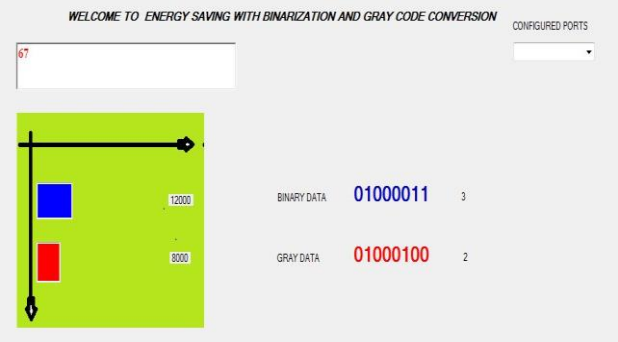

Fig 3: Energy saving result

Table 1 show the comparison between the Energy saving by using the Ternary with Silent Symbol (TSS), RBNSizeComm technique and Gray code Technique. About 20% - 36.9% energy is saved by using the TSS technique, 33% - 62% energy is saved by using RBNSizeComm Technique and about 50% -70% energy is saved by using the proposed gray code technique.

Table 1: Comparison of TSS, RBNSiZeComm, and Proposed System

Sr. No	***Method Name***	***Energy Saving at***	***Energy saved in %***
1	*TSS*	*Transmitter and Receiver*	*20% -36.9%*
2	*RBNSiZeComm*	*Transmitter*	*33% - 62%*
3	*Proposed*	*Transmitter and Receiver*	*50% - 70%*

VI. CONCLUSION

This paper presents a new low energy communication scheme that can save transmission energy simultaneously at the transmitter and receiver. Using low cost and low complexity implementation scheme we can save about 60% of energy than the previous scheme. An efficient algorithm is used for the binary to gray conversion and gray to binary conversion which contain only addition process.

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