Energy Conservation in WSN using Binary to Gray Topology

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Abstract – *Multiple sensor node are present in Wireless sensor network which are capable of performing some processing, gathering information which is collected by sensor and communicating by means of transmitting and receiving with other connected node in the network of WSN. In WSN self-organized sensor which are spatially distributed to monitor physical or environmental conditions such as temperature, pressure and sound etc. and pass their data through wireless network to the desired location. Typically wireless sensor network consist of multiple sensor nodes of hundreds of thousands number. The sensor node can communicate with each other using radio signals. 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. In this paper, by using gray code technique a new data transmission mechanism is developed to save transmission energy.*

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.

Keywords—Communication System, Gray encoding, Binary to Gray code Conversion, Wireless sensor node.

1. INTRODUCTION

In Wireless sensor networks, they have multiple sensor nodes which are capable of performing some gathering, processing, sensor information and transmitting and receiving this information with other connected node in the network. WSN are spatially distributed self-organized sensor to monitor physical or environmental conditions and pass their data through wireless network to the main location. Most WSNs have 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 is depleted of energy, it would be useless for the network. And hence energy saving in WSN is become necessary task. In this proposed system the energy conservation 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. This system could save 19% energy at transmitter and 39% energy at receiver, reducing transmission energy. 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.

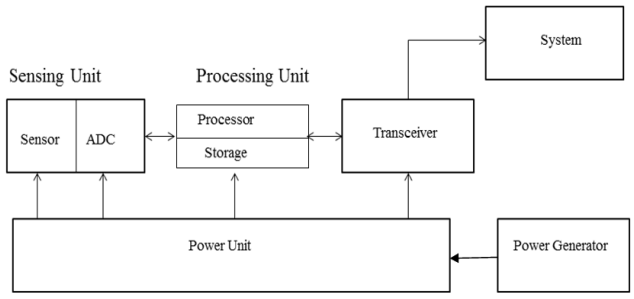

Fig -1 Block diagram for Sensor node

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2. 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.

3. 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 19.5% energy at transmitter and up to 36% 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 Ardino 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, Ardino module, processing unit for conversion of binary to gray code conversion, USB to 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.

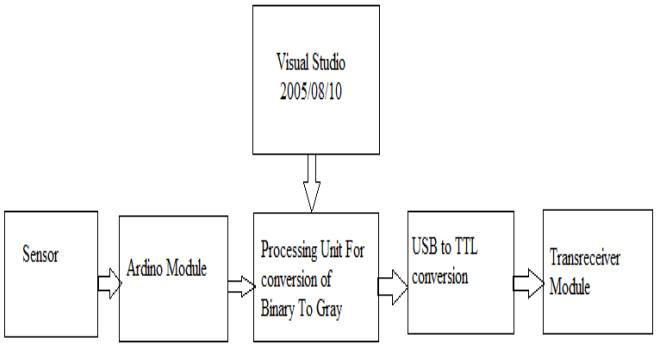


Fig-2: Transmitter of System

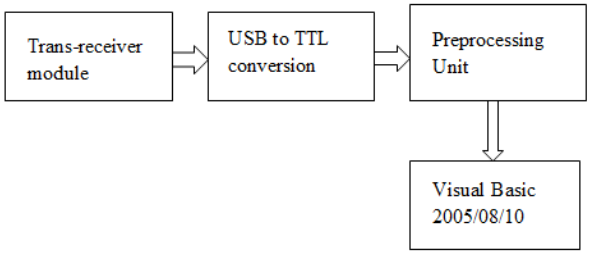


Fig-3: Receiver of System

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.

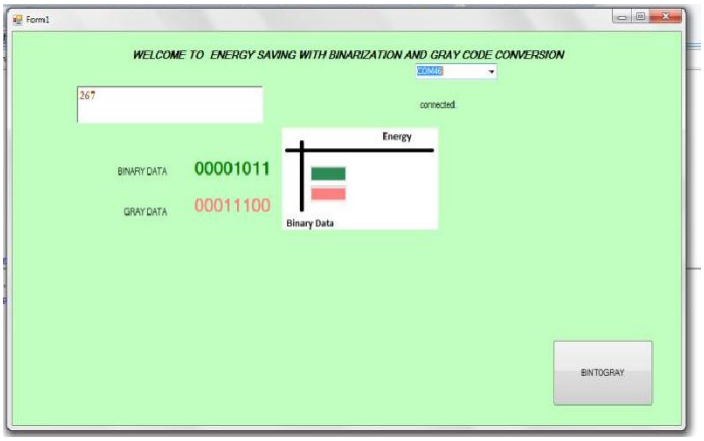
Step 8: Compare the x1 & y1 variables, if they are equal then add “0” to the previously stored MSB bit (X) which is explained (extracted) in step no 6.

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.

4. RESULTS

In this system, it presents a new energy efficient communication technique 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 33% to 62%. It can save 19% of energy at transmitter and about 39% energy at receiver; we can use this system in much communication system or in 3G cellular network system.



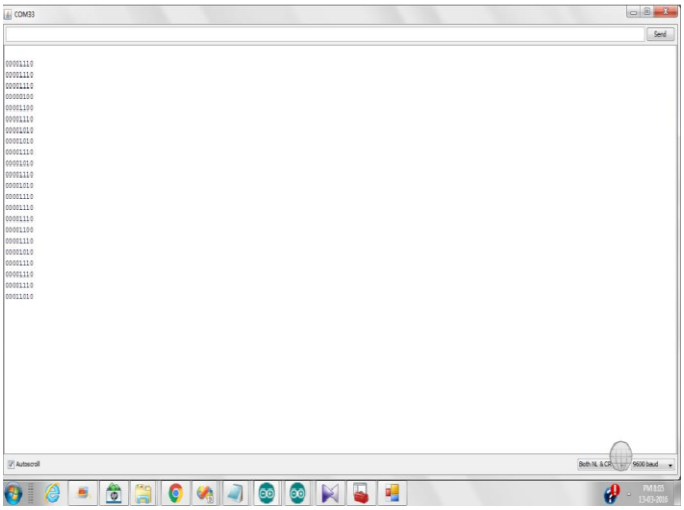


Fig-4. Results of the system

5. CONCLUSION

For data monitoring wireless sensor network can be designed in underground mine involves several steps, including the selection of node locations and power assignments. These collected data in this system could help the network designer by providing useful information. 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.

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