A Review- Compression on Data Packets in Body Area Network

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Abstract **- In body area network data through the nodes gets variety of actions, each node consumes lots of energy during small data transmission and data receiving and effects the lifetime of network. There may be data loss, so if compression techniques are applied on each node, it may be possible that more data can be transferred on less power consumption. This paper presents survey on these techniques and how & which compression techniques will help to prevent data loss and increases lifetime of network.**

Index Terms **- Body area network, sensor node, compression, LZW, forward node.**

I.INTRODUCTION

Body area network (BAN), also known as a wireless body area network (WBAN) or a body sensor network (BSN), is a wireless network of wearable computing devices on human body. BAN devices may be embedded inside the body or implants or may be surface mounted on the body in a fixed position with some Wearable technology or may be accompanied devices which humans can carry in different positions, in clothes pockets, by hand or in various bags. A typical body area network kit will consist of sensors, a Processor, a transceiver, and a battery. Physiological sensors, such as ECG and SpO2sensors, have been developed [1][2]. Other sensors such as a blood pressure sensor, EEG sensor and a PDA for BSN interface are under development.

II. SENSOR NODE

As wireless sensor nodes are typically very small electronic devices, they can only be prepared with a limited power source [6]. Since a sensor node has limited sensing and computation capacities, communication performance and power, a large number of sensor devices are distributed over an area of interest for collecting information (temperature, humidity etc.). These nodes can communicate with each other for sending or getting information either directly or through other intermediate nodes and thus form a network, so each node in a sensor network acts as a router inside the network.

A typical sensor node consists of four main parts.

Sensing unit, Processing unit, Power unit and Transceiver unit

a. Sensing Unit: The sensing unit collects the data (analog signal) and its analog to digital converter (ADC) converts the data to digital then sends it to the processing unit.
b. Processing Unit: The processing unit manages the task list and procedures to collaborate with other sensor nodes. The processor can perform simple operations on the received digital signal and can store it into its memory.
c. Power Unit: The power unit manages and sometimes generates the power using solar cells if available. The power supply is to power the node. The sensor circuitry can transform physical quantities into an electric signal.
d. Transceiver: The transceiver unit sends and receives the data to neighboring sensors [5]. The Sensor networks are used to sense environmental factors like temperature or pressure. These can be deployed in factories in order to monitor toxic or hazardous materials. They are also used to measure the weakness in building structures, or in vehicles and airplanes.

III. COMPRESSION

Data compression is the branch of information theory, whose primary objective is to minimize the amount of

data to be transmitted. Data compression is Technique used to reduce the number of bits required of particular information during transmission of data sets. The main function of data compression is to eliminate the redundancy in a data set which reduce its size. It plays an important role in data transmission and storage [3]. The data compression is referred as coding. It used less usage of resources such as memory space or transmission capacity. It involves the bit rate reduction and is done in encoding and decoding of data, which uses the less number of resources during transmission. In wireless sensor networks data compression technique is used for compression of data packets of sensor nodes which improves the energy levels of sensor nodes and helps in transmitting more data in less energy [3]. The compression technique also helps in selecting the cluster head whose energy is efficient and increases lifetime of network. The block diagram of compression is shown figure 1.

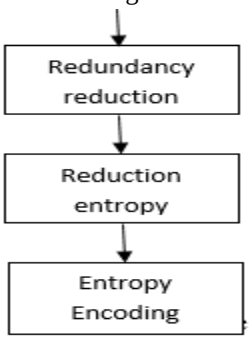

Figure 1 Data Compression Model

Data compression is classified into lossless and lossy compression. Lossless compression is used for text and eliminating statistical redundancy. Whereas lossy compression is for image and reduces bits by removing unnecessary or less important information given in the sets.

IV. LZW (LEMPEL-ZIV WELCH) COMPRESSION

In 1980, Terry Welch invented an algorithm called LZW algorithm which became the popular technique for general purpose compression systems. LZW algorithm is just like a greedy approach and divides text into substrings [4]. LZW algorithm works in both compression and decompression techniques. LZW compression is one of the Adaptive Dictionary techniques. The dictionary is created while the data are being encoded. It takes each input sequence of bits of a given length in bits and creates an entry in a table (sometimes called a "dictionary" or "codebook") for that particular bit pattern. The LZW works in two Modes.

Encoding: This algorithm works on the string of given input in a given dictionary and on scanning the input string for successively longer substrings until it finds one that is not in the dictionary [3]. The general steps accomplished by the processes during encoding is given below [3].

1. Initialize the dictionary with set of strings of length one.
2. Find the longest string W in the dictionary among set of strings that matches the current input of stirng.
3. Then avoid the dictionary index for value W to output and remove W from the input set string.
4. Then Add W followed by the next symbol in the input string to the dictionary.
5. jump Step 2.

Decoding: The decoding processes is done to retrieve the original data packets at nodes. Here the received binary data will be back converted into the character or string. After undergoing all these processes, we will get the actual data which is sent from the cluster member. The main purpose of using this LZW compression technique in WBAN is to improve the lifetime of the network.

V. LITERATURE SURVEY

Mark A.Hanson in his paper defines all challenges and opportunities, in this paper the architecture of body area network with different components are explained. Sensors are the fundamentals of all sensing network; Sensors are of three categories. First the Physiological sensors which measure continuous glucose monitoring, core body temperature, ambulatory blood pressure, blood oxygen, and signals related to respiratory inductive plethysmography.

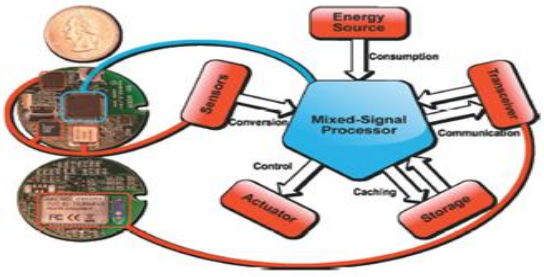

Figure2 Architecture of WBAN [1]

electrocardiography (ECG), electroencephalography (EEG), and electromyography (EMG) [1]. The second category called Biokinetic sensors which measure acceleration and angular rate of rotation derived from human movement. And the third called Ambient sensors measure environmental phenomena, such as humidity, light, sound pressure level, and temperature [1].

The second components in the architecture of BAN is signal processing used to extract valuable information from the data, which is captured, these are transient events, such as falls, as well as from trends, such as the onset of fever [1]. For the coordination purpose communication channel is used which restricted the range of transmission within Body Area network. As microelectronics industry is exploring lower power nonvolatile memory such as MRAM and RRAM used for storage purpose, with the availability of on-node storage might enhance BASN functionality [1]. This paper also explains different topology protocols and data aggregation overview.

Q. Nadeem [2] in their paper defines a new method for Body Area Network called SIMPLE (Stable increased-throughput Multi-hop protocol for link efficiency in wireless body area network). This paper purposes a cost function for the selection of Parent node or forward node,

$$C.F(i) = \frac{d(i)}{R.E(i)}$$

Where di is the distance from the Node i to Sink and R.Ei is Residual Energy of node i. The cost function selects the Parent node which has higher residual energy and minimum energy. The protocol is designed to increase the stability of the network. The system model consists of eight nodes deployed on the human body; sink is placed at the center of the body. The two-node node 1 ECG node and Node 2 called glucose node sends data direct to the sink and other nodes through the forward node then to the sink. The model is shown in figure 3.

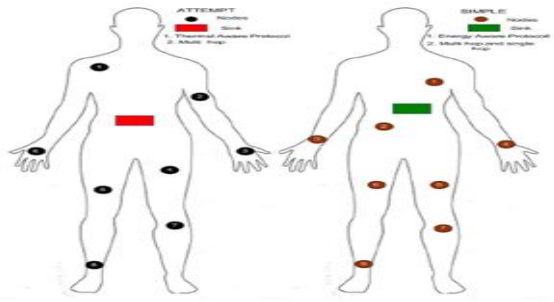

Figure 3: Node Deployment model [2].

The different parameters calculated are throughput and residual energy through different phases i,e initial phase, selection of next hop and scheduling.

Neetu et al, in their paper presents a heterogeneous model for the deployment of sensor nodes on human body [6]. The architecture composes of 8 nodes and a sink planted on different parts of human body, 5 nodes are deployed on lower parts of body, two on wrist and one on upper part which is fixed. The working model used in this paper works in phases with multilevel multihop scheme for the selection of some advance nodes called forward nodes planted on lower part of body. This scheme helps in to reduce path loss and to increase throughput by implementing two forwarding nodes on each side of lower part of body. The distance between nodes are measured in feets which is quite difficult to enhance the performance of small area, to accomplish this we can use distance in meters by implementing smart node.

As Body area network has novel applications in healthcare, but research must address issues such as size, cost, compatibility, and perceived value before networks that use such sensors can become widespread. But to implement a reliable, energy efficient and high throughput routing protocol for wireless body area network is still a aim for the development, many protocols are implemented and are focused on the minimum path loss and high throughput and stability period of the network. The paper “stable increased throughput multi-hop protocol for link efficiency for the wireless body sensor network” by Q.nadeem,n.javid at el proposed a protocol which is based on 8 sensors planted on the body, 2 on the upper part and 6 on lower part of the body and focused on the multi-hop technique but does not focus on relocation of forwarder node with respect to other sensor node, I proposed relocating of forwarder node and implement LZW compression on data packets which helps on minimum energy consumption with minimum path loss and maximum network stability.

Comparison:

The first dead node starts in between round 4000 & 5000	The first node dead in between round 5000 & 6000
The pathloss decreases after round 4000	The path loss decreases after round 5000

The number of packets received is less at any round. Also, the throughput effects.	The packets received are more as compare to other method, through put is better.

VI. CONCLUSION

The paper elaborates the body area network how to increase the stability of the network by introducing the LZW compression technique on data packets at each node. By relocating of forwarder node and implement LZW compression on data packets which helps on minimum energy consumption with minimum path loss and maximum network stability

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The above contents and survey we mentioned is true to my knowledge.

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