Energy-Efficient Relay Selection Mechanism

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***Abstract*— Collecting the physiological data from the Human body by continuously monitoring are the major part of the wireless body area network [WBANs]. The limited energy of the each WBANs network node and depletion energy which causes the severe in the network performance disgrace such as latency and the energy strategy. The result of the heterogeneity is different for the different sensor consumption of the energy rate. As mentioned the above problems an, Energy-efficient routing mechanism is proposed in these paper which can manages the energy consumption in body sensor and increase the network lifetime. Our major work done includes: (1) the original Physiological data are processed by discrete wavelet transform [DWT] compressive sensing [CS] which can reduced the data size of the network node which can be transmitted further.(2) the remaining energy levels, are can be used as residual energy are can be consider by Energy-efficient data forwarding strategy [EDFs] for the optimal selecting the relay. In addition, the simulation results demonstrate that the EDFs cab be effectively deal with the WBANs topologies which can be providing balance the energy in the network.**

***Index Terms*— Wireless body area network, Forwarding data for Energy-efficient, synergistic Transferring.**

I. INTRODUCTION

A wireless sensor network [WSNs][1] is a healthcare of biochemical related fields, have the attention toward the industry, relay time application and governments sectors[2][3]. WBAN having the sensor on the body with the processing and monitoring ability, which are the implanted and can be collect the physiological data such as ECG [electrocardiogram], temperature, pulse, blood pressure EEG [electroencephalogram], etc [4]. In WBANs are very high energy and they are resource limited and the replacement of the sensor are the very costly and they very complex. Hence how we can improve the energy efficient and how the network lifetime can be of WBANs are the basic challenges of the paper and the implementation.

Network size, WBANs are generally small and the consumption of the energy on the forwarding the data is mainly can be determined by the content of the data transmitted and the selecting the relay sensor. According to the present work on the structure of the senor and the consumption of the sensor model, transmission data can be contribute a major sensor energy consumption part [4]. Therefore, reducing the data size which can be transmitted which can defectively improve the sensor energy efficiency. In the efficient caused which can be improvement of the body which is lead to the changing wireless link and the status of the network for the different posing and topology on continuous were consistent of the human monitoring the physiological data are can be determine. As the traditional routing of the result for the mechanism for the fixed topologies of the network topology . The work in [2] and [3] are obtained which is greatly can be enhance the inter-node communication. In the many-hop WBANs, the figuring of the mechanism of the routing are greatly remains as unexplored.

The relay sensor which can be collaboratively perform and can be operation for the other sensor of the body for the successful transmission of the data. Therefore the relay selection senor [1] were it can be afficitude to the energy consumption rates of the sensor of the body depends on the and the related application the related application network connectivity. Some of the pervious work which can be related to the WBANs consumption of the energy and the application. WBANs may can uploaded in the cloud for the next further processing for the saving of the energy.

Exploiting samples of the sparsity of the signal, Compressive sensing[CS] [1] the theory can be compress the data signal of original samples for the lower dimension of the space, that can be obtain the by the discrete of samples and the recover the original of the signals from the signal of compressive with the nonlinear algorithm [4]. Numerous reaches say about the data collected by the WBANs sensor are the sparse [3]. Thus CS technology which can be exploiting and can be size of the data is reduced. The work is included in the CS technology for the WBANs to present the data sparsity and the physiological data and the action can be recognition. Besides, computational can be complexity of the CS technology at the sensor of the source the data can be recovered relatively recover of algorithm is complex were perform by the sink with resource are the abundant data.

Although algorithm is mentioned above that successfully can reduced the size of the transmitted data, and the transmission in WBANs application which can be in a collaborative with the energy of the cost and the relay senor.

Which is causes unbalanced the energy consumption. Some work is related to the transmitter strategy that can be reported in [1],[2],[3],[4],[15] for the heterogeneity for the body sensors, where the energy is consumption rates that can be simply employing initial and the residual energy cannot give the related values for the heterogeneity.

Based to the above analysis, where relay sensor can be properly selected for the data can be forwarding for the WBANs processes so they the network can be forwarded the data to the network consumption of the energy that can be transmitted. However, movement are the difficult to be accurately and are changing dynamically. The changing the position of the senor of the relay, neighbor detection failure sensor and the dynamically network topologies can be changing that can be result to the data packet for the communication. Due to dynamically feature of the WBANs the forwarding the data that should be support the changing WBANs topologies that are designed for the routing in the network performance.

Focusing on the above mentioned problems, an Energy-efficient data can be forwarded [EDFS] is approached in these paper. Once the physiological data are can be obtained WBANs sensor employee by using the Discrete wavelet transform [DWT] and the sparse for the binary random measurement matrix. During the data can be forwarded the consumption which is rate of the sensor body which is important degree of the collected of the data are in the portion of the residual energy which can be consider for the selection of the relay sensor by which can be the multi-hop of the network that data can be translated and can achieve the consumption of the energy and the network lifetime.

Through effective using the impact of the body sensor and the movement of the body which can be link to the status, the major work can be given these paper can be summarized as follows .

- The CS technology which can be employed in this paper for the preprocessing of the signal that can be collected by the physiological data, which can be reduced the size of the data of the original data and also the energy consumption. With the help of the spares measurements matrix and the redundancy removal by using the DWT signal in that we can use the Haar wavelet for the reeducation of the data by doing all these we can achieve the speed and the accuracy.
- The residual energy and the senor are the important factor are can be combined that can be consider to be for the balancing the energy of the senor node in each WBANs network for the increase the life time.

The paper is presented as follows. The model of the system II. The compressive sensing of the given data in section III. The relay sensor selection in section IV. Numerical results in section V. VI section about the conclusion in the paper.

II. Model System

As we known the star topology which is single-hop and the multi-hop network topologies are generally can be employed in the WBANs network. In a star topology , the sink can receives the data of physiological that can be collected
By the body sensor, that can be forwarded to the many of the remote areas for the control center and the feedback information by the remote areas for the body sensor, where the transmitter and the receiver data can be transmission are can be achieved in the single hopping. The single-hop topology is can be employed for the providing the relay-time of the data and in the WBANs features for the little of the network and the size and the close for the inter-node distance.
The low complexity of the single-hop topology that can be increased the transmission for the body sensor, energy can be consumption and the unhealthful and the heat can be emitted, were to the accuracy and the packet of the loss requirements [32]. However the shortcoming the single-hop topology, multi-hop network gains attention on the researches, where body closer to the sink that data can be forwarded.

The energy can be efficient data forwarding mechanism in the WBANs. Modes that can be actually WBANs application target, system system shown in the figure1 that can be employed for the archive the data transmission. Particular in the WBANs, which is the multiple for the body sensor, where the sink can be receives these for the data packet. Obviously, packets of the data can be transmitted to the sink by using the several hops and to the remote body have the properly can be selecting the selection of the relay to the forwarding of the data.

The consumption of the energy in the WBANs for the mainly contains of the three parts as can be shown in Eq.(1), where the P_{total} that can denote as the total energy can be consumption, P_p, P_r, P_p denotes the energy of the receiving of the processing transmitting and the receiving packets.

$$P_{total} = P_t + P_r + P_p \quad (1)$$

Let P_p be the consumption of the energy for the transmitting the each data dit, P_{amp} of the amplifying of the circuit ŋ and the packet length, d is be the distance of the transmission and the α power of the loss coefficient and the transmission.

$$P_r = n\_ \ P_e \quad (2)$$
$$P_t = n\_ \ (P_e + P_{amp} d\_)$$

The cost of the consumption employing the CS, mainly the processing the data transmission for the energy consumption of the non valuable in WBANs, receiving the energy consumption, and the processing and the transmitting ñ bits of the data that can be calculated as.

$$P_{total} = n\_(2P_e + P_{amp} d\_) + P_p \quad (3)$$

The cost consumption of employing the CS, that can be data processing, energy consumption, where In WBANs the energy can be consumption of the processing and the transmitting for the total transmitting of the data.

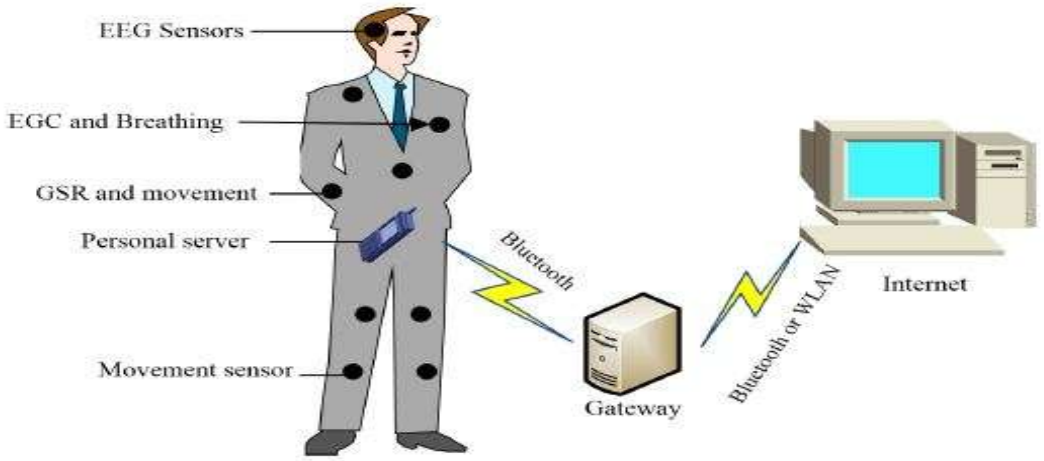

Figure 1: Topology of WBANs

III. COMPRESSIVE SENSING FOR THE COLLECTED DATA

A new sampling approach referred to as compressed sensing (CS) is used to reduce the wastage of the most of the samples. The resource energy that can be processing of the WBANs sensor are the constrained for the real time human body monitoring constantly for the generating the a huge volume of the data. Thus, all the given original physiological data that can be transmitted which causes the high energy consumption and the network are in congested area. To solve these problems, the collection of the physiological data are can be firstly compressed by using the body sensor by using the DWT compression sensing. The physiological data of the original signal data can be transmitted and they energy can be consumption. The received vector of the sparse that can be accurately for the accurately determine the recovery of the original of the data by the sink.

The DWT CS technology is carried by the paper that can be present the physiological data which is collected data $R = [R_1, R_2, \ldots\ldots\ldots R_N]$ with the basis vector $Psi\ (i = 1,2,\ldots. N)$ as can be shown in the Eq(4) where $j = (j\_1, j\_2 \ldots. j\_n)^T$ are the coefficient of the different samples of the vector psi and the sparsity of the vector of the signal. The compression can be done by using the DCT where considering the original samples of the in the first applying the scarification of the signal and the redundancy removal which are firstly can be compressed by the original samples . The firstly CS measurement can be done at where the satisfied the isometric property the Bernoulli, Random Fourier, Gaussian random, which can be done as given in the above equation the compressive sensing block diagram can be given the Figure 2

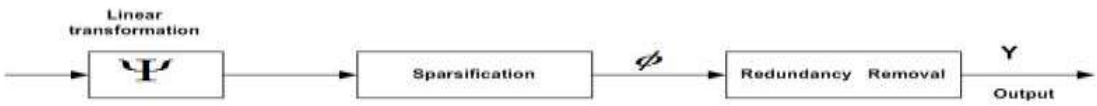

Figure 1:General block diagram of compressive sensing

IV. RELAY SENSOR SELECTION WITH EDFS PROTOCOL

According the system model, the transmitted of the packets he all the data can be transmitting to the sink by considering the many hops. Therefore the relay sensor selection which is directly can be affected for the network and causes the degradation of the network performance to the sending the data directly to the sink. WBANs network sensor has the various function that are responsible for the different physiological data such as temperature, pulse, blood oxygen levels, EEG, ECG, etc. Due to various of the energy can be contained the different physiological data sensing are also different. Therefore, the relay sensor can be selected that can be given for the more of the matrix and the both the residual and the levels into account. In WBANs, monitoring the different physiological information from the body sensor which is having the different sampling frequency such as 250, 200 and 0.1 Hz of ECG . A Hence the body sensors which is having the high we known that the different energy means the different frequency of consumption rate. Obviously, where the forwarding capability can be given to the body sensor which is inversely proportional to the sampling frequency of its. Body sensor which is having the more residual energy that can be provide for the forwarding to the services, with the less energy that must be forwarded to the load extend lifetime. Energy rate of consumption should be consider along with the residual energy of the sensor levels in optimal relay selection. In body sensor monitoring of the different physiological information of the WBANs sensor which is having the various sampling frequencies. As shown in the Figure 3

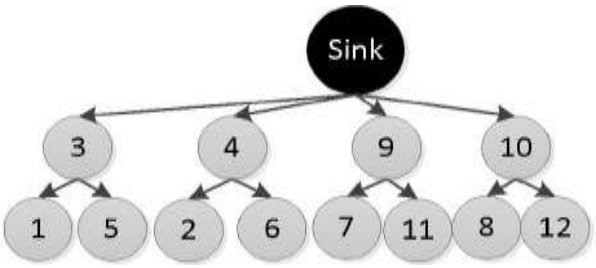

Figure 3: Standing position

Here we are considering the standing position where the nodes are in the constant form where there are many number of the posture can be consider the standing the laying position can be consider depended on the usage of the signal hence they product of many of the signal that can be produced On considering the standing position the these paper as shown in Figure4.

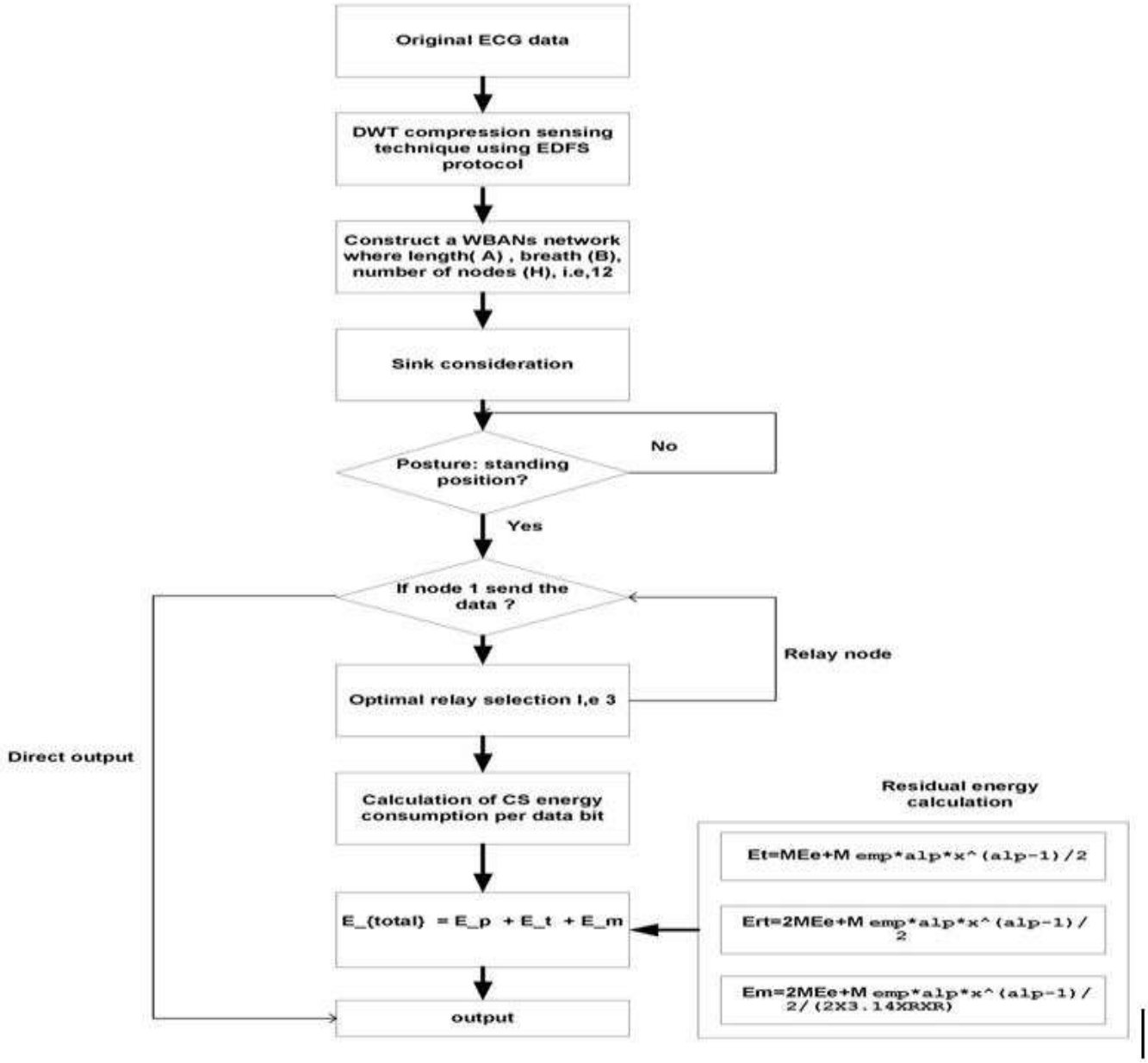

Figure 4: Flow chat for EDFS algorithm

V. WITHOUT EDFS PROTOCOLS

The with EDFs protocols say about the selection of the relay sensor where they are can be performed as selecting of many of the senor where there can be used for directly passing of the data from sensor node one to sink nodes as shown in the Figure 5

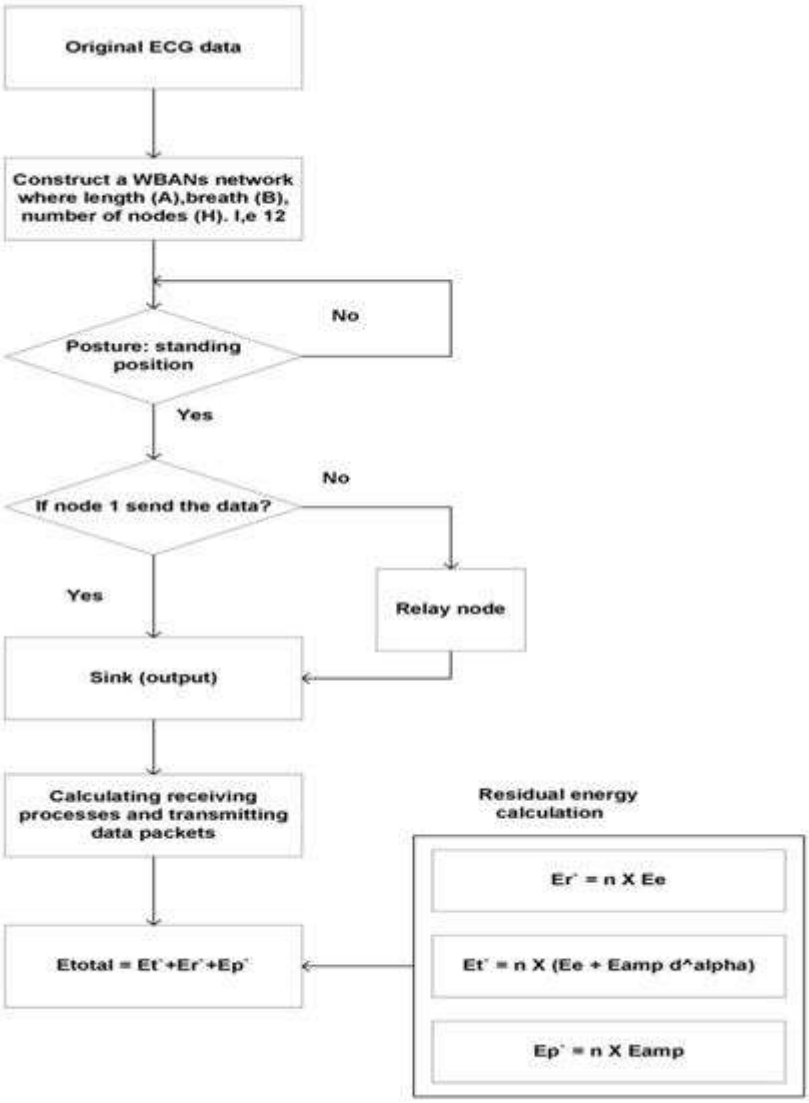

Figure 5: Flow chat for without EDFS algorithm

V RESULTS AND CONCLUSION

In this chapter an introduction to the EDFs protocols analysis are initially describe. The EDFs ECG compression sensing algorithm is implemented. Where ECG data are compressed which reduce its data size of nearly 32768 to 8192 bytes, hence Energy-efficient can be done at each node which gives to network for long lasting in WBANs. By considering the optimal relay sensor selection for the standing posture design can be calculated using residual energy for the given initial energy. The original ECG data are given in the Figure 6 as shown which is taken from the 100.m file from the net.

The Figure 7 shows the compressed signal of the ECG data. The Figure 8 shown the Compression of with and without EDF protocols by using the 40 and the 30 as the different energies.

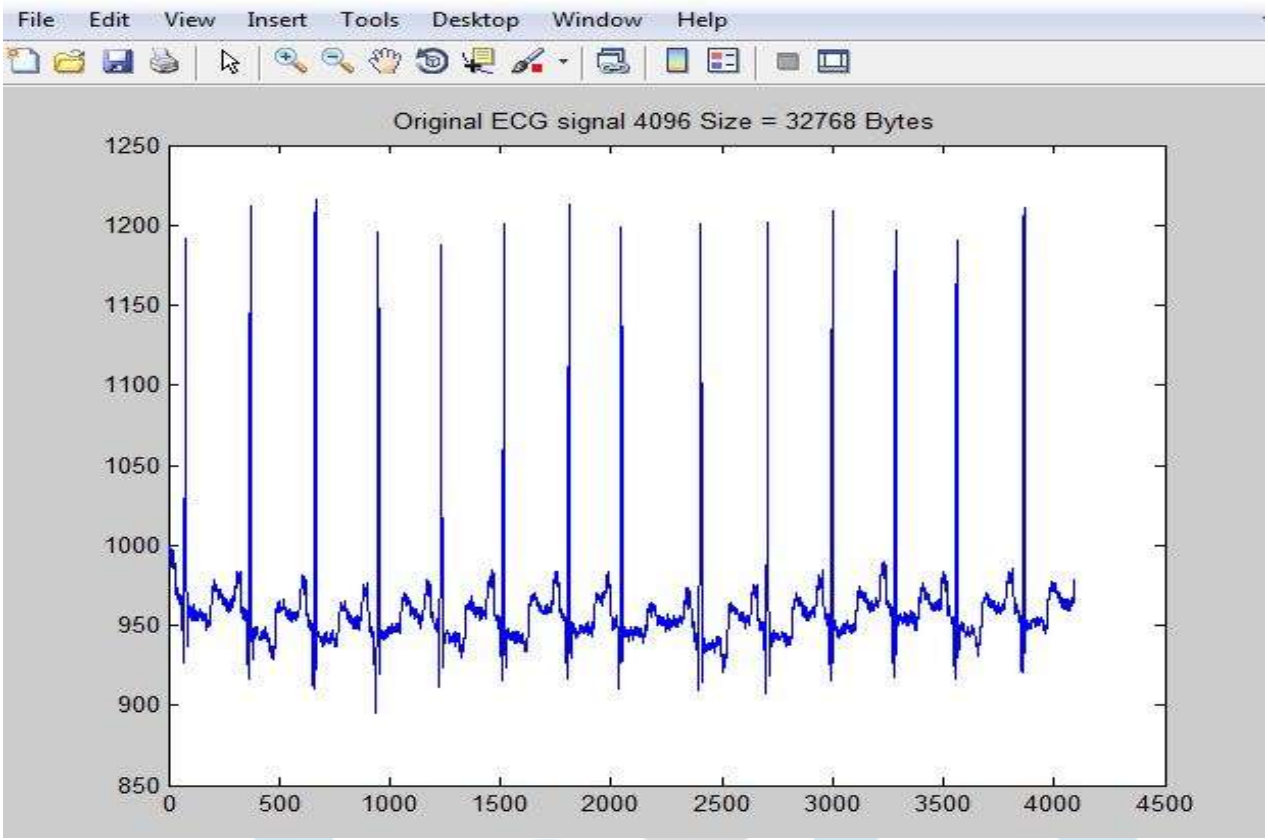

Figure 6: Original ECG data

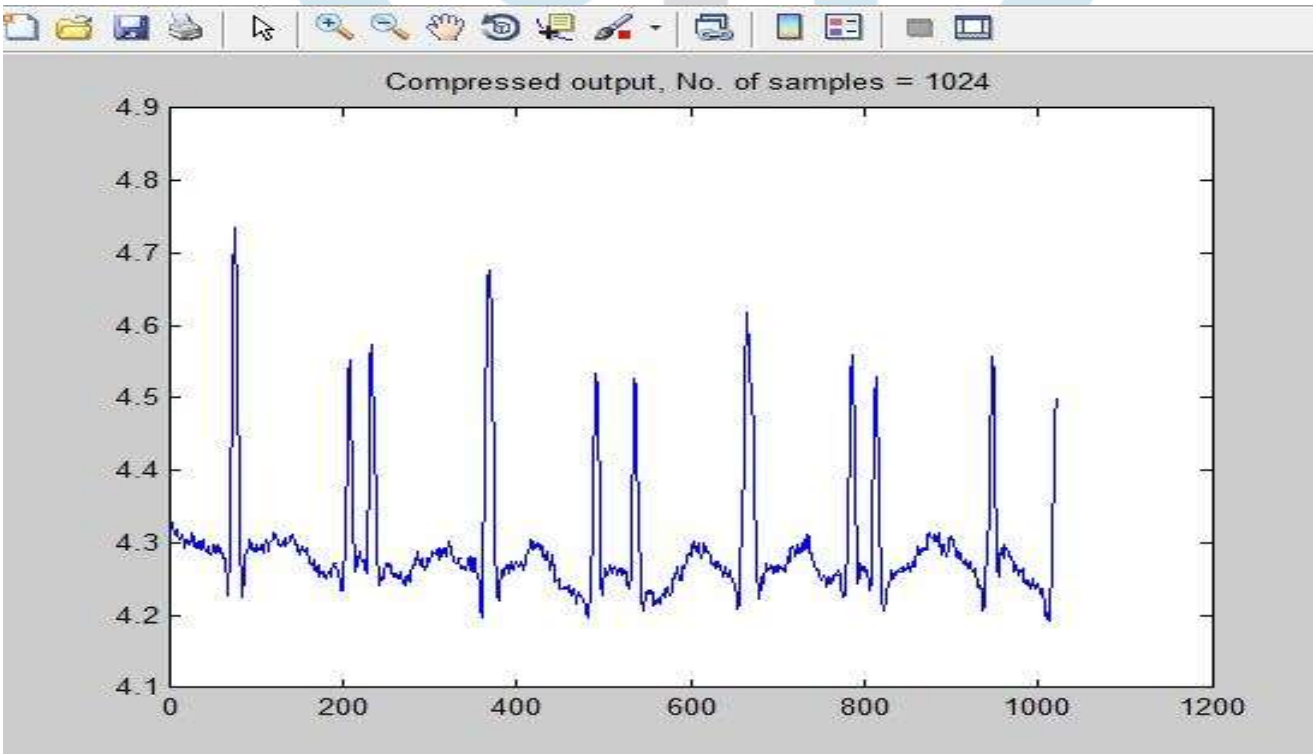

Figure 7: Compressed ECG data

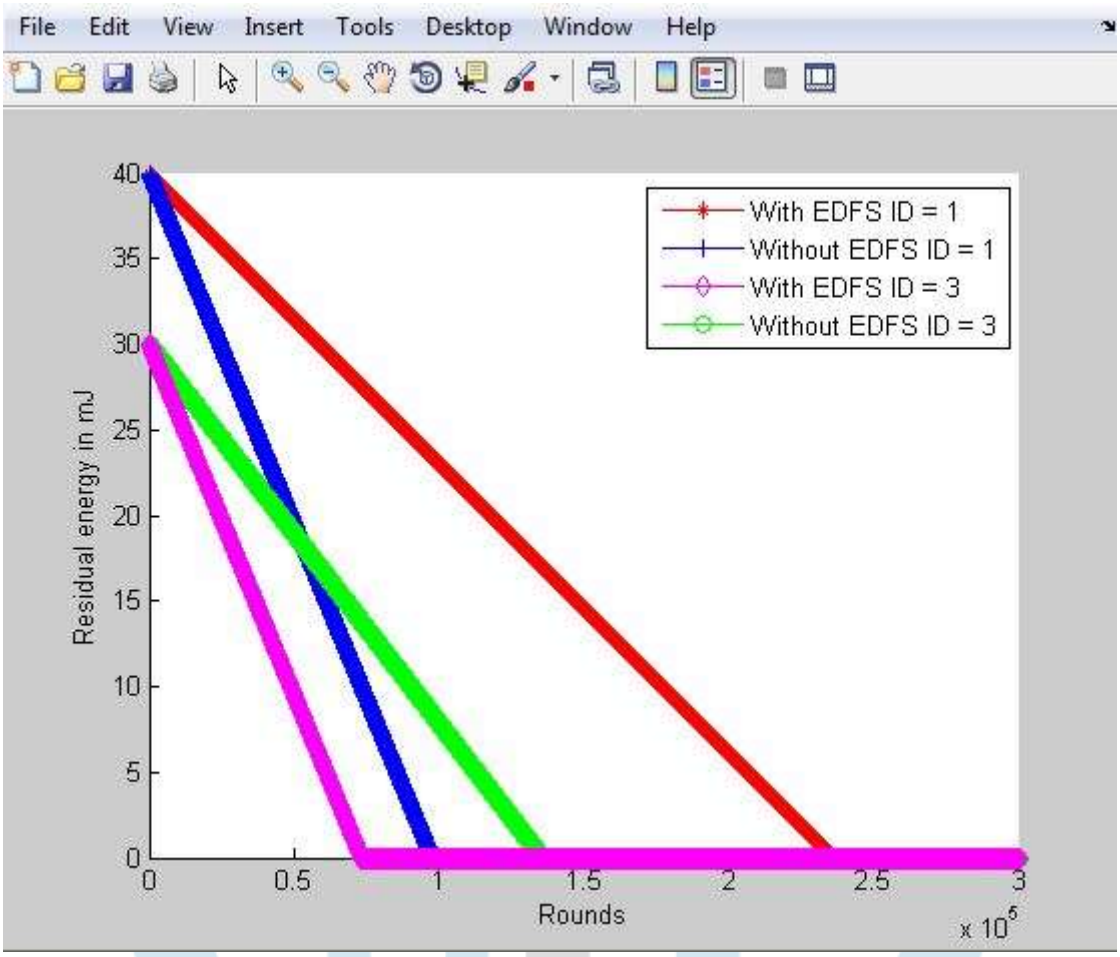

Figure 8: Compression analysis

VI. CONCUSLION

The DWT compression is the very good compression where the signals are can be reduced where the can be used in many other various wireless fields hence they can be produced the many of the compression of the signal they can be used for providing the signal hence they may used. The conclusion of the given as there is something where the compression of the data can be given in above where it can be form of the same hence the frequency of the data are can be performed.

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