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WBAN- An Experimental Approach

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Abstract: Advances in bio-medical science and engineering, and with the miniaturization of biosensors, there has been a serious revolution in the field of Body Area Networking. A biosensor is an analytical device which converts a biological response into an electrical signal which is later processed or forwarded. Advances in wireless communication technologies, such as wearable and implantable biosensors, along with recent developments in embedded system design and low power sensor circuitry has led to the deployment of innovative health care monitoring system. In this paper various biological parameters/physiological parameters of a human being is measured and recorded using Body Area Networks. We make use of wireless protocols and routing algorithms [3] which constitutes Wireless BAN called (WBAN). The physical, data-link and the routing protocols are explained practically with a real-time example. Heart beat in beats per minute (bpm), oxygen saturation in % vol and blood glucose in mg/dl are the major parameters of interest. The process of monitoring a person's oxygen saturation is called pulse oximetry and a device is designed solely for it. The information or data packets from all these sensors/ equipment are allowed to transit throughout the area of the body wirelessly.

Keywords: Advances in bio-medical science and engineering, miniaturisation of biosensors, Body Area Networking, low power sensor circuitry, biological parameters/physiological parameters, beats per minute (bpm), oxygen saturation in % vol and blood glucose in mg/dl, pulse oximetry, Wireless BAN called (WBAN), Network layer.

I. INTRODUCTION

Wireless Body Area Network (WBAN) is a Body Area Network [1] using wireless protocols [2] to interconnect nodes and to enable packet transmission between them. The lower layers of the OSI model have to be selected carefully for proper and resourceful implementation of the Body Area Network. The lower layers of the OSI [3] model are

- Layer1- Physical layer
- Layer2- Data-Link layer
- Layer3- Network layer

There are several physiological parameters to be measured and the data transmitted/shared between the intra-body nodes [4]

- Heartbeat (Measured in beats per minute (bpm))

i. Obtain graphical representation of heart rate and blood pressure.
ii. Determine the effect of exercise on the heart rate, and systolic, diastolic and mean arterial pressures.
iii. Correlate the fitness level of individuals.

- Oxygen saturation (measured in percentage (% vol))

i. To non-invasively measure/monitor a person's peripheral oxygen saturation or arterial oxygen saturation.
ii. Measure the amount of oxygen carried by the red blood cells.
iii. To guide the physician about the amount of oxygen to be given to the subject.

- Blood glucose (in mg/dl)

i. To measure the Fasting Blood Sugar (FBS)
ii. To measure the Post prandial Blood Sugar (PBS)
iii. To measure Random Blood Sugar (RBS)
iv. To measure the oral glucose tolerance through oral glucose tolerance test

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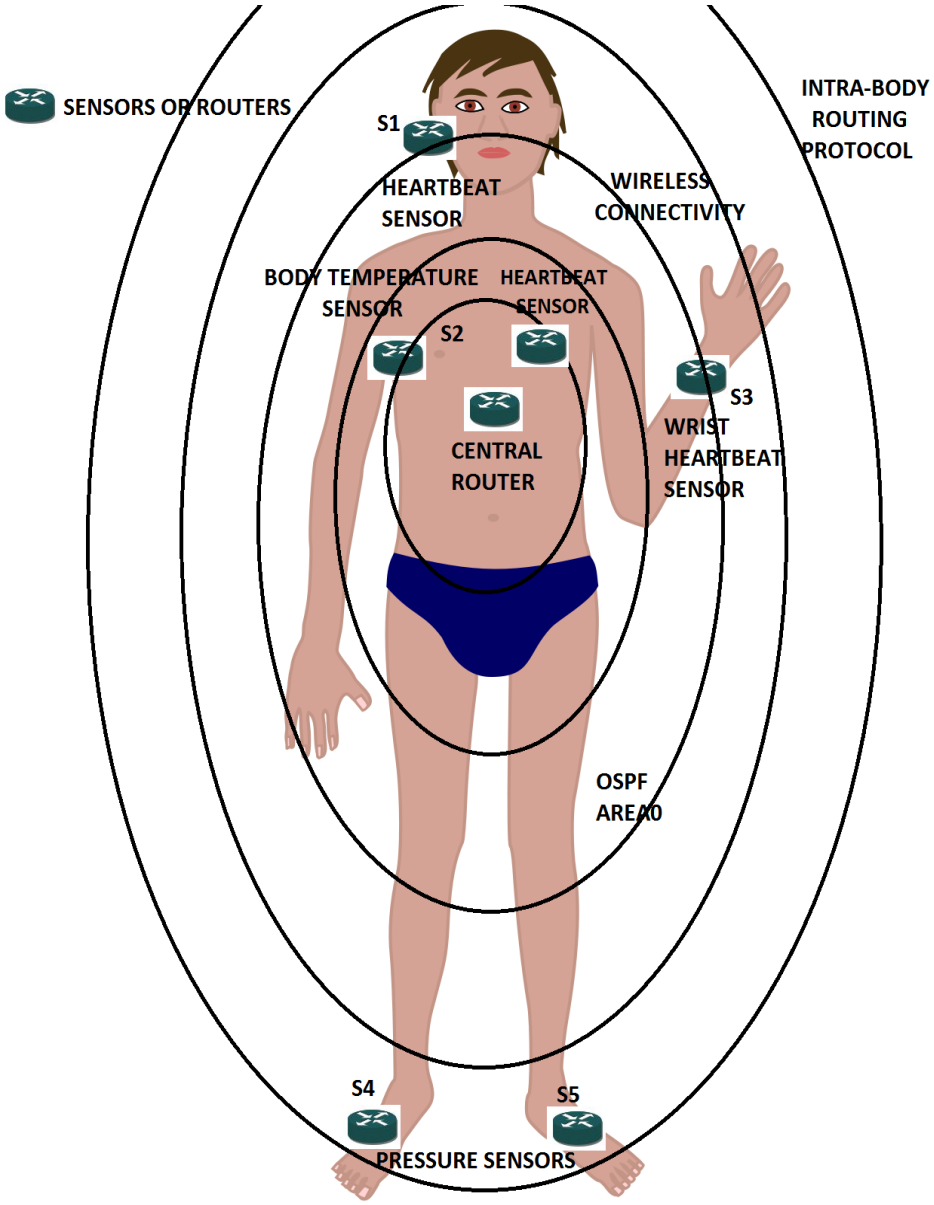

Figure 1 shows the Body Area Network to measure the above physiological parameter and other parameters like body temperature and foot pressure.

II. PHYSIOLOGICAL PARAMETERS

The heartbeat sensor is placed at strategic positions on the body like, near the chest or plugged onto the ear lobe. Figure 1 shows the Body Area Network to measure the above physiological parameter and other parameters like body temperature and foot pressure. The heartbeat sensor is responsible for measuring the number of times a heart beats in a minute and is called beats per minute (bpm). The monitoring of the heart rate can be carried out throughout the day, or even for weeks. A graphical representation of the heart rate and blood pressure is obtained. Figure 2 shows the plot of heartbeat in bpm against time.

- The second physiological parameter to be measured is the person's oxygen saturation. It is a non-invasive method of measuring the amount of oxygen carried by the red blood cells. This process is called pulse oximetry and the measuring device is pulse oximeter. A pulse oximeter comes with a small unit with a built in finger/toe clip. Beams of light from the devise pass through the blood of one's finger (earlobe or toe) to measure oxygen. Figure 3 shows both pulse oximeter and heartbeat sensor being placed as an intrabody network.
- Blood Sugar level is one of the physiological parameters of great importance. Diabetes Mellitus (DM), commonly referred to as diabetes belongs to a group of metabolic diseases in which there are high blood sugar levels

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for a prolonged period. Self-monitoring of blood glucose level is essential to optimise glycaemic control in DM. Figure 4 shows the result of blood glucose level being measured in mg/dl at different periods of time in a day.

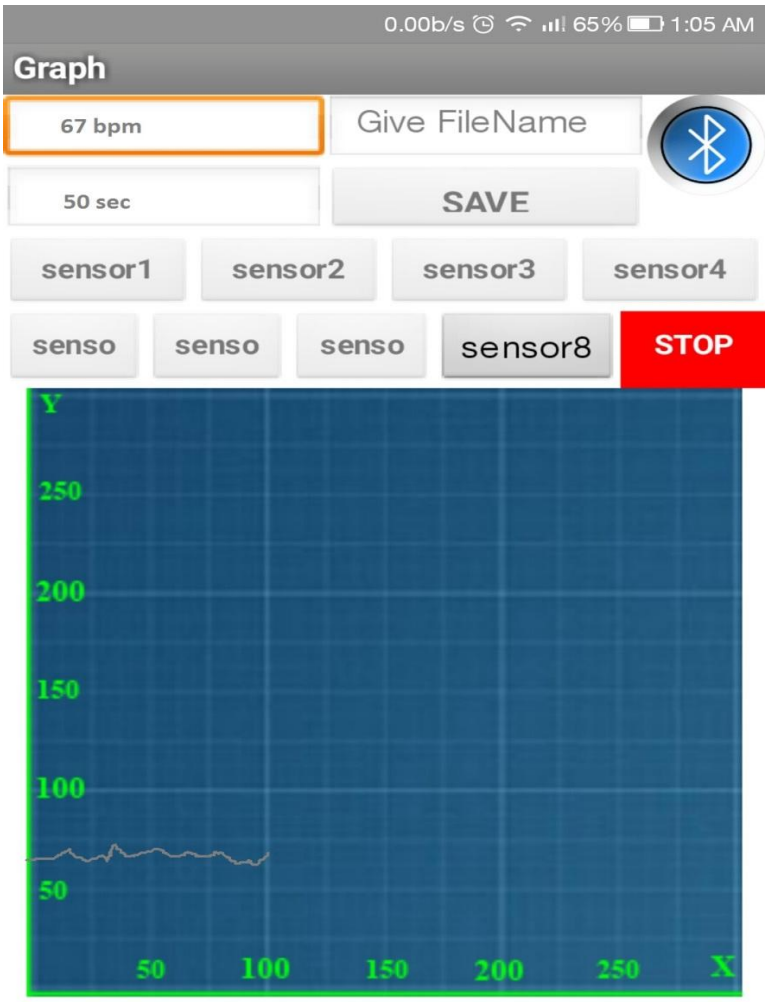

Figure 2 shows the plot of heartbeat in bpm against time

III. NETWORK AND METHODOLOGY

Figure 5 shows the intrabody network to measure the following parameters and their locations on the body [2].

- Heartbeat sensor- Plugged to the earlobe and placed near the chest to measure the heartbeat/ heart rate in bpm.
- Pulse oximeter- Clipped to the finger or toe to measure the saturation of oxygen in the red blood cells.
- Blood glucose monitoring- The glucometer is held by a wrist band and the blood sample is placed on the strip containing the chemical/ enzyme to measure the blood sugar level of the body.

IV. ANDROID APPLICATION

An android application is built to monitor physiological parameters of the subject and record the data in a database for historical analysis and diagnosis. The android application is installed into the smart phone which is the output and the storage device which is wirelessly connected to the sensors, detecting various physiological parameters. A single application for monitoring all the above-mentioned parameters saves time and power. The application has the following features.

- Easily installable onto the smartphone.
- The scale of the graph can be easily adjusted when measuring the parameters with different units.
- Is a Third party application and can be easily downloaded from a web-forum.
- Has facility to save the data to a database (SD Card).
- All sensors' data under one roof.

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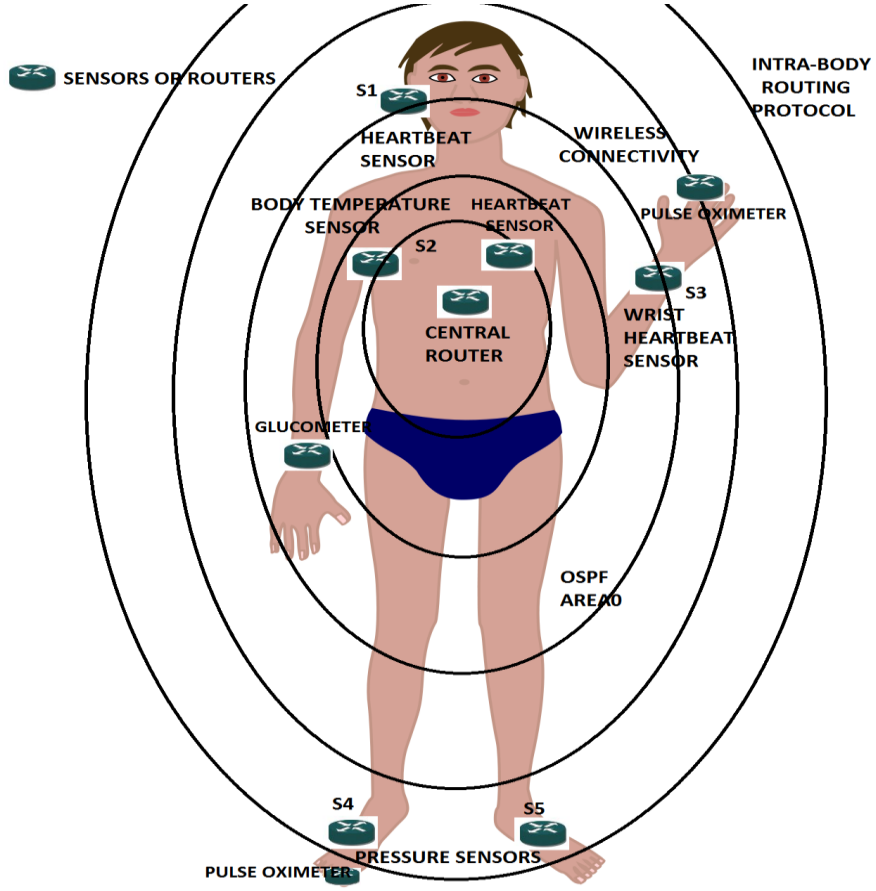

Figure 3 shows both pulse oximeter and heartbeat sensor being placed as an intrabody network.

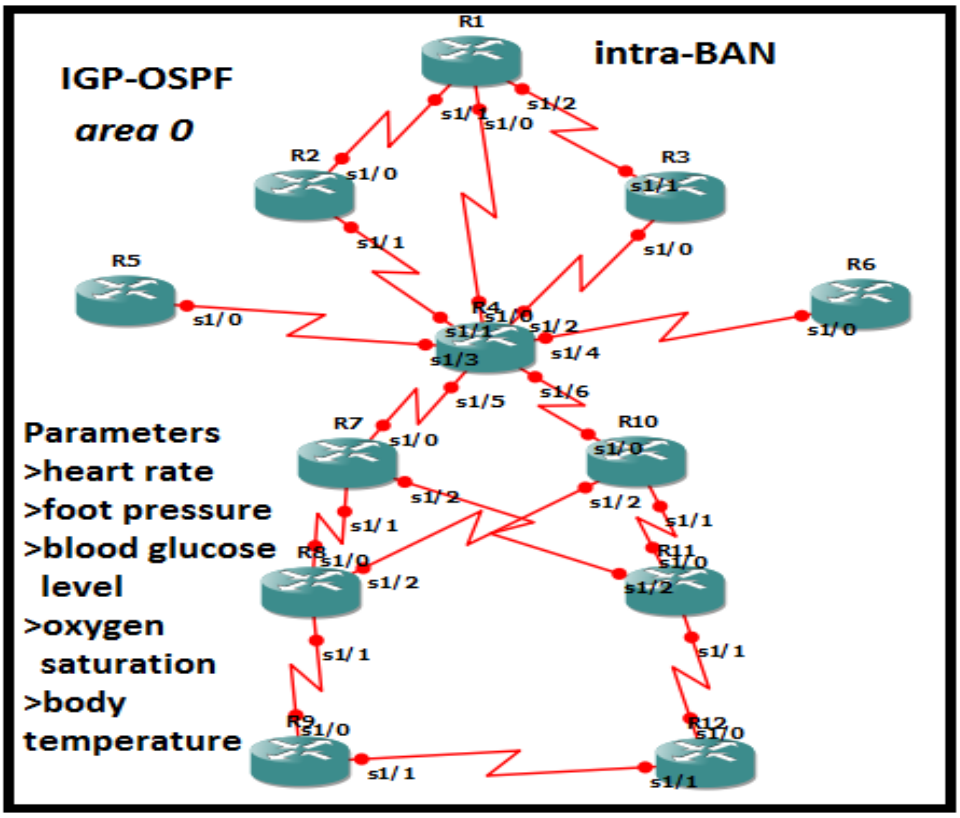

Figure 5 shows the intrabody network to measure the following parameters and their locations on the body.

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V. CONCLUSIONS

In this paper, we have attempted to interconnect biological sensors measuring different physiological parameters which are vital to understand a human body's behaviour under different circumstances. The output of these sensors is easily monitored using an android application. The parameters of interest are heart beat in bpm, blood glucose level in mg/dl, and saturation of blood oxygen in % vol. the results are plotted and recorded by the smartphone installed with third party android application.

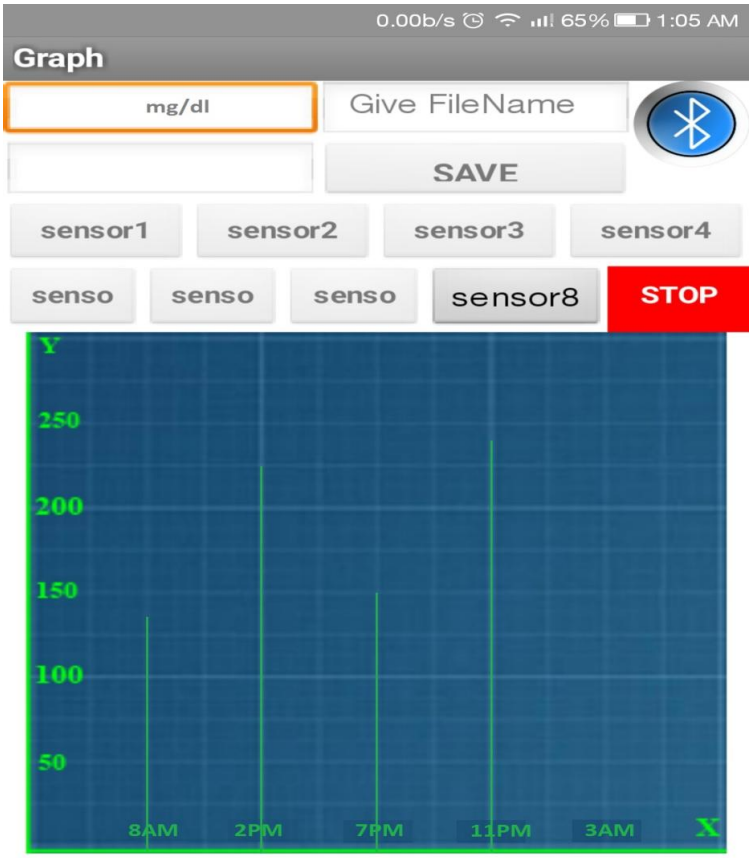

Figure 4 shows the result of blood glucose level being measured in mg/dl at different periods of time in a day.

REFERENCES

[1] Conceptual Study of Wireless BAN using Bluetooth/IEEE 802.11n- http://www.ijarcce.com/upload/2016/november-16/IJARCCE%2084.pdf
[2] Simulation of Wireless BAN using Network Simulation Tool- http://www.ijarcce.com/upload/2017/january-17/IJARCCE%2081.pdf
[3] Open Shortest Path First (OSPF) Routing Protocol and the Use of Virtual-Links-http://www.ijarcce.com/upload/2017/july17/IJARCCE%2033.pdf
[4] BAN: intra-BAN and inter-BAN- http://www.ijarcce.com/upload/2017/july-17/IJARCCE%2056.pdf
[5] BAN- Implementation- DOI10.17148/IJARCCE.2017.6817

BIOGRAPHY

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