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Architecture and Applications of Wireless Body Area Network

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Abstract: *Over the course of years a booming Internet is comprehended in the field of wireless communication for the evolution of a monitoring system to notice the human vital organs activities remotely. Wireless Body Area Network (WBAN) can be wearable or implantable in the human body. Due to its applications in the field of health, medical, entertainment services and many more, WBAN have received great attention. In this paper a concise survey consisting of the existing approaches of WBAN and its challenges has been discussed. Its abundance applications in the field of medical and non-medical sectors have been outlined. And finally this paper describes the future scope for further research in the field.*
Keywords: *Wireless Body Area Network, Auto medication, easily accessible, affordable.*

I. Introduction

Recently, the research community has directed its interest towards the development of substantial and adaptable networks, which is made up of small devices having the ability to collect information regarding the enclosed environment. This approach is commonly called "sensing" and the corresponding devices are called "sensors" [1]. As a result of the exceptional advances in the field of wireless communications, computer networking and hardware design, the recognition of sensors has become recently possible and cost efficient.

The recent technological improvement in integrated circuits, physiological sensing and wireless communications qualify for the production of miniature, light-weight, ultra-low power intelligent monitoring devices. Many of these devices can be integrated into a Wireless Body Area Network (WBAN), a new enabling technology for healthcare monitoring.

Due to the increasing poverty and the number of elder people existing in the world, the need for personal home health care is growing. To end this, wireless sensor technologies have validated new types of applications for monitoring and regulating people's physiological parameters.

The first generation of e-healthcare results were to some degree replacement of a wire with a wireless communication channel, i.e., another set of protocols on top of a new physical communication media. In the second generation, with a local system host, the devices communicated wirelessly, whichtransmit alarms. In the third generation the mobile body area network are wirelessly attached to healthcare sensors and actuators.

The Wireless Body Area Network (WBAN) varies from other Wireless Sensor Networks (WSN) with some eloquent points. The first difference between a WBAN and WSN is energy consumption. WBAN consumes less energy than other WSNs. The second difference is mobility. The user can move with sensor nodes with same mobility patterns in WBAN whereas WSNs are usually immobile. Based on geographical coverage, WBAN operates close to the human body (1m-2m). WPAN (Wireless Personal Area Network) surrounds the person (up to 10m). WLAN (Wireless Local Area Network) surrounds the person (up to 100m). WWAN (Wireless Wide Area Network) covers the largest geographical area. WBANs are subset of WSN or WSAN (Wireless Sensor and Actuator Network) [2]. Furthermore, WBAN sensor devices are found cheaper than WSNs.

II. Wban Architecture:

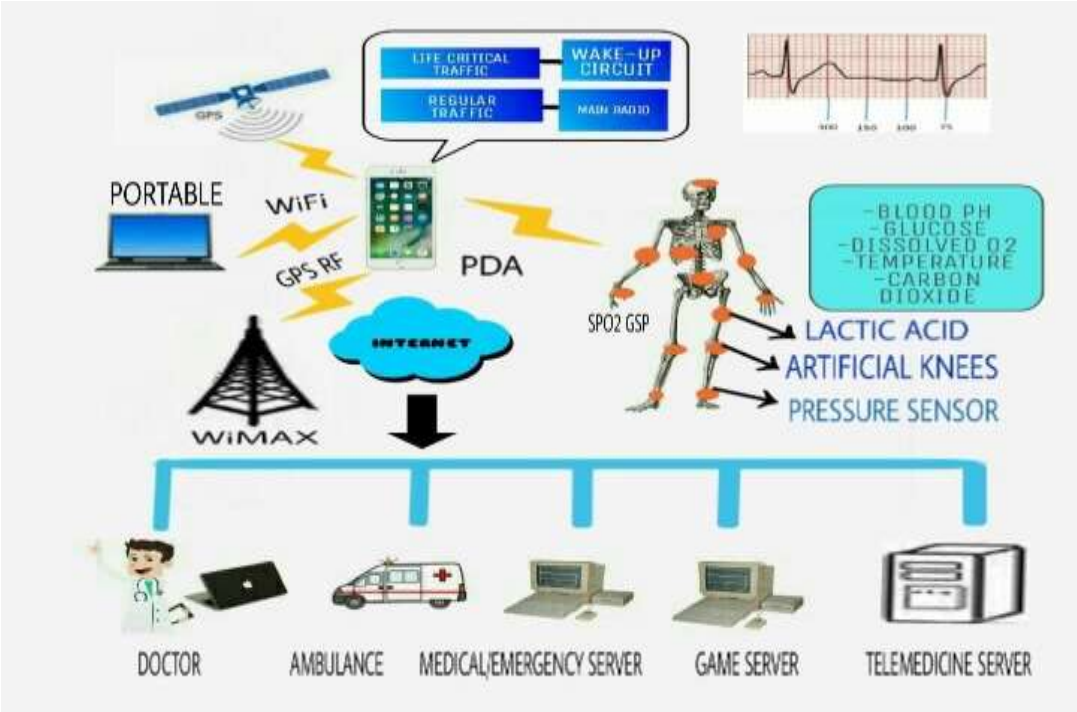

Figure 1: Architecture of WBAN

A structure for the wireless real-time monitoring of physiological data from a body can be systematically arranged in a wireless BAN as illustrated in the Figure 1. Tier 1 takes in or contains different sorts of wireless medical sensor nodes. The physiological signs from these little sensor nodes are been displayed by WBAN which have remote transmission capacity set either inside or around a man's body [3]. They are deployed to collect important wellbeing information of a person which occurs during medicinal or game or training activities. Every single sensor has the capability to inspect and recognize as well as to take action on at least one of the physiological signs. For example, Electrocardiogram sensor (ECG) have the ability to check on cardiovascular activity [4], the level of oxygen in our body can be measured by Oxygen saturation sensor (SpO2), and many others. Tier 2 takes in or contains the personal server(PS) application running on a client Laptop , Personal Computer, iPod or some other suitable gadgets which have the information collected of the remote devices and at a particular time the whole data is transferred to a appropriate PC when a compatible interface is accessible. Tier 3 incorporates several remote based-stations that have kept recorded all the personal/therapeutic/non-medical information and based on those reports recommendation are given.

Examples:

There are many examples available for the wireless technology that are already in existence and are been used. They can be wearable also. Some of the examples that can be provided are Smart shirt which, when worn by a person, regulates the body temperature, blood pressure, heart rate, the working of internal organs and gives you the correct information and recommendations that will be helpful for the person [5].

Another example would be bandages which when plastered to a person it stops the blood clotting, prevents the infection to spread and it even quickly heals the infected area. One more example can be of Electroencephalography (EEG), it records the electrical activity of the brain. The recording time would be of about 28-43 minutes [6]. It mainly focuses on the spectral neural oscillations signals that are observed. EEG measures the fluctuations voltage that occurs due to the ionic current flows surrounding the neuron of the brain. Due to this, many diseases of the brain, neuro problems, and diagnosis of epilepsy have been detected. And it also checks whether the patient is corresponding to the therapy or not. All these examples and many other wireless body area sensors help in the correct maintenance of the body. It helps the elderly people, weak people and the people who can't afford costly treatment. It not only detects the patients' health problem but also immediately informs the doctor. And when been informed to the doctor, the patient in response gets a reply. This works even in distant areas. The information can also be transformed through a personal server

such as wireless network like RF, WLAN, Bluetooth or Cellular network. The wireless server before time indicates the upcoming of a person's heart attack. Thus this helps the people in many ways.

III. Wban Applications:

The WBAN has introduced many modern, useful and effectual applications. They have been in use for a couple of years now and have given quite a positive response. For better understanding, they can be categorized into two types [Figure 3]. They are therapeutic and non-therapeutic applications. Let us first look on the therapeutic applications.

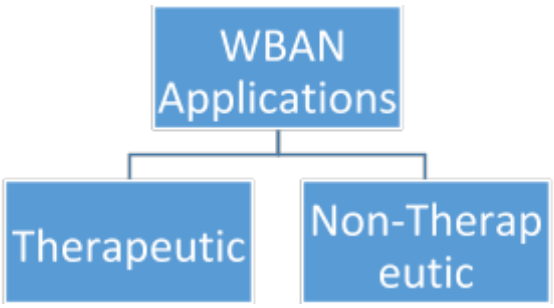

Figure 3: WBAN Applications

A) Therapeutic Application:

The therapeutic applications have helped the people in medical sector. It has improved the doctor-patient relationship. This has made easier for the patients to connect directly to their doctors at the time of emergencies [7]. The therapeutic applications can be divided into various sectors. They are distant health Monitoring, Assisted Support and Telemedicine. Distant health monitoring helps connecting the patients living in isolated areas to their doctors [8]. Through the help of sensors the body organ status can be indicated to the doctors. Assisted Support is another method of therapeutic application, which helps the patient get their treatment in their homes instead of staying in the hospital. Telemedicine is one of the enthralling application fields, which provides medical treatment over a distance through the help of communication technology.

B) Non-Therapeutic Application:

Fitness and Sports Monitoring, military, gaming and for entertainment purpose this non-therapeutic application is used.

IV. Challenges Of Wban:

Despite the fact that WBAN is helping in both therapeutic and non-therapeutic sections, still there are some challenges which are to be taken care of.

Privacy Issues: Privacy is one of the most important challenges of WBAN. The information of patient health is collected that's why WBAN must ensure the privacy of the individual information.

Sensor Authorization: sensor need to validate the data that are being collected. Thus, this will help in the detection of problems in hardware and software designs.

Security: Security is another one of the challenges in WBAN [9]. This is to ensure that one patient's information doesn't mix with other patient information. Attempts are being made to keep the WBAN more secure.

Interference: Interference should be less in the WBAN system of large scale implementation.

Management of Data: A large amount of data is originated in WBAN [10]. Accumulating and organizing this large amount of data is challenging and also important.

V. Conclusion And Future Scope:

WBAN is an arising technology in today's world. WBAN has the capability to provide good and cheap healthcare services and provides more convenience to patients and the society. WBAN improves the standard of life as it enables the person to live a normal life with normal activities rather than staying in a hospital

or near a medical electronic device. WBAN acknowledges the physical, chemical and biological changes in our body and then alarms the person about it. It focuses on prevention and early detection. Context-Sensitive Medicine, a Pre hospital Mobile Database for Emergency Medical Services and Patient Homecare are some of the future applications of WBAN. Thus in this paper we discussed on the architecture of WBAN, its examples, types of WBAN application and the challenges that are faced by WBAN.

Reference:

[1]. J.K.Madsen, H. Karstoft, F.O.Hansen, and T.S. Toftegaard, "ASE-BAN- a Wireless Body Area Network Testbed," Proceedings EMERGING 2010, Florence, Italy, 2010, pp.1-4.

[2]. A. Natarajan, et al., "Link Layer Behavior of Body Area Networks at 2.4 GHz," in the 15th Annual International Conference on Mobile Computing and Networking (MobiCom '09), Beijing, China, 2009, pp. 241-252.

[3]. Chen, M., Gonzalez, S., Vasilakos, A., Cao, H., & Leung, V. C. (2011). Body area networks: A survey. Mobile Networks and Applications, 16(2), 171-193.

[4]. K. Akkaya and M. Younis, "A survey on routing protocols for wireless sensor networks," Ad hoc networks, vol.3, no. 3, pp.325-349, 2005.

[5]. Wearable Sensors for Remote Healthcare Monitoring System Narendra Kumar, Alok Aggrawal and Nidhi Gupta C.M.J. University, Shillong JIIT, NOID A2

[6]. Troyk, P.; Schwan, M. Closed-loop class E transcutaneous power and data link for microimplants. IEEE Trans.Biomed. Eng. 1992, 39, 589-599.

[7]. D.Cypher, N. Chevrollier, N.Montavont, and N.Golmie,\Prevailing over wires in healthcare environments: Benefits and challenges,"IEEE Communications Magazine, vol.44, no.4,pp.56{63,Apr.2006}.

[8]. Patel, S., Park, H., Bonato, P., Chan, L. and Rodgers, M. (2012) A Review of Wearable Sensors and Systems with Application in Rehabilitation. Journal of NeuroEngineering and Rehabilitation, 9, 21.

[9]. Office for Civil Rights, United State Department of Health and Human Services. Medical Privacy. National Standards of Protect the Privacy of Personal-Health-Information. Available online: http:// www.hhs.gov/ocr/ privacy/hippa/administrative/ privacurule/index.html

[10]. P.Patel and J.Wang, "Applicatons, Challenges, and Prospective in Emerging Body Area Networking Technologies," IEEE Wireless Communications, February 2010, pp.80-88.