Human Activity Monitoring Using the Wearable Sensors in Health care

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***Abstract*: Increase in the world population along with a significant aging portion is forcing rapid rises in healthcare costs. The healthcare system is going through a revolution in which continuous monitoring of inhabitants is possible even without hospitalized. This paper gives a brief idea about the basic structure, standards, applications and some recent development technologies in smart sensors in divergent fields. Smart sensors are compared to the sensors can sense along with special purpose computing tools which are connected to the sensor networks. The advancement of sensing technologies, embedded systems, wireless communication technologies, embedded systems, wireless communication technologies, nano technologies, and miniaturization makes it possible to generate smart systems to monitor activities of human beings continuously.**

Index Terms: **Wearable sensors, smart sensors, sensor networks, wireless sensor networks, body sensor networks, body area networks, activity monitoring,**

1.INTRODUCTION

Health is one of the global challenges for human [1]. According to the constitutions of World Health Organization (WHO) the highest accomplished standard of health is a fundamental right for an individual [2]. Healthy persons lead to secure their lifetime income and hence to increase in gross domestic product and in tax revenues. Healthy persons also reduce force on the already over helmed hospitals, clinics, and medical professionals and reduce workload on the public secure networks, charities, and governmental or non-governmental organizations. To keep individuals healthy and effective and recently reachable present healthcare system is a precondition. A modernized healthcare system it provides better healthcare services to the people at any time and from anywhere in an economic and patient friendly manner. In the traditional approach the healthcare professionals play the important role. A normal person can performs daily activities at regular interval of time. This implies that a person is mentally and physically fit and leading a regular life. If there is decline or change in the regular activity the wellness of the person is not in is normal state. Elder people aspiration to lead an self supporting lifestyle but old age people become prostrate to different accidents. So living alone is high risk and it is recurrent.

To develop the system to monitor the activities of an elder person is living alone so that help can be provided before any unforeseen situation happened. Elder people desire to lead an independent lifestyle, but at old age, people become prostrate to different accidents, so living alone has high risks and is recurrent. In the present technology, an intelligent home monitoring system based on ZIGBEE wireless sensors network [1,2] has been designed and developed to monitor and evaluate the healthy of the elder living alone in a home environment. The LabVIEW program assists monitoring and its displaying the data. The patient's temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data can be detected by our present system. Our careful design of the hardware and software element of the system is able to fulfil any future requirement of the users.

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II. STRUCTURE OF SMART SENSOR

The basic architecture components of smart sensor node is shown in the Figure 1. Different parameters are sensed by sensing unit and digital signals are produced by signal conditioning circuitry from electrical signals. Analog to digital transformation is performed and this input is given to processing units or application programs. The task procedure is done by memory unit and communicate with base station or sensors or sinks in WSN is done by transceivers.

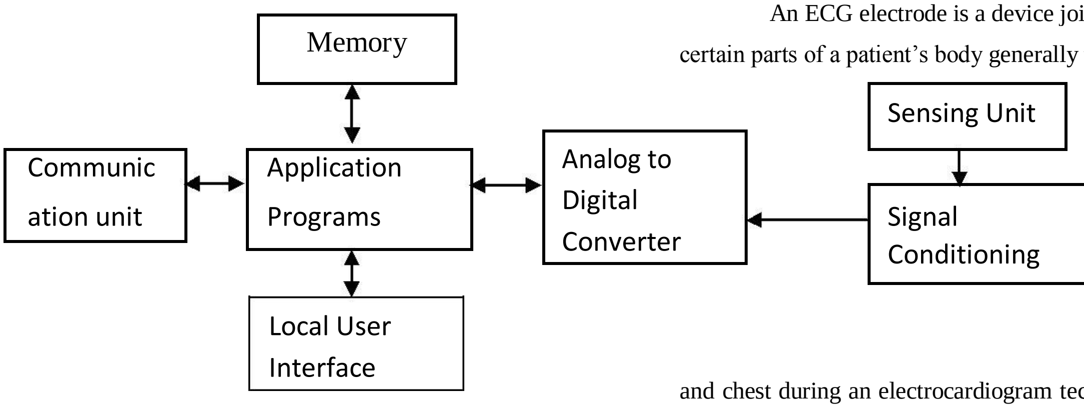

Fig. 1 Basic Architectural Components of smart Sensor Node

Five main parts of sensor node are:

- **The central unit:** Its in the form of microprocessor it manages all the tasks.
- **Battery:** It gives source of energy.
- **A Transceiver:** Communicate with the environment and collects data.
- **Memory:** It is used for storage media for processing data or storing data.
- **Communication module:** It includes transceivers and forwards queries and data to and from central module. Energy orderly in all parts of sensor network is very crucial for long network lifetime. Nodes in the sensor network cooperates and spreads the data procedure task and sends the processed information to sinks. For reducing the fixed cost of power supply of each and every node, Radio Frequency Identification (RFID) chips with no batteries are developed. Sensors are used to detect different parameters related to lighting conditions, noise levels, humidity, vehicle move, soil makeup, mechanical pressure levels, presence or absence of certain type of objects and other properties.

III SYSTEM COMPONENTS

In addition to the Health Sensor Platform we used the following components to implement this system: (a) ECG Electrodes, (b) temperature sensor (LM35), (c) blood pressure sensor, (d) blood glucose sensor.

A. ECG Electrodes

An ECG electrode is a device joined to the skin on certain parts of a patient's body generally the arms, legs, and chest during an electrocardiogram technique. It detects electrical impulses produced each time the heart beats. The number and arrangement of electrodes on the body can vary, but the function remains the same. The electricity that an electrode discovers is transmitted via this wire to a machine, which translates the electricity into wavy lines collected on a piece of paper. The ECG records, in a special detail, are used to diagnose a very broad range of heart conditions. An ECG electrode is usually calm of a small metal plate surrounded by an adhesive pad, which is coated with a conducting gel that communicate the electrical signal.

B. The LM35 Temperature Sensor

The LM35 series are precision integrated circuit LM35 temperature sensors, whose output voltage is linearly proportional to the temperature in Celsius (Centigrade). The LM35 sensor thus has an advantage over linear temperature sensors, calibrated in °Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. The LM35 sensor does not require any external calibration or trimming to

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provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

C. Blood Pressure Sensor

Blood pressure sensor is a tool that measures the pressure of the blood in the arteries as it is pumped around the body by the heart. When our heart beats, it decrease and pushes blood through the arteries to the rest of our body. This force creates coercion on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats). Some special features of blood pressure sensor includes (i) electrical measurement of systolic, diastolic and pulse, (ii) large LCD screen with LED backlight, and (ii) touch pad key. In incorporation a typical blood pressure sensor can store 80 quantification data with time and date.

D. Blood Glucose Sensor

Blood glucose sensor is a medical instrument for determining the approximate absorption of glucose in the blood. A small drop of blood, obtained by pierce the skin with a lancet, is placed on a expendable test strip that the meter reads and uses to compute the blood glucose level. The meter then displays the level in mg/dl or mmol/l.

IV. DISCUSSIONS AND FUTURE DEVELOPMENTS

In this paper, we have presented the experimentation, of applied nature, done to monitor physiological parameters such as skin temperature, heart rate, and body affect. A prototype was successfully developed and tested to establish the proof of concept. The algorithms were checked and found to be accurate and reliable at this developed/development stage. The tale aspect of the design is its low cost and testing of medical distress which does not necessitate pressing any panic button. This is an huge improvement over existing commercial products. A panic button has also been provided in the developed system which can be used under an difficulty condition. An important aspect of the design was miniaturization, so that the system was as nonintrusive as possible to the wearer. This was performed by the use of surface-mounted devices on the PCBs designed. Low-power working amplifiers were used to reduce battery consumption. The major cost comes from the use of ZigBee modules in the current design. With some qualification, the system can be made available commercially. Future improvements will focus on the use of pliable PCBs to replace the stiff cards, so that it could be moulded around the wrist unit, making it more pleasant for the wearer. The design of the IR sensors could be improved to decrease its susceptibility to noise, to a point where it could be progress onto the wrist unit. This would provide a much more comfortable and less intrusive unit, getting rid of the need of a finger glove. The addition of a blood-oxygen sensor would allow the system to more exactly detect medical distress by measuring the amount of oxygen in the blood (HbO). This could be accomplished by the addition of another diode operating at a different wavelength which is more readily absorbed by oxygen, and calculate the difference of absorption between the two wavelengths. The unit was initially designed for use by the elder, within the house, where a caregiver is present but is not able to be constantly in visual contact with the patient. The receiver unit would preferably enhanced so that it can connect to either the local or cellular phone network, and in the case of an accident would contact an ambulance. Beyond the application for elder patients is the use by anyone who is at-risk, with a intellectual or physical disability. Monitoring of athletes whilst exercising would be possible if the sensitivity to movement was decreased.

V. RECENT DEVELOPMENTS IN WIRELESS SMART SENSOR NODES

A. *Smart lighting sensor solution for smart cities*

These smart lighting sensors calculate ambient light (luminosity) with a new set of directed sensor probes. These Smart Lighting devices are also efficient of monitoring conditions inside tunnels or building or outside

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in the streets and also has temperature and humidity sensors.

B. *E-Health Sensor Shield*

The e-Health Sensor Shield users to perform biometric and medical applications where body monitoring is needed by using nine different types of sensors: pulse, oxygen in blood (SPO2), airflow (breathing), body temperature, electrocardiogram (ECG), glucometer, galvanic skin response (GSR- sweating), blood pressure (sphygmomanometer) and patient position (accelerometer).

C. *Encryption Libraries – AES/RSA Cryptography for Sensor Network*

Encryption Libraries sensor policy in order to ensure the authentication, confidentiality (privacy) and integrity of the information collected by the sensors. For that different cryptography algorithms including AES 256 and RSA 1024have been implemented in the libraries.

D . *3G connectivity to ZigBee, Wi-Fi, and Bluetooth sensors*

The new multiprotocol router for wireless sensor networks model to connect Wi-Fi, Bluetooth and ZigBee sensors to the Internet through 3G connectivity. These allows to send the information collected by hundreds of sensor nodes at the same time, bandwidth of 5.5 Mb/s more than 10 times faster than contrast with traditional GPRS gateways.

VI. CONCLUSION

A smart phone based health monitoring system has been granted in this work. By using the system the healthcare professionals can detect, diagnose, and advice their patients all the time. The physiological data are stored and published online. Hence, the healthcare professional can monitor their patients from a remote location at any time. Our system is simple. It is just few wires connected to a small kit with a smart phone. The system is very power efficient. Only the smart phone or the tablet needs to be charged enough to do the test. It is easy to use, fast, accurate, high efficiency, and safe (without any danger of electric shocks). In polarity to other conventional medical equipment the system has the capacity to save data for future reference. Finally, the reliability and validity of our system have been ensured via field tests.

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