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A Conceptual View to Empower Medical Gadgets by Harvesting Energy Using TEG

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ABSTRACT
A 16-bit MSP430 controller version with an android app is uniquely intended for an incessant E-diagnosis system for remote patients, from their home to corresponding doctors and caretakers. Existing framework running on GSM and wired link to exchange data between patients and doctor have its own particular confinement, for instance, consistent upkeep, transportation, and dedicated caretaker, which is costing more to the family members of the patient. It will be implemented by building up a framework which gets power from TEG module attached to patient and stores that same into battery banks with low bandwidth, which must play all the procedure without human interference and must carry out the work which current system is doing. Put away power will be utilized by the controller to screen heart rate, temperature, and blood pressure and transmit SoS information utilizing Wi-Fi with CoAp architecture uncommonly intended for low bandwidth link. Essential block comprises of control unit, sensory, communication, power generation and conversion for adaptable and unending operation

Keywords: Constrained Application Protocol; Internet of Things, Mixed Signal Processor, General Purpose Input Output, Liquid Crystal Display.

1. INTRODUCTION

Health is very important to all human beings of all the ages and it is one of the most valuable and significant because health is called as wealth. Diseases and other health issues are causing due to the breathing of toxic air, drinking contaminated water, adulterated food and for some other reasons. This is because of quickly developing population. To overcome this, its need a better approach for assisting patient's or need once approach for this system. This is done by assisting or appointing a caretaker to look after their approach; this will cost more and must be appointed by a trained person, thus there is a requirement to develop the system to empower all the process with vital signs, monitoring system is done by using specific protocol called CoAP, to send and receive status by using limited bandwidth for long range communication.

CoAP process on publishing and subscribe technique, it is to sense vital signs and send warning messages using IOT.

Our paper is aimed at developing an architecture based on smart devices and smartphones using android app to monitor the health of the patients in various scenarios. Patients are monitored using a portable and mobile device which accumulates and process data. Hence the total number of parameters to be monitored has to be designed keeping in mind the cost, complexity, and reliability of the system.

Proposed e-health monitoring is highly suitable for the following scenarios. Firstly patients suffering from hypotension for e.g. a patient suffering from low blood pressure can cause unsteadiness, dizziness, fainting, palpitations, and blurred vision and sometimes it leads to death. Second situation for those patients suffering from hypertension for e,g. patients suffering from high blood pressure cause blockage of arteries sometimes it leads to heart attack, brain damage and it also damages the kidney. Thirdly to monitor the pulse rate, there are two types of conditions; one is pulse rate more than 100bpm this causes anemia, heart diseases etc and pulse rate less than 60bpm which leads to hyperthyroidism, heart block and nervous system impairment. The fourth type of patients requiring monitoring is temperature; high temperature (44 c or more) almost leads to brain damage, cardiorespiratory collapse and almost it leads to death. Low temperature causes shallow breathing and possibility of serious heart rhythm problems and may also appear to die. In our architecture for the system, smart device plays major role in processing as well as relaying of data acting as a gateway, hence it reduces the costs in the process, we have developed this architecture keeping in mind the prospect of this being used in rural parts of India, where health care units and hospitals are not as well equipped.

2. RELATED WORK

In this paper proposed system is to monitor the patients continuously from remote areas using wearable sensors. This system consists of many sensors temperature, pressure, heartbeat, and accelerometer. Data are collected and analyzed using a microcontroller. Based on the predefined values it compares and displays the information about the patients with a stage in LCD using embedded c coding. If it exceeds that condition immediately send the information to the ambulance or doctor's mobile phone or relatives via SMS using GSM modem [1].

In this paper technology of electronic patch is described in detail with emphasis on the encapsulation of the sensor and electronics embedded in the adhesive material. The paper includes a description of firmware, data acquisition and a preliminary clinical evaluation against a standard pulse oximeter [2].

This paper is aimed at developing an architecture based on smart devices and wireless sensor networks to monitor the health of patients in various scenarios. Patients are monitored using a portable and mobile device which accumulates and process data from an array of wearable sensors. Data is furthermore correlated to data from sensors embedded in the surrounding environment [3].

In this paper a smartphone based wireless healthcare monitoring system which can provide real-time online information about the medical status of a patient. In addition alarming and reminding messages about the patient health status can also be sent to patient mentors for necessary medical diagnosis and advising [4].

This paper summarizes the state of the art of wearable medical systems for health. Three critical issues in the development of wearable medical systems are thoroughly discussed i.e., the need for minimizing motion artifacts, need for developing ways to achieve energy harvesting and urgency to establish standard protocols for the evaluation of newly developed wearable medical systems [5].

This paper demonstrates the use of wearable wireless body area networks as a key infrastructure enabling unobtrusive, continuous, ambulatory health monitoring. This new technology has potential to offer a wide range of benefits to patients, medical personnel and society through continuous monitoring in the ambulatory, setting, early detection of abnormal conditions, supervised rehabilitation and potential knowledge discovery through data mining of all gathered information [6].

This paper describes in-home patient monitoring with body sensor network is an effective solution for patient monitoring. It reduces the healthcare cost and waiting for a long time in hospitals. Multiple patients can be monitored at a time. Body sensors continuously collect the body parameters of the patient and they immediately forwarded that to the hospital. It reduces the chance of false treatment and improves the quality of treatment [7].

The paper describes the health care monitoring system using web server and android app, and health scheme will be focus on the measurement and monitoring the real-time health parameters of ill patients such as blood pressure, heartbeat rate, pulse rate, body temperature and many other parameters, using the android app, doctor can continuously monitor the patient's condition on smartphone and also complete data of the patients will be stored on the web server. In many cases the patients are discharged from the hospital but in some period they are in observation. In this case, the system very uses full.

Based on the android, the emergency alarm and healthcare system implanted through GSM and GPS network, using this technology, track the patients when they are in need of assistance and raise a warring messages are sent to doctor they can immediately take action to assist [8].

This paper is implementing by checking the health via mobile. These systems offer a benefit to the people especially for those who have in a critical situation and need daily observation.

In this system wearable sensor device, this used to capture the patient's data. The sensor will be placed on the human body for example finger, hand and cuff. These sensors monitor the various vital sign in the body. Sensors are interfaced to Uno [9].

This paper deals with the design and development of GSM enable the embedded system to monitor the parameters like body temperature and blood pressure. GSM used for communicating between the people and authorized person for providing facility when needed.

In an abnormal situation, if any parameter crosses the threshold values will be immediately sensed and an alert message will be given to get help from the nearby people. If no such help is available, the system uses the GSM, which sends the SMS to the doctor or caretakers mobile phone. It is a bidirectional communication system, and known the patient's status in present situation condition of the patient's, at any time [10].

In this paper remote the IOT healthcare monitoring system, the system helps to monitor the patient's vital sign via a web browser. This paper also describes the step for connecting the 6LOWPAN network with internet and outside the world. The main work of the project is to be the implementation of CoAP protocol in Mozilla Firefox web server, and control from calming assets by CoAP methods.

To avoid the well-known issues related to constrained environment, to use the CoAP protocol for IOT application CoAP is dependable and effective application protocol, intended for use in WSNS. Wireless sensor network with an internet of things (IOT) by utilizing the CoAP protocol to provide a web service based on WBAN prototype [13].

WBAN is a RF-based wireless networking technology and it has a wearable WBAN and implantable WBAN, it consists of two nodes like in-body and on-body [11].

In this paper design a health care and alarming system for the health status of the patient. The proposed system has an embedded microcontroller connected to a set of sensor and communication module (Bluetooth) [12]. The microcontroller checks the patient health status is well or not by the medical signal. If the result is abnormal, the embedded unit uses the patient or caretaker phone to transmit this signal to the respect to the medical center or hospital. In this case, the doctor will send medical advice to the patient to save their life.

Recently wireless network has been adopted for real-time monitoring and alarming in a healthcare application. And in critical situations use the wireless communication technology is the best way, those related to life. Utilize the wireless technology in the healthcare system will achieve many goals such as accuracy, diagnosis time and many other [10]. Using this technology the doctor will monitor the patients constrained and without any need, the patient's physically present.

3. PROBLEM IDENTIFICATION

Literature review overall concludes the efficiency and effectiveness of the current proposed system. Previous frameworks consist of different technologies such as GSM, Bluetooth and 6lowpan used to empower medical gadgets by harvesting energy. Disadvantages of these systems are a one-time connection, one-time response of the global system for mobile communication. Short range hopping based system for Bluetooth which is inefficient and frequency ranges cannot detect easily, whereas in 6lowpan technology web server based need browser which is a late process and also Wi-Fi protocol needs specific routing protocol for secure operation.

4. METHODOLOGY

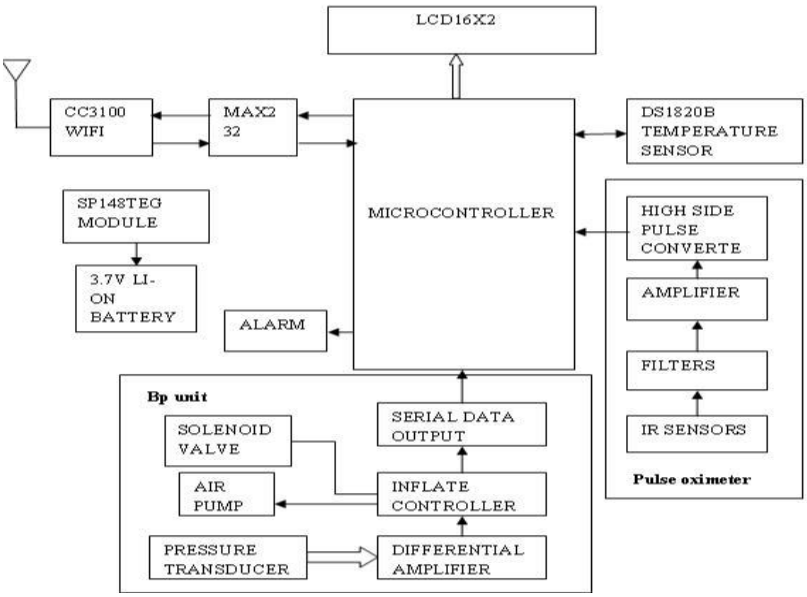

Fig- 1: Architecture of the system

CC3100 node MCU is loaded with CoAP architecture to communicate with desired broker address using static IP with a gateway port, which will be forwarded by AWS to the host. There Wi-Fi communicates at 100Kbps speed using 2.4GHz, wireless link user can access status information of the sensor by using specific android app install on the smartphone.

LCD is used to provide visible information like heart rate, BP, the temperature in degree centigrade etc; pulse oximetry is a non-invasive type measurement for photoplethysmography which measures arterial blood flow called as oxygenated blood in fingertip by transmitting invisible infrared light and getting reflecting from photosensor by the blood cells.

The ds18b20 digital sensor is used to measure temperature variation of the patient, this sensor is an RTD-type which gives the output as according to variation in temperature resistance.

The output voltage of the sensor will vary from 0.1 to 5v of the sensor will be connected to GPIO channel of the microcontroller for conversion HEX value into temperature.

Blood pressure systolic and diastolic pressure of blood by using auto in late, BP unit which consist of cuff, air pump, solenoid pressure value and 50Kpa pressure sensor, when system is activated it starts pumping air into cuff through air pump, which must not be more than 161mmg, when systolic pulse is obtained at 121mmg pump w ll be stopped after that air will be deflected, when pulse disappears, it is called diastolic after that the total air will be removed.

CC3100 low-power high-speed 802.11b/g/n 256 bytes SSL encrypted wireless fidelity is used to send & receive messages through local connection forwarded by ISP provider to AWS service. A library called PUBSUB is used to mount up CoAP stack on to this WIFI. Once this is successfully done, this device will configure the process for the remote access using dedicated IP with a reserved gateway for remote connection CoAP is chosen because it can send & receive data with a minimal bandwidth of 2KB.

Piezoelectric buzzer of 3 kHz is used to generate an alarm as audible information when sensor level crosses the threshold.

The overall system needs a power source to continuously monitor to do this process, a battery pack of 1.5AH 8v is used which will be charged using TEG.

5. RESULT ANALYSIS

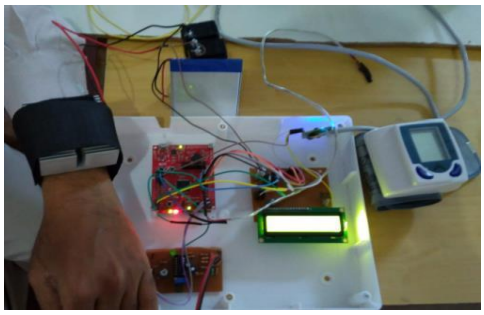

Fig- 2: Overall prototype of the system

Various processes involved to perform the scan of the sensor and to avoid any communication drop using CoAP enabled gadget developed for the conceptual view to empower medical gadgets by harvesting energy using TEG. Where patient and hospitals authorized persons can access the necessary data providing the information and parameters of one's health.

To do the corresponding task, an intelligence is been created to send and receive corresponding messages with the cloud service provided by Amazon to an android APP specifically developed for doctors and caretakers, which is done automatically by doing layered architecture called subscribing and publishing. In this module energy is harvested using thermo electric generator with a power bank with integrated BP, temperature and pulse is done.

Battery source is very important to the entire gadget and specific pack must be selected depending upon the application type. Here various batteries and its charge cycle with corresponding to TEG is as shown in table 1. Zinc polymer battery is used as power bank

Table 1: Different types of batteries with charging cycle on temperature difference

Types of battery	Temperature	Time for charging	Remarks
Li –ion	20◦c 25◦c 34◦c 40◦c	6 to 7 hrs 5 to 6hrs 2 to 4hrs 1 to 3hrs	More toxicant and leeks lithium ion content into air, Not suitable for medical gadgets
LiPo	20◦c 25◦c 34◦c 40◦c	4 to 5hrs 3.5 to 4.5hrs 2 to 3hrs 1 to 2hrs	These cells are highly sensitive to temperature raptures etc, cause instant fire.
SLA	20◦c 25◦c 34◦c 40◦c	17 to 18hrs 14 to 16hrs 10 to 13hrs 6 to 8hrs	Large in size, emit poisonous gases during electrolytic process and may leek sulphuric acid when bend
Zinc polymer	20◦c 25◦c 34◦c 40◦c	4 to 5hrs 2 to 3.75hrs 1.5 to 2.75hrs 1.5 to 2.75hrs	This can made as thin as possible and it can also be design as tiny as few hundred microns, safety for medical gadgets that sit on even in the body.

Medical equipments are the most critical and complex electronics due to its sensitive and compactness and how accurate is our device is as shown in the table shown in 5.2. Clinical trials are most important for all the

medical equipment some must be done under control environment and some can be done in normal condition. Trial provides the data of 5 people of different ages and there parameter under normal condition.

Table 2: Parameters measured for peoples

Persons	Temperature (C)	Pulse (bpm)	BP systolic/diastolic
1	36.9	79	115/78
2	37.3	88	130/84
3	38	74	110/73
4	37.7	78	130/90
5	36.4	90	110/70

6. CONCLUSION

Critical conditioned patients need to be monitored round the clock. If minor variations occur it may lead to severe disaster from which multiple organs may fail or even death. To do this process, a qualified care taker must be present which is costing more to the members of that family. In case of emergency patient must be shifted within the time to the trauma care unit. The available devices in the market are needs to be charged, which is the major limitation of the system. For this reason a device is designed so that it can charge its battery by using the temperature of the human body. This throughput power is used to energize sensors communication equipments controllers etc. as it is a medical gadgets security in the communication is one of the major issu es. To overcome this problem CoAP based architecture using low bandwidth with level 3 QOS is used and a specific IP address with a gateway for cloud service is used for real time data transmission. Android based specific application is developed to view parameters of the sensors as a personal view.

7. REFERENCES

[1]] S.Gayathri1, N.Rajkumar2, V. Vinothkumar, "HUMAN HEALTH MONITORING SYSTEM USING WEARABLE SENSORS", International Research Journal of Engineering and Technology (IRJET), e -ISSN: 2395 -0056 Volume: 02 Issue: 08 | Nov-2015 www.irjet.net p-ISSN: 2395-0072 © 2015, IRJET ISO 9001:2008 Certified Journal Page 122

[2] Haahr, Rasmus Grønbek; Duun, Sune Bro; Toft, Mette H.; Belhage, Bo; Larsen, Jan; Birkelund, Karen;Thomsen, Erik Vilain "An Electronic Patch for Wearable Health Monitoring by Reflectance Pulse Oximetry",I E E E Transactions on Biomedical Circuits and Systems, 10.1109/TBCAS.2011.2164247, 2012

[3] Srijani Mukherjee, Koustabh Dolui, Soumya Kanti Datta " Patient HealthManagement System using e-Health"

[4] Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, and Mohammed Tarique, "REAL TIME WIRELESS HEALTH MONITORINGAPPLICATION USING MOBILE DEVICES", International Journal of Computer Networks & Communications (IJCNC) Vol.7, No.3, May 2015DOI: 10.5121/ijcnc.2015.7302 13

[5] Xiao-Fei Teng, Yuan-Ting Zhang, Carmen C. Y. Poon, andPaolo Bonato, "Wearable Medical Systems for p-Health"

[6] Aleksandar Milenković, Chris Otto, Emil Jovanov, " Wireless Sensor Networks for Personal Health Monitoring: Issues and an Implementation",

[7] R.Suji Pramila, Shajin Nargunam, PhD, ".A Survey on Effective in-Home Health Monitoring System", *International Journal of Computer Applications (0975 – 8887) Volume 68– No.7, April 2013*

[8] Eriola J. Shanko, Michalis G. Papoutsidakis, "Real Time Health Monitoring and Wireless Transmission: A µController Application to Improve Human Medical Needs", IEEE, January 2013, vol. 978, No. 1, ppl.4799-2373.

[9] NurHidayahBinti Abu Bakar, Khaizuran Abdullah and MdRafiqul Islam, "Wireless Smart Health Monitoring System Via Mobile Phone" IEEE, August 2016, vol. 978, no. 1, ppl.5090-2427.

[10] Sudhindra .F, Annarao. S. J, Vani. R. M and P.V. Hunagund, "A GSM Enabled Embedded System for Blood Pressure & Body Temperature Monitoring" IJAREEIE, January 2014, vol. 3, Issue 1.
[11] Sana Ullah, Pervez Khan, Nimamat Ullah Sahnaz Saleem, Henry Higgins, and kyung sap Kwak, "Review of wireless Body area Network for Medical applications", arXiv: 1001.0831v3 [cs.N1], pp. 1- 3, 3 August 2010.(references).
[12] Muhammad Moid Sahndhu1, Nadeem Javaid1, Muhammad Imran, Mohsen Guizani, Zahoor Ali Khan, Umar Qasim, "BEC:A Novel Routing Protocol for balanced energy consumption in Wireless body area network".
[13] Dejana Ugrenovic, Gordana Gardasevic, " CoAP protocol for web based monitoring in IOT healthcare applications", IEEE, May 2015, vol. 978, No. 1, ppl. 5090-0055.
[14] Kasim M. Al-Aubidy, Ahmad M. Derbas. & Abdullah W. Al-Mutairi, "Real-Time Patient Health Monitoring and Alarming Using Wireless-Sensor-Network", IEEE, June 2016, vol. 978, No. 1, ppl. 5090-1291.