International Journal of Advance Research, IJOAR .org
Volume 3, Issue 6, June 2015, Online: ISSN 2320-9119

REMOTE MONITORING OF CHF PATIENTS HEALTH USING WEARABLE SENSORS

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Abstract-

The paper proposes the preventive health care for patients in hospitals. Here the sensors are directly fixed in the human body and these sensors are connected with a high processing microcontroller. Failure of any desired temperature, blood pressure, heart rate or any sudden ill condition or if the patient is suffering with fits will be immediately indicated to the care taker who is near to the patient through the buzzer and the parameter which is affected will be displayed in LCD. The care section block diagram in our proposed system will be designed as a handheld device and will be given to the doctors in hospitals. That is, during an emergency period, a message of a particular emergency patient's condition will be displayed in LCD and a voice output also given to the doctor's handheld device through the zig-bee module from the transmitter to the receiver section. In addition, a text message about the patient's condition is also send to the doctor's mobile through GSM module.

Keywords-

Sensor, microcontroller,GSM,zig-bee,heart rate

I. INTRODUCTION

Chronic heart failure (CHF) represents one of the most relevant chronic disease in all industrialized countries, affecting approximately 15 million people in Europe and more than 5 million in the U.S., with a prevalence ranging from 1% to 2% and an incidence of 3.6 million new cases each year in Europe and 550000 cases in U.S. Admission to hospital with heart failure has more than doubled in the last 20 years, and it is expected that CHF patients will double in 2030.Recently, the use of wireless body area sensor networks (WBASNs), a growing research area, has increased in medical healthcare applications. WBASNs provide healthcare monitoring, especially for the elderly, infants, and chronically ill people. Generally, a WBASN consists of several wireless sensor and actuator nodes placed on near, or in a human body. The WBASN nodes sense and process vital signs (blood pressure, blood flow, body temperature, pulse oximetry, electrocardiography, etc.) acquired from the human body. Main objective is to avoid the delay in reaching patients during an emergency and also to provide timely and immediate care. Patients' signs, symptoms and raised alarms can be received by healthcare providers, and aggravations can be quickly detected and acted upon. It mainly aims in providing several benefits, such as identifying emergency conditions for patients, producing alerts, and allowing alerts to be accessed using mobile devices. In addition, employing WBASN-based systems decreases the workload, enhances the efficiency of medical personnel, and improves the comfort of patients.

II.EXISTING SYSTEM

The existing system has no voice message. As well as no particular sensor to give the heart rate of a patient accurately. Also there is no particular sensor to monitor patients during fits. Patient medical record can be send only to a pc. An ultra low power microcontroller is used in an existing system. This low power microcontroller can be used only for limited applications with slow processing speed and also with maximum delay between two processes. A separate ADC is needed in this type of microcontroller. The main disadvantages of existing system are doctors may not be available all the time and so there will be a delay in taking timely actions in case of emergency. Here the home gateway may be pc or laptop normally connected to the power line, but the internal battery ensures about 5h of autonomy in case of power failure. An ultralow power microcontroller is used. This low power microcontroller can be used only for limited

applications with slow processing speed. It produces maximum delay between two processes. A separate ADC is needed in this type of microcontroller.Without internet the user cannot access the developed health face. Unavailability of networks leads to failure in sending the reports to the patient's database. As an existing prototype is using Bluetooth power consumption will be more.
The system faces the difficulty of operating in situations that challenge instrumentation designed for use in the controlled environment of a clinical situation.

III.PROPOSED SYSTEM

During health emergencies, when time is of the essence, there is little tolerance for system errors and poor usability designs. Through the use of standard-based software and best-of-breed hardware, our goal is to deliver a system which is scalable, reliable, and user-friendly. This mainly consists of temperature sensor, heart rate sensor, blood pressure sensor and MEMS sensor. The heart of the project is micro controller unit.

The health at hospital is making use of GSM technology and zig-bee technology which is serially interfaced with microcontroller. Due to the advance in sensor technology, people have an interest in the development of systems for monitoring human subjects over long period of time using wearable monitoring units. Wireless sensor networks (WSNs) provide capabilities that are valuable for continuous remote monitoring, as research into military and environmental systems attest.

IV.SOFTWARE USED

Keil Compiler is used to convert the programming language (Embedded C) into Hex File. Embedded C is the language used in the microcontroller. Flash Programmer is used to burn the hex file into the microcontroller. ORCAD tool is used for circuit layout design.

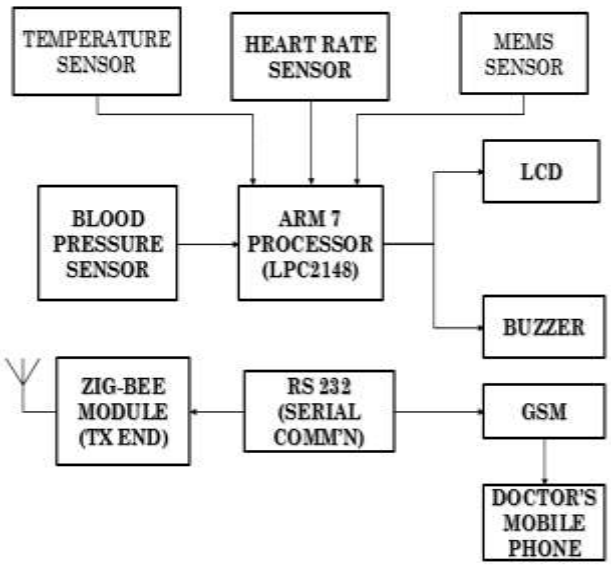
For healthcare applications, they can be deployed inexpensively in existing structures without IT infrastructure. Data are collected automatically, enabling daily care and longitudinal medical monitoring and diagnosis. The wireless devices can integrate with a wide variety of environmental and medical sensors.

In our proposed system, an ARM7 LPC2148 microcontroller is used. ADC, serial and parallel communication are inbuilt in this microcontroller and also provides high speed in processing. This project is a step towards the preventive health care for patients in hospitals. Here the sensors are directly fixed in the human body and these sensors are connected with a high processing microcontroller. Also, it will be continuously monitoring the heart rate, temperature, blood pressure, fits and displayed on LCD. The LM35 sensor is used to sense the sudden ill condition or if the temperature in patient body is increased or decreased. MEMS sensor is mainly used in detecting abnormal vibrations produced by patients during fits. Heart rate sensor is used to sense the abnormal heart beat of patient during heart attacks. A blood pressure sphygmomanometer is used to sense the abnormal BP rate in patients' body. Therefore, these are the vital indicators for patients' health before the serious cause happening to them.

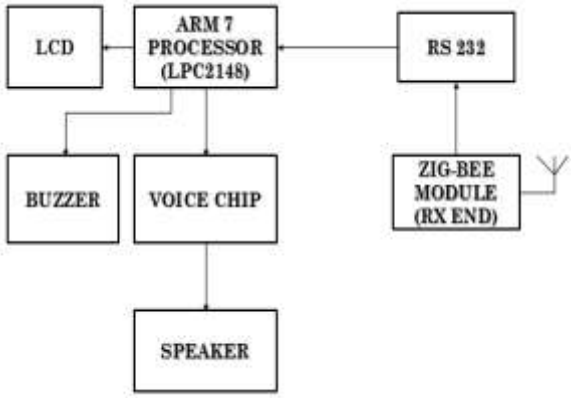
Failure of any desired temperature, blood pressure, heart rate or any sudden ill condition or if the patient is suffering with fits will be immediately indicated to the care taker who is near to the patient through the buzzer and the parameter which is affected will be displayed in LCD. The care section block diagram in our proposed system will be designed as a handheld device and will be given to the doctors in hospitals. That is, during an emergency period, a message of a particular emergency patient's condition will be displayed in LCD and a voice output also given to the doctor's handheld device through the zig-bee module from the transmitter to the receiver section. In addition, a text message about the patient's condition is also send to the doctor's mobile through GSM module. The advantages of proposed system are it will automatically detect the heart attack. It will alert the physician so that he can give immediate care. No need of frequent visit to patient's room. No need of additional computer to view the affected vital parameter. Does not need any internet connection or web browser. No chance of network failure in alerting doctors and caregivers. Additionally, it will also alert the physician through a voice message.

V. BLOCK DIAGRAM

The block diagram of the complete hardware circuit is shown in Figure 1.



A. Patient Section



B. Care Section

FIG 1: COMPLETE FUNCTIONAL BLOCK DIAGRAM

The heart of the project is micro controller unit. The health at hospital is making use of GSM technology and zig-bee technology which is serially interfaced with microcontroller. The body temperature is measured using LM35 temperature sensor which helps in measuring body temperature. The controller is programmed in such a way that if the patient temperature fall above threshold value it will indicates through a buzzer and also displayed in LCD. Meanwhile, a text message is also send to the doctor's mobile through GSM and a voice output also send through the zig-bee module. For demo purpose the changes in temperature can be shown by bringing any hot material near to sensor. The heart rate sensor is used to measure the pulse of the patient, where this is an analog device so it is connected to controller through ADC. Crossing of the threshold heart rate will be indicated by the programmed microcontroller. A vibrator sensor is used to sense when the patient is suffering from fits and a buzzer is raised so that the patient can be treated immediately. Thus, remote monitoring of patient is possible. Time maintenance can be achieved. Immediate nursing care can be given. Alerting the concerned doctor and care taker immediately. Hearing audio output for chronic conditions will increase the patient safety used by specific applications. It leads to an improvement in quality of care. With the remote monitoring, the medical staff can realize changes in the parameters of patients without frequently visiting them and consequently they can take concerned action to prevent possible aggravations.

VI. RESULTS AND DISCUSSION

The transmitter and receiver model of proposed system is demonstrated by the following.

A.TRANSMITTER MODEL OF THE PROPOSED SYSTEM

B.RECEIVER MODEL OF THE PROPOSED SYSTEM

VI.CONCLUSION AND FUTURE ENHANCEMENT

Our proposed system provides the immediate care to the CHF patients in hospitals by continuously detecting the changes in their vital parameters.And also it leads to an improvement in quality of care in hospitals.No need of frequent visit to patients' room. Does not need any internet connection or web browser.And also there is no chance of network failure in alerting doctors and caregivers.In future,additionally EEG and ECG reports are also transmitted along with the other parameters during an emergency period.

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