Resend Trend of E-Helth Acquistion, Transmission & Monitoring System

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Abstract *- The main focus of the paper is to address an e-health acquisition, transmission and monitoring system. Patient health parameters are monitored by wireless sensor network and communicated to the far end through LoRa interface. Data. If the parameters are abnormal it configures the GSM module to send SMS on doctor mobile phone. System implemented in this paper is made for such patients who are not in the critical state but they need to be monitored continuously. When the critical condition occurs, system will originate an alarming message and send it to the doctor. It is fast, less costly and monitors patient remotely from their homes.*

Keywords- *PC (personal computer), ICU (intensive care unit), ALG (application layer gateway), GSM (global system for mobile communication).*

I.INTRODUCTION

The development of communication and network technologies has greatly improved the data transmission speed and efficiency. In this paper the design and implementation of a remote data collection and monitoring system was investigated. The proposed system utilized GSM short message service to perform remote data collection and monitoring. The communication software written in VB programming language achieved efficient control of serial interface ports and real-time synchronization of remote data into system database, thus the multi-directional data monitoring was accomplished effectively[1]. Despite of its accuracy, somehow it is costly, involve many clinical settings and patient must be attended by medical experts for continuous monitoring. For a patient whom already diagnosed with fatal heart disease, their heart rate condition has to be monitored continuously. This paper proposed an alert system that able to monitor the heart beat rate condition of patient. The heart beat rate is detected using photoplethysmograph (PPG) technique. This signal is processed using PIC16F87 microcontroller to determine the heart beat rate per minute. Then, it sends sms alert to the mobile phone of medical experts or patient's family members, or their relatives via SMS [2]. For the medical professionals it becomes important to continuously monitor the conditions of a patient. In a large setup like a hospital or clinical center where a single doctor attends many patients, it becomes difficult to keep informed about the critical conditions developed in each of the patients. This project provides a device which will continuously monitor the vital parameters to be monitored for a patient and do data logging continuously. If any critical situation arises in a patient, this unit also raises an alarm and also communicates to the concerned doctor by means of an SMS to the doctor [3]. This wireless communications would not only provide them with safe and accurate monitoring but also the freedom of movement. In this, heart beat and temperature of patient are measured by using sensors as analog data, later it is converted into digital data using ADC which is suitable for wireless transmission using paging messages through GSM modem. AT89S52 micro controller device is used for temporary storage of the data used for transmission. Wrist strap watch, or any other commercial heart rate monitors which normally consisting of a chest strap with electrodes [4]. The paper consists of sensors which measures heartbeat and body temperature of a patient which is controlled by the microcontroller. Both the readings are displayed in LCD monitor. Wireless system is used to transmit the measured data to a remote location. The heartbeat sensor counts the heartbeat for specific interval of time and estimates Beats per Minute while the temperature sensor measures the temperature and both the data are sent to the microcontroller for transmission to receiving end. Finally, the data are displayed in the LCD at the receiving end [6]. In addition the proposed system is able to send alarming message about the patient's critical health data by text messages or by email reports. By using the information contained in the text or e-mail message the healthcare professional can provide necessary medical advising. The patient's temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data are monitored, displayed, and stored by our system [7].

II. MOTIVATION

A. Patient monitoring system

It is the system in which different body parameters of patient are monitored and observed. An existing example of such system is an ICU (intensive care unit), where sensors are attached to the patient body. The results are displayed on respective patient monitoring screen and are observed by the doctors. In under developed countries the health issues are of serious concerns. The number of people suffering from different diseases is quite high. The main cause is high population, pollution and less health care facilities. Some serious diseases require regular monitoring. Otherwise these can be fatal. The following are some diseases in which patient should be monitored on regular basis:

- Heart disease
- Diabetes
- Kidney diseases
- Liver disease
- Lungs disease.

System developed in this paper provides the necessary solution for our problem.

III. SYSTEM COMPONENTS

The system components are divided into two sections i.e.; transmitter and receiver. These are elaborated as under:

Transmitter section

Transmitter section constitutes ECG electrodes, temperature sensor, Blood pressure sensor, Arduino, Zigbee transmitter and antenna. These are explained as under:

1.   ECG electrodes

Electrocardiography is term used for recording the electrical activity of heart over a specific period of time by using electrodes attached to human skin. Human heart gives off electrical signal current when it beats. ECG records the electrical activity generated by heart [7]. Although these signals are of very small amplitude but are sensed precisely by the ECG electrodes attached to the body of patient. ECG tells us about heart rhythm, heart rate and many more.

2.   Heart Rate Sensor

The other device, which is used to sense the pulse rate, is implemented. In this human heart rate is measured by a PIC microcontroller through his finger. When the heart beats, basically it pumps the blood into the body. So this creates some fluctuations in the volume of blood in artery. That blood fluctuation is measured through a sensor working on optical mechanism. Although that signal is low but it is amplified and then blood volume fluctuation is counted in term of heart rate through the tip of a finger. There is another IC that is used in the circuit, which senses heart rate that is LM324. It is basically an amplifier, which amplifies the output from the heart rate sensor. This IC consists of 4 independent operational amplifiers. And these four operational amplifiers are operated through a single power supply instead of 4-power supply for each.

3.   Temperature Sensor

The other sensor, which is attached with the body of the patient, is temperature sensor. That sensor senses the temperature of a patient [5]. The IC that is used to sense the temperature is LM35 as shown in Figure 3, which consist of 3 pins. 1st pin is of 2-40 volts and 2nd pin is for output voltage and 3rd pin is for ground. As the temperature of the body increases, the output voltage of IC LM35 also increases. Basically it is a diode whose voltage changes with respect to the temperature. As we connect this sensor to the body of a patient. As the temperature of the body increases, the output voltage of that IC also increases with accordance to that temperature. So in this way our sensor measures the temperature.

4.   Blood Pressure Sensor

Blood pressure is the one which measures the pressure of blood in the arteries. When the human heart expands and contracts it causes a change in the flow of blood in the arteries which are measured by the blood pressure sensor which can store up to 80 readings [6] with time and date.

5.   Arduino

Kit is programmed in such a way that it interacts with the patient's wireless sensors and get values from them. These are then sent to the receiver through LoRa transmitter.

6.   LCD display

The LCD display is used to monitor the sensor readings live at the remote location of the patient.

7.   LoRa transmitter

LoRa (Long Range) is a wireless technology that offers long-range, low power, and secure data transmission for M2M (Machine to Machine) and IoT applications. LoRa is a spread spectrum modulation technology that is derived from chirp spread spectrum (CSS) technology.

8.   LoRa receiver

LoRa, essentially, is a clever way to get very good receiver sensitivity and low bit error rate (BER) from inexpensive chips. That means low-data rate applications can get much longer range using LoRa rather than using other comparably priced radio technologies.

9.   GSM

GSM kit is on the receiver side and it is basically used in our system for alerting the doctor when the condition of the patient is severe. There is a slot in this kit where we can insert SIM and through which we can send our alerting message to the doctor's clinic or hospital where we are required to send it. The GSM module used in our project is SIM900. There is another device connected to this GSM and that is its antenna. This is used to enhance the signal quality to send the message. It is implanted on the roof or out of the window. And it is connected to the GSM kit through a wire at the antenna slot.

10.   Doctor Cell phone

The doctor cell phone receives emergency message regarding patient's serious condition and acts accordingly as per requirements to provide solution of the problem. Limit 100 degree, then the patient is fine but if the value of the sensor cross that specified either the lower limit or the upper limit then will generate a warning message. That message will be transmitted to the doctor, under whose observation is the patient through GSM.

11.   PATIENTGUARDIANCELL PHONE

The guardian cell phone receives emergency message regarding patient's serious condition and acts accordingly as per requirements to provide solution of the problem. limit 100 degree, then the patient is fine but if the value of the sensor cross that specified either the lower limit or the upper limit then will generate a warning message. That message will be transmitted to the guardian, under whose observation is the patient through GSM.

12.   AMBULANCE DRIVER CELL PHONE

The ambulance driver cell phone receives emergency message regarding patients' serious condition and acts accordingly as per requirements to provide solution of the problem. Limit 100 degree, then the patient is fine but if the value of the sensor cross that specified either the lower limit or the upper limit then will generate a warning message and call. That message will be transmitted to the ambulance driver, under whose observation is the patient through GSM.

IV. CONCLUSION

E-health monitoring system of a patient is useful for those patients, which are in their initial stage of disease. In this way they are observed and medicated in less costly way in their own home instead of hiring a room in the hospital and hiring a doctor for the regular observation continuously in the hospital.

V. FUTURE WORK

This scheme can be more improved if we add prescription in this project too. It means that we programmed our microcontroller in such a way that if it seems an alarming situation then neither it will alert the relatives/doctors but also prescribe the medicine that patient should take in that scenario. It will be then much more helpful for the patient and the caretaker too.

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