

Android Based Heart Monitoring and Reporting System

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Abstract: Now-a-days Health care Environment has become technology oriented. Humans are facing a problem of unexpected death due to the reason of heart attack which is because of lack of medical care to patient at right time. So we are developing project to avoid such sudden death rates by using Body Area Network (BAN) technology.

In this system a patient will be carrying hardware having sensors and android phone application, the sensors will sense the body temperature and heart rate of patient and these data is transformed to android smart phone via Bluetooth. Device even it allows patient to move freely and can be monitored continuously. The android phone will be containing an application which will detect the heart attack according to the received data respectively and if any abnormalities are found regarding heart attack message will be send to patient's doctor, relatives and hospitals. The SMS contains patient's situation and location (via GPS) to provide urgent medical attention. Simultaneously it will send important data to server which will plot graphs so that doctor can view it using URL.

Proposed system also includes telemedicine system. In which part patient can submit symptoms to the server and can get disease name and remedies respectively.

Keywords: Sensors, android smart phone, Body Area Network (BAN), GPS (Global Positioning System), URL (Uniform Resource Locator), telemedicine system, SMS (Short Message Service), Wireless Sensor Network (WSN), Wireless Body Area Network (WBAN).

I. INTRODUCTION

Heart attack is a disease in which proper and continuous care should be taken. In which 24 hours of patient's monitoring is necessary. But practically patient cannot afford to go in the hospital for 24 hours. So we have worked on the system which will be used outside the hospital also patient can go wherever he wants. And continuous monitoring of patient is done.

Proposed system is based on Body Area Network (BAN). Sensors are connected to the hardware and attached to the patient's body. Using sensors values of heart rate and body temperature are sensed and these values are sent to the android mobile phone. Android application takes the values and these values are analysed for predicting heart attack.

II. RELATED WORK

Researches are done for evaluation in Healthcare System and also in wireless sensor network. Those are helpful in maintaining and monitoring the health of patient.

Research is done in the domain Body Area Network (BAN) from 1967. There was a project named Code Blue Project By Astang Coupe in 1967. The wearable computer is made which was attached to the patient's wrist and the values are taken to predict disease [3].

In 2008 a project is made by V. Annamalai & S.K.S.Gupta named as Project Ayushman. It is a real time project which is sensor network based medical

monitoring system which collect and analyse health information [3].

The project European Mobihealth by Katarzyna Wac in 2009 which works as WBAN. But it has some major issues; they are security and reliability of communication resource [3].

AID-N system developed. It consist of smart dust which is a wearable computer attached to the patient's wrist. Parameters are continuously transmitted to doctors tablet device. Transmission protocol used is IEEE 802.15.4 standard. Due to this collaborative and time critical system is developed for emergency. AID-N system relieve the workload by automatically recording and analysing the patient's vital data and alert the doctor if any abnormal condition occurred [3].

III. PROPOSED SYSTEM

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A. Motivation

25% of deaths in India caused due to heart attack. This is because of delays in detecting the Heart Attack symptoms and lack of early diagnosis. We can avoid such conditions by using real time WSN with android mobile phone. In WBAN technologies are increasing in Healthcare System.

Due to this early prediction of Heart Attack will be possible and also early diagnosis will be done.

B. Objective

The concepts from Body Area Network(BAN) for patients healthcare. As the health of patient is major issue now days.

In proposed system Body Sensor Network (BSN) is used which is also called as Body Area Network. Body Sensor Network is composed of sensors or actuators which are used to measure the vital signs from the human body.

Firstly the sensors are attached to the patient's body which are connected to the hardware. The sensors used are Body temperature and Heart Rate sensors which are used to collect the heart rate and body temperature parameters. These values are collected on the hardware which is mainly PCB. It sent the values to the android phone which is connected by Bluetooth device.

These values are analysed and monitored for predicting heart attack. If heart attack occurs then the SMS is sent to the doctor's, relatives and hospitals registered number. The SMS contains the patient's values of temperature and heart rate and its location. Location is tracked by the GPS (Global Positioning System).

Also the telemedicine system is part of the proposed system. It is used as a mobile health application. It is an android application which is used by user or patient. They have to submit symptoms of their disease. After submitting symptoms application gives online medical prescription or suggestion. It is very helpful in medical health application.

C. Design

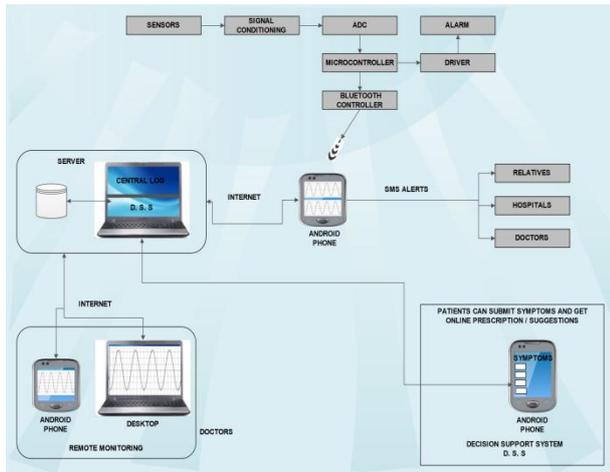


Fig. 1. Architecture of Android Based Heart Monitoring and Reporting System

D. Technical Terms used

WBAN is used for sensing the values from the body of patient. The sensors are attached on the body of patient. Those can be ECG sensor, motion sensor, heart rate sensor, pressure sensor, positioning sensor etc. To make the connection between the sensors and hardware device the wireless sensors are used [1].

The wireless technologies are the next step for improving the mobile health applications. Mobile health is also referred as mHealth and electronics health is referred as eHealth. A Wireless Body Area Network contains small and intelligent systems or devices attached to the body of the patient which is to be continuously monitored by the mobile health application over a wireless communication device which can be Zigbee or Bluetooth.

WBAN gives the continuous data and monitoring and real time graphs and feedback to the user, patient or to the doctor allocated for that patient. Next the values taken are used for analysing purpose. The analysed values are used to check that any kind of disease will occur. The data is recorded for the long period of time.

E. Mathematical Model

Venn diagram

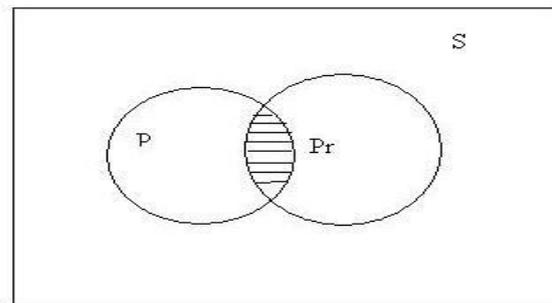


Fig. 2. Venn diagram of patient and its parameters

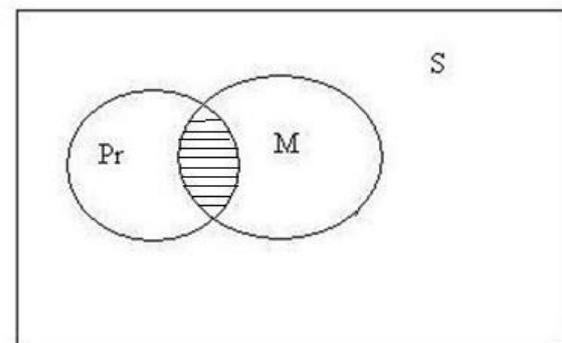


Fig. 3. Venn diagram of patient parameters and mapping function

TABLE I
VENN DIAGRAM PARAMETERS

Pr	Set of Patient Parameter	$Pr = \{Pr_1, Pr_2, Pr_3, \dots, Pr_n\}$
M	Mapping Function	M subset of Pr
S	Universal Set	S
P	Patient	P

Mapping Function

- ADC values are given to the mapping function which is coming from hardware. $M(a_i, VT)$
- Where, a_i is ADC value representing temperature, heart rate.
- A_i belongs to $\{0, 1, 2, \dots, 255\}$
- VT is vector table for physical parameter.

- Mapping function is nothing but formula. $Pri = f(a_i)$
- If the value of a_i changes then value of Pri also changes.

Mathematical Formula

- Mapping function is used for the calculating actual parameter value.
- $Pri = (a_i * X)$ where.
- a_i is ADC value.
- A_i belongs to $\{0, 1, 2, \dots, 255\}$
- X is multiplier.
- Value of X is according to the sensor.

IV. HARDWARE IMPLEMENTATION DETAILS

The hardware consists of PCB on which devices are mounted. The devices are ATmega32 microcontroller having 10 bit inbuilt ADC (Analog to Digital Converter), MAX232 IC used for serial communication purpose, ULN Darlington used as a voltage regulator. Bluetooth is also connected to PCB. Also sensors used are body temperature and heart rate.

The sensors are attached to human body and connected to the hardware. The values are sensed which are in analog format and sent to the microcontroller. The microcontroller converts analog values to digital values. +5V supply is given to microcontroller by +12V ULN Darlington. MAX232 is used for serial communication between microcontroller ATmega32 and Bluetooth device.

The values are sent through the Bluetooth device to the Android mobile phone which is connected to it.

V. ANDROID APPLICATION

The android application is connected to the hardware via Bluetooth device. The data is received from hardware. Data received displayed on application i.e. temperature and heart rate pulse. This data is analysed for predicting heart attack. For prediction of heart attack threshold values for heart rate and temperature is set. When the temperature and heart rate will be below or upper the threshold value SMS is sent to patient's relatives, doctor's and hospital's registered number. The SMS contains patient's heart attack parameters and location. Location is track via GPS. The application contains the IP address of server to which we wants to send the data for graph plotting. Server contains database also doctor can check graph of heart rate for their convenience. Server also contain database for telemedicine part.

VI. TELEMEDICINE SYSTEM

In telemedicine system an android application is developed which is used for detecting disease. Firstly user has to submit the symptoms of disease in the application. These symptoms are sent to server. Server contains database which has information about all the diseases and remedies for those. According to those symptoms which are sent to server by user; server will predict the disease.

And send suggestion to user or prescription to the user or patient.

VII. CONCLUSION

Proposed system 'Android Based Heart Monitoring and Reporting System' is developed with the help of Android Open Source Platform. The system is very usable for patient as patient can go wherever he wants along with system. Also the parents and doctors will ensure the patient's safeties as if any problem occurred, the system will immediately inform them. Also it is useful for doctor as he can check each details of patient whenever necessary. As the system is movable there is no longer need to stay in hospitals for patient. So he will be in relief. We are developing prototype of this application using the continuous monitoring of parameters to verify and predict the heart attack and generate SMS alerts. Because of availability of movable monitoring devices this application can be used in very great extent. Work will be done as delicate parameters such as ECG, Brain tumor etc. in future work.

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