Real Time Heart Behavioral Informatics System using Internet of Things

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ABSTRACT

Now a days, as many people suffer from heart disease and it becomes difficult and time consuming process to detect heart disease. so with the help of new techniques like Internet Of Things(IOT) it becomes easier and faster to detect heart abnormalities and their stages.so with the help of sensors like level sensor, heart beat sensor and temperature sensor we are monitoring patients. for detecting abnormalities we set some threshold limits and we compare them with patients monitored values. Thus with the help of this system we can reduce the death rate and patient can be easily diagnosed.

Keywords: *Heartbeat Sensor, Level Sensor, Temperature Sensor, Heartbeat Monitoring, IOT.*

1. PROBLEM STATEMENT

The major challenge with heart patients is difficulty in recognizing of heart related problems. These days we have an increased number of heart diseases including increased risk of heart attacks. Unfortunately, people always finds that it is too late to receive serious medical care when things are non-invertible. If early actions can be taken in time then lots of patients can be cured.so with help of advanced technologies like Iot fast and quick recognition of abnormalities related to heart rather than using old one patients get diagnosed fast and they can start the process of treatment related to heart abnormalities upon knowing stages of disease and get cured fast.

2. INTRODUCTION

Internet of Things is a latest technology which is combination of sensors actuators which are embedded in a devices and control remotely does not enquired human intervention. There are so many people in the world whose health may suffer because they do not have proper access to hospitals and health monitoring. Due to the latest technology, small wireless solutions which are connected to IOT can make it possible to monitor patients remotely.

Example: A variety of sensors which are attached to the body of a patient, and the collected data can be analyzed and sent to the server using different transmission media.

1.1 Techniques

Internet of things (IOT):

The internet of things is the network of physical object or things embedded with electronics, software, sensors, actuators and network connectivity.

Android: It is open source software platform and operating system for mobile device. It is based on Linux kernel.
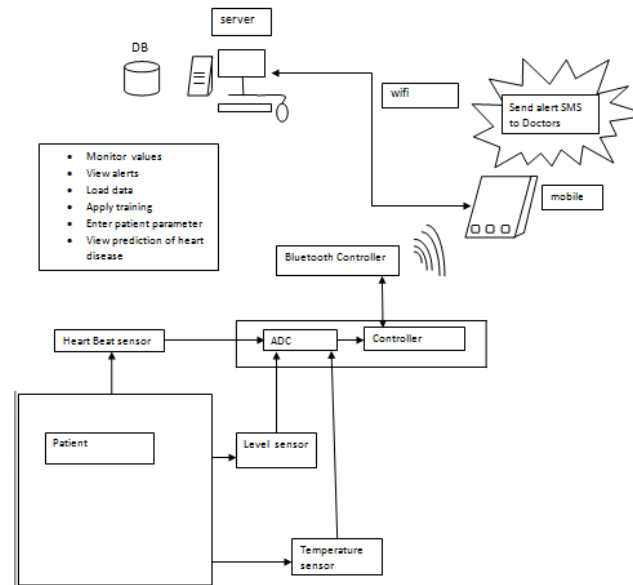
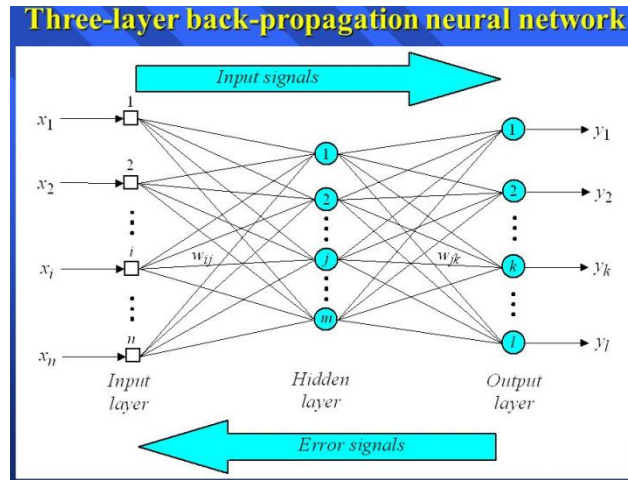**1.2 System Architecture**

Fig. Overall System Architecture

The overall system design consists of following modules:
(a) Hardware module: Microcontroller, ADC
(b) Training module: ANN (Artificial Neural Network).
(c) Prediction module: Data mining.
(d) Data base: Serialization.

First of all the system starts and ask the user and doctor that authority for credentials to access the system.Then the system proceeds through the credentials verification and the system tasks as shown in the System Architecture identify the stages related data specific to the standard data set specified then after collection of this data it is stored in an structured database SQL.The primary design constraint is the Desktop platform. Since the application is designated for Desktop Systems, effective GUI and well user friendliness will be the major design considerations. Creating a user interface which is both effective and easily navigable is important. Also as we are utilizing the database for our each of the four major steps based on ANN algorithm so storage space need to be considered for smooth functioning of system.Other constraints such as memory and processing power are also worth considering.The analysis and prediction system is meant to be quick and responsive even when dealing with large amount of data so each feature of the software must be designed and implemented considering efficiency.As our system involves ANN algorithm the system must consider the requirements of algorithm for the format of input and output generated and their individual working efficiency and its contribution to overall software applications efficiency. The software will give the desired results only if the specified software requirements are satisfied. Application software designed must implement the algorithms effectively on the collected data and predict the expected result successfully also the interface of software must be easy and simple to be understood by patient analysis and no extra efforts needed by them to understand the usage of software.

ANN: BACK PROPAGATION:

Back propagation artificial neural network is back propagation of errorBack propagation as name suggest the error and therefore the learning propagates backward from the output nodes to the inner nodes speaking about back propagation is used to calculate the gradients of the error of network with respect to the networks modifiable weights.This gradient always regularly used in a simple to find out weight that minimize the error .so its used in more general ways.It calculate both the gradient and its usage in stochastic gradient decent This algorithm allows quick convergence on satisfactory local minima for error in the kind of network to which it is suited.

Fig. ANN

1.3 Software and Hardware Specification

HC-05:

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module.

Hardware features

Typical -80dBm sensitivity

Up to +4dBm RF transmit power

Low Power 1.8V Operation, 1.8 to 3.6V I/O

Software features

Default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control: has. Supported baud rate: 9600,19200,38400,57600,115200,230400,460800. Given a rising pulse in PIO0, device will be disconnected. Status instruction port PIO1: low-disconnected, high-connected;

HeartBeart Sensor (PPG):

Heart beat sensor i.e pulse sensor is used for heart beat sensing through PhotoPlethysmoGraphy (PPG) sensors use a light-based technology to sense the rate of blood flow as controlled by the heart's pumping action.The changes in blood flow is sensed by ppg sensor when any changes occurs via relflection of tiusses or the change in intensity of light are associated with small change in blood perfusion Infrared light is used by PPG the waveform is used to represented by two main components Direct current detected signals from tissues Alternating current – detected signals from blood volume changes For other side measures we places a photo detector that helps to measure the small changes in the transmitted light intensity. The changes in the photo detector signal are related to changes in blood volume inside the tissue. At last we get signals which are obtain a nice and clean PPG waveform, which is synchronous.

Temperature Sensor:

We used NTC negative thermistor coefficient

Applications:

- Heating systems
- Industrial electronics
- Automotive electronics

Features:

- Fast response
- High measuring accuracy
- Different tolerances available
- Epoxy resin encapsulation
- PTFE-insulated leads of silver-plated
- nickel wire, AWG 30
- UL approval (E69802)

Level Sensor (Potentiometer):

A potentiometer is generally named as POT potentiometer is used for dividing voltage Pot consist three terminal resistor with sliding ,rotating contact resistor and rotating contact used for an adjustable voltage divider generally it used two terminals only ,one for end and other for wiper as it is act as a variable registor, rheostat. A pot (potentiometer) is used as measuring instrument is essentially a voltage divider. Used to measure electric potential (voltage).

ATMEGA 32(Microcontroller):

It is 8 bit microcontroller with advance features and high performance.
It uses advance RISC processor architecture
It consist 131 Powerful Instructions
In ATMEGA 32 Most Single-clock Cycle Execution
Consist general purpose registors 32*8
all operations are fully static
Max Up to 16 MIPS Throughput at 16 MHz
Also consist On-chip 2-cycle Multiplier
High Endurance with Non-volatile Memory segments
In-System Self-programmable Flash program memory which is of 32k bytes
EEPROM is of 1024 bytes
Internal SRAM 2K Byte
Cycles: 10,000 Flash/100,000 EEPROM Write/Erase

3. CONCLUSION

The existing system consists of phases like Data Collection, Data Classification,, Prediction and Visualization. The final output of this system is in the form of visuals but the final output of the proposed system is in the form of ECG and stages of heart abnormilites. In this way we are developing the system which able to detect any heart anomalies and tracking heartbeat of a user. so that it can be further analysed and reformed in future by a more improved system than the proposed system. Thus, on the basis of literature survey and by analysing the existing system, we have come to a conclusion that the proposed system will not only aid the law-enforcement agencies but will also help to digitize the criminal database and in turn help to deploy resources efficiently to prevent crime and increase safety and security of the citizens.

4. REFERENCES

[1] S. M. R. Islam, D. Kwak, M. H. Kabir, M. Hossain and K. S. Kwak, "The internet of things for health care: a comprehensive survey", IEEE Access, Vol. 3, pp. 678-708, 2015.
[2] K. M. Lim, J. W. Jeon, M. S. Gyeong, S. B. Hong, B. H. Ko, S. K. Bae, K. S. Shin and E. B. Shim,"Patient-specific identification of optimal ubiquitous electrocardiogram (U-ECG) placement using a three-dimensional model of cardiac electrophysiology , and Cheng Chen, Student Member", IEEE Transactions on Biomedical Engineering, Vol. 60, No. 1, pp. 245-249
[3] S. Cho, Y. Lee and I. Chang, "Designing a novel ECG simulator: multi-modality electrocardiography into a three- dimensional wire cube network ", *IEEE Technology and Society Magazine,* Vol. 35, No. 1, pp. 75-84, 2016.
[4] Z. Zhang, "Photoplethysmography based heart rate monitoring in physical activities via joint sparse spectrum reconstruction", IEEE Transactions on Biomedical Engineering, Vol. 62, No. 8, pp. 1902-1910, 2015
[5] Kaleem ullah, Munam ali Shah, Sijing zhang, "Effective Ways to Use Internet of Things in the Field of Medical and Smart Health Care", IEEE Journal 2016
[6] Kala Vengopal and Amit Kumar, "Centralized heart rate monitoring and automated message alert system using WBAN", international journal of scientific and research publications, volume 3,
[7] Kala John Kappiarukudil and Maneesha Vinodini Ramesh, "Real-time monitoring and detection of "heart attack" using wireless sensor networks", 2010 fourth international conference on sensor technologies and applications
[8] C. Karmakar, A. Khandoker, T. Penzel, C. Schöbel and M. Palaniswami, "Detection of respiratory arousals using Photoplethysmography (PPG) signal in sleep apnea patients",*IEEE Journal of Biomedical and Health Informatics,* Vol. 18, No.3, pp. 1065-1073, 2014.
[9] Shah Ahsanul Haque, Syed Mahfuzul Aziz and Mustafizur Rahman," Review of cyber physical system in healthcare", international journal of distributed sensor networks, volume 2014, article ID 217415.
[10] Zhi-Young-Bai and Xin-Yuan-Huang,"Design and implementation of cyber physical system for building smart living spaces", international journal of distributed sensor volume 2012, article ID 764186.