

# Design of Self-Learning System for Diagnosing Health Parameters using ANFIS

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**Abstract** – Nowadays, predicting of heart diseases is critical issue for humans. In previous, heart diseases cannot be identified before it attacks. This paper describes the work of self learning system for monitoring heart activities using ANFIS. Here, heart diseases can be understood after reaching abnormal state or in any fall detection stage. This paper develops a method of classifying the degree of heart diseases in patients using ANFIS. Neural network will predict the targeted level and fuzzy-logic compares the targeted level with current inputs and optimizes it. Here IoT plays a major role. The predicted and optimized data about heart disease is posted in the server for continuous information and it will be posted for every 10seconds interval. Hence the preliminary stages of heart diseases can be identified and recovered and also current problems and future directions can be identified.

**Key Words:** ECG, Pulse Oximeter, Arduino UNO, ThingSpeak server.

## 1. INTRODUCTION

Heart diseases mainly occur due to blocking of blood vessels. It includes coronary artery diseases, myocardial infarction, bradycardia and tachycardia. This may be caused by high blood pressure, obesity, smoking, poor diet. High blood pressure results in 13% of CVD deaths, tobacco results in 9%, stoutness 5% and diabetes 6%. Coronary vascular disease is avoidable by predicting it earlier. Human computer interaction system is a study of relationship between people and computers mediated information. The future of human computer interaction system lies in how intelligently these systems can take into account the user's context like Application areas, social organisation and work. Researchers on recognising the daily activities of people has progressed steadily but little focus has been devoted to recognizing jointly activities as well as movements in a specific activity.

### 1.1 EXISTING APPROACH

In the existing system, health care system was used to monitor the physiological signal and current position of a patient by automatic learning feature. Health care box was used for automatic detection of ECG signals and position of the patient. ECG acquisition module detects the signal and transmits it to the health care centre. The position of the patient position of patient can be recognized using an

outdoor precision GPS. Through health care centre, doctors can assist the detailed health condition of a patient when the patient reached the abnormal stage or fall, that notification for rescuing them is send to healthcare box. Healthcare box constantly record the status of the ECG signal. Once abnormal stage is reached, it will give an emergency notification to doctors and concerned family members. It has some disadvantages like remote monitoring of patients, prediction of diseases is not possible, heavy cost.

## 2. PROPOSED SYSTEM

In this paper, Neuro-Fuzzy based health diagnosis and Arduino is used as a gateway to communicate to the various sensors such as ECG sensor, Temperature sensor, and Pulse Oximeter sensor. The microcontroller picks up the sensor data and sends it to the network through WiFi and hence provides real time monitoring of the health care parameters for doctors. Initially, ANFIS algorithm is converted as embedded C code and it is dumped in microcontroller. Usually ANFIS has two parts: a) Training b) Testing. In the training part, targeted level is set by giving some data as input from the data set of LVM file. During testing, the clinical input data from the patient body is compared with the targeted values. The data can be accessed anytime by the doctor. In this, remote monitoring system is that the data as to be securely transmitted to the destination end and provision is made to allow only authorized user to access the data. User/doctor can access the data by logging in to the html webpage. At the time of extremity situation in order to prevent the patient from abnormal situation, a twitter alert message is sent to the doctor through ThingSpeak server (Internet of Things) which is connected to the controller. A mobile application software (ThingsView) is also provided to check the health conditions of a patient continuously through the mobile phone.

## 2.1 BLOCK DIAGRAM

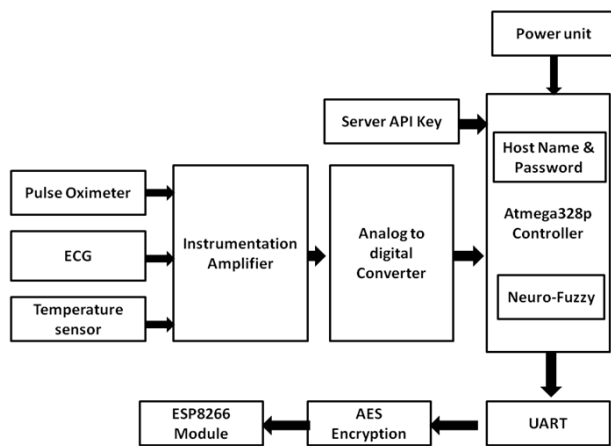


Fig -1: Block diagram

## 2.2 BLOCK DIAGRAM DESCRIPTION

### 2.2.1 INPUTS

#### Pulse Oximeter

Pulse Oximeter indicates fastness of blood and measures oxygen content in blood. It has IR transmitter and a photo detector which indicates the flow of oxygen as 0's and 1's. The '1' will be taken as 1023 because of 10 bit ADC usage.

#### ECG

In this, three electrode ECG is used. One electrode is placed in left arm and another in right arm and the other will be taken as a reference electrode. The left arm and right arm electrodes will determine the heart pulses.

#### Temperature sensor

It senses the temperature of patient's body.

### 2.2.2 Instrumentation amplifier

The sensor values are given as an input to the IA. It has two parts a) amplifier b) Filter. Filter will remove unnecessary signals, amplifier will amplify the filtered sensor values.

### 2.2.3 ADC

The amplified analog signal is converted into digital signal by using ADC. The output will be represented as 0's and 1's which will be given to microcontroller.

### 2.2.4 ESP8266

It is a wifi module. It has a firmer in which operating system (OS) is installed. For checking network connection of ESP8266, putty software is used.

### 2.2.5 ThingSpeak server

It is free server and is used for posting the data and also for monitoring the health values continuously. For this, each person is having a separate username and password to login.

## 3. METHODOLOGY

### 3.1 ANFIS

It refers to Adaptive Neuro Fuzzy Inference System. Neural network has learning ability like supervised and unsupervised learning. This paper describes backward propagation in supervised learning. In backward propagation mainly uses multi-layer perceptrons which includes input, hidden and output layer. This algorithm uses a computed output error to change the weight values in the backward direction. The formula for sigmoid activation is

$$f(x) = \frac{1}{1 + e^{-input}}$$

## 4. Result

### 4.1 ThingSpeak Server output

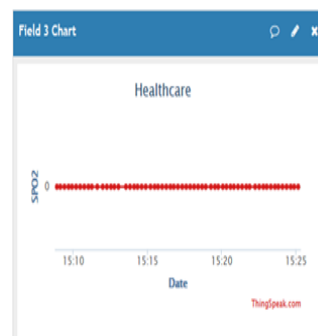


Chart -1: Pulse Oximeter

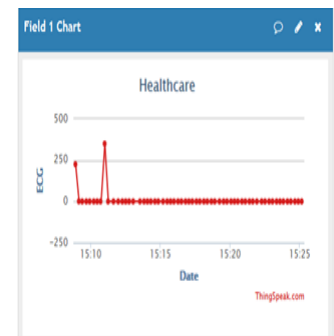


Chart- 2: ECG Sensor

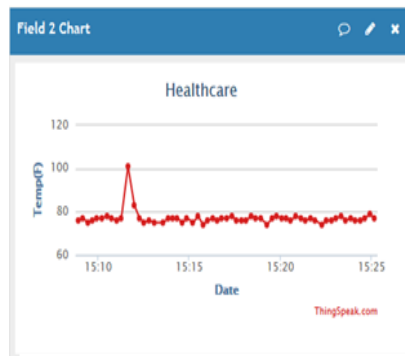


Chart-3: Temperature Sensor

### 4.2 Twitter Output

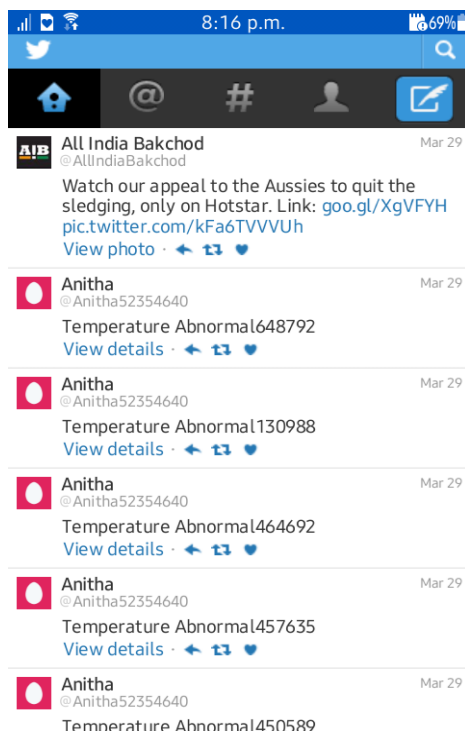


Fig 2: Twitter output

### 4.3 Snapshot

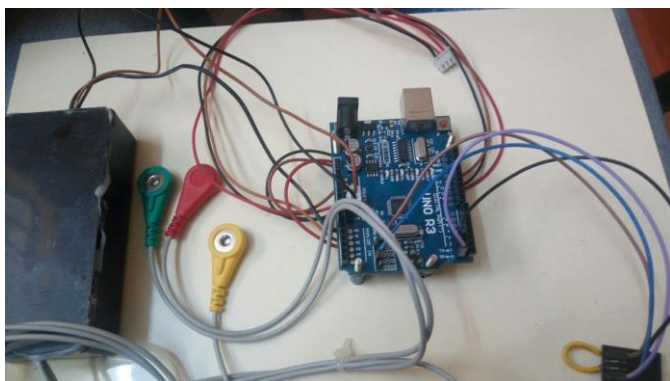


Fig 3: Implemented Circuit

### 5. CONCLUSION

Nowadays, heart disease plays a major role in human life because of the lifestyle changes. This design of self learning system for diagnosing health parameters using ANFIS will predict the heart diseases before it severely attacks the human. This device is successfully designed and verified.

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