International Journal of Future Generation Communication and Networking
Vol. 13, No. 1, (2020), pp. 170-183

A NOVEL ARTIFICAL NEURAL NETWORK BASED SMART HEALTH MONITORING SYSTEM USING IoT

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Abstract

In recent trends artificial neural network is a crucial factor in AI for health care monitoring system. Now a day in many medical applications health monitoring is a big challenge to find the optimized solution. IoT is a great platform for monitoring human health and analyze the solution then and there and also show the details of every individual human by its own way without the need of an external source. In general existing so many cases are analyzed by manually; from the manual observation the system has reached many difficulties in finding the solution. So to overcome the issues today's every monitoring system is under in Artificial Neural network by the help of different learning technology like machine learning and deep learning. This learning technique is a best and upgrade a solution in many ways for improving all the information and technology related method it is used to medical , communication, material designing applications etc., This paper proposed a novel idea which is more helpful for society to improve the technology as well as the person to identify and analyze their problem by their own without any dependencies. In this paper different sensors are used like bio sensor, GPS sensor, noise sensor, shimmering sensor, swallowing sensor, heart beat sensor, dietary sensor for health care monitoring system. It is very useful to identify whether the person is normal or abnormal. The information of person data is stored in cloud and using ANN and IoT to monitor the person's health by continuous improvement technique. From the observation the ANN is connected that person in IoT and this IoT is used to guide the whole system. Finally it will produce optimized solution with the help of training set, detection set and also test set. This proposed methodology produce 96% of efficiency when compared with previous analyzing methodology. The simulation and hardware result shown by using Node MCU and RAPERRY Pi in IoT.

Keywords*: Artificial neural network, cloud system, , Internet of Things, Bio medical signal, sensors.*

I. INTRODUCTION

The Internet of Things (IoT) is an important and creative area among various studies and in the business areas. In the upcoming years there will be enough support for the success of Internet of Things. How Internet of Things will take place an important place in our daily lives. Interconnecting of things or devices are called IoT which consists of varieties of sensors in medical field, software devices, network and required electronics which is used to collect data's and to exchange these data's to required user. IoT is an architectural framework that is integrated and the data are exchanged between the users to computer for various analysis. IoT is not an independent device it is an interconnected network. Any object that is connected by the Iot to produce an accurate result. This will help us for a healthy and safer life because; it

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will predict the problem before it happens. For example, the alarm clock is not only used to wake you up but also inform the water heater that the person has awake that it notifies the geezer to start the water heater.

Here we consider healthcare system to identify and control various diseases like Lung Disease, Heart Disease, Liver Disease, Blood Glucose, Kidney Disorder, Irregular Heart Beat, Severe Headache, Obesity, and Hypertension at an starting stage. The set gives notifications to the persons who use and at the same time to the doctors in the time of emergency. The set also helps in identifying various diseases and always monitoring the person's body conditions to predict the risk of various diseases using the IoT setup which contains various medical sensors. The cloud system is used to store the information that is collected by the medical sensors. During emergency, the current information of the user also stored. The changes in the parameters of the user is identified by comparing the user's current parameters and previously observed parameters. Then to save the user three solutions are made, doctors reach the user, ambulance to reach the user's place and to inform the user's current state to the family members of the concerned user.

Deep learning is a type in artificial intelligence that resembles the activities of the biological brain in functioning of the data parameters for decision making. It is one of the topics under machine learning of artificial intelligences that has the ability of acquiring knowledge with the help of networks of the not arranged networks. Artificial Neural Network is inspired but not similar to biological brain's neural network. The systems come to know to do activities by taking examples, usually not created with task - specific rules. Consider the following one, in image recognition, they could know to find images has contains roses by considering the available ones that have been named as "rose" or otherwise "no rose" and from this it will be easy to find roses in the other ones. The activity is done without knowing anything about roses, that is, that roses have petals, leaves, and thorns. Instead, they automatically create characteristic features already created previous ones.

An ANN is of connected nodes or units known as artificial neurons and it is roughly similar to the one which is in biological brain. ANN has the neurons which are divided into layers. Various layers many do various transformations on their inputs. They are input, output and hidden layers.

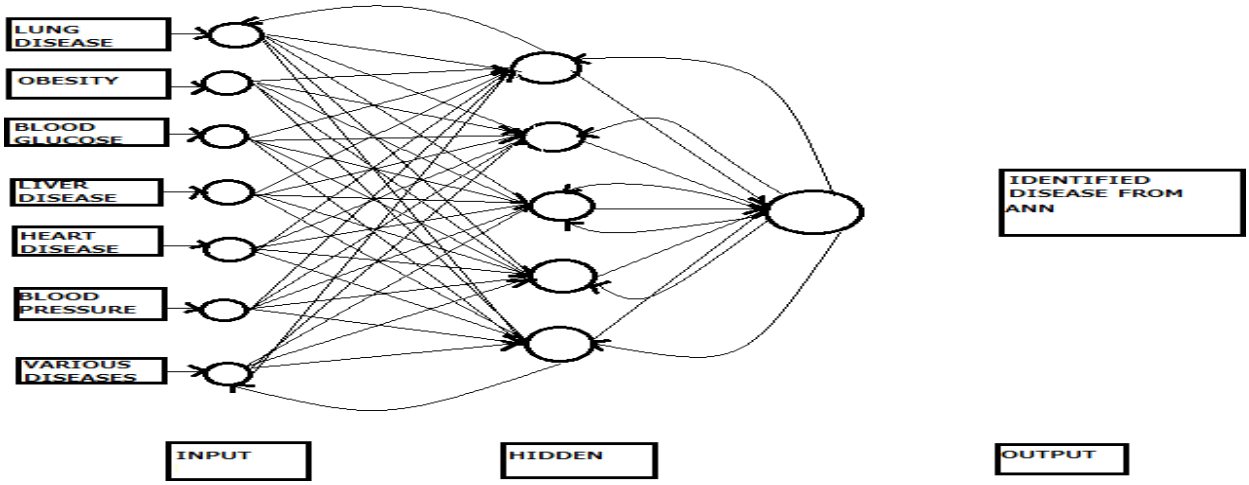

Fig. 1 Prediction of various diseases by ANN.

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II. DIFFERENT TYPE OF SENSORS

1) GPS Sensor

GPS Sensor can also be called as detector with antennas that utilize satellite-based navigation system with a network of twenty four satellites in orbit round the earth to supply position, velocity, and temporal arrangement data as shown in fig 2.1.

Fig 2.1.GPS Sensor

2) Noise Sensor

The sound sensing element is one form of module accustomed notice the sound. Generally, this module is employed to sight the intensity of sound. The applications of this module principally embody switch, security, additionally as observance. The accuracy of this sensing element may be modified for the benefit of usage. This sensing element employs a electro-acoustic transducer to produce input to buffer, peak detector associate degreed an electronic equipment.

This sensing element notices a sound, & processes associate degree o/p voltage signal to a microcontroller. After that, it executes needed process. This sensing element is capable to work out noise level at intervals DB's or decibels at three rate six rate frequencies around where the human ear is sensitive. In smart phones, there's associate degree mechanical man application particularly sound unit meter accustomed live the sound level with the help of fig 2.2

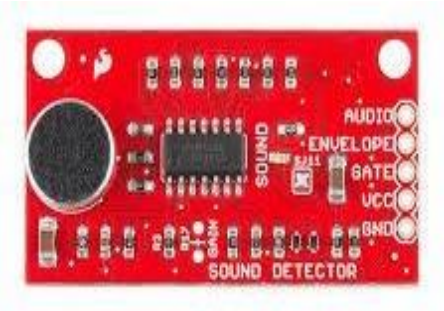

Fig 2.2 Noise Sensor

3) Bio Sensor

Biosensors are associate degree analytical devices, created to find the presence of a chemical substance, which mixes a biological element and a chemical science detector. The biological components which are sensible, e.g. tissue, microorganisms, organelles, cell receptors, enzymes, antibodies, nucleic acid, etc, may be a biologically derived material or biomimetic element that

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communicates with, mixes with, or acknowledges the analytic below study. They also can be created by biological engineering. The electrical device or the detector components that converts one form of signal into the other one, behaves in a very chemical science method: optical, electricity, chemical, electrochemical luminescence etc, ensuring from the interaction of the analytic with the biological components, to simply live and quantity.

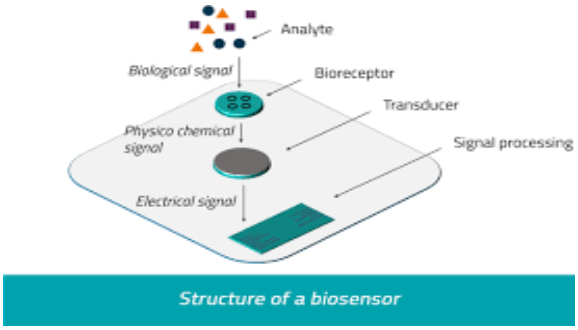

Fig 2.3 Biosensor

Fig 2.3 shows the sensor's device which read is connected with the physical science or signal processors that are mainly to blame the show that ends up in an easy means. It generally deals with the foremost pricy a part of the device, but it's doable to come up with a user friendly show that has electrical device and sensitive component.

4) Cardio Check Pulse

Human pulse is the rate at which your heart beats. The pulse is usually called your heart rate, which is the number of times your heart beats each minute (bpm). But the rhythm and strength of the heartbeat can also be noted, as well as whether the blood vessel feels hard or soft. Changes in your heart rate or rhythm, a weak pulse, or a hard blood vessel may be caused by heart disease or another problem. As your heart pumps blood through your body, you can feel a pulsing in some of the blood vessels close to the skin's surface, such as in your wrist, neck, or upper arm. Counting your pulse rate is a simple way to find out how fast your heart is beating.

Fig 2.4 Cardiac Check pulse

Fig 2.4 shows the cardiac check pulse by which the human pulse rate is calculated.

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5) Room Sensor

When you install a smart thermostat and set the temperature, the thermostat is only sensing the area around it. So while it may be 70 degrees in your main floor hallway where the thermostat is, the guest bedroom upstairs could be 75 degrees. These hot or cold spots in your house can be annoying, and make being in certain rooms uncomfortable. Room sensors allow you to see the temperature in every room you put them in, meaning you have a better idea of what the temperature is over your whole house by the instrument which is shown in the fig 2.5.

Fig 2.5 Room Sensor

6) ACCELEROMETERSENSOR

The accelerometer sensor can be used to measure the acceleration exerted upon the sensor. Usually the acceleration is given in two or three axis-vector components that make up the sum/net acceleration. Accelerometers have quite a few uses. User can probably think of a few already glass breakage detector, video game remote controls, or even electronic bubble levels for when person are trying to hang a picture frame on wall. The major advantage of using an accelerometer sensor in biometrics is, of course, its ubiquitous presence in everyday life. This is

due to the wide spread of smart phones, which nowadays always have these sensors built- in.

Fig 2.6 Accelerometer sensor

7) Swallowing Sensor

The Sensor used to capture swallowing events was a miniature throat microphone placed over the laryngopharynx. This sensor detected characteristic sounds of swallowing originated when the

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bolus of food passes through the pharynx by the instrument shown below in the fig 2.7.

Fig 2.7 Swallowing sensor

III. EXISTING SYSTEM

Two setups are utilized as customer and the server. One MCU behaves as a customer and another as a server. The server and the customer are linked in a wireless connection. The collection of sensing devices used is pulse sensor, temperature sensor, pressure sensor as shown in Fig.3.1

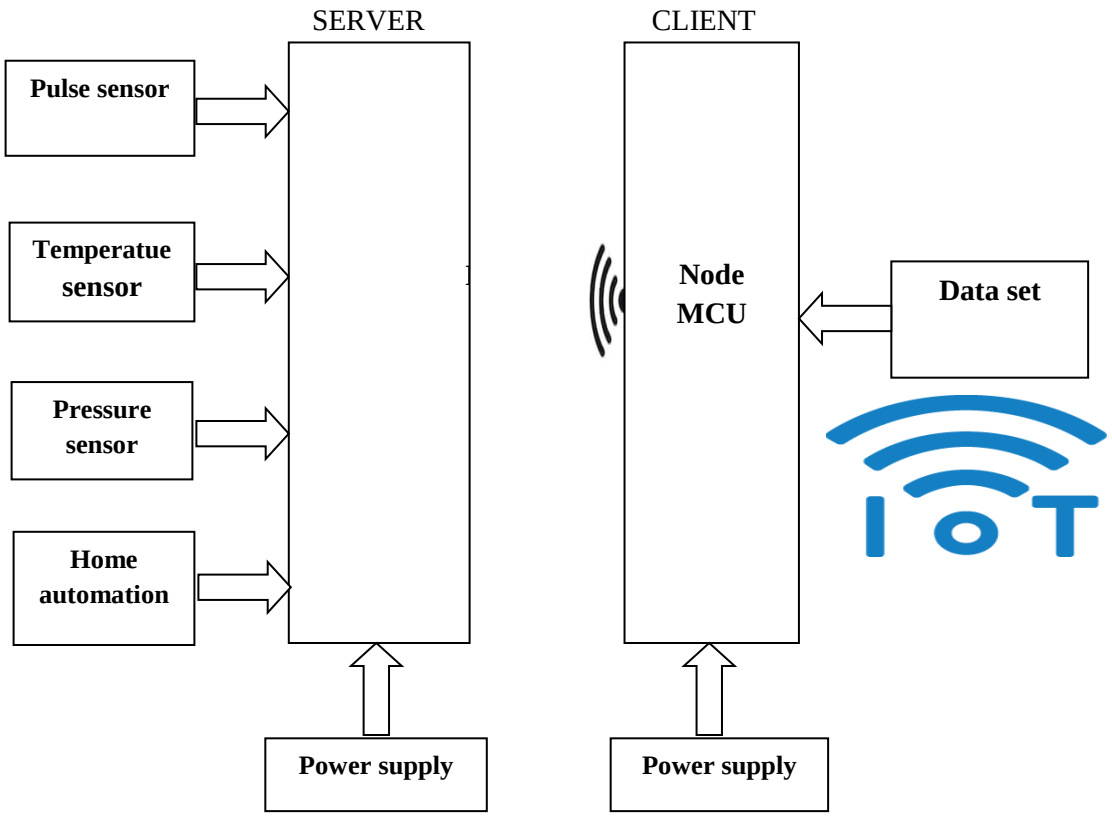

Fig 3.1 Block diagram of preterm labor pain detection system using EMG

The pulse sensor, temperature sensor and the pressure sensor are linked to the server of the MCU. The Wi-Fi is first connected within two node MCUs. The setup is linked to the customer and the server and verified if they are linked. The normal value is compared with the digital value from the setup. When there are large changes in the value, they are sensed automatically. When there are drastic changes in the value the pulse and the temperature is sensed automatically. When there is change in the value detected, the power supply to the sensing devices is varied according to the needs and the necessary actions are taken.

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IV. PROPOSED SYSTEM

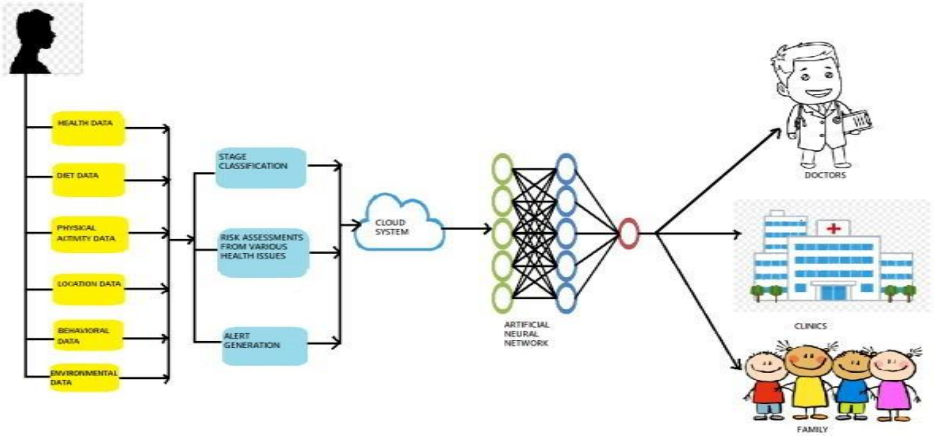

Fig 4.1.Proposed System

1) Health data

Health data of a person includes various health signs of user. The data includes obesity, sugar level, liver, kidney disorder and various health parameters. All these data have a chance of producing various diseases. Each disease has a different parameter by using this data we can able to analyze the various health issues of a person. Here various health sensors are used to capture the data from a person.

2) Environmental Data

This deals with cleanliness and encompassing details of the surroundings which have an effect on patient's health monitor. The varieties of knowledge of persons surrounding by variety sensors placed or inserted in person's surroundings.

3) Physical Activity Data

This includes the various body conditions that is the body state of a person. This also one of the reasons for health issues in a person. For example, the blood pressure of person may increase during various physical activities including sitting, sleeping, walking, and running even during exercise. These sensors are used for doctors to get a better analyzing purpose.

4) Behavioral Data

Behavioral dataset that is the behavioral aspects obtained during the measurement. During the nature of human behavior the dataset varies for every minute. The behavior of a person such as anxiety, restlessness, stress and feeling uncomfortable. By using various bio sensors these data are obtained from the user.

5) Dietary Data

Dietary data includes details about the in taking eatables by the person during various health measurements. The foods may be fast food, spoiled food and the supplements can be alcohol etc. This

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data can be obtained from the various sensors that is inserted in the person's body as well as the time of intake also recorded.

6) GPS Data

The place where the user lives or resides is indicated by the GPS data. The GPS sensor senses the locations to have present location of every person. Present residence of the person has an impact various health range increases on greater heights and various climatic conditions. In case of emergency it helps the person in having correct details regarding nearly clinics. By using the communication technology IoT sensor data is send to cloud.

7) Personal Data

Personal data is considered to be all details of an individual's so that it can be identified directly or indirectly such as name, identification number, location data, network identifier, physiological, genetic, economic, cultural identity of individual.

8) Cloud system

Cloud system is used for keeping the end results of patient body condition. It has big quantity of storage to store analysis results, collected body condition info of every person, and transfer among approved medical workers, users, pharmacies, hospitals and healthcare professionals. Government power assisted healthcare centers may transfer knowledge yet as any information relating to carefree camps, etc. Patient and approved information's will access information regarding their body conditions at anytime from anywhere. Temporal knowledge granulation part in health system transfers knowledge granulation information to this computing system for permanent storage so it may be used by the other part of system in anytime for additional analysis. As well as, emergency messages relating to the present standing of body condition is used for additional checkup by consultants to require on spot action and to give proper first aid just for the need of urgency.

TABLE I
Data set to be measured in persons

Set of Data used	**Description**
Health Data	Person's parameters related to health
Environmental Data	Person's environmental condition of surrounding during various measurements
Physical Activity Data	Position of the person during various measurements like sitting, sleeping, running, standing and exercising
GPS Data	Location of person during various measurement
Behavior Data	Behavioral characteristics of the person during various measurement
Dietary Data	Data about the various food consumed by person

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V. CASE STUDY

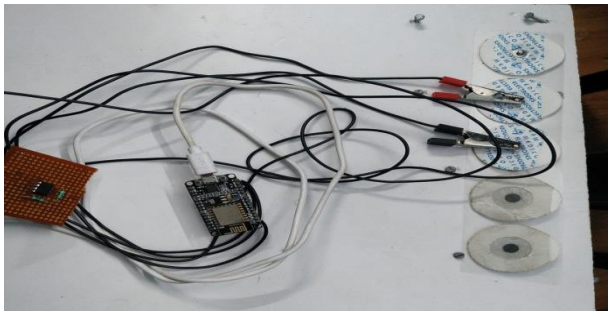

Fig 5.1.EMG

EMG

Electromyography is one of the types for calculating and acquiring the data about electrical behavior created by the biological muscles. EMG is done or calculated by the device called electromyography to create the electromyogram.

VI. SIMULATION RESULT

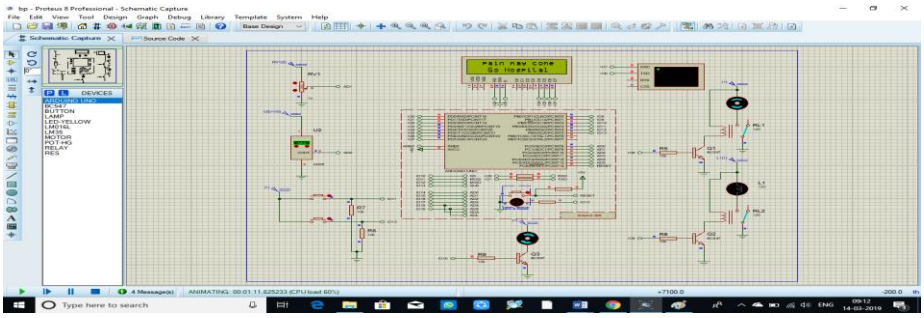

Fig 6.1(a) Simulation result

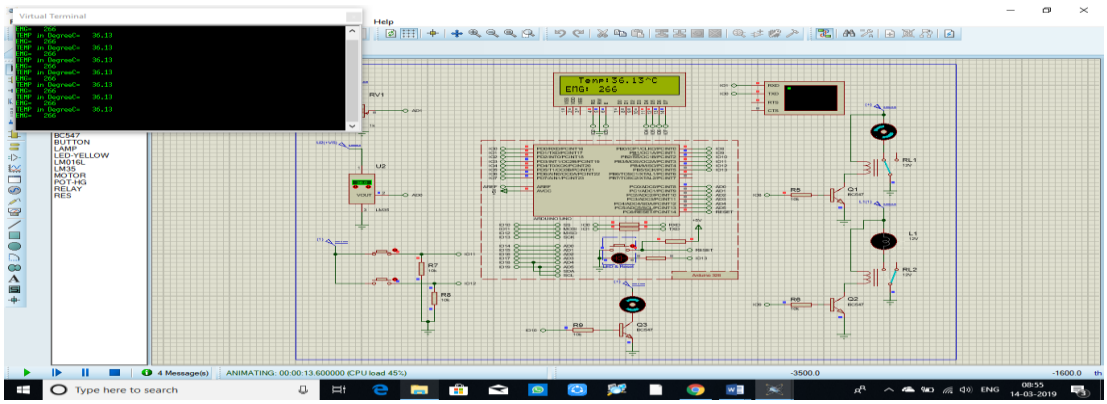

Fig 6.1(b) Simulation result

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Fig 6.1(a) and 6.1(b) shows the simulation results got from using the software proteus by Comparing the normal and changed value.

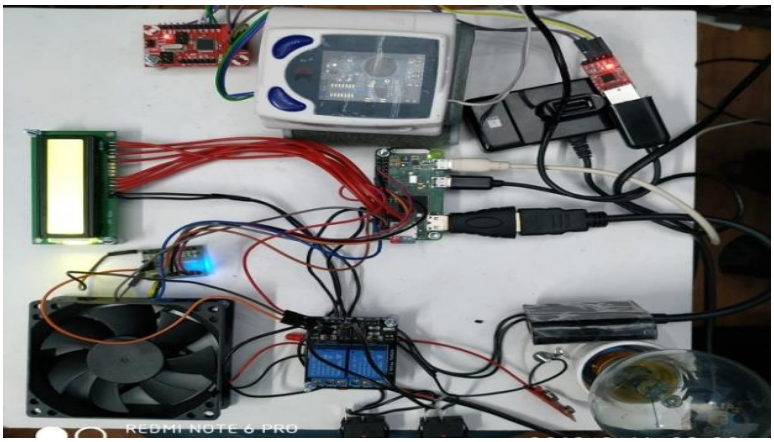

Fig 6.2 prototype module 1

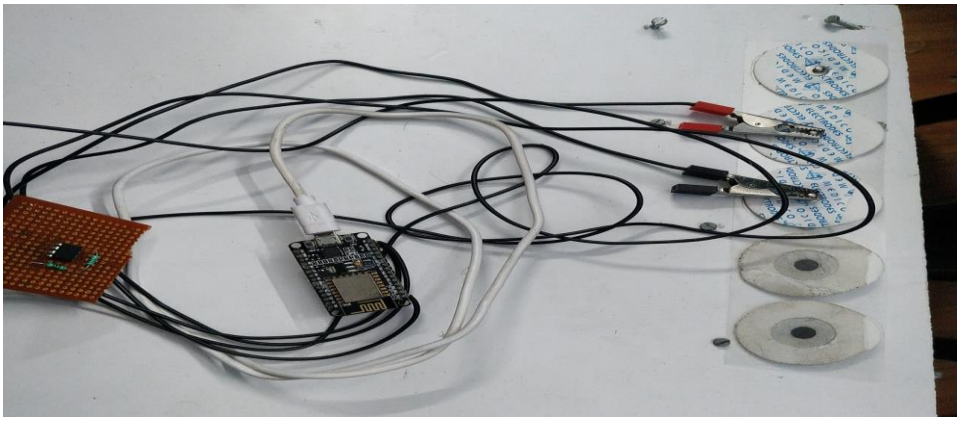

Fig 6.3prototype module 2

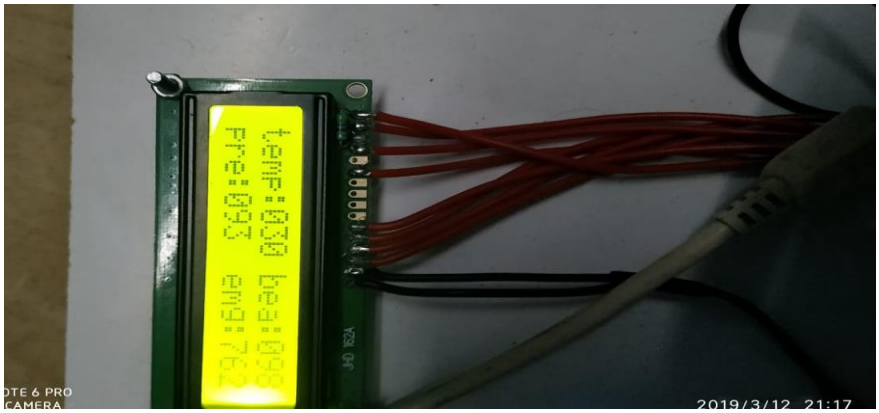

Fig 6.4 LCD output of pressure and temperature measurement

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Fig 6.4 shows the output received in the LCD display as it can also be shown as the messages sent to the family members to take care of the patient in time of emergencies.

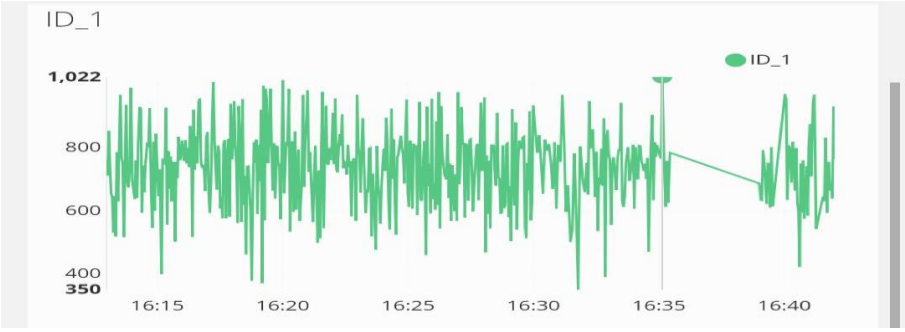

Fig 6.5 Graphical representation

Fig 6.6 EMG, Temperature and pressure value in app

Fig 6.7 Light and fan control using app

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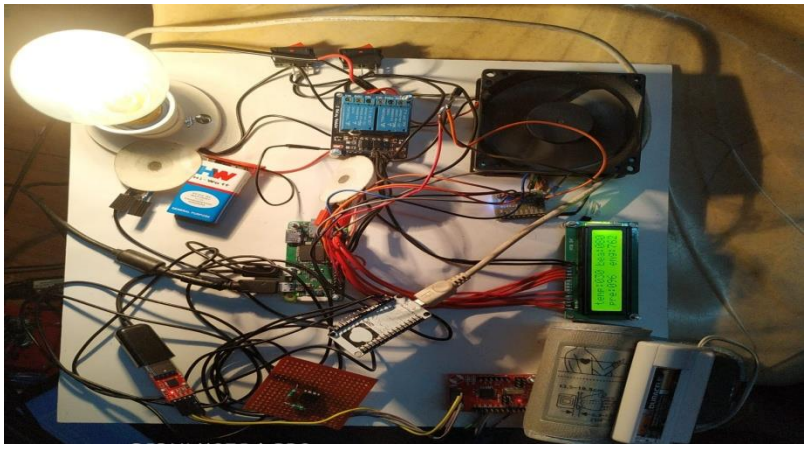

Fig 6.8 Hardware Implementation of EMG signal and home automation

VII. CONCLUSION

The project mainly focuses on helping the patients at emergency situations by storing the patients' basic information on cloud using IoT. The disease which affects the patient is found by using Artificial Neural Network (ANN). By gaining the patient's details, Ambulance can be sent to the person's place, doctors or clinicians can reach the patient. The project's aim is to help everyone with secured services. The setup can be minimized much smaller so that it will be more easy to use. More data can be collected by connecting more sensing devices and they can be easily collected and identified. In this paper we have created a usage to monitor the person's body condition. In the upcoming days, technologies can be utilized to identify the pain.

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