Non Invasive E-Health Care Monitoring System using IOT

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Abstract- **The E-health monitoring system is one amongst the main developments within the field of life science. An automatic wireless health monitoring system is employed to live patient's temperature, pressure, pulse etc. which are accustomed evaluate the health condition of the patient. Providing the collected information to the doctor and making proper decision on the information collected also notifying the patient is that the challenging task within the IOT. During this project, an IoT based E-health care monitoring system is proposed which is Non-Invasive in nature . As the population ages, there is a greater need to develop clinical and personal diagnostic tools. As wait times for medical attention increases, the automation of non-invasively collecting patient vitals could significantly improve the efficiency of modern health care. The system components are presented and their accuracy is discussed, along with suggested enhancements.**

Index terms- **Non-invasive, Health monitoring, E-HealthCare, Pulse rate senor, Temperature Sensor, Heartbeat Sensor, Arduino**

I.INTRODUCTION

Health monitoring is the major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues.[1] Health Monitoring is becoming critical and in-affordable. More than 50 percent death occurs in patients who are not continuously monitored. Heart attack, high blood pressure, high blood glucose are parameters affecting the health of people. There are lots of devices available now days to monitor the health of patient over internet. But the treatment is impaired, because the diagnosis is Invasive and Non-Continuous.

A. What is health monitoring system?

The patient health monitoring system is one of the major developments in the medical area. An automatic wireless health monitoring system is used to measure patient's body temperature and heartbeat by using embedded technology. The sensors used in the system helps to monitor the condition of the patient.

B. What is Non-Invasive Patient Health Monitoring System?

Non-Invasive Patient Health Monitoring System does not involve the introduction of instruments into the body. They are increasingly helping people to better monitor their health status both at an activity/fitness level for self-health tracking and at a medical level providing more data to clinicians with a potential for earlier diagnostic and guidance of treatment.

C. Why Non-Invasive?

Everyone has had an experience, most of them unpleasant, involving sharp objects and blood. The main advantage of non-invasive methods is the relief from pain and discomfort due to frequent finger pricks.

II RELATED WORK

Modern health care system introduces new technologies like wearable devices or cloud of things. It provides flexibility in terms of recording patients monitored data and send it remotely via IOT. For this connection, there is need of secure data transmission .To transmit the data with privacy is the Moto of this paper. The proposed system introduces security of health care and cloud of things .System works in two major parts viz. storage stage and data retrieving stage. In storage stage, data is stored, updated for future use. In data retrieving stage, retrieve data from cloud.

The cloud server can share with authenticated user as per request. A patient with wearable devices continually updates his record every 5 or 10 min. In emergency mode, it updates for every 1min.The wearied device will send results to phone using Bluetooth connection or NFC technology. This can able to give to cloud server using GSM and 3G.

At cloud server, each patient is defines with unique address. So data at cloud can authenticate the right patient and provide the required request.[2]

Telemonitoring system via WBAN is evolving for the need for home based mobile health and personalized medicine. WBAN can able to collect the data acquired from sensor and record the output. This output results sent to controller wirelessly to health monitoring system. In this paper, Zigbee is used to in WBAN technology due to its guaranteed delay requirement for health telemonitoring system. Zigbee used in the communication.[3]

Afef Mdhaffar, Tarak Chaari, Kaouthar Larbi, Mohamed Jmaiel and Bernd Freisleben has explained low power WAN network to perform analysis of monitored data in health caring system. They have established WAN network for communication upto the range of 33m 2 at around 12 m altitude. Also they have demonstrated that power consumed by LoRaWAN network is ten times less than the GPRS/3G/4G.The IOT architecture has been given for step wise working for understanding of IOT .The main purpose of LoRaWAN is the energy consumption. The power consumption in idle mode for LoRaWAN is 2.8mA while in GPRS is 20mA.Hardware cost in LoRaWAN is 10doller while in GPRS is 50 dollar. Maximum data rate in LoRaWAN is 50kbps (uplink), 50 kbps downlink while in GPRS is 86.5kbps (uplink, 14kbps (downlink).These results gives the overall efficiency of LoRaWAN in the demonstration of IOT for health monitoring system. [6]

Mohammad M. Masud, Mohamed Adel Serhani, and Alramzana Nujum Navaz had given the measurement of ECG signals at various intervals and at different situations. They have considered energy aware, limited computing resources and lose network continuity challenges .For these challenges; mathematical model has been developed to execute each task sequentially. There are three approaches designed to work out the process .One is mobile based monitoring approach, data mining and third is machine learning approach [7]

Ayush Bansal , Sunil Kumar, Anurag Bajpai, Vijay N. Tiwari, Mithun Nayak, Shankar Venkatesan, Rangavittal Narayanan focuses on development of a system which is capable of detecting critical cardiac events. Using an advanced remote monitoring system to detect symptoms which lead to fatal cardiac events [8]

Hamid Al-Hamadi and Ing-Ray Chen gives trust based health IOT protocol that considers risk classification, reliability trust, and loss of health probability as design dimensions for decision making. Comparative analysis of trust based protocol and baseline protocols te check feasibility.[9]

Muthuraman Thangaraj Pichaiah Punitha Ponmalar Subramanian Anuradha."Digital hospital" term is introduced for hospital management. It enables automatic electronic medical records in standard. Also discusses with the implemented real world scenario of smart autonomous hospital management with IOT.[10]

III. DESCRIPTION OF THE PROPOSED SYSTEM

The system uses Arduino UNO microcontroller board based on ATmega328P. It is powered using USB or a external power supply between 7-12 volts.LM35 is an analog linear temperature sensor. Its output is proportional to the temperature (in degree Celsius).The Pulse Sensor is a plug-and-play heart-rate sensor for Arduino. The Pulse Sensor is clipped to fingertip and plugged in Arduino, it is then ready to read heart rate The pulse sensor will record pulses in bpm. Also, it has an Arduino demo code that makes it easy to use.The blood pressure has been calculated by considering on and of clock pulses of the output from sensor. The max value is obtained by dividing the ON clock pulses by 10. Similarly the min value is obtained by dividing the OFF clock pulses by 10.

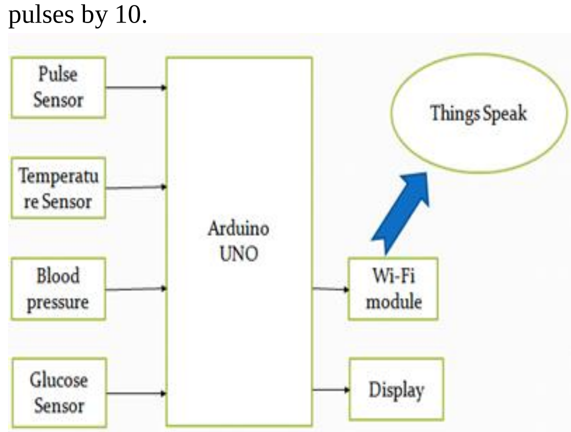

Fig 1 Proposed System

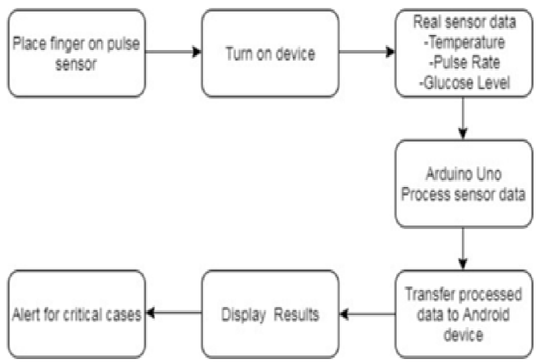

Fig 2 Flow Chart of health Monitoring System

IV HARDWARE DETAILS

A. Pulse Sensor:

The Pulse Sensor is a plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game and mobile developers who want to easily incorporate live heart-rate data into their projects. The essence is an integrated optical amplifying circuit and noise eliminating circuit sensor. Clip the Pulse Sensor to your earlobe or fingertip and plug it into your Arduino, you can ready to read heart rate. Also, it has an Arduino demo code that makes it easy to use. The pulse sensor has three pins: VCC, GND and Analog Pin. There is also a LED in the center of this sensor module which helps in detecting the heartbeat. Below the LED, there is a noise elimination circuitry which is supposed to keep away the noise from affecting the readings.

B. LM35 Temperature Sensor:

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The any external calibration or trimming to provide typical accuracies of C at room temperature and Cover a full 55C to 150C temperature range.

C. ESP 8266

The ESP8266 is a very user friendly and low cost device to provide internet connectivity to your projects. The module can work both as a Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making Internet of Things as easy as possible. It can also fetch data from internet using API’s hence your project could access any information that is available in the internet, th us making it smarter. Another exciting feature of this module is tha t it can be programmed using the Arduino IDE which makes it a lot more user friendly. The ESP8266 module works with 3.3V only, anything more than 3.7V would kill the module hence be cautions with your circuits.

D. INA216

It is a Current Sensing connected to an Arduino the INA219 is a high-side current shunt and power monitor with an I2C interface. The INA219 monitors both shunt drop and supply voltage, with programmable conversion times and filtering. A programmable calibration value, combined with an internal multiplier, enables direct readouts in amperes. An additional multiplying register calculates power in watts. The I 2C interface features 16 programmable addresses. The INA219 senses across shunts on buses that can vary from 0V to 26V. The device uses a single +3V to +5.5V supply, drawing a maximum of 1mA of supply current. The INA219 operates from –40°C to +125°C. The INA219 current sensor is used in the implementation of this digital Glucose meter.

V. Software Details

A. Arduino IDE:

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

B. ThingSpeak

ThingSpeak server is an open data platform and API for the Internet of Things that enables you to collect, store, analyse, visualize, and act on data from sensors. Introduction to ThingSpeak[12]. ThingSpeak is an open data platform for the Internet of Things. Your device or application can communicate with ThingSpeak using a restful API, and you can either keep your data private, or make it public. In addition, use ThingSpeak to analyse and act on your data.

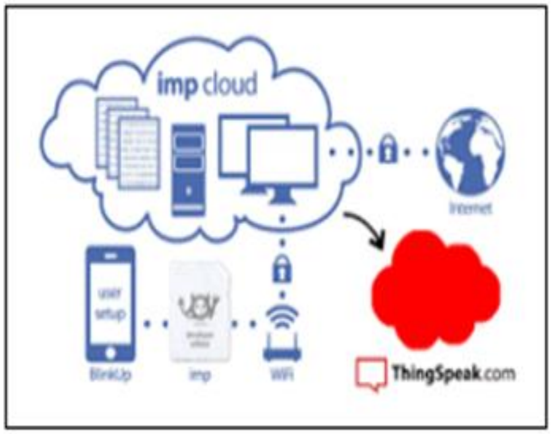

Fig 3 ThingSpeak App

VI. RESULTS

The output was given by the device according to the conditions set in Arduino. If the normal BPM value is set up to 100. If the BPM count is less than 100 the device will show the BPM a ell as temperature value of the person, but if the BPM exceed the normal value which is 100, the device will only show the BPM count. The output of the device is shown as below:

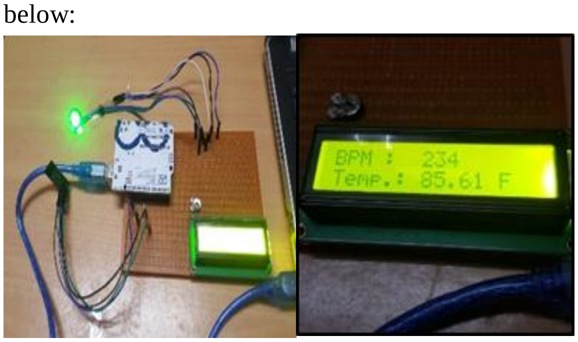

Fig 4 Hardware results and Real Time Reading

Fig 5 gives parameters that is temperature and pulse rate is shown online on IOT platform and simulation window of Arduino IDE of program.

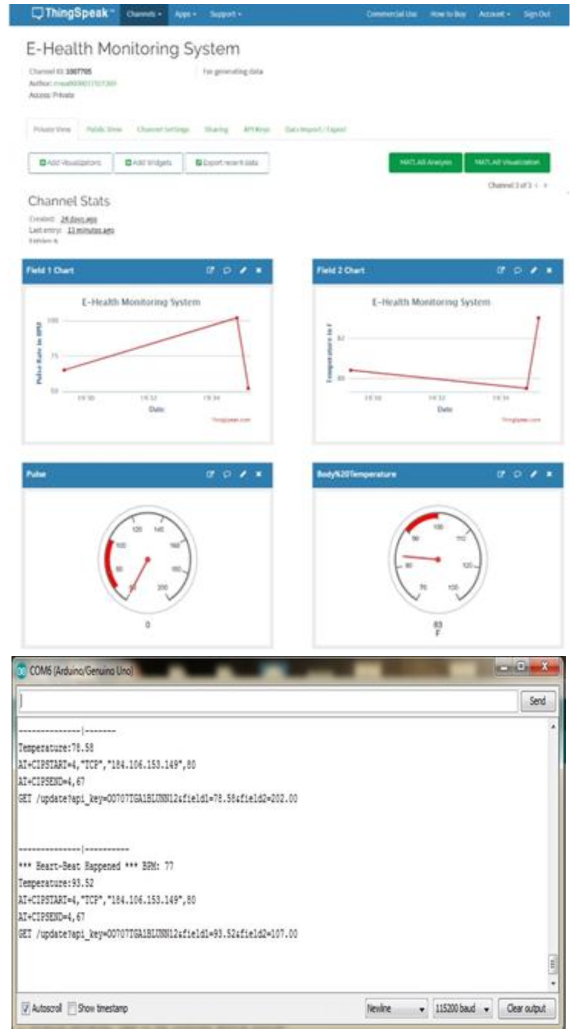

Fig 5 Software results

VII. CONCLUSION

The prototype designed functioned the way it as expected to with reasonable accuracy. The initial goal was to obtain the proper functioning of the device and to get some data to process no matter the accuracy of the result. Then the results were processed to obtain the required accuracy after the proper working of the device. The obtained values were compared with the values measured from commercial devices. The values were nearly accurate.

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