DESIGN OF IOT BASED SMART HEALTH MONITORING SYSTEM

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ABSTRACT: *Health is very important for human life. In this modern generation, occurrence of diseases became more compared to earlier so it became necessary to take care of health. In these days heart attack cases are increasing and also other diseases, so as to prevent these, real time health monitoring is needed. In this advanced age, event of sicknesses turned out to be more contrasted with before so it became important to deal with wellbeing. Nowadays corona cases are expanding and furthermore different sicknesses, in order to forestall these, ongoing wellbeing checking is required. In the current medical care framework, the patient requires successive visit to clinic to realize their ailment, which is certainly not a simple assignment to accomplish for patient. The proposal will give a wellbeing model which help to screen patient by 24X7 which maintains a strategic distance from the need to as often as possible visit clinic. The idea of Internet of Things is widely utilized in the field of clinical conclusion and medical services to screen the state of a patient. Here, the Healthcare Monitoring System with an IoT application structure that utilizes various sensors and thingspeak for monitoring the present condition of the patient which helps the doctor to provide the treatment according to the patient condition*.

Keywords: *Node MCU, Cloud Platform, DHT11 and Heartbeat sensor.*

I. INTRODUCTION

The design and deployment of a smart health monitoring system of a patient is our project's main goal. The sensors used here are placed on the patient's body to detect their temperature and heartbeat. Two extra sensors are installed at home to monitor the humidity and temperature of the patient's room. The derived values are subsequently sent to the base station through the cloud. These values are then retrieved by the doctor at any location from the base station. Thus, based on the temperature, heart rate, and room sensor measurements, the doctor may determine the patient's condition and take suitable treatments.

The number of healthcare monitoring systems in hospitals and other health institutions has dramatically expanded. In recent years, new technology-based healthcare monitoring systems have become a major source of concern for governments all over the world. Iot is made up of a variety of sensors and communication devices that are essential components of IoT-based health monitoring systems [6]. During the pandemic, IoT devices are being widely used in many locations to give viable solutions for personnel temperature detection, medical treatment, and quarantine management. However, because of the large volume of sensitive data stored in IoT-enabled apps, major security issues are unavoidable [9].

The previous decade has seen a lot of study into healthcare services and their technology advancements. To be more precise, the Internet of Things (IoT) has showed promise in linking a variety of medical equipment, sensors, and healthcare specialists in order to deliver high-quality medical treatment in a remote place. Patient safety has improved, healthcare expenses have decreased, healthcare services have been more accessible, and the healthcare industry's operational efficiency has grown exponentially. The current study provides an up-to-date overview of IoT (HIoT)-based technologies' prospective healthcare applications. The development of the use of the HIoT in tackling different healthcare concerns has been presented in this paper from the standpoint of enabling technologies, medical services, and applications [2].

II. LITERATURE SURVEY

In 2016, F. Corno et al, proposed a methodology that will enable to make the life a bit easier for the people with disabilities. The authors research activities on healthcare support systems mainly focus on people in their own homes or nurses and doctors in hospitals. A limited amount of research aims at supporting caregivers that work

with people with disabilities in assisted living facilities (ALFs). The authors work explores and applies the Internet of Things to the ALF context. In particular, it presents the design, the implementation, and the experimental evaluation of Care4Me, a system supporting the daily activities of assistants [17].

In 2017, Mengxuan ma et al, created a personal healthcare application using angel sensor. The author used amazon echo and developed it as a model for the blind. Amazon echo would read out the status of the patient without using the words which are often confusing. The model used to read out the temperature of the person and the room [16].

In 2020, Valsalan et al, presented a portable physiological checking framework, which can continuously monitor the patient's pulse, temperature, and other fundamental room data. Using Wi-Fi Module based remote correspondence, the author presented a nonstop checking and control instrument to screen the patient's condition and save the patient's information in the server. A remote health monitoring system based on IoT is presented, in which authorised individuals may access data stored on any IoT platform, and ailments are analysed by doctors from their respective places based on the values received [18].

In 2022, Najma Taimoor et al, proposed a methodology that will not only enable autonomous, automatic, and rigorous diagnosis of stealthy health conditions based on biological dependencies among various health conditions, but will also enable autonomous, automatic, and rigorous diagnosis of stealthy health conditions based on clinical characteristics. Healthcare 5.0, personalized healthcare services and their primary criteria, which are divided into three categories: dependability, resilience, and tailored healthcare. Importantly, the author has defined customised healthcare services as a link between a patient's numerous health issues and the features of their underlying biological process as well as the mechanical monitoring system that is connected with them [7].

III. PROPOSED METHODOLOGY

The heart rate of patients in hospitals is frequently monitored remotely. This gives you greater control and allows you to operate more rationally. One of the most important jobs that has been handled both historically and lately is detecting heart rate. While algorithms and analogue electronics solutions have been supplied and are well established, new technologies from the Internet of Things (IoT) present new options for ensuring online and cloud communication [19].

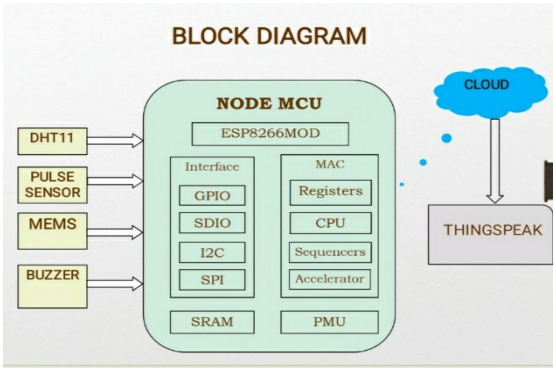

Fig. 1 Block Diagram of proposed system.

3.1 PIN Connections

Figure 1 shows the block diagram of our proposed device where Node MCU ESP8266MOD will be our microcontroller device. All the sensors are to be connected to the Node MCU. The ESP8266 module contains built-in Wi-Fi, which allows it to connect to a Wi-Fi router and collect data from sensors. The gadget should be linked to the IP address of the code hosting server for monitoring [19].

Fig. 2 NodeMCU ESP8266

Figure 2 shows the ESP8266 module. ESP8266 NodeMCU require 2.5V to 3.6V Operating Voltage, On-board 3.3V- 600mA regulator, 80mA Operating Current, 20µA Current during Sleep Mode. Power to the ESP8266 NodeMCU is supplied via the on-board Micro USB connector [20]. It can be easily programmed by using the Arduino IDE.

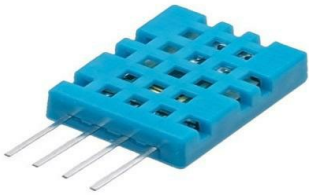

Fig. 3 DHT11 Sensor

DHT11 is a type of sensor which consists of capacitive humidity sensing element and a thermistor for measuring the temperature. The temperature range is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range is from 20 to 80 percent with 5 percent accuracy. It is in small size with operating voltage from 3 to 5 volts. It uses 2.5mA maximum current while measuring. This sensor has 4 pins VCC, GND, Data Pin and NC pin. The Vcc pin in DHT11 is connected to 3v3 pin of ESP8266, GND is connected to GND and the signal pin of DHT11 is connected to D5 pin of ESP8266. Figure 3 shows a DHT11 sensor.

Figure 4 shows the heartbeat or pulse sensor, where it's signal pin is connected to D4 of ESP8266 module and the pulse sensors Vcc and GND are connected to their respective pins in ESP8266. It is based on the principle of photo Phlethymography and it also consists of a light emitting diode and a detector.

Figure 5 shows the buzzer, whose positive terminal is connected to the D8 of ESP8266 module and the other is connected to GND. The buzzer is an electronic device which produces an audio signal. The way we have used this buzzer in our project is that if it produces an audio signal then the patient needs to be addressed immediately. We have programmed the node MCU such that if the body temperature goes above 100°F then the buzzer should produce an audio signal. Similarly, if the pulse rate goes above 100. The ADXL335 accelerometer employed in this study uses a silicon on insulator (SOI) MEMS technology and takes use of electrically distant differential sensor cells that are automatically connected. The differential capacitance varies as the detector frame moves. The change in capacitance is measured and converted into an output voltage using an on-chip electronic circuit [21]. Figure 6 shows ADXL335 accelerometer.

Fig 4 Heartbeat sensor

Fig 5 Buzzer

Fig 6 ADXL335 accelerometer

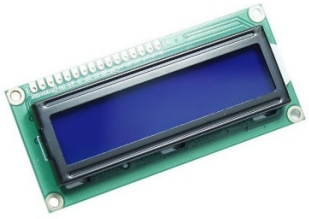

Fig 7 12c 1602 Serial lcd

The Vcc, GND pins of ADXL335 accelerometer are connected to their respective pins in ESP8266 module. Xout, Yout, Zout pins to D2, D4, D3 of ESP8266. Figure 7 shows the 12c 1602 Serial LCD, it will display 16x2 characters on 2 lines and white characters on blue background. Supply voltage is 5volts and it has adjustable

contrast. Its dimensions are 80x36x20mm. It can easily compatible. It displays all the measured values. The SCL and SDL pins of LCD are connected to D0 and D1 pins of ESP8266 respectively.

3.2 Cloud Interfacing

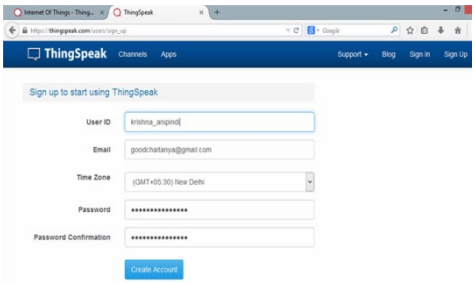

Fig 8 ThingSpeak Account Creation

NodeMCU used in this project needs to be connected to the Wi-Fi in order to export our data. The credentials like username and password of Wi-Fi should be entered in the program written in Arduino IDE. For the cloud storage we are using thingspeak. Figure 8 shows the thingspeak account creation. We have created a channel in the thingspeak and entered the channel id in the program where we are interfacing the thingspeak. ThingSpeak shows the data in the form of graph which is recorded simultaneously in our design and also being shown in the LCD.

IV. RESULTS AND DISCUSSIONS

The pulse sensor, temperature sensor, buzzer and MEMS are calibrated using the Node MCU. The sensor values are sent to thingspeak through the NodeMCU which is a wi-fi module. The lcd used here is for the patient to know the status of his health condition.

In this proposed methodology the results will be displayed both on the 12c 1602 serial lcd and the channel of thingspeak. The health condition of the patient can be predominantly known by his temperature and his pulse rate. Figure 9(a) shows the room temperature of the patient, figure 9(b) shows the position and heartbeat of the patient and figure 9(c) shows the temperature of the patient and humidity of the room in the thingspeak channel.

These data will be analysed by the doctors and checks patients' health condition at any place and at any time. This project helps the doctor to the know present health condition of the patient by using the cloud technology the data will be stored and shares to doctor and when it's an emergency the doctor will be notified by the buzzer and doctor can suggests the patient to take proper precautions to get back to the normal condition. This project will solve some of the necessary issues and helps the patient to be in normal state.

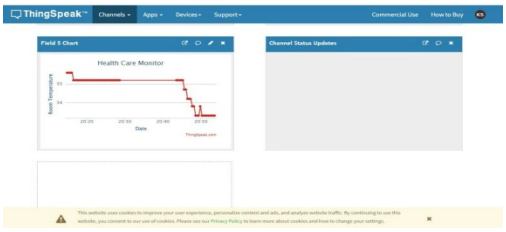

Fig. 9(a) Room temperature

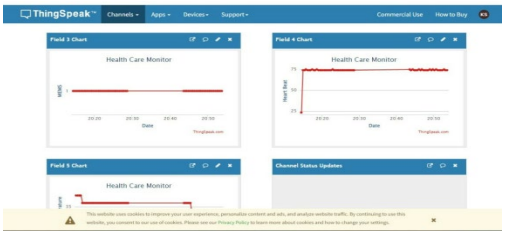

Fig. 9(b) MEMS and Heartbeat

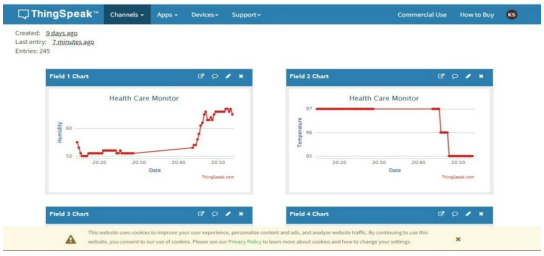

Fig 9 (c) Temperature and Humidity

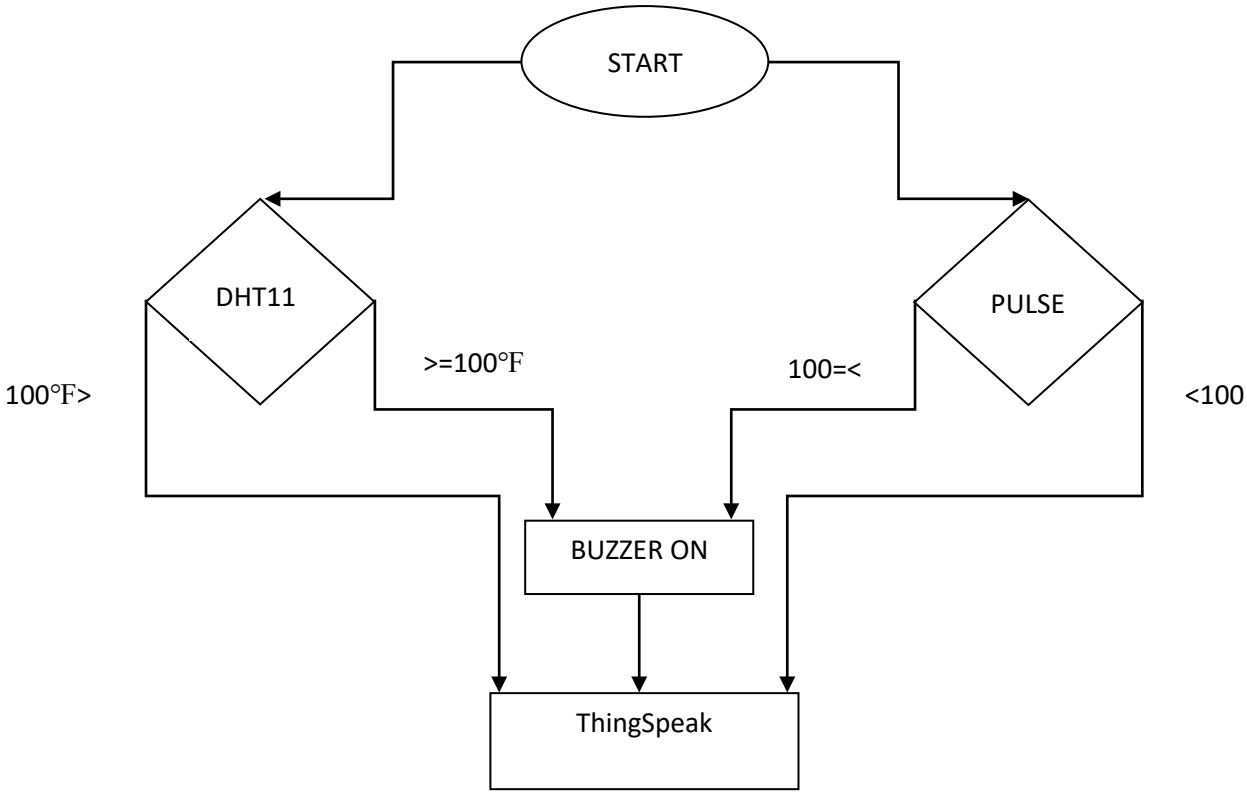

Fig. 10 Flow Chart

Figure 10 shows the flow chart of the project which clearly indicates that if the temperature goes above 100°F or pulse rate goes above 100 the buzzer gives an audio signal. Irrespective of buzzer on or off the data goes into the thingspeak channel and simultaneously displayed on LCD for the patient.

V. CONCLUSION AND FUTURE WORK

The proposed model is to ensure that we overcome the effect of recent pandemic where the whole world needed to maintain the physical distancing and at the same time health workers needed some extra assistance. By this project, we wanted to prove the importance of the smart healthcare monitoring system especially during this COVID-19 pandemic situation. Considering the need of requirements of the people and more importantly doctors one may focus on the development of the health monitoring systems and make it with more advance features in the future by adding GSM model, GPS, Bluetooth, Speakers, Gas sensors, sound sensors and other features which are going to be helpful for the people health condition. By incorporating a global positioning system into this device, the location information of a user may be gathered, which also aids in the safety monitoring of patients. The goal for future development is to create a mobile application that allows users to conveniently access history data or reports from within the application and can help the doctors to check the patient's daily routine.

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