IoT based virtual health assistant system using PHP

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***Abstract*—Internet of things is used as a communication module between the actuality and the electronic components. Access things from any part of the world without indiscipline of time. Generally, internet of things provides the internet connection to the sensors and gather the information from the sensed data, based on the data it will take decision accordingly. In this paper we have advanced a system which can monitor and calculate the air flow, pulse rate, temperature of the human if it exceeds the predefined limits, then a alert mail is sent to the concerned person using "PHP Mailer" website created over a platform on the internet.**

Keywords—Air flow, Internet of things, Responsive website, Heart rate, Arduino ethernet.

I. INTRODUCTION

In recent condition, we can realize that increasing rate of Covid-19 cases and the demand of the hospital beds and medical facilities even for the normal medical cases also there is no proper medical expert advice to the patients. This system is developed using internet of things and its related technologies like sensor modules. Internet of things have a capability to conceive a real experience around anywhere so that we can feel reality. To make it use in the real-world entity we have to feed the input and output to the things. Sensed data is transferred from the sensor modules to the internet.

Lot of analysis has been carried out in the area of remote health monitoring system where analysis is to build a continuously monitor the patient condition over the website and internet. Even though doctor is also can give instructions to the patients form anywhere over the website. In case of emergency the doctor is alerted using mail.

II. BACKGROUND & RELATED WORK

During the past few years, tremendous research work has been carried out on patient health monitoring system. Here, we shortly compile a few of the significant analysis in the area of health monitoring based on IoT.

In various papers they built a holdable patient health monitoring system which can be worn for continuous monitoring of patient under medication. He developed the module with less than 5% brink level so that the fault rate of sensed data is less. Maradugu Anil Kumar and Y.Ravi Sekhar [2] had made a model which can admit the abnormality in health condition and automatically alert the concerned doctor and emergency unit. Mohammed had sharped out that security is the important property in data transfer so that apparatus can relocate the important confidential data of patient through the internet with high security.

III. SYSTEM ARCHITECTURE

A. *Proposed System*

This proposed system has been divided into two sections hardware and software which applies in parallel for improved performance. The hardware component of a system is branched into two blocks as transmitter and receiver.

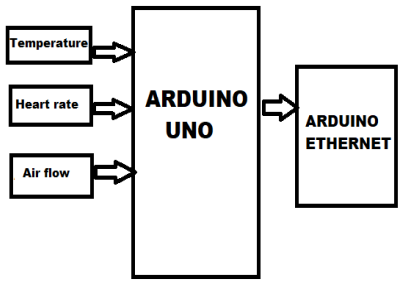

Fig.1. Block Diagram of Transmitter

First left side three blocks are the sensor modules which is going to sense the patient's data and it is connected to the Arduino Uno. In this section, sensors at one end are connected to the person who is suffered whereas another end is attached to the Arduino UNO. Then data is to pass on from the Arduino UNO ethernet to a PHP server for further purposes.

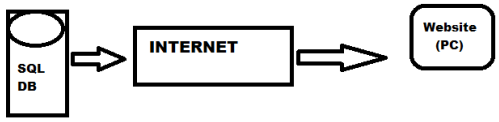

Fig.2. Block Diagram of Proposed System Receiver

Arduino ethernet transmits the sensed data and it is received at a database server. A concerned doctor can monitor all the health condition of the patient using a website. In receiver section, the data from the Arduino ethernet is uploaded to the PHP server which is handled using MYSQL database from the database the patient

information is imported to the website which is created using Html and PHP.

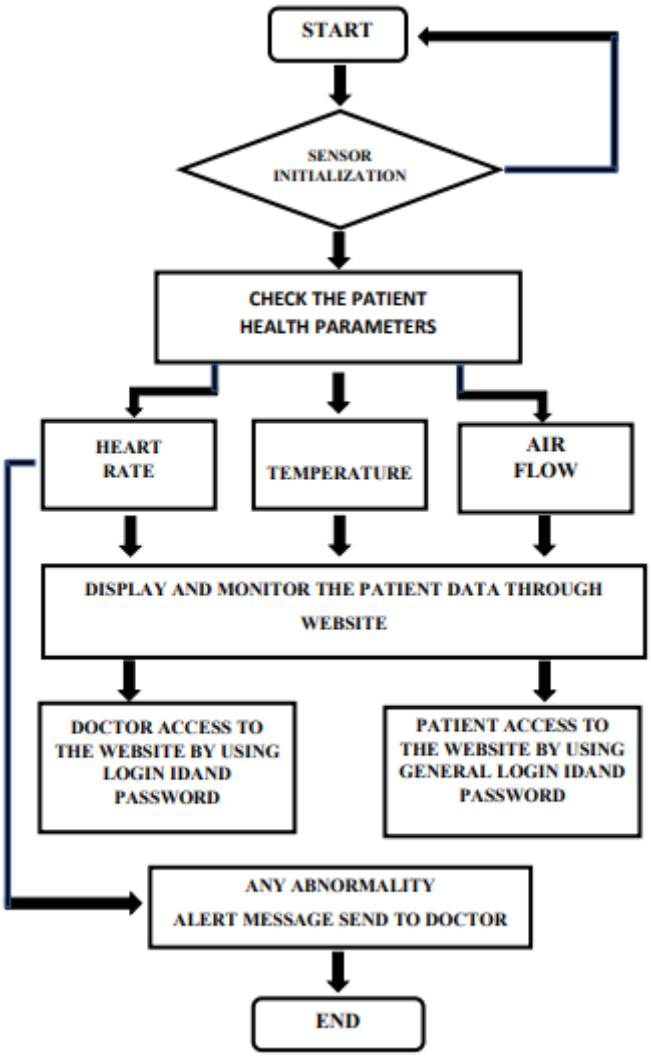

Fig.2. Flow Chart of designed System

IV. IMPLEMENTATION METHODLOGY

A. Hardware Definition

In intelligent medication system, following technologies and methodologies which will implement an effective and convenient environment for the functioning of the system:

- Arduino Uno
- Arduino ethernet shield
- Heart rate sensor
- Temperature sensor
- Airflow sensor

Each component we used is discussed in detail below:

I. Arduino Uno

Arduino is an easily accessible microcontroller based on free to use hardware and software and it has the ability to read inputs from the digital and analog sensors. Arduino Uno board subsist of 14 digital input and output pins, in which 6 is used for provoking PWM. To store the sensed data and other calculations it can be incorporate with flash memory of 32kb, USB is used as a serial communication device, ICSP header is accessible to combine it directly and stored data and temporary calculations can be reset by just pressing the reset button. Another aspect of ADC (Analog to digital converter) improves its importance with especially assigned pins (A0 to A5) which is capable of read analog data. 10-bit inbuilt ADC works it convenient for Arduino Uno to distinguish 1024 analog values. It can able to measure analog voltage values from 0 to 5 volts into various 1024 integer values.

II. Arduino Ethernet Shield

The Arduino ethernet module is an Arduino based internet provider board which contains the inbuilt wiznet ethernet interface module. 14 digital input/output pins, power jack, 6 analog inputs, an RJ45 connection, an ICSP header, a 16 MHz crystal oscillator and a reset button are available in the ethernet module.

Arduino ethernet contains inbuilt microSD card reader, which can be used to save files for serving over the network, which is usable through the SD library. Pin 10 is used for the wiznet incorporation, SS for the SD card is on Pin 4. Also, Pins 10, 11, 12 and 13 are assigned to interact with the ethernet module and in other ways, it should not be used. This cut down the number of listed pins to 9, with 4 applicable as PWM outputs.

The ethernet shield attached to an Arduino board in which prolong through the shield. This retain the pin layout perfect and grants another shield to be deformed on top. which can be made to save files and upload to the server through the network.

Fig.3. Arduino Ethernet Shield

III. Heart Beat Sensor

Heartbeat sensor basically measure the heart rate and contains a photodiode and LED. LED emanate light photons and it interfere through the skin which when strike with the circulate of the blood in our body, depending on the thickness of the blood circulating through veins of our body, that quantity of the light is reflected back. The light reflections will differ as blood pulses below skin past the light.

IV. Temperature Sensor

Here DTH22 sensor is used in our project to scale the warmth of the human body. DTH22 is also read exact temperature because of its finest aspect and it is also capable of scaling the humidity. The output voltage is precisely proportional to temperature value in degree Celsius. DTH22 does not lack any calibration to get a convenient and accurate output. The typical efficiency of DTH22 is $\pm 4^{\circ}$C at room temperature. The temperature ranges from -55 degree Celsius $_{to}$ $+150$ degree Celsius.

V. Airflow Sensor

This airflow sensor is made to sense airflow rate for a patient in demand of respiratory help. This sensor contains a flexible thread which is perfectly fitted behind the ears and a set of two prongs which are fits in the nostrils. Breathing is sensed and calculated by these prongs and it is highly sensitive. The movable breathing detector, senses, calculates, and displays in real-time values on breathing frequency and intensity. A LED indicates at critic levels of breathing.

Fig.4. Air Flow Sensor

B. Software Defintion

I. Arduino Uno Program

The coding part of Arduino microcontroller is completed using Arduino C programming with the help of Arduino IDE software. Arduino Uno module is used to program the microcontroller.

II. Proteus 8.0 ISIS Professional

The constructed circuit is simulated using Proteus 8.0 software which is a fundamental modelling software discovered by Labcenter Electronics. This software is basically created to simulate the microcontroller-based designs which incorporate animated components, sensors modules, electronic and electrical components simulation and microprocessor models.

C. Methodology

Sequence of process of the developed system is defined step by step in the following when the hardware is initiated.

Step 1: After the hardware is initiated, the ethernet module is connected to the already compiled and program uploaded Arduino Uno and the MYSQL database is created with different tables to store the patient data which are to be displayed to the website. The MYSQL database is virtual health assistant and the pre-programmed MYSQL password is "root".

Step 2: A patient need to login to see the health condition and the same data is displayed to the concerned doctor from that the doctor can give prescription to the particular patient.

Step 3: Authentication of ethernet status and is signaled on Arduino IDE display as "CONNECTING Wi-Fi." on first line and after the authentication process done, it is displayed by "CONNECTED." message on compilation terminal.

Step 4: After the configuration settings are completed, the system starts connecting to phpMyAdmin server database over the internet in which the server is predefined. After that, the system starts monitoring the heart rate level and temperature.

Step 5: Sensed value of the heart rate is displayed on the first line of a virtual terminal as "BPM: 72", whereas the scaled value of temperature is calibrated and processed in degree centigrade scale and it is displayed on the second line of the virtual terminal display as "Temp: 32 deg".

Step 6: During monitoring at every regular interval of time, sensor values are uploaded to the database server and the connection is also authorized again and again for improved performance. All the sensed data of patient is directed to the website using database server. So that the concerned doctor can view the heart rate, airflow and temperature of patient from anywhere in the world by login to the website with unique login ID and password.

Step 7: Incase heartrate and airflow of the patient measured by the sensor exceeds the predefined limit, then the system undoubtedly alerts the concerned doctor and emergency unit by mail thereby indicating the critical health situation of the patient to doctor.

V. SIMULATION AND RESULTS

A. Proteus Simulation

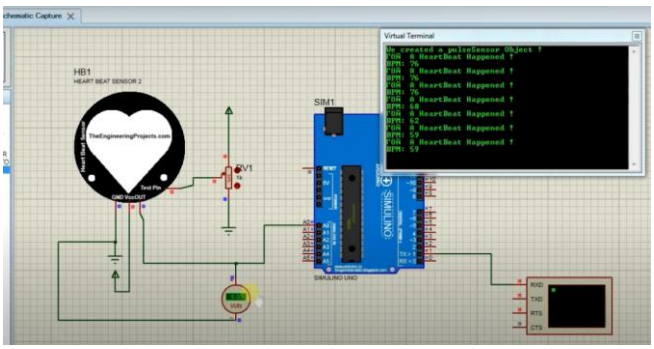

Fig.5. Simulation Results

(1) The heart rate sensor is connected to Arduino in Proteus and simulated.
(2) In this project, a 5V Dc supply is used as a power source power up the Arduino.
(3) The resistor is pointed as (R2) and the variable potentiometer is used to get the required gain value and output impedance. The signal obtains at the output, after a DC blocking capacitor.
(4) Analyzed sensor values on the virtual terminal on Proteus and corresponding data is sent to the Arduino ethernet wi-fi module for further processing.
(5) The temperature sensor is also connected and processed to obtain the required results in which the sensed data is fed to the microcontroller.
(6) The scaled readings from all the sensors are displayed on the virtual terminal.

B. Obtained Sensor values

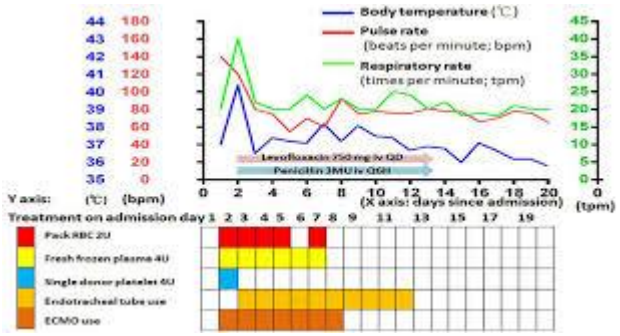

Fig.6. Sensor Values

In normal condition heart beat of a normal human varies from 60 to 100 BPM and the temperature ranges from 36 degree Celsius to 37 degree Celsius. If the sensor values exceed the predefined limit the alert mail is sent to the doctor and emergency unit.

C. Virtual Health Assistant Webpage

A virtual health assistant website is a peculiar collection of data provided by a sensor from the patients and it is displayed to an assigned doctor only not to the all doctors in a web browser. This website typically consists of many pages connected together in a logical fashion.

This website is created and hosted using HTML, CSS, and JS for frontend, MYSQL for backend and to connect the frontend and backend PHP is used. This website also helps doctors to restore patient history and provoke the monitoring process more comfortable for the medical unit. At first, we start with the login page, Therefore, each doctor has to login to monitor the patient by user name and password to make the system more secure.

Monitoring webpages are divided into many pages such as home page, patient profile, chatbot and video call page, login page, registration page and prescription page

Fig.7. Home Page

Home page as welcome page to all and has the various tab that contains about us, contact us and help pages.

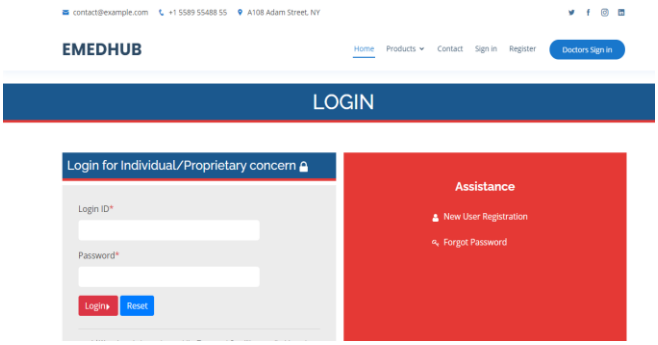

Fig.8. Login Page

Login and registration page this page used to login the particular patient to the details and to register a new patient for further medical queries.

Patient profile where the patients make an appointment, make a call with consent doctor, chat with the bot to clarify the medical doubts and maintain health records.

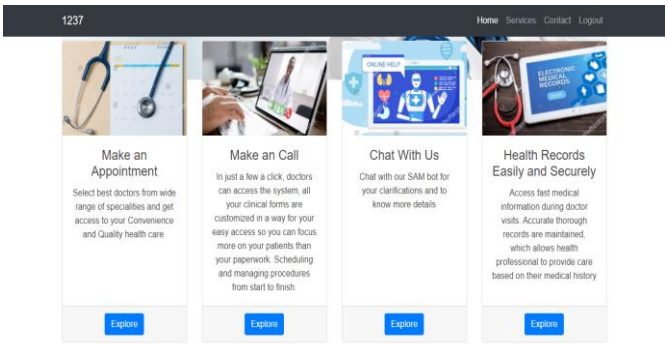

Fig.9. Patient Profile Page

Make an appointment this page will display a form to be filled by the patient and submit to make an appointment with the doctor for ordinary or general consultant. A doctor can fix his/her appointment time by checking their mails from the patients.

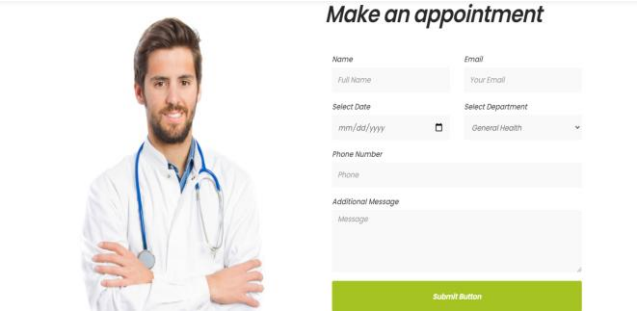

Fig.10. Make an Appoint Page

Medical prescription table used by doctors either to display the medical history or to insert new medical prescription of the particular patient. This is evaluated by the display, insert tab.

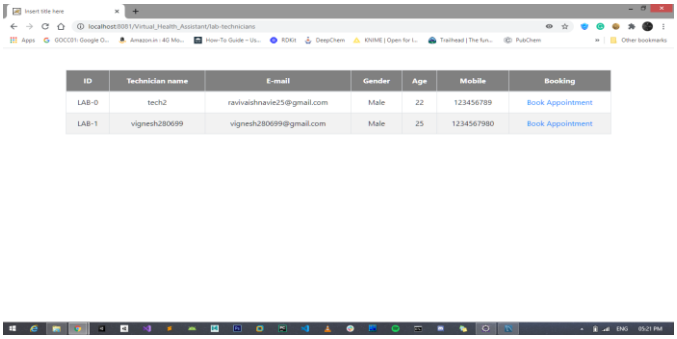

Fig.11. Patient details page

VI. CONCLUSION AND FUTURE SCOPE

The proposed system is constructed by keeping in mind to increase the safety of the doctors and the patient's health. This simulation is used to obtain the results and upload it in the database server and the website about the obtained results. In country like India, most of the cities are severely affected by COVID-19, hence healthcare organizations of the country want real-time, stable, steady, and accurate diagnostic results provided by the IoT devices that can be monitored and controlled remotely, whether the patient is in a hospital, home, or at any part of the world. Hence this device is very much helpful for the doctors to work safely. The main object of the system is to prevent the doctors from affected by any diseases and to establish the no physical contact between patient and doctor. They can monitor their patient health and other works in their atmosphere remotely and alerts the emergency unit in case of emergency or danger. This project has been designed to obtain the results of the simulation which are effective and transmitting data to long range in order to attain the proper result the hardware and software components needs to be effective that's why our proposed system is remotely handled. And this project is very much helpful to save the home quarantine patients and the doctors who work as a frontline warrior.

The future scope of this system is to make it completely wireless the sensor modules are connected to the Raspberry-pi and the given prescription and the data of the patient should be secured by encrypting and decrypting the data to make it more efficient.

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