Automatic Health Care Monitoring System

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Abstract— With tons of new healthcare technology start-ups, IoT is rapidly revolutionizing the healthcare industry. As elderly population increases day by day caretaking demands are also increasing. Hence patient health monitoring systems are gaining importance these days. This paper is based on monitoring of patients. we have designed the IoT Based Patient Health Monitoring System using ESP8266 & Arduino UNO. We have designed and developed a reliable, energy efficient patient monitoring system. It is able to send parameters of patient in real time. The system would be smart to intimate the patient's family members and their doctor about the patient's current health status and full medical information through the application, in case any medical emergency arises. The people in need of healthcare services find it very expensive this is particularly true in developing countries. This project is an attempt to solve a healthcare problem currently society is facing.

Index Terms- IoT in health care, patient monitoring, real time intimation, smart health monitoring.

I. INTRODUCTION

Health is always a major concern in every growth the human race is advancing in terms of technology. Like the recent corona virus attack that has ruined the economy of China to an extent is an example how health care has become of major importance. In such areas where the epidemic is spread, it is always a better idea to monitor these patients using remote health monitoring technology. So Internet of Things (IoT) based health monitoring system is the current solution for it. In previous methods, monitoring of patient can be done only by using different instruments for different parameters. So, we decided to monitor required conditions of patient by assembling different instruments in a single module. Nowadays IoT is the widely used technology. The growth of internet is tremendous and has been further extended to connecting things through internet. All devices are connected to one another with various smart technologies to create worldwide ubiquitous network called Internet of Things (IoT). We recorded the data of each sensor and uploaded the data into the server. In hospitals there are provisions for continuous monitoring of patients. Their ECGs, heartbeat…are continuously monitored. There is no provision to check the parameters when they return to home. And hence there is a chance that the disease may return again. Patient's data (temperature, heart rate, ECG, position) will be frequently measured and sent to server. Period of sending (say every 1 min) can be set. Monitoring person learns patient specific threshold. Say the regular body temperature of a patient is 37°c whereas one person feels feverish if his body temperature is 37.0˚c. By employing an averaging technique over a relatively long time, Observer can learn these thresholds for patients. Using Android Application in doctor's smart phone, doctor can view his patient's health status. When any of the parameter goes beyond the threshold value, he will get an alert notification.

II. HEALTH MONITORING SYSTEM

A. HISTORY OF HEALTH MONITORING SYSTEM

India's Ministry of Health was established with independence from Britain in 1947. The government has made health a priority in its series of five-year plans, each of which determines state spending priorities for the coming five years. The National Health Policy was endorsed by Parliament in 1983. The policy aimed at universal health care coverage by 2000, and the program was updated in 2002.

The health care system in India is primarily administered by the states. India's Constitution tasks each state with providing health care for its people. In order to address lack of medical coverage in rural areas, the national government launched the National Rural Health Mission in 2005. This mission focuses resources on rural areas and poor states which have

weak health services in the hope of improving health care in India's poorest regions. The health care system in India is universal. That being said, there is great discrepancy in the quality and coverage of medical treatment in India. Healthcare between states and rural and urban areas can be vastly different. Rural areas often suffer from physician shortages, and disparities between states mean that residents of the poorest states, like Bihar, often have less access to adequate healthcare than residents of relatively more affluent states. State governments provide healthcare services and health education, while the central government offers administrative and technical services.

Lack of adequate coverage by the health care system in India means that many Indians turn to private healthcare providers, although this is an option generally inaccessible to the poor. To help pay for healthcare costs, insurance is available, often provided by employers, but most Indians lack health insurance, and out-of-pocket costs make up a large portion of the spending on medical treatment in India.

On the other hand, private hospitals in India offer world class quality health care at a fraction of the price of hospitals in developed countries. This aspect of health care in India makes it a popular destination for medical tourists.

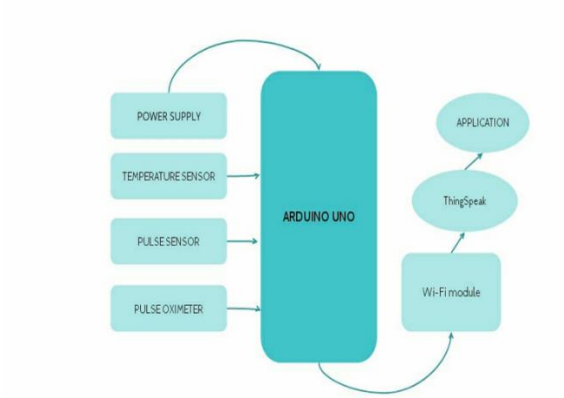
B. EVOLUTION OF IOT IN HEALTH SECTOR

Healthcare is one of the world's biggest economic challenges. The growing population is placing further strain on healthcare systems. With a growing aging population and the prevalence of chronic diseases across the world, there is an urgent need to find new ways to improve patient outcomes, increase access to care, and reduce the cost so that all segment of the society can afford a medical care. With the advancements in sensor technology & IOT, the ubiquitous availability of cellular technology like 3g & 4g, and falling costs of communication devices are opening up new channels for improving patient care and quality of life. Using seamless, continuous remote patient health monitoring, healthcare providers, insurance payers, and the government are looking to significantly alter how care is provided to patients, while reducing cost of care at the same time. In India particularly, IOT can also help in monitoring the functioning of the rural health care units, can make the skilled doctors available remotely and make the healthcare more affordable. Patients and healthcare providers both stand to benefit from IoT. Some uses of healthcare IoT are mobile medical applications or wearable devices that allow patients to capture their own health data. Hospitals adopt IoT to keep control on the location of medical devices, personnel and patients.

C. CONSTRUCTION

The proposed system consists of ESP8266 wifi module, Arduino UNO, LM35 temperature sensor, pulse sensor, pulse oximeter sensor and resistors. Firstly Connect Pulse Sensor output pin to A0 of Arduino and other two pins to VCC & GND. Then Connect LM35 Temperature Sensor output pin to A1 of Arduino and other two pins to VCC & GND. Connect the LED to Digital Pin 7 of Arduino via a 220-ohm resistor. Connect Pin 1,3,5,16 of LCD to GND. Connect Pin 2,15 of LCD to VCC. Connect Pin 4,6,11,12,13,14 of LCD to Digital Pin12,11,5,4,3,2 of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by connecting the 2.2K & 1K resistor. Thus the RX pin of the ESP8266 is connected to pin 10 of Arduino through the resistors. Connect the TX pin of the ESP8266 to pin 9 of the Arduino.

D. FIGURE



III. COMPOINENT DESCRIPTION

A. ESP8266:

The ESP8266 is a very user-friendly and low-cost device to provide internet connectivity to your projects. The module can work both as an 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 the Internet of Things as easy as possible. It can also fetch data from the internet using API's hence your project could access any information that is available on the internet, thus making it smarter. Another exciting feature of this module is that it can be programmed using the Arduino IDE which makes it a lot more user friendly.

B. 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 & 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 & 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 that is supposed to keep away the noise from affecting the readings.

C. ARDUINO:

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

D. LM35:

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 LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range.

E. PULSE OXIMETER SENSOR

Pulse oximetry sensors use red and infrared LEDs to measure deoxygenated and oxygenated hemoglobin. LED contamination can affect the oximeter calibration, resulting in inaccurate SpO2 readings below 80%.

IV. WORKING

IoT Based Patient Health Monitoring System using ESP8266 & Arduino. Pulse Sensor and LM35 Temperature Sensors measure BPM & Environmental Temperature respectively. The Arduino processes the code and displays it to 16*2 LCD Display. ESP8266 Wi-Fi module connects to Wi-Fi and sends the data to IoT device server. The IoT server used here is Thingspeak. Finally, the data can be monitored from any part of the world by logging into the Thingspeak channel. ThingSpeak provides a very good tool for IoT based projects. By using the ThingSpeak site, we can monitor our data and control our system over the Internet, using the Channels and web pages provided by ThingSpeak. Then create a new channel and set up what you want. The tutorial in the video below. Follow the video for more clarification.Then create the API keys. This key is required for programming modifications and setting your data. Then upload the code to the Arduino UNO by assembling the circuit shown above. Open the serial monitor and it will automatically connect to Wi-Fi and set up everything.

V. APPLICATION

The proposed system gets patient's body temperature, blood oxygen level and heart rate through respective sensors. The sensor data are converted into strings and passed on to the IoT server - ThingSpeak.

The data from the IoT server is fetched and dispalyed to the user in an application. As health care services

are important part of our society, automating these services lessen the burden on humans and eases the measuring process. Also the transparency of this system helps patients to trust it. When threshold value is reached, the alarm system that consists of application alerts the doctors with the measured value and he can act more quickly. The objective of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure.

CONCLUSION

In this paper, we have presented and proved the prototype for a health care monitoring system that guarantees monitoring of heart rate, blood oxygen level and temperature using the sensors. we have the prototype which can help with the prediction of any kind anomaly in the patients' health by comparing the parameters which we have programmed it can be accessed through mobile application anywhere around the world. The proposed system can be set-up in the hospitals and massive amount of data can be obtained and stored in the online database. The patient can check their health status anytime from the comfort of their homes and visit hospitals only when they really need to. The system can be further improved further by adding artificial intelligence system components to facilitate the doctors and the patients. The data, consisting medical history of many patients' parameters and corresponding results, can be explored using data mining, in search of consistent patterns and systematic relationships in the disease. For instance, if a patient's health parameters are changing in the same pattern as those of a previous patient in the database, the consequences can also be estimated. If the similar patterns are found repeatedly, it would be easier for the doctors and medical researchers to find a remedy for the problem.

REFERENCES

[1] Lakmini P. Malasinghe, Naeem Ramzan and Keshav Dahal, "SpringerLink", Remote patient monitoring: a comprehensive study, October 26, 2017.

[2] Margaret E Kruk, MD, "THE LANCET", Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries, September 5, 2018.