



# International Journal of Innovative Research in Computer and Communication Engineering

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## Smart Healthcare System for Cardiovascular Patients

B. Ilakkiya<sup>1</sup>, G. Alagu Deepika<sup>2</sup>, P. Naveen Prasath<sup>3</sup>, M. Jothi<sup>4</sup>

Assistant Professor, Department of CSE, RVS College of Engineering and Technology, Coimbatore,  
Tamil Nadu, India<sup>1</sup>

UG Student, Department of CSE, RVS College of Engineering and Technology, Coimbatore, Tamil Nadu, India<sup>2,3,4</sup>

**ABSTRACT:** Improving efficiency of the healthcare system is one of the most challenging goals for today's society. The Internet of Things (IoT) is re-designing modern health care in which objects are sensed and controlled remotely. Patient's physiological information is managed and recorded for long time using wearable sensors. This system is expected to reduce costs, increase the quality of life, and enrich the user's experience. According to World Health Organization standard, 60% population of India is affected by chronic and cardiovascular diseases. Our healthcare system will reduce the headache of patients to visit the doctor periodically. In our system, the wearable IOT device embedded with sensors like Heartbeat sensor, temperature sensor and electromagnetic sensor will be given to the patient and the data are recorded by the sensors are continuously monitored and stored in cloud which can be viewed by the doctors in hospital. If the data sensed becomes abnormal, immediate alert is given to the doctors. This system is expected to reduce cost, increase the quality of life and enrich the users experience.

**KEYWORDS:** IoT, cloud, healthcare, wearable sensors.

### I. INTRODUCTION

The Internet of Things (IoT), a new technology connects physical objects with the help of internet. The IoT has different applications in smart cities, healthcare, logistics, and industrial control. Intel Edison development platform is very useful to design IoT and wearable computing products. It has 20 digital inputs, 6 analog inputs, 1 UART and 1 I2C. It has in built Wi-Fi and Bluetooth. This IoT platform provides device to cloud communication. Cloud is a foundation tool to collect, store and process the data. The electrical activity of the heart is measured in the waveform using ECG sensor. Pulse sensor is optical heart rate sensor which amplifies the signal and cancels the noise. The Intel architecture provides benefits such as reduced hospital stays, lower cost, and improved self-management of health conditions, timely, affordable and easy access to care anywhere and anytime when it is needed. The existing in office care is very costly. New emerging systems are more efficient for management of remote monitoring of patient's physiological parameters is major application of IoT in healthcare sector. The use of wearable devices provides greater flexibility for the elder people to monitor their health at home with less hospital related infections. According to WHO, many people die due to chronic and cardiovascular diseases. IoT provides immediate access to doctors and hospitals by measuring and processing vital signs of patients. This helps in reducing the mortal rate caused due to heart failures and strokes. Biomedical sensors measure the human body's heartbeat, blood pressure, pulse and ECG. In this study, we use the Intel Edison as an IoT device to process patient's vital parameters.

Intel Edison development platform is very useful to design IoT and wearable computing products. It has 20 digital inputs, 6 analog inputs, 1 UART and 1 I2C. It has in built Wi-Fi and Bluetooth. This IoT platform provides device to cloud communication. Cloud is a foundation tool to collect, store and process the data. The electrical activity of the heart is measured in the waveform using ECG sensor. Pulse sensor is optical heart rate sensor which amplifies the signal and cancels the noise. The Intel architecture provides benefits such as reduced hospital stays, lower cost, and improved self-management of health conditions, timely, affordable and easy access to care anywhere and anytime when it is needed. The existing in office care is very costly. New emerging systems are more efficient for management of chronic disease patients.

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## II. LITERATURE REVIEW

IoT based healthcare applications will have large impact on global economy by 2025. There are different applications of IoT in healthcare such as Glucose level sensing which measures blood sugar level using non-invasive techniques. Body temperature sensors are responsible for temperature recordings and transmission. Oxygen level monitoring measures oxygen percentage in blood using noninvasive method. Home monitoring is a method that can help health systems work more closely with physicians and patients. It is estimated that many elder persons are suffering from chronic illnesses and may benefit from a telemedicine solutions. The existing remote monitoring solutions have higher cost and complexity. A newer advanced solution reduces the cost compared to traditional delivery models. Every year around 17.3 million people die due to cardiovascular diseases and it will increase by 2030. Healthcare Statistics. Many monitoring devices that display the patient's physiological data are present in the operating rooms. But there are instances where the doctor is not available in case of an emergency; also the data cannot be shared remotely with other specialized doctors and the family members. The existing solutions are of large size, very expensive and needs lot of wires. Several communication protocols that are used between gateway and cloud include HTTP, CoAP, MQTT, and XMPP. HTTP is not perfect for IoT because it is not offering predictable latency and it depends on polling to detect state changes.

## III. SYSTEM COMPOSITION

### HARDWARE

- Arduino nano
- Bustick
- ESP 8266
- Heart beat sensor
- Magnetic sensor
- Temperature sensor

### SOFTWARE

- Python idle
- Arduino code

### I. HARDWARE IMPLEMENTATION

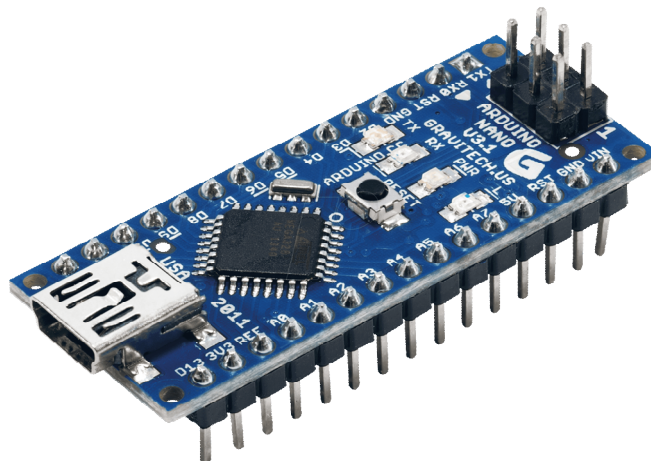


Figure 1: Arduino Nano

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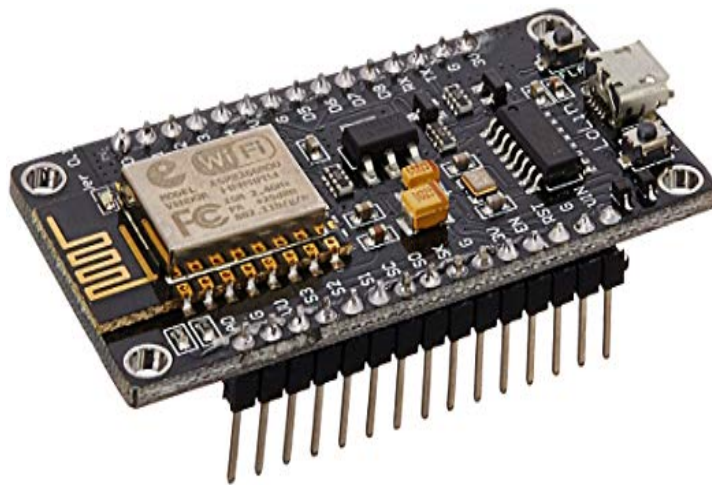
(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 2, February 2019

Arduino nano is a small complete and breadboard friendly board based on the ATmega328P. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. In our project it is used to convert the analog data from patient body to digital signals.

## ESP8266



The ESP8266 is a WiFi microchip with full TCP/IP connections. This small module allows the micro controllers to connect to a WiFi network. A general purpose input/output (GPIO) is an uncommitted digital signal pin on an integrated circuit is controllable by the user at runtime.

## Heartbeat sensor:



megaeshop.pk

The heartbeat sensor is based on the principle of photo plethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

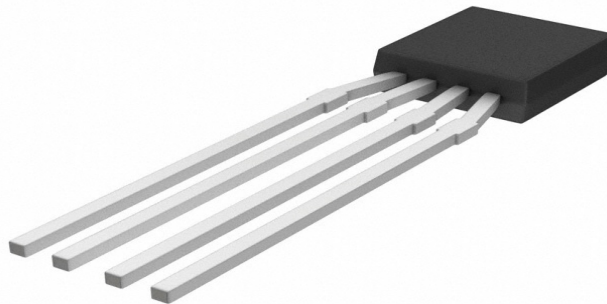
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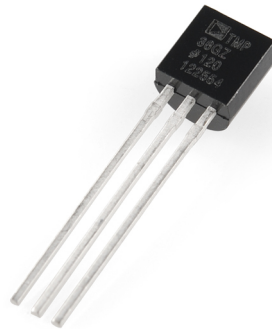
Vol. 7, Issue 2, February 2019

### MAGNETIC SENSOR :



TI's magnetic Hall effect sensors are known for robust durability and dependable operation for any position sensing application. Whether simply detecting the closing of a lid or performing complex motor commutation and precise position measurement, Hall effect sensors will reliably and accurately sense the position in your system.

### TEMPERATURE SENSOR:



Digital output sensor usually contains a temperature sensor, analog-to-digital converter (ADC), a two-wire digital interface and registers for controlling the IC's operation. Temperature is continuously measured and can be read at any time. If desired, the host processor can instruct the sensor to monitor temperature and take an output pin high (or low) if temperature exceeds a programmed limit. Lower threshold temperature can also be programmed and the host can be notified when temperature has dropped below this threshold. Thus, digital output sensor can be used for reliable temperature monitoring in microprocessor-based systems.

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## II. SOFTWARE IMPLEMENTATION

Python idle:



IDLE (short for integrated development environment or integrated development and learning environment) is an integrated development environment for Python, which has been bundled with the default implementation of the language since 1.5.2b1. It is packaged as an optional part of the Python packaging with many Linux distributions. It is completely written in Python and the Tkinter GUI toolkit .

ARDUINO CODE:



Arduino IDE is a special software running on your system that allows you to write sketches for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language.

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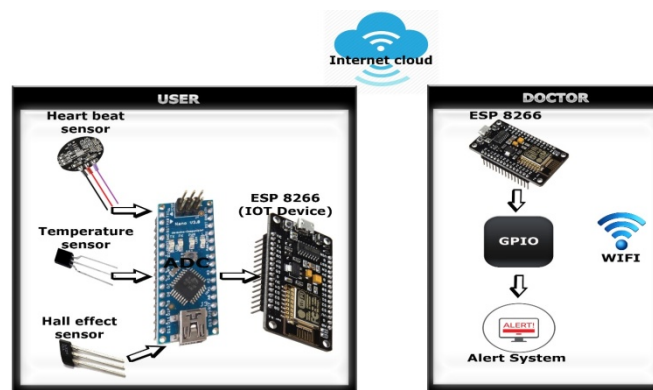
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Vol. 7, Issue 2, February 2019

### III. EXISTING SYSTEM

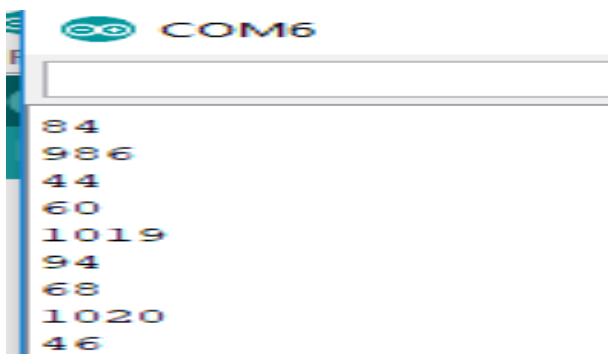
The present system gives only hospitalized treatment and monitoring of patients and also patients need to suffer continuously with the wires from the Hardwares which are meant for treatment. After the treatment, there is no interaction between the Doctor and patient. Only healthy lifestyle advice -script is given to patient.

### IV. PROPOSED SYSTEM



Our paper briefly describes about the monitoring system of patients and alert system of doctor. In our smart healthcare system, we have created a wearable IOT device through which we can sense and get the data from patients. In this IOT device, we are using three main sensors namely Heartbeat sensor, Temperature sensor and hall effect sensor. With the help of these sensors we can detect the patient when they get the symptoms of heart attack. When the heart attack or stroke is confirmed by the sensors immediate response is sent to the hospital through our ESP8266 chip. There the doctor will get the alarm sound which will be given by our IOT system present at the hospital. After that the doctor will check the location of the patient through the GPS present in his mobile.

### V. RESULT



```
void loop() {  
    temp = analogRead(tempPin);  
    // read analog volt from sensor and save to variable temp  
    temp = temp * 0.48828125;  
    // convert the analog volt to its temperature equivalent  
    Serial.print("TEMPERATURE = ");  
    Serial.print(temp); // display temperature value  
    Serial.print("°C");  
    Serial.println();  
    delay(1000); // update sensor reading each one second  
}  
  
#define PROCESSING_VISUALIZER 1  
#define SERIAL_PLOTTER 2  
  
// Variables  
int pulsePin = 0;  
int blinkPin = 13;  
int fadePin = 5;  
int fadeRate = 0;
```



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```
void setup() {  
  pinMode(ledPin, OUTPUT);  
  pinMode(interruptPin, INPUT_PULLUP);  
  attachInterrupt(digitalPinToInterrupt(interruptPin), test, CHANGE);  
  Serial.begin(9600);  
}
```

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