PATIENT HEALTH MONITORING SYSTEM

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Abstract - Nowadays automation using wireless communication has made the monitoring systems more smart and automated. The use of wireless communication has made the monitoring remote parameters and conditions easier. In medical domain, monitoring the patients health play an important role in diagnosing and giving appropriate treatment. In the existing systems patients are monitored using bedside monitoring stations with wired sensors, which makes the patients to be periodically monitored by the doctors or nurses. In some situations it becomes hard for hospitals to frequently check patients conditions. Continuous monitoring of patients in ICU is not possible. In this study, a system is designed to continuously monitor the Electrocardiogram (EeG) and other vital parameters. This data is displayed in a website that can be accessed only by authorized personnel. This paper describes system which uses sensors to measure various parameters of the patient like temperature and ECG, sends it to cloud based server with the help of ESP8266 module. The main task of this system is to update the data to the database and alert the doctors for any emergency . By determining the patterns in the parameters seen, nature of disease can be easily predicted. The paper mainly focuses on the system design and the algorithm used to accomplish the task. The obtained results are shown in this paper.

Keywords: ECG, Arduino, ESP8266, Internet of things, Healthcare applications.

1. INTRODUCTION

Health is one of the big challenges faced by humans in modern society. The healthcare has drawn considerable amount of attention nowadays. The prime goal is to develop a reliable patient monitoring system so that the healthcare professionals can take care of the patients. Internet of Things is the networking of devices, vehicles and other items embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data. Esp8266 and IoT can be used in monitoring patient's health parameters. The unexpected occurrence in patient's health are monitored using IoT. In this paper specialized sensor is used to monitor patient's temperature and ECG. One of the key learning platforms for IoT is Esp82688. The combination of Node MCU and IoT becomes a new innovation technology in healthcare system. Node MCU collects data from sensors and then it transfer to cloud with the help of Esp8266.

Cloud Computing is a general expression for any technological service provided through the Internet. Cloud computing provides compatible and on-demand network access for numerous computing resources such as networks, systems, applications, and services. Moreover, cloud computing are using recent and flexible methods to provide and manage for information technology services with minimal management effort and cost. Cloud computing technology has several advantages such as flexibility, highly automated, low cost, fast services providing, and a huge storage capacity. The Cloud's allows customers to build, test, and deploy their applications on servers using different infrastructures and various operating systems.

The functions of various components are given below :

ESP8266:

The ESP8266 WiFi Module has a TCP/IP protocol stack integrated in it that can give any microcontroller access to users WiFi network and it is a self contained SOC . The ESP8266 is capable of either offloading all Wi-Fi networking functions from another application processor or hosting an application. Each ESP8266 module comes with AT command pre-programmed and set firmware, meaning, user can simply hook it up to Arduino device and get about as much WiFi ability as the WiFi shield offers .The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. it has 2.4 GHz Wi-Fi, 16 general-purpose input/output, 10 bit analog to digital conversion, Serial Peripheral Interface ,serial communication protocol, UART and pulsewidth modulation (PWM).

Temperature Sensor(LM35) –

It is an IC sensor that is used to measure temperature with an output voltage linearly proportional to the Centigrade temperature. The LM35 sensor has an advantage over linear temperature sensor, as the user has not to make the conversion of Kelvin to Centigrade. This is major significance of LM-35 that it calibrate directly in Celsius and it is also suitable for remote
applications. It has better efficiency than thermistor

Fig 1 : ESP8266 Module

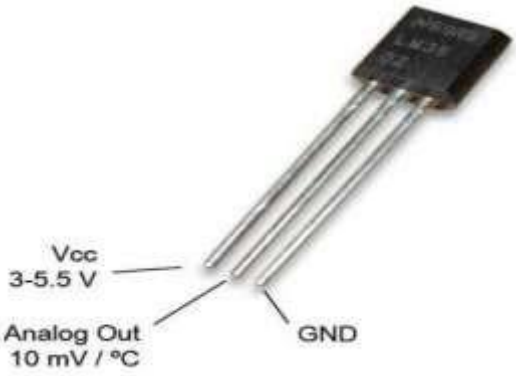

Fig 2 : LM35

Pulse sensor –

The pulse sensor has two sides, on one side the LED is placed along with an ambient light sensor and on the other side we have some circuitry. This circuitry is responsible for the amplification and noise cancellation function. The LED on the front side of the pulse sensor is placed over a vein in our human body. This can either be ones finger tip or ear tip, but it should be placed directly on top of a vein. Now the LED emits light which will fall on the vein directly. The veins will have blood flow inside them only when the heart is pumping, so if we monitor the flow of blood we can monitor the heart beats as well. If the flow of blood is detected then the ambient light sensor will pick up more light since they will be reflected by the blood, this minor change in received light is analysed over time to determine our heart beats.

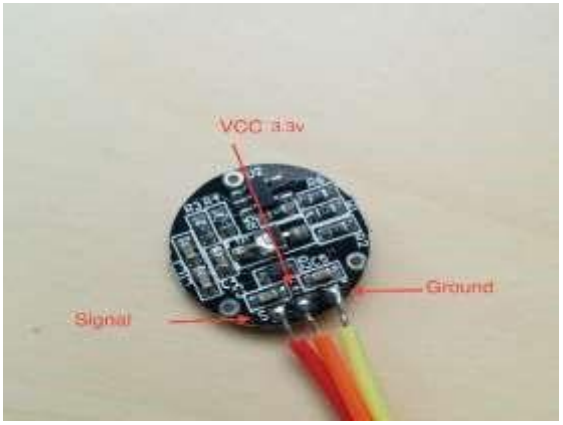

Fig 3 : Pulse Sensor

Electrocardiogram (ECG):

The electrocardiogram (ECG) is the book of heart's electrical activity. Heart muscles contract and relax by electrical stimulation, known as excitation or activation. These muscles are electrically charged when at rest and they get contracted by depolarizing the charge. ECG [10] is the graph of these electrical signals in heart. It gives the information about heart rate and rhythm of heart, and the volume or mass of the chambers of heart. There are several methods for determining this heart rate. In this paper we have used the IC ad8232.

The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement. This design allows for an ultralow power analog-todigital converter (ADC) or an embedded microcontroller to acquire the output signal easily..

Fig 4 : AD8232

2. IMPLEMENTATION :

System Design :

The health Monitoring system goal is to monitor the various health parameters of the patient , and updating those parameters on the website used so that any authorized person will have access to the patients data , and if the parameters go

below the threshold level the buzzer will be turned on indicating that there is an emergency. This is achieved by displaying the the information on an IOT platform ThingSpeak. Here we have designed a separate sensor node for obtaining heartbeat value as well as Body temperature value. We have mounted this sensor nodes on bands with the help of which we can place this sensor nodes on their respective position i.e on wrist for calculating pulse rate and on upper left arm for calculating body temperature. First step is to make an account on the ThingSpeak platform, which generates an unique ID for the user thus providing security to the patients data. The next step is to collect the patients data using the sensors.

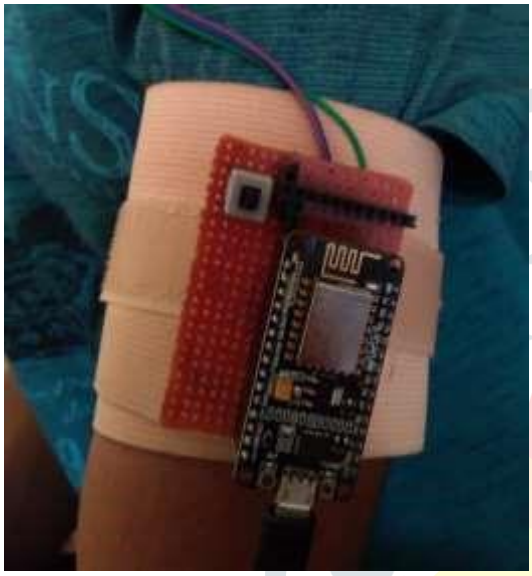

Fig 5 : Sensor Node to Sense Temperature

The pulse sensor is attached to finger of the patient and temperature sensor under the armpits of the patient. The data received from the sensor is relayed to the node MCU. The output of the pulse sensor is analog so we connect this to Analog pin of node MCU and as node MCU has inbuilt ADC we do not need to connect external ADC to convert this output into digital form

The information then received by the node MCU through A0 pin of node MCU, then this data is further sent to the IOT based platform ThingSpeak.

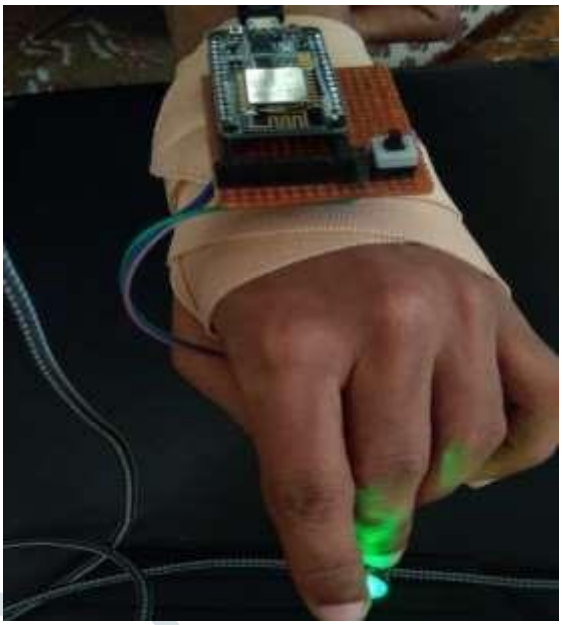

Fig 6 : Sensor Node to Sense Pulse rate

The data thus received on the unique account is displayed using the various inbuilt function of the platform.

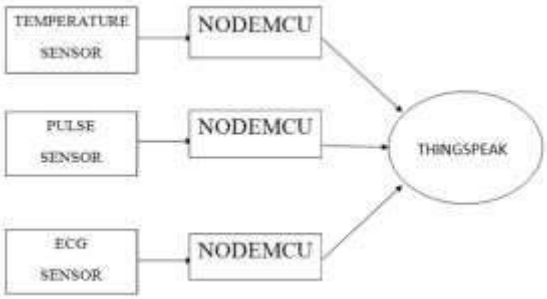

Fig 7 : Block Diagram

3. ALGORITHM

For easy purpose, Arduino IDE is needed in order to code the program and for the communication with ECG machines and updating website database. Altogether the purpose of the algorithm, written in Arduino IDE, is to update the website and alert the authorized individuals for any emergency.

Following Steps are Performed while implementing this system :

I. Import all the libraries and modules required for serial communication.
II. Each sensor node will sense their respective values for which they are deployed.
III. Obtain the Pulse Rate , ECG and Body temperature of the patient.
IV. These obtained values will be displayed on serial monitor of Arduino IDE and will also be uploaded onto Thingspeak.

V. Check if all the parameters are in the normal range.

VI. If there is some abnormality in the Parameters then send data to Things speak.

VII. If the Parameters are in normal range then the monitoring Continues.

4. RESULTS

Health care system is practically implemented and the results are obtained. Each sensor node sent its data to thingspeak and they were plotted in different fields of thingspeak . Photos of those parameters are attached below.

Any person with authorization can view this health platform and look at these essential parameters of the Fig 4.2 show the terminal diagram that finding the heart beat from the input sample files and updating the database of website.

Fig 8 : LM35 Output on Thingspeak

Fig 9 : ECG Signal Obtained

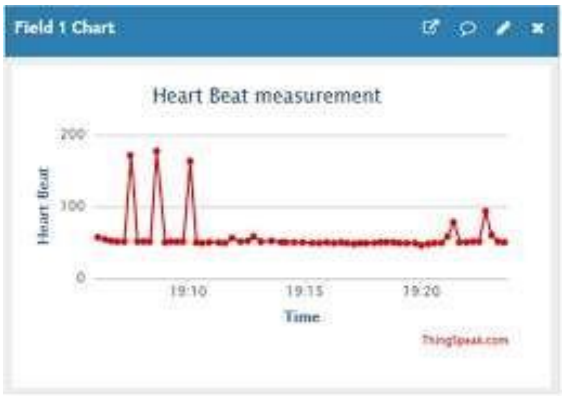

Fig 10 : Pulse Sensor Output on Thingspeak

5. FUTURE SCOPE

A large amount of data can be collected using this system. This colossal amount of data, consisting medical history of many patients' parameters and corresponding results, can be explored using signal processing techniques and data mining, in search of consistent patterns and systematic relationships in the disease. This could be a breakthrough in the field of medical research. Simply, the researchers provided with actual results which make their study easier. Additionally, they can also predict the nature of disease and take some preventive measures in advance. 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 same patterns are repeatedly confirmed, it would be easier for the medical personnel to find a remedy.

6. CONCLUSION

The system is superfine in rural areas as there would be no need for the patients to get their continuous follow-up. User friendly and bridges gap between doctor and patients. Applicable in every hospitals. It can be used at the time of emergency. Intensive care can be possible.The system speeds up and extendes the communication coverage to increase the freedom for enhanced patients quality of life. It gives immediate information to the responsible person. Easy to monitor in case of emergency and also helps in reducing the death percentage in accident. Message to responsible person means immediate aid can be provided.

7. REFERENCES

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