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## IoT Based Patient Health Monitoring System

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### ABSTRACT

Health-related issues are considered as one of the most problems now a days that will affect human life span. Avoidance of healthcare monitoring using negatively leads to many aspects. Among the extensive applications enabled by the net of Things (IoT), digital health care could be a mainly essential one. Internet of Things (IoT) provides a replacement life to the healthcare field. one amongst the higher ways is where the doctors are ready to certainly and quickly use the relevant patient information through the assistance of internet of things to require suitable actions. This tremendously improves the standard of knowledge and also the patient care within the Medical field. So, IoT provides a platform for monitoring and storing data of the human health. The proposed system presents the private healthcare system that are both flexible and scalable. Making use of embedded wearable sensors, the system monitors the health parameters dynamically. The acquired data is transmitted to the Arduino UNO. This analyzed data is stored on cloud for scalability and suppleness purpose. Results of the analysis are then automatically sent to the doctor when a critical condition occurs. The patient's health data's are monitored by IoT if any value is abnormal means suddenly E-Mail or SMS intimation will send to user.

Keywords: Patient Health Monitoring System, Sensor technology, IoT.

### Introduction

Many patient's loss their lives due to unawareness and negligence of the doctor about the critical condition of the patients. this is often because doctor cannot carry on monitoring the patient continuously. So there's a right away need of a system that keeps on checking the status of the patients continuously and also the doctor is updated and if there's any variation in his condition i.e. if the condition becomes critical, the doctor is alerted in order that he can treat his/her patient immediately. this may avoid loss of the many lives and can save doctor's time. This paper presents a proposed project which uses temperature sensor and rate sensor to live temperature and pulse, which is a vital parameter for a patient in order that the doctor will monitor and might take immediate actions directly if he finds any abnormality within the patient's heart beat and temperature. within the proposed system, the node from the temperature sensors and heart beat sensors are attached to the patient's body that finds the temperature and heartbeat of the patient and is fed to the microcontroller. The microcontroller used is Arduino UNO. The Arduino UNO processes the info and also the data is stored on database. These data are stored within the database. The doctor can access these data from the opposite side. IoT is implemented to share these health information's with the doctor.

### Literature Survey

Tao et. al(2009) developed a wearable sensor system to observe the movements of the patients. The system was calibrated to a intensity but 5percent with the aim of minimizing the error rate of the captured data. Stefano et. al(2012)proposed a detection system to watch the move- ments of patients which recognizes a drop and automatically sends letter of invitation for help to the care takers. Gennaro et. al(2012) developed a private health diagnosis supported the symptoms of the patient. a large amount of collected data is employed to research the disease and risk of the patients. Franca et. al (2012) has discussed that the innovations of the new gener- ation systems are the event of continuous monitoring features for the patient and also the

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improvement of workflows and productivity of medical personal. There has been emphasize on the varied wireless technologies and therefore the advantages of using those technologies for faster communication. eHealth Service Support In IPv6 Vehicular Networks by Imadali S et al(2012) This paper provides an IPv6 vehicular platform which integrates e-Health devices and allows sending captured health-related data to a private Health Record (PHR) appli- cation server within the IPv6 Internet. Security could be a key concern within the IoT devices management.

Parameters like vital sign, heart rate, temperature etc. are important to estimate one's health. Monitoring these parameters nowadays is incredibly important to sense any danger that may happen within the near future. In [2] Maradugu Anil Kumar et al have proposed a system for monitoring the above said parameters. The physician/doctor will be able to track the record of patient because the data is stored during a server. In [3] Ufoaroh S.U et al have proposed a system which monitors the guts rate of a patient and sends an SMS attentive to the concerned person and medical personnel if the worth exceeds a group threshold through GSM. the center rate is additionally displayed in an LCD screen. B.S.S.Tejeshet. al have addressed the problems that are being faced in smart agriculture, smart home automation, smart street lights etc which uses IOT. during this paper authors have also presented the importance of IOT in every sector and also security issues in these areas also are presented IOT connected smart home system is gaining importance nowadays. All the appliances in home will be connected through a Wi-Fi module like ESP8266 ESP-01 where the status of every appliance is monitored remotely from anyplace.

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## Proposed System

The proposed prototype model is made of;

### 3.1. Hardware:

Arduino Uno is the microcontroller used here. It's operating voltage is 5V. 5V DC power supply is given to Arduino for its operation. Three sensors (TS18B20-temperature sensor, SEN\_11574-pulse sensor, BMP085-blood pressure sensor) are used here. All the 3 sensors are contact type sensors. They operate in 5V power supply; the power supply is given to the sensors through Arduino. Arduino read the sensor readings and display in LCD and the sensor values are stored in IoT. Internet connectivity is achieved through esp8266 Wi-Fi module.

### 3.2. Sensors:

A) Temperature sensor (DS18B20):

The DS18B20 is a 1-wire programmable Temperature sensor from maxim integrated. it's widely wont to measure temperature in hard environments like in chemical solutions, mines or soil etc. The constriction of the sensor is rugged and can also be purchased with a water-proof option making the mounting process easy. It can measure a good range of temperature from -55°C to +125° with a good accuracy of  $\pm 5^\circ\text{C}$ . Each sensor includes a unique address and requires only 1 pin of the MCU to transfer data so it a really good selection for measuring temperature at multiple points without compromising much of your digital pins on the microcontroller.

B) Blood pressure sensor (BMP085):

Blood Pressure are often measured both by invasive and non-invasive methods. within the non-invasive method, no piercing is required and is straightforward to use. pressure Sensor is employed to live the force per unit area using the non-invasive method. it's kind of like sphygmomanometers but rather than the mercury column, a pressure sensor is employed to detect the pressure.

C) Pulse sensor (sen-11574)

Pulse sensor is a heart rate sensor which sense the patient's heart rate. Its operating voltage is +5V to +3.3V current consumption. The 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 work. The LED on the front side of the sensor is placed over a vein in our human body. This can either be your Finger tip or you ear tips, but it should be placed directly on top of a vein.

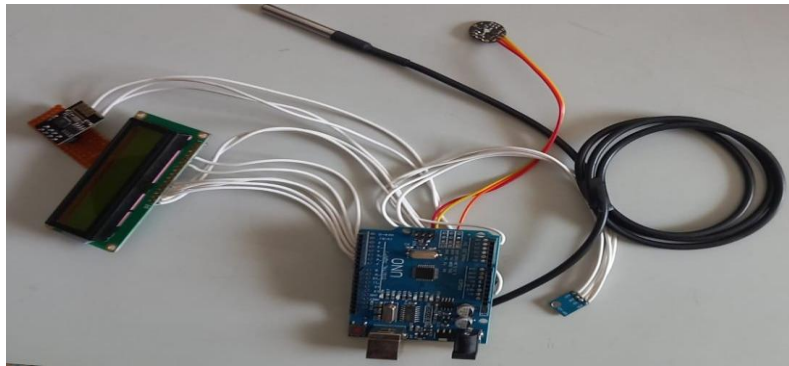
### 3.3. Software:

The basic software requirement is Arduino ide that helps us in interfacing the sensors with controller board. The output from the sensors are fed into data pins of the controller and here the data is processed and the data is displayed and the displayed data is also stored in cloud.

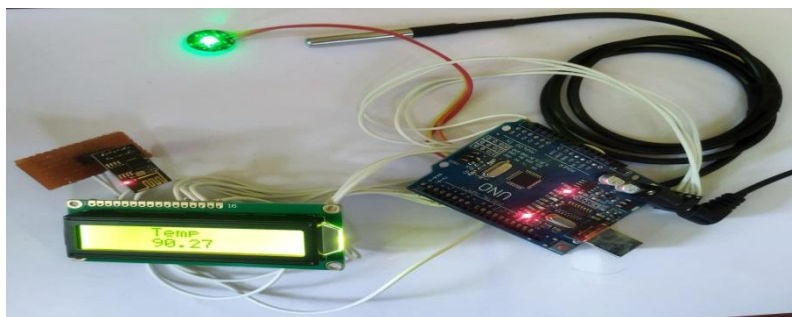
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## 4. Results and Discussions

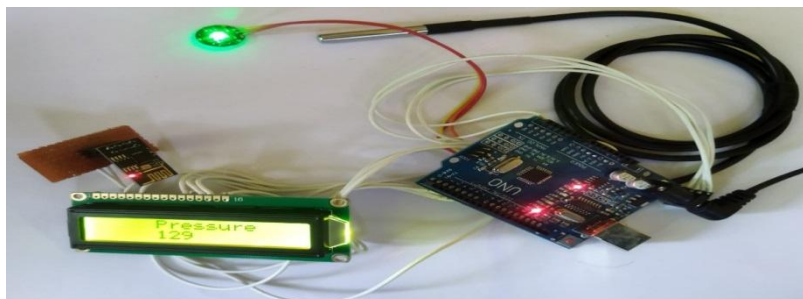
As stataed, here the sensors are connected to the controller as shown in figure 2. According to the human body sensor (temperature, blood pressure, pulse rate) data and send the data to the Arduino and the controller send the same data to be displayed in Lcd display and also to be stored in cloud by using the wi-fi module.



**Figure 2 – Hardware setup of the proposed system**



**Figure 3 – Implementation and Testing of the Hardware setup**



**Figure 4 – Implementation and Testing of the Hardware setup**

Testing of the complete hardware components was done and the result analysis is shown in figure 4.

## 5. Conclusion

Thus, the system health monitoring system based on IoT has been successfully implemented. We have analyzed how sensors which are interfaced to the Arduino UNO are calculating the heartbeat and temperature of the patient's body and the values are updated on the database. The doctor can access the data, which is done by implementation of IoT. To monitor the patient's oxygen, pulse, Heartbeat, Blood pressure by using some Sensors. Thus, our system would save patients from critical loss of life and would help the doctor to take appropriate action at proper time.

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