



IoT BASED PATIENT MONITORING AND ALERT

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ABSTRACT:

Technology plays the important role in health monitoring not only for sensory devices, Recording and communication. It is vital to observe varied medical parameters. So the most recent development in health monitoring communication methodology, IoT is an online system. It is used in different applications and makes life comfortable. It is used to communicate any location through IoT. The health monitoring system collects the Body temperature, heart Beat, and Oxygen levels. The improvement of mobile technologies and smart devices in the health zone. Now a days health specialists are using smart devices to change in the medical services and modify the clinical settings. It gives the data continuously on the condition of patient's health to the doctors mobile or web. The main of this project for observing vital body signs like body temperature, heart Beat, and Oxygen levels. It is used as a sensors. An Aurdino microcontroller board is used for analysing the inputs from the patients monitoring systems to give an alarm. It has the capacity of reading and transmitting the signs to the cloud and then sends the message to the doctors mobile and web.

Keywords: Health monitoring, Internet of Things, Telnet app, Wi-Fi module, Smart Phone

I. Introduction:

Today internet has become one of the vital components of our daily life. It is modified to methodologies how individuals live, work, play and learn. Internet serves as a tool for several purposes like education, finance, business, industries, recreation, social networking, shopping and etc.

Patient Health Monitoring system was first began in the year 1625. This system is used for observing the patient's physiological signs that include the parameters like Heart Beat, Temperature, and Oxygen levels. The data receives the information from each patient and transmits through the Arduino microcontroller. The patient's physical parameters and movement status is continuously sent to the doctor's mobile or web through Wi-Fi module to alert the doctor's through alarm system. It is a wireless technology. The sensor electronics module consists of a wireless personal area network. Arduino contains low power consumption, low cost, small size, frequency etc.



Patient health monitoring consists of different circumstances when a patient is in the accompanying conditions:

- In unstable physiological regulatory systems-for instance, in the case of an overdose of anesthesia.
- In a life-threatening condition-for instance, when there is an indication of a heart attack in a patient.
- In a situation leading to the developing of a risky life-threatening condition.
- In a critical physiological state.

Patient health monitoring is not another new framework in medicinal services. It framework consists of two monitoring systems:

Single parameter monitoring system:

Single parameters monitoring systems are used for measuring only single physiological signs of patient's health conditions. It is a old technology but now a days, it is also continue to be used in developing countries like in India, Pakistan, Bangladesh, etc. It is available in very low cost and easy to manufacture and maintain.

In this single parameter is available for measuring the heartbeat, oxygen levels and body temperature.

Multi parameter monitoring system:

Multi parameter monitoring system is used for multiple physiological signs of the patient. It is used to transmitting the data like heartbeat, Body temperature, and oxygen levels. It is an observing system that holds a huge part in the field of medicinal device monitoring system. Monitoring system increased the effectiveness and very flexible.

In the proposed system contains sensors like heartbeat sensor, temperature sensor, SpO2 sensor. These sensors observing the health condition, fall detection and sleep pattern of the patient.

II. LITERATURE SURVEY

Prof. Sunil. Rahane, Prof. Ramesh. [1] By using wireless sensor networks patient's life relaxed. The safety is very important in health monitoring system. It provides the wide range of security. It is used in hospital. [2] S. J. Jung and W. Y. Chung studied the flexible and scalable of patient's health monitoring system in 6LOWPAN. In this system contains the drawback that is technology and networking approaches are integrated. IoT is a wireless technology. This technology used in different areas of information. It is used as CDMA optimized and electronics. It is isolated simple electrocardiogram. [2].

G. LAWTON et al. [3] Amna Abdullah, Asma Ismael, Aisha Rashid, Ali

Abou-ElNour developed the new technology that is detection system. This System monitors the patient's condition and automatically send the request to the doctor's and caretakers. [5]. Tao et. Al developed a wearable sensor system to monitor the patient's conditions. To ensure reliability accuracy of the system can be tested. The test results show that our system is able to measure the patient's physiological data with a very high accuracy. If threshold level of less than 5% to minimize the error rate of the captured data. [6]



Stefano et.al [7] there are many more machines defined as the things with mechanical, electrical or electronics in the world. The increasingly popular machine to machine technology plans to development. The new technology is that vendors are expanding M2M in to wireless technology using radio chips. They can easily attach to any device or machine. [8] Developed a personal health diagnosis based on the patient's health conditions. A huge amount of collected data is used to analyse the disease and risk of the patient's. Wireless technology is advantage for faster communication. Bhoomika. B. k and Dr. K N Muralidhara [9] The PIC18F46K22 microcontroller is used to communicate to the different sensors like temperature, heartbeat, and SpO2. It senses the data and sends it to the network through Wi-Fi. The controller is also connected with a buzzer to alert the caretaker about variation in sensor output. [10] Developed to maintain the patient's health conditions collected in different geographic locations. The data is directly sent to the doctor's and caretakers. Jieran et.al. [11] developed a radio frequency technology. Then the system is detecting to the condition and alert the medical staff to wash the hands after the contact with the disinfected articles. GoutamMotika et al.[12] aim is to provide technological solutions to help decrease the fatal mortality rate. For example we consider pregnant women; they have to come to the hospital 2-3 times a week for their regular check-ups.

III. SYSTEM ANALYSIS

a. Existing System

In olden days the health monitoring systems are fixed Monitoring system. It can only detect the disease when patient is in hospital. In hospitals there are more number of patient's, because of that it can't possible for the doctors or nurses to monitor the patient continuously. When patient is in critical condition at that time doctors are not available and even they are not able to press the emergency Alert button.

The main drawback in existing system, The regular monitoring of the patient is required when they are in hospital. Once patient is discharged it is not possible to monitor. The existing system is measure the patient health parameters and send it through Bluetooth protocol. It transferring the data is not possible for long distance communication, because Bluetooth protocol is used for short range communication.

B. Proposed System

Our systems not only monitor the patient health condition when Patient is in hospital but also patient is out of hospital. The monitored patient data is transfer to doctors or nurse through WIFI module. It is continuously detect the parameters like temperature, Oxygen levels, heartbeat and compare it to predetermined range set and if these values cross the specific limit, It immediately alert the doctors. The microcontroller is used in this system for transmitting the data. IoT is used to provide the information to the doctor or caretakers. It is connected to the microcontroller. The LCD and Buzzer is also connect to microcontroller, because when the patient body parameters are cross the limit it can alert the doctor's and caretakers via SMS through Telnet app. In emergency cases patient will get treated immediately.

IV. METHODOLOGY

The methodology of the system is explained in the following figure

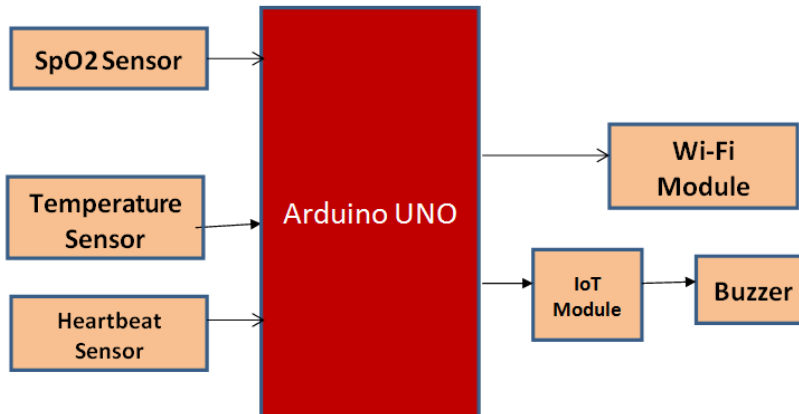


Figure 1: Architecture of patient health monitoring system

To run the system first we need Arduino UNO with power supply. Arduino is the main control unit. IoT patient monitoring has 3 sensors heartbeat sensor, temperature sensor and SpO2 sensor. These 3 sensors are connected to the input side of the Arduino board. Now a day's many IoT Apps are also being developed. So now the doctor or family members can easily monitor the patient's health condition. To operate an IoT based health monitoring system, you need a Wi-Fi connector. The microcontroller or the Arduino board connects to the Wi-Fi module. Without Wi-Fi network the system is not work. The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data to a particular URL/IP address then this action of sending data to IP is repeated after a particular interval of time.

The monitoring system consists of three sensors SpO2 sensor, Temperature sensor, Heartbeat sensor. Arduino UNO, Wi-Fi Module, IoT Module.

SpO2 Sensor:

SpO2 sensor full form is Saturation of Peripheral Oxygen. It is also known as oxygen saturation. It is measure of the amount of oxygen carrying hemoglobin in the blood relative to the amount of hemoglobin not carrying oxygen. It shows the percentage of oxygen present in the blood. The normal range of oxygen level is 95% or higher. If oxygen level is lower than 95% consult your doctor. This sensor detects the oxygen levels by looking at the colors of the blood. It uses the way of light passes through the finger to measure the oxygen level in the blood and sends the information to the device screen as shown in below



Figure 2: SPO2 Sensor

Temperature Sensor:

LM35 series are precision integrated-circuit temperature sensor. The LM35 is a temperature sensor. It is an integrated circuit device and temperature reading in Celsius degree. The output voltage linearly proportional to the centigrade temperature. The advantage of an LM35 over thermistor is it does not require any external calibration. LM35 temperature sensor uses the basic principle of diode. When the temperature increase and voltage also increase. It is easy to generate an analog signal. The range of LM35 temperature is -55 degree Celsius to 150 degree Celsius. LM35 maximum voltage output is 1500 mv as shown in the below figure 3.

Sensors calibrated in kelvin like the user is not needed to less the large constant conductivity from its output to convert centigrade scaling.

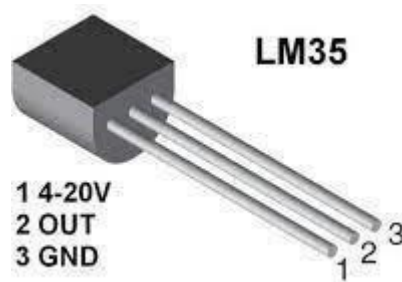


Figure 3: Temperature Sensor

Heartbeat Sensor:

Heartbeat sensor is invented in 1977. It is an optical sensor and electronic device. Heartbeat sensor is used to give a digital output of pulse rate when a finger placed on it. It measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pump blood. By locating the finger in between the light emitting diode and LDR, the pulse of the heart is detected as shown in below figure 4.



Figure 4: Heartbeat Sensor

When the heart beat detector is working. The digital output can be connected to the microcontroller directly to detect the Beats Per Minute (BPM) rate. It works on the principle of light modulation technique by blood flowthrough finger at each pulse. The sensor can send the data over phone lines or an internet connection far away doctor or nurse. Heartbeat sensor input is an input connected to the Aurdino.

IoT Module:

An IoT module is a small electronic device embedded in objects, machines, and things connected wireless networks sends and receive data. IoT is a wireless technology. It is used in different applications. It contains the same technology and data circuits found in mobile phones but without like a features like a display or keypad. In real time Applications need to send data automatically and operate continuously. It works using internet to communicate any location through IoT.

Arduino UNO:

The Arduino UNO is an open source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino.cc. It has 14 digital input and output pins, 6 analog inputs, a USB connection, a 16 MHz ceramic resonator, a power jack, an ICSP header and a reset button as shown in figure 5.

ATmega328P is classic high-performance, low power. It is easily replaced as it is not soldered to the board. It is a low cost, flexible, and easy to use.



Figure 5: Arduino Microcontroller

V. RESULTS AND DISCUSSIONS:

The body temperature sensor, heartbeat sensor, and SpO2 sensor values are calibrated using the microcontroller. The complete prototype of the health monitoring system with the sensors where it shows the output values of the sensors calculated and displayed in the LCD display, So that these values are visible even to the patient. These sensor values are sent to the database server. These data can be accessed from cloud by the authorized users using the IOT application platform as shown in the below figure 6.



Figure 6: Patient monitoring and alert system kit

All the hardware components are connected your hardware according to the circuit diagram. IoT sends the data to Telnet app it will display the results in LCD display as shown in the below figure 7.

Based on these values received the disease of the patient is diagnosed by applying the rules set. The diagnosis of the health state performed by the medical practioner. The medications can be prescribed and appropriate action can be suggested by the doctor even from a distance.

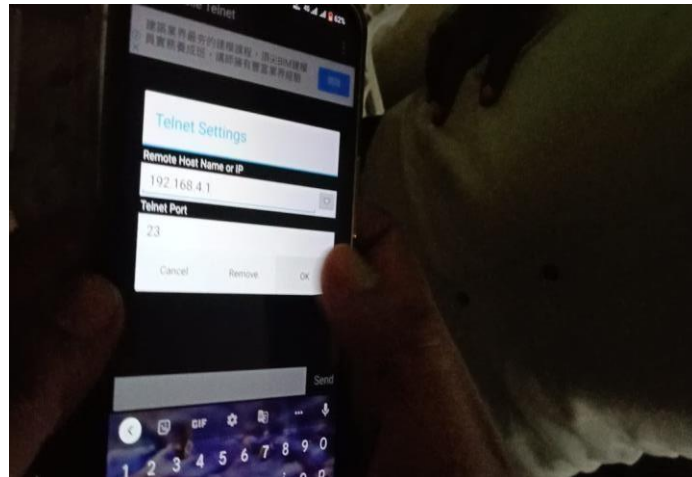


Figure 7: Connections of IoT

You will see data is updated defined in the Arduino IDE, after the interval you need defined in the timer.

VI. CONCLUSION

Wireless health monitoring system will reduce the time consuming in the gathering of patient's data. The proposed system can be used at home and hospital. This system can be further improved to monitor more than one patient's health information. The system technologies being used by smartphones or gadgets in the present time where we also mentioned advantages, challenges and opportunities. Features associated with it are need of doctors are less, easy to operate, multipurpose system used to measure the different parameters. The present system represents time reducing and reduces cost especially for rural area people. In the proposed system we are using the Telnet App.

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