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IoT BASED PATIENT MONITORING SYSTEM

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Abstract: The Internet of things is increasingly allowing integrating devices capable of connecting to the Internet and providing information on the state of health of patients and providing information in real time to doctors who assist. To develop architecture based on ontology capable of monitoring the health and workout routine recommendations to patients with chronic diseases. The heart rate is one of the significant physiological parameters of the human cardiovascular system. Heart related diseases are increasing day by day; therefore an accurate affordable and portable heart rate measuring device is essential for taking action in proper time. This paper describes health monitoring system, which allows patients to monitor their own vital signs from their home and communicate results to a medical person wirelessly.

Keywords: Internet of things (IoT), Heartbeat, Temperature, Humidity etc.

I. INTRODUCTION

The objective of this paper is to monitor and improve the quality of care of people in remote location and to provide continuous information about the patient for making better health care decisions in critical situation and to reduce the regular checkup of the serious patients. It helps the doctor to monitor their patients at any time apart from their consulting hours. Heart rate is a very vital health parameter that is directly related to the soundness of the human cardiovascular system. Heart rate is the number of times the heart beats per minute, reflects different physiological conditions such as biological workload, stress at work and concentration on tasks, drowsiness and the active state of the autonomic nervous system. So to reduce some of these major problems we require some real time monitoring device to overcome problem. Internet of Things gathers and share information directly from patients and it also make possible to collect, record and analyze new data stream faster and more accurately. As the technology for collecting, analyzing and transmitting data in the IoT continues to mature, with the help of sensors and computing devices. This provides data communication capabilities. This IoT is increasingly recognized by the researchers and analysts as one of the most sophisticates technologies for health monitoring and it is safety for people and it also tackled by all. IoT refers to a new kind of world where almost all the devices and appliances that we use are connected to a network, so in this paper we sense some important parameters such as heart beat, body temperature, room temperature, room humidity. These measured parameters are displayed on webpage by using IoT to monitor and reduce the heart related diseases.

II. LITERATURE REVIEW

The IoT is a device which gathers and share information directly with transmitter and receiver, this enables the doctor to collect record and analyze new data streams faster and more accurate. The IoT technology possibly obtains the measured data from the sensor for monitoring and analyzing the health status of the patient with basic vital signs such as heart rate.[1]

The heart rate is one of the significant physiological parameters of the human cardiovascular system. Heart related diseases are increasing day by day; therefore, an accurate, affordable and portable heart rate measuring device is essential for taking action in proper time. This paper describes home health monitoring system, which allows patients to monitor their own vital signs from their home and communicate results to a medical person wirelessly. In fact, the doctor could increase the ability to address a problem before a patient requires acute care. This paper proposed efficient architecture for monitoring patient.[2]

The increased use of mobile technologies and smart devices in the area of health has caused great impact on the world. Health experts are increasingly taking advantage of the benefits these technologies bring, thus generating a significant improvement in health care in clinical settings and out of them. Likewise, countless ordinary users are being served from the advantages of the Health applications and E-Health to improve, help and assist their health. Applications have major refuge for these users, so intuitive environment. The Internet of things is increasingly allowing integrating devices capable of connecting to the Internet and providing information on the state of health of patients and providing information in real time to doctors who assist. It is clear that chronic diseases such as diabetes, heart and pressure among others, are remarkable in the world economic and social level problem. The aim of this article is to

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develop an architecture based on an ontology capable of monitoring the health and workout routine recommendations to patients with chronic diseases.[3]

The sensor is then interfaced to a microcontroller that allows checking heart rate readings and transmitting them over internet. The user may set the high as well as low levels of heart beat limit. After setting these limits, the system starts monitoring and as soon as patient heart beat goes above a certain limit, the system sends an alert to the controller which then transmits this over the internet and alerts the doctors as well as concerned users. Also the system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus concerned ones may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time.[4]

The applications of Internet of Things are parking at smart way, automatic home control, smart city, smart environment, industrial places, agriculture fields and health monitoring process. One such application is in healthcare to monitor and care taken the patient health status Internet of Things makes medical equipment's more efficient by allowing real time monitoring of patient health. We have proposed a system which is very helpful in monitoring & updating the patient health status in a graph report format to the doctor via PC or Desktop. We also developed a WLAN Technology for the faster communication. Thus we have implemented a PULSE MONITORING for continuous pulse rate measurement for an Hours/Day is done by Blood pulse sensor. Likewise Body Temperature has been noted by using Temperature Sensor with help of ADC converter. A Raspberry PI module picks up the sensor data and sends it to the network through Wi-Fi and hence provides real time monitoring of the health care parameters for doctors. These data and record can be accessed anywhere and anytime by the doctor. The proposed design of the Project is to report a clear notification of patient database health status in graphical form to the doctor side.[5]

III.PROPOSED BLOCK DIAGRAM

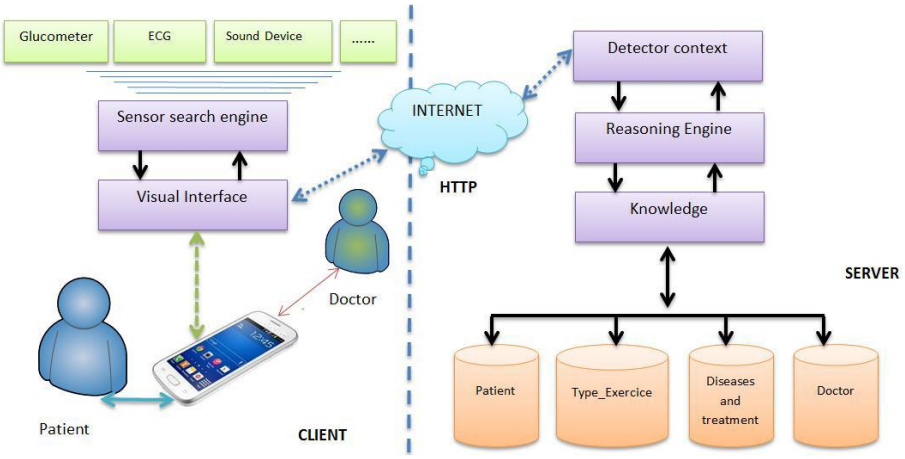

Fig. 1 Architecture of IoT system

IoT has Characteristics such as Intelligence, Connectivity, Dynamic Nature, Enormous scale, Sensing, Heterogeneity and Security. Also provides the advantages such as Improved Customer Engagement, Technology Optimization Reduced Waste, and Enhanced Data Collection.

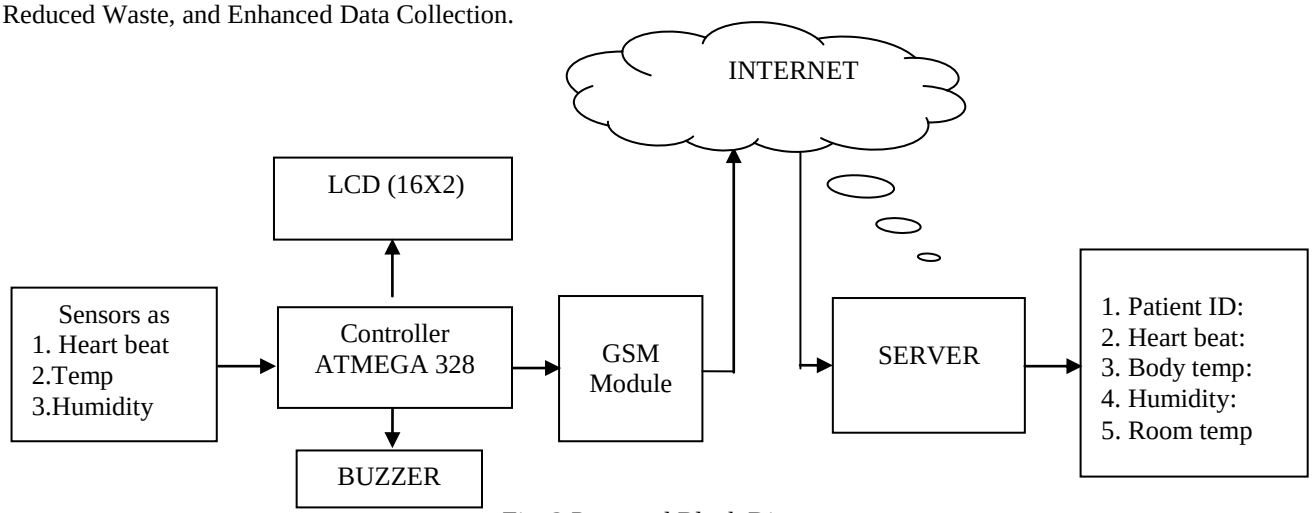

Fig. 2 Proposed Block Diagram

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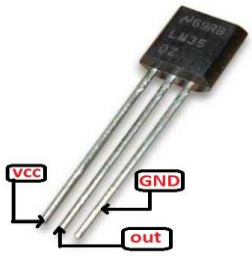
Temperature sensor:



The LM35 series are precision integrated-circuit temperature devices with an Output voltage linearly-proportional to the Centigrade temperature. The LM35 device has a 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.

Heart beat sensor:

Fig. 4 Heart beat sensor

This technique often used non-invasively to make measurements at the skin surface. It uses an infrared light source to illuminate the finger on one side, and on the other side of the finger a photo detector is placed, this will measure the small variations in the transmitted light intensity. The light-absorbing property of hemoglobin is used in the measurement of Heart Beat rate. The light from an infrared light source on the underside of the monitor is shone on blood vessels just under the skin. The light that is not absorbed, but reflected back is captured by a photodetector. The variations in the photodetector signal are related to changes in blood volume inside the tissue. The photo detector produces an electrical signal when the reflected back light strikes it. The signal which we obtained from the sensor is an analog signal and it is converted into a digital signal. Furthermore, the signal can be filtered and then amplified to obtain a perfect PPG (Photo Plethysmo Graph) waveform, which is synchronous with the heart beat.

Humidity Sensor:

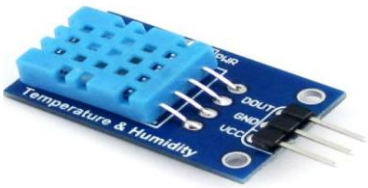


Fig. 5 DHT11 Humidity Sensor

This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programs in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package

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III. WORKING PRINCIPAL

The sensing devices from the patient are connected to the microcontroller and programmed to convert the sensed data from patient to readable digital signals controller or processors used, and is not specific to any particular microcontroller or any system. Microcontroller transfer the information to the IoT devices through which the data from the sensors are transfer

Health monitoring system mainly includes transmission section and receiver section. In this transmission section, the temperature sensor is used to detect temperature and heart beat sensor is used to detect heart beat of patient. And the data which are sensed by sensor is sent to the microcontroller. The transmitted information can be encoded by controller and patient health information displayed on LCD display. If heart beat and temperature of patient is increases or decreases than set value then buzzer is ON and gives indication to doctor. The encoded information is transmitted through internet and store on server and the doctor can monitor patient's status anywhere as long as there is internet facility.

IV. PROPOSED CIRCUIT DIAGRAM

OrCAD PCB Designer is a printed circuit board designer application, and part of the OrCAD circuit design suite. PCB Designer includes various automation features for PCB design, board level analysis and design rule checks (DRC). The PCB design may be accomplished by manually tracing PCB tracks, or using the Auto-Router provided. Such designs may include curved PCB tracks, geometric shapes, and ground planes. PCB Designer integrates with OrCAD Capture, using the component information system (CIS) to store information about a certain circuit symbol and its matching PCB footprint. The system circuit diagram which is shown in below this can be draw by using OrCAD software.

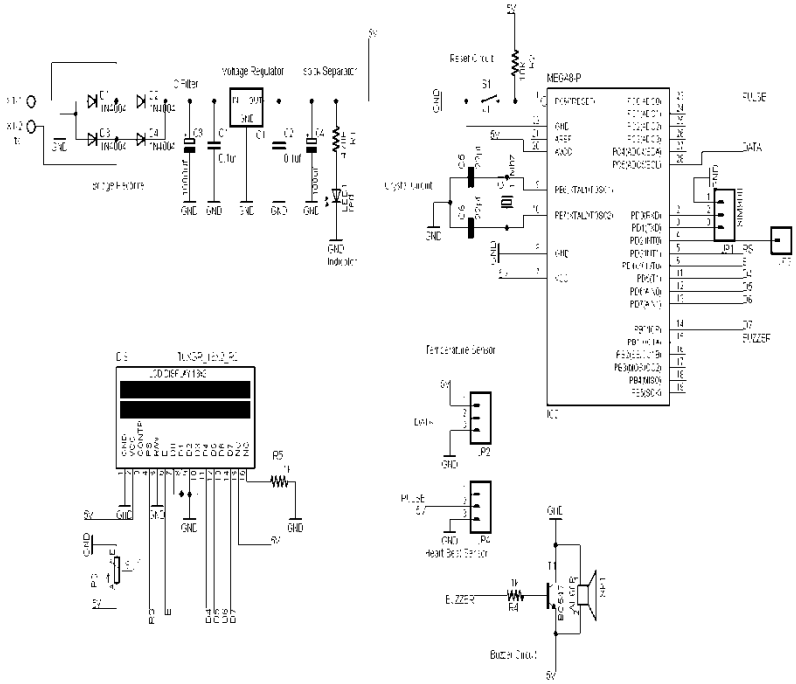

Fig. 6 Proposed Circuit Diagram

5V supply is given to the pin no 7 of Atmega 328 microcontroller and pin of power supply is connected to pin no 22. Heart beat sensor is connected to pin no 4, temperature sensor is connected to pin no 5 of analog input pin and DHT 11 humidity sensor is connected to analog input pin 0 of Atmega 328. Microcontroller process on this input data and display the result on LCD and simultaneously this data is stored and display on webpage. If any critical condition is occurred the buzzer is turn on which is connected to 15 no. pin of Atmega 328 microcontroller.

V. DATA TRANSMISSION USING IOT

Thingspeak:

ThingSpeak is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. 8 fields for storing data of any type - These

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can be used to store the data from a sensor or from an embedded device. 3 location fields - Can be used to store the latitude, longitude and the elevation. These are very useful for tracking a moving device.1 status field - A short message to describe the data stored in the channel. To use ThingSpeak, we need to sign up and create a channel. Once we have a channel, we can send the data, allow ThingSpeak to process it and also retrieve the same.

Data Sharing Setting:

Fig. 7 Data Sharing Setting

VI. EXPERIMENTAL SETUP & HARDWARE RESULT

In this experimental set up all the sensors such as heart beat sensor, temperature sensor& humidity sensor sense the physical parameter and give input to the microcontroller. Controller process the input data and display result on LCD. If any abnormal condition is occurred then buzzer gives continuous beep.

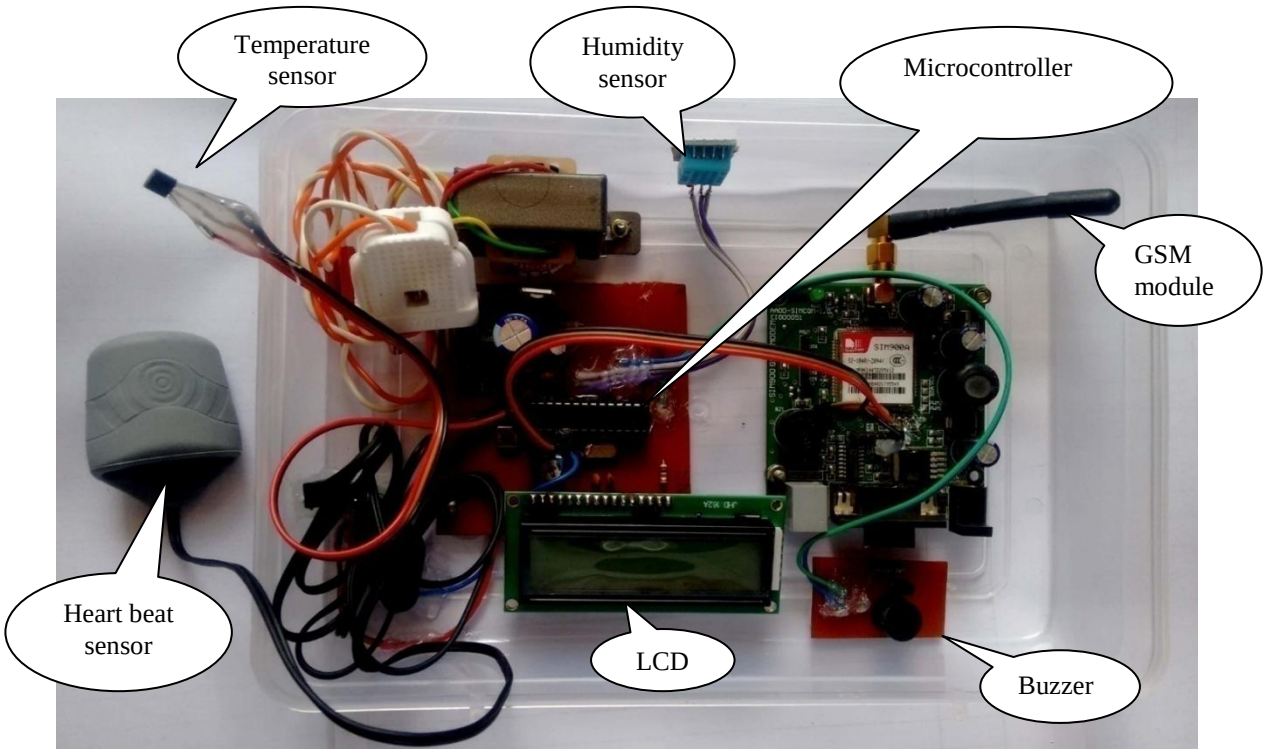

Fig. 8 Experimental Set-up

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a) LCD output

In the figure no. 8.2 we are displaying parameters such as heart beat, body temperature, room humidity, room temperature.

Fig. 9 LCD output

b) Output on webpage:

❖ Field 1 shows the heart beat rate of the patient.

Fig. 10 Heart Beat Output

❖ Field 2 shows the body temperature of the patient.

Fig. 11 Body Temperature Output

❖ Field 3 shows the room temperature.

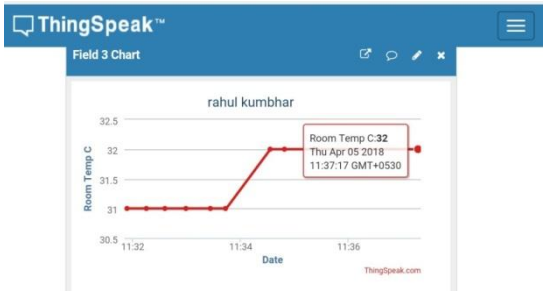

Fig. 12 Room Temperature Output

❖ Field 4 shows the room humidity.

Fig. 13 Room Humidity Output

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VII. CONCLUSION

Health of patient monitored using internet of things and enable the doctor to monitor their patient outside the clinic and also a part there consulting hours. Connected health care device utilize resources to provide an improved quality of care, leading to better clinical outcomes. Measurable benefits of connected medical devices include reduce clinic visits, including reduction in bed days of care and length of stay in hospitals. Using internet of things patient condition are obtained and store for further analysis in this project the heart rate and blood pressure of patient are monitored. Healthy and active people can also benefit from IoT driven monitoring of their well-being it also enable features for the aged person who want only a monitoring device that can detect a fall or other interruption in every day activity and report it to emergency responders or family members.

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