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Interfacing of Temperature Sensor with Raspberry-Pi based on IoT for Smart Health Care Kit

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ABSTRACT: Internet of Things (IOT) can be expressed as the wireless network of devices that are connected to each other for sharing information and data in reference to communicate and produce new information so as to record and analyze it for future use. In this paper, we have presented an detail analysis of Interfacing of Temperature Sensor with Raspberry-Pi which is based on IOT health monitoring system for emergency medical services. The result shows the design is working perfectly. We will further design a reliable, energy efficient patient monitoring system. The proposed system will then enable users to improve health related risk and reduce healthcare costs. It will also reduce the headache of patient to visit to doctor every time he or she need to check Heart beat rate, temperature, Blood pressure, ECG etc.

KEYWORDS: Internet of thing (IoT); Temperature Sensor: Medical Services; Health care; Health Monitoring;

I.INTRODUCTION

The internet of things (IoT) is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

In the proposed system we will design and implementation of an IOT-based health monitoring system for emergency medical services and for household patients which can demonstrate collection, integration, and interoperation of IoT data flexibly using a Raspberry pi third generation microcomputer development board. The proposed model enables users to improve health related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently. The idea of this project came to reduce the headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and ECG and sends an emergency alert to patient's doctor with his current status and full medical information.

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At present, due to busy life style health negligence on is increased which causes in large number of diseases among people. And every time visiting a doctor is not an easy option for patients so this system will keep track of patient's activity and his vitals. And send them to remote servers from where it can be accessed by doctors as well as patient himself. [10]

II. VITAL SIGNS

Vital signs are used to measure the body's basic functions. These measurements are taken to help assess the general physical health of a person, give clues to possible diseases, and show progress toward recovery. The normal ranges for a person's vital signs vary with age, weight, gender, and overall health. There are four main vital signs: body temperature, blood pressure, pulse (heart rate), and breathing rate.

Body Temperature: The average body temperature is 98.6 degrees Fahrenheit, but normal temperature for a healthy person can range between 97.8 to 99.1 degrees Fahrenheit or slightly higher. Body temperature is measured using a thermometer inserted into the mouth, anus, or placed under the armpit. Body temperature can also be measured by a special thermometer inserted into the ear canal.

Any temperature that is higher than a person's average body temperature is considered a fever. A drop in body temperature below 95 degrees Fahrenheit is defined as hypothermia. Keep in mind that temperature can vary due to factors other than illness or infection. Stress, dehydration, exercise, being in a hot or cold environment, drinking a hot or cold beverage, and thyroid disorders can influence body temperature. Because older adults do not control body temperature as well as younger adults, older adults may be ill without ever displaying signs of a fever.

Blood pressure: Blood pressure is the measurement of the pressure or force of blood against the walls of your arteries. Blood pressure is written as two numbers, such as 120/80 millimeters of mercury (mm Hg). The first number is called the systolic pressure and measures the pressure in the arteries when the heart beats and pushes blood out to the body. The second number is called the diastolic pressure and measures the pressure in the arteries when the heart rests between beats.

Factors that can influence a blood pressure reading include:

Stress, Smoking, Cold temperatures, Exercise, A full stomach, Full bladder, Caffeine, alcohol consumption, Certain medicines, Gaining or losing weight, Salt intake.

If you are taking your blood pressure, beware of these factors when reading your measurements. If someone else is taking your blood pressure, be sure to tell him or her of any these possible causes you may have for high blood pressure. Also know that the blood pressure stations often available at drug stores and grocery stores are not considered accurate measures of your blood pressure.

Pulse: Your pulse is the number of times your heart beats per minute. Pulse rates vary from person to person. Your pulse is lower when you are at rest and increases when you exercise (because more oxygen-rich blood is needed by the body when you exercise). A normal pulse rate for a healthy adult at rest ranges from 60 to 80 beats per minute. Women tend to have faster pulse rates than men. Your pulse can be measured by firmly but gently pressing the first and second fingertips against certain points on the body—most commonly at the wrist or neck (but can also be measured at the bend of the arms, in the groin, behind the knees, inside the ankles, on the top of the feet, or at the temple area of the face)—then counting the number of heart beats over a period of 60 seconds.

A faster than average pulse can indicate such health problems as infection, dehydration, stress, anxiety, a thyroid disorder, shock, anemia, or certain heart conditions. A lower than average pulse may also be a sign of a heart condition. Some medications, especially beta blockers and digoxin, can slow your pulse. A lower heart rate is also common for people who get a lot of exercise or are athletic.

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If checking your pulse, your pulse rate should not be routinely less than 60 beats per minute. The beats also should be equally spaced out, not excessively strong (would indicate a heart that is working hard), and no beats should be missed.

Respiratory rate: A person's respiratory rate is the number of breaths you take per minute. The normal respiration rate for an adult at rest is 12 to 20 breaths per minute. A respiration rate under 12 or over 25 breaths per minute while resting is considered abnormal. Among the conditions that can change a normal respiratory rate are asthma, anxiety, pneumonia, congestive heart failure, lung disease, use of narcotics, or drug overdose.

III.INTERFACING OF TEMPERATURE SENSOR WITH RASPBERRY-PI

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ºC) .You can measure temperature more accurately than a using a thermostat. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

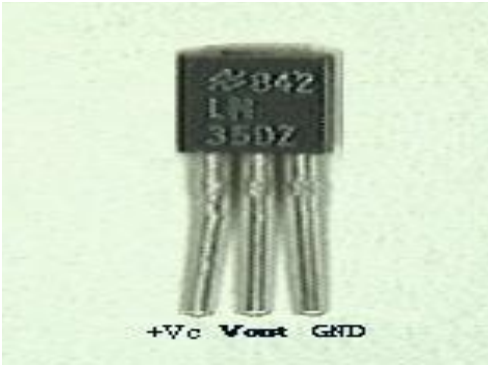

Figure 1: Temperature sensor-The LM35

It has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/ºC The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4 ºC at room temperature and +/- 0.8 ºC over a range of 0 ºC to +100 ºC.

The figure below shows the Interfacing of Temperature Sensors with Raspberry-Pi.

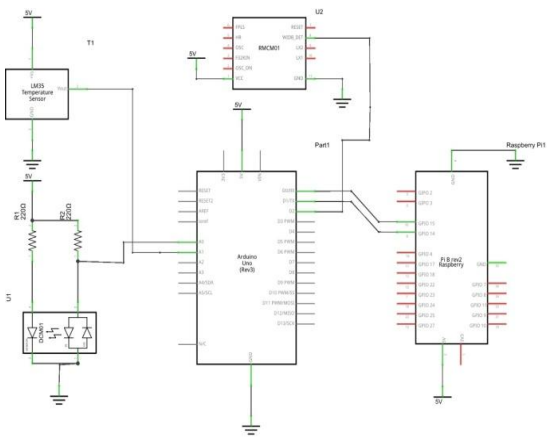

Figure 2: Interfacing of Temperature sensors with Raspberry-Pi

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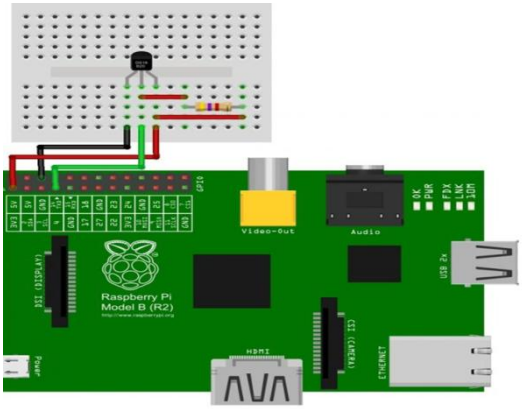

Figure 3: Circuit Diagram of Temperature sensors with Raspberry-Pi

The circuit consists of 3 sensor Heartbeat Blood pressure and temperature sensor. All sensor gives analog output and raspberry pi 3 has no ADC that's why we are using atmega 328 as converter for sensors.

Lm 35 temperature sensor used to measure values of temperature in gives linear output of 10mv per degree Celsius rise. So it is connected to 10 bit ADC of our atmega 328 microcontroller which reads the data from sensor and converted it into voltage value by multiplying actual value with 4.887 .and gives output in degree Celsius and further converted into Fahrenheit and sent to raspberry pi using Serial communication.

The second sensor is blood pressure sensor which is interfaced to atmega 328 using serial interface with one communication. It gives data in form of systolic and diastolic pressure. Also the heartbeat sensor which is shown separately in the above circuit is part of sensor module which gives the heart beat pulses value per minute which are used for calculation of respiration rate of person.

IV. COMPARATIVE ANALYSIS

Table below shows the Comparative analysis of Temperature Sensors with Raspberry-Pi.

	[1] Parameters	[2]	[3]	[4]	Propose work
Sensors using Monitored parameters	• Temperature sensor RTD PT 100 •Pressure sensor MPX 5050	•Temperature sensor	•Temperature sensor LM-35 •ECG sensor •Heart sensor	•Heart beat sensor(XD - 58C pulse sensor) •LM-35 temperature sensor	•Heart beat sensor •temperature sensor •Blood pressure sensor •ECG sensor

Normal Temperature Ranges

	Men	Women	Overall
Oral	35.7 - 37.7°C	33.2 - 38.1°C	33.2 - 38.2°C
Tympamic	35.5 - 37.5°C	35.7 - 37.5°C	35.4 - 37.8°C
Axilla	-	-	35.5 - 37.0°C
Rectal	36.7 - 37.5°C	36.8 - 37.1°C	34.4 - 37.8°C

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V.CONCLUSION & FUTURE SCOPE

The module designed here is Temperature sensor with raspberry-pi. For designing of Health care monitoring system using Intel Galileo and database stored on local server using XAMPP server gives higher delay with larger hardware required. So, as to reduce the delay and to minimize the power consumption we can use Raspberry PI with database stored on internet. Hence, designing of IOT based health monitoring system using Raspberry PI version 3 with high speed and less area will be the probable outcome of this proposed work. [10]

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