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Real time health monitoring system using Arduino and LabVIEW with GSM Technology

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Abstract— *In our paper we are designing such type of device which is used for continue monitoring of patients in hospital. We introduce "Real Time Health Monitoring System with Arduino and LABVIEW with GSM Technology". In previous research we have seen that either the data is monitoring in simple LCD screen or send it by GSM, but in our paper the new thing is that we can continue monitor the Heart Rate and human body Temperature and we can also analyze his/her health condition using LABVIEW software, which is used as the integrating platform for acquiring, processing and transmitting data and it has provide graphical platform to analyze.[1] then the analyzed data can send to doctor or parents of patient using GSM Technology. Later we can also introduce IOT technology to make it more flexible and more accurate that doctor can monitor his patient condition by simple clicking on web page which is connected to LABVIEW software using File Transfer Protocol (FTP). Overall we are introducing such type of design which can monitor health condition and analyze the parameter and give an alert if something going wrong and we can transmit data wirelessly anywhere by using GSM technology.*

Keywords— *Health monitoring, Heart Rate, Body Temperature, ARDUINO, LABVIEW SOFTWARE.*

I. INTRODUCTION

In our paper we have discussed the modern visionary of healthcare industry is to provide better healthcare to patient anytime and anywhere in the world in a more economic and patient friendly manner. Therefore for increasing the patient care efficacy, there arises a need to improve the patient monitoring devices. The medical world today faces basic two problems when it comes to patient monitoring, firstly the need of healthcare providers present bedside the patient and secondly the patient is restricted to bed and wired to large machines [2]. In order to achieve better quality patient care, the above cited problems have to be solved. This paper discusses the acquisition of physiological parameters such as heart rate, body temperature, ECG and displaying them in graphical user interface for being viewed by the doctor.[1]

II. OBJECTIVE

The main objective of our research paper is to make health monitoring system simple and accurate currently in our paper we are monitoring only body temperature and heart rate but we can further expand our system by measuring various parameters like ECG, PCG, SPO_2 and blood pressure etc. The another objective of our research is to analyze these parameter to identify accurately the problem to give patient better cure as soon as possible and these analyze data can wirelessly transmit to the doctor anywhere in the world by using GSM and IOT. It is very costly to measure each single parameter so in our design we are combining all three parameter in single device.

III. METHODOLOGY

In our proposed design we are using two sensors one is temperature sensor (LM35) another one is pulse rate sensor. For analyzing the data graphically we use lab view software and for transmitting data we use GSM and IOT technology.

A. Block diagram

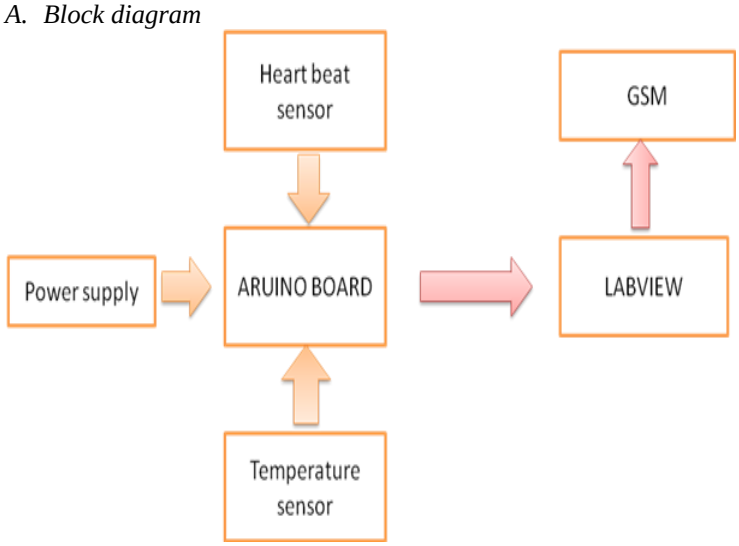


Fig 1: Block diagram of health monitoring system

B. Hardware

1. Temperature Sensor

To measure the human body temperature we LM35 sensor.LM35 sensor measure temperature more accurate than a using a thermister since it is industrial temperature sensor. It generate higher output voltage than thermocouple so no need to amplify the output voltage. The output voltage is directly proportional to the Celsius temperature. The scale factor is 0.1v/^{o}c. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. The range of this sensor is -55^0 C to 150^{0}C. It is low cost and easily available sensor. It has also low self heating. LM35 has three terminal VCC, GND, O/P.

Features of LM35[8]

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee able (at +25°C)
- Rated for full −55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 µA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1⁄4°C typical
- Low impedance output, 0.1 W for 1 mA load

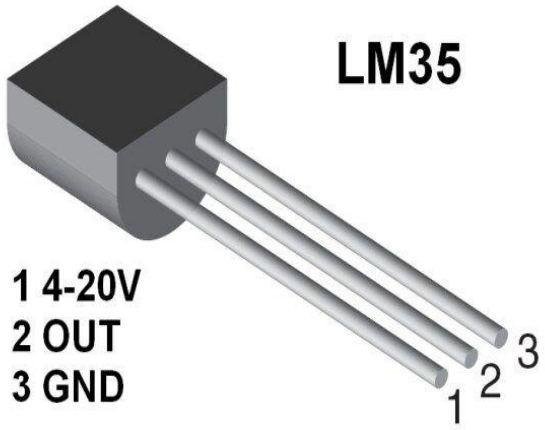


Fig 3: temperature sensor LM35

2. Heart Beat Sensor:

Heart beat sensor provides a simple way to study the function of the heart which can be measured based on the principle of psycho- physiological signal used as a for the virtual for the stimulus for the virtual reality system. The amount of blood in the figure change with respect to time. The sensor shines are light low (a small very bright LED) through the ear and measures the light that get transmitted to the LDR. The amplified signal gets inverted and filtered in the circuit in order to calculate heart rate based on the blood flow to the finger strip.

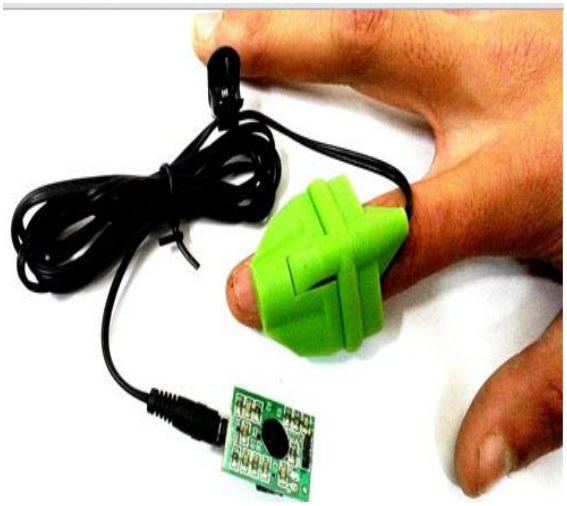


Fig 2: Heart Beat Sensor

3. ARDUINO BOARD:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter. With the help of this we can directly communicate with the PC or computer. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. in our project we use Arduino board since it has inbuilt ADC so we no need to interface external ADC to connect with sensor, since most of the sensor gives their output in analog form. This board is also simple for programming it does not need any external programmer or burner to burn the program in microcontroller. Since it has 32kb flash memory so we can save our program as well as we can change the program according to our requirement.

Feature of Arduino Uno board[09]

- Microcontroller ATmega168 or 328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Flash Memory 16 KB (ATmega168) or 32 KB (ATmega328)
- of which 2 KB used by bootloader

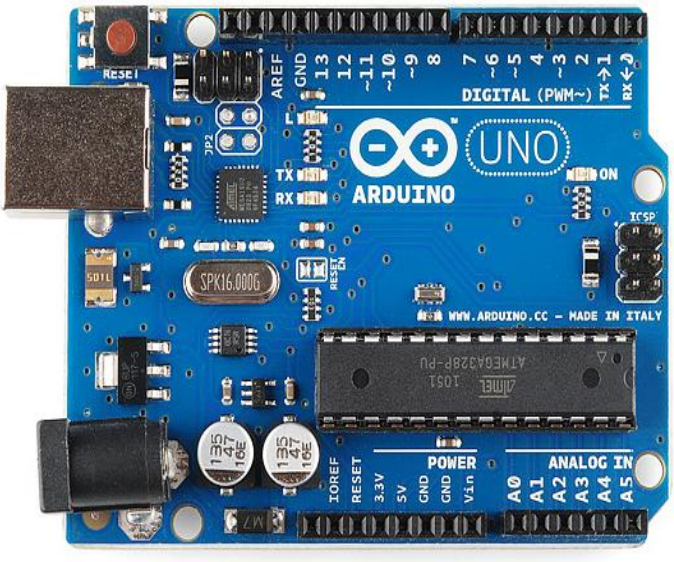


Fig 4:- Arduino Uno Board

4. GSM 900A

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem,you can make audio calls, SMS, Read SMS, attend the incoming calls and internet ect through simple AT commands.

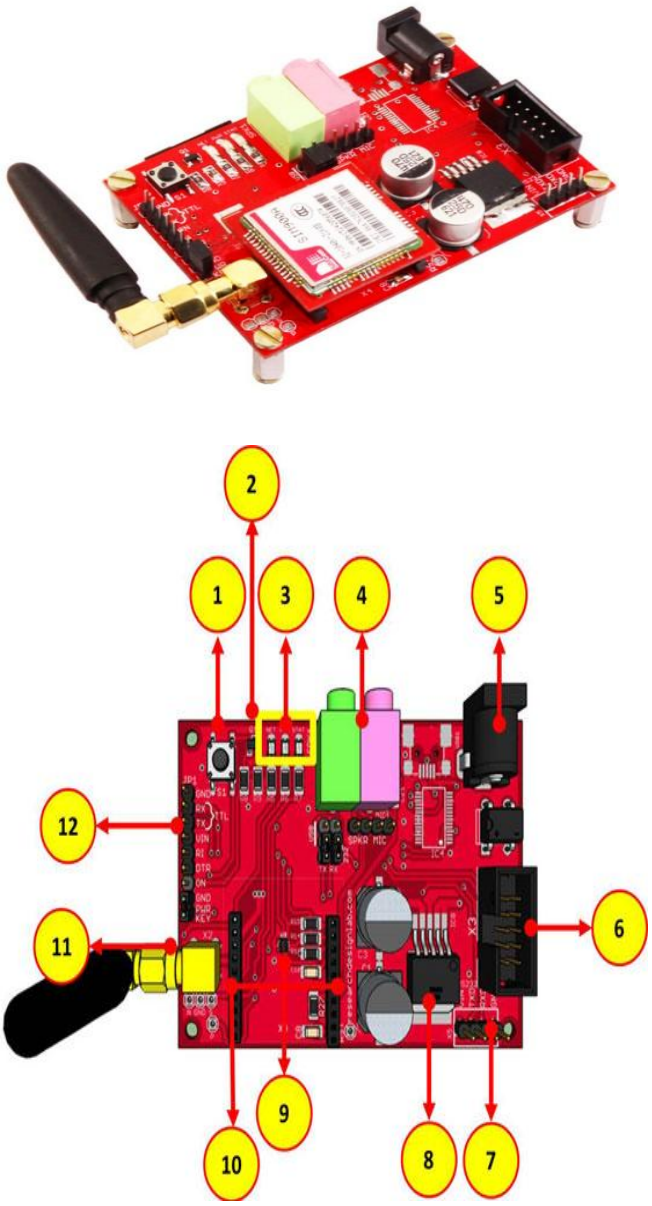


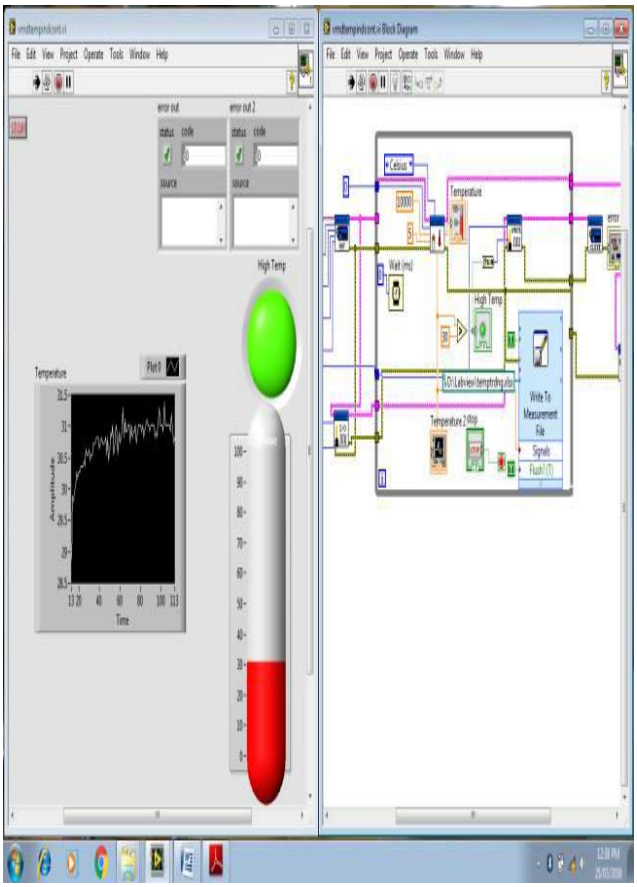
Fig5: GSM 900A

1. Power ON reset switch.
2. Sliding SIM holder.
3. Network, Power and Status indicator.
4. MIC and Speaker Socket.
5. Power supply 12V/2A
6. FRC Connector.
7. RS232 header.
8. DC to DC Converter (29302WU IC).
9. ESD Protection enabled.
10. SIM900A stack on header.
11. Stub antenna with SMA connector.
12. General GPIO SIM900A

In our proposed design we use SIM900A instead of SIM300. SIM300 is widely used in GSM modem around the globe, and more popular among students and hobbyists. SIM300 is now succeeding with improved quad band version SIM900A. SIM900A is quad band modem operate in 850, 900, 188, 1900 MHz band and improved with GPRS functionality, while SIM300 is tri-band GSM modem. All commands of SIM300 are used in SIM900 and SIM300 is not comfortable for web interfacing.

C. Software

1. Lab VIEW: The Lab VIEW software is used as the integrating platform for acquiring, processing and transmitting the physiological data as it is an excellent graphical programming environment to develop sophisticated measurement, test, and control system using intuitive graphical icons and wires that resemble a flowchart. The software also includes numbers of advanced mathematics blocks for functions such as integration, filter and other specialized capabilities. The Lab VIEW Professionals Development System allows creating stand-alone executables and the resultant executable can be distributed an unlimited number of times. The run-time engine and its libraries can be provided freely along with executable. Using report generation toolkit present in Lab VIEW a real time patient record containing basic patient information such as name, age, gender and clinical information like temperature, spo2,heart rate, ECG waveform and PCG waveform is generated.



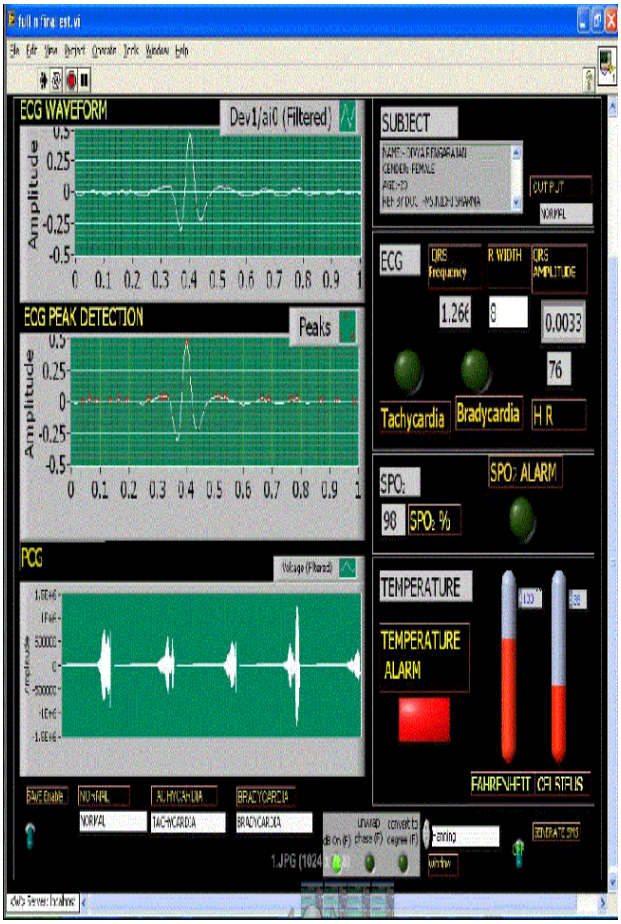


Fig 6: Graphical Analysis of data in LabVIEW

IV. Result and Discussion

Result of our research work is that the human body parameter like body temperature or heart rate is very sensitive parameter if any physical or non physical or mental change occur to human then it rapidly changes its value. The standard value of body temperature is 37°c and heart rate is 72 bit/second. In our proposed design the new thing we add is we are combining two parameter in single device also we analyze the data in LabVIEW that is main part of our project and the analyzed data is send to the doctor using GSM. The primary objective of our research work to reduce the cost, manpower and the time to send the information, and make analysis as simple as possible.

Fig:- Alert Message is generated and send to doctor

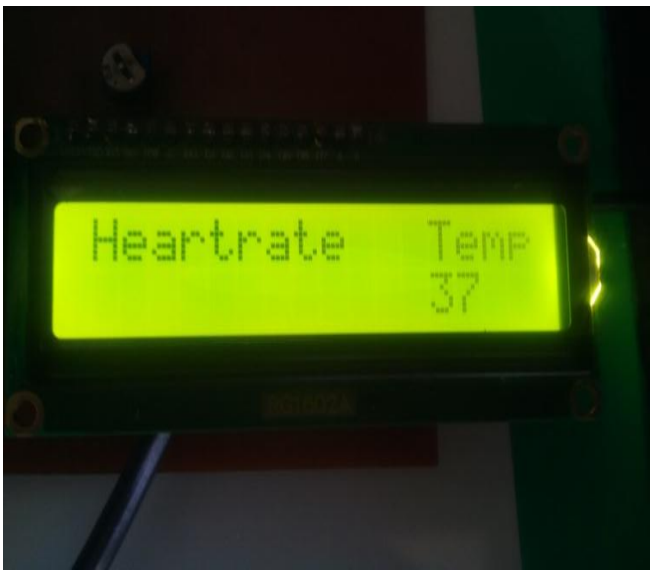


Fig 7:- temperature is displaying on LCD

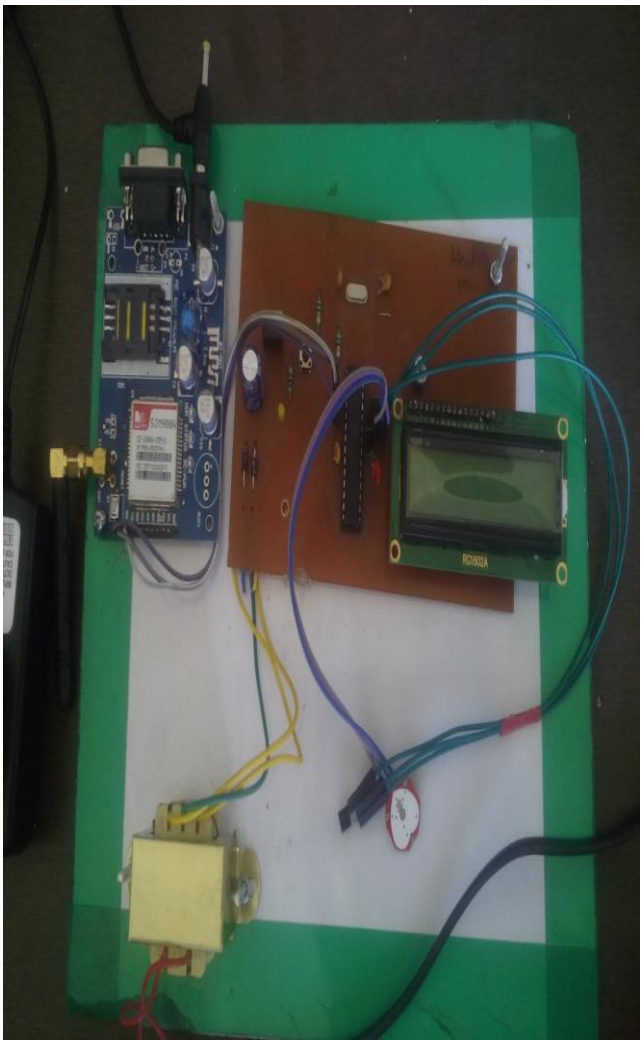


Fig 8:- Hardware of health monitoring system

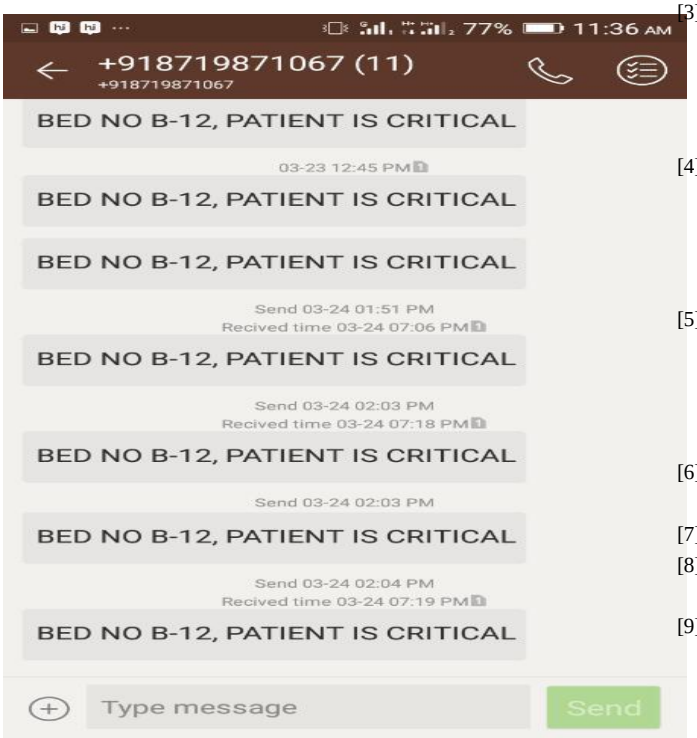


Fig 9:- Text message send by GSM

VI CONCLUSION

Conclusion of our research is that it is very much essential to measure the human body parameter which is in critical situation and to analyze the date, without analyzing we can't identify the exact problem and if we analyze the data then we can treat patient more accurately more efficiently and as soon as possible. With the help of GSM we can transmit that analyzed data wirelessly to doctor.

VII FUTURE WORK

This project can be further enhanced by sensing and displaying other vital statistics of a patient like ECG, blood pressure, glucose level etc. the other thing which is to add is presently we are monitoring the data in LabVIEW in future we can monitor data in web page using internet of thing technology.

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