Temperature monitoring of Asset using NI myRIO

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Abstract- *Temperature monitoring system consists of digital sensor that measure temperature across a continuous range. Digital temperature monitoring system monitors and alert if the temperature is above or below a pre-determined value. This paper presents a temperature monitoring and alert system using the temperature sensor and buzzer. The system consists of NI (National Instruments) myRIO controller that acquires the temperature value and transmit the data wireless. The temperature sensor used is Pmod TMP3. The buzzer circuit is also controlled using the myRIO to ring an alert signal when the temperature value rise high.*

Keywords- Temperature monitoring, buzzer, sensor,NI myRIO, Pmod TMP3,alert signal

I. INTRODUCTION

Temperature is the most often measured environmental quantity. This might be expected since most physical, electronic, mechanical systems are affected by temperature. In order to efficiently operate a machine the measurement of temperature value is important. Temperature monitoring also plays a vital role to prevent any damage to the machines or electronic circuits. In this paper we have developed a solution for efficiently monitoring the temperature and to ring an alert signal when the temperature value goes high

The Internet of Things [1] is an advanced solution for monitoring the temperature at different points of location in a data centre, making this temperature data visible over internet through cloud based dashboard and sending SMS and email alerts to predefined recipients when temperature rises above the safe operating zone and reaches certain high values. The variation in the temperature is monitors by online dashboard. This Wireless Sensor Network (WSN) based monitoring system consists of temperature sensors, ESP8266 and Wi-Fi router. ESP8266 is a low power, highly integrated Wi-Fi solution from Espressif. Ubidots cloud dashboard is used for real time cloud management and generated alert when temperature is high.

Wireless Temperature and Humidity Monitoring system [2] consists of ATmega328 microcontroller that based on the Arduino Uno platform. The temperature and humidity sensor DHT11 collects data and transmits through nRF24L01 wireless transceiver module. The transmitted values are displayed dot-matrix LCD12864 .

Vehicle monitoring and tracking system [3] is for monitoring the vehicles which are moving from one place to the other in order to provide safety and security. The system consists of Global Positioning System (GPS) and Global System for Mobile Communication (GSM) for vehicle tracking and monitoring purpose using SIM800 module. The GPS provides present site of the vehicle and the GPRS sends the tracking information to the server and thus an alert message generated is transmitted to the owner of the vehicle. Also a alert message is sent when the vehicle moves in the wrong path. The system also monitors the status of the owner with the use of alcohol sensor and if the owner is drunk then warning sound is produced by Buzzer. The proposed system also consists of a Temperature sensor to monitor vehicle Engine Temperature to avoid sparking of the vehicle their by preventing from the disaster.

Temperature monitoring system [4] consists of an Arduino Uno board. It includes graphical user interface (GUI) based system that allow users to set monitoring parameters. The temperature value from sensor is acquired and certain important parameters are displayed . The system sends a warning message when the temperature exceeds the threshold value specified by the user.

Maximum temperature selection circuit [5] consists of a set of temperature sensor. Two different types of temperature sensors are used proportional to absolute temperature PTAT which uses bipolar structures and CMOS one which uses thermal dependencies of MOS transistors. The circuit is includes the method for optimum control of throughput (OCT method) of microprocessor. The circuit is designed in CMOS 0.18Pm technology and is a part of chip called Taceo.

Parameter sensing and object tracking [6] consists of real time. object tracking system build using the Arduino UNO-R3 microcontroller board and the GR-87 GPS module. It operates on a portable battery operated object tracking system. It can also sense environmental parameter like temperature

II. HARDWARE SETUP

A. Using NI MYRIO into the application

NI myRIO 1900 is a moveable reconfigurable I/O tool which is able to acquire and generate signals using a variety of communication protocols. NI myRIO programming environment permits reliable communication between hardware and software elements. NI myRIO interfaces with external devices using analog and digital pins or by various communication protocols: UART, I2C. The proposed model use NI myRIO for acquiring the sensor data and transmits the data over Wi-Fi to a mobile phone.

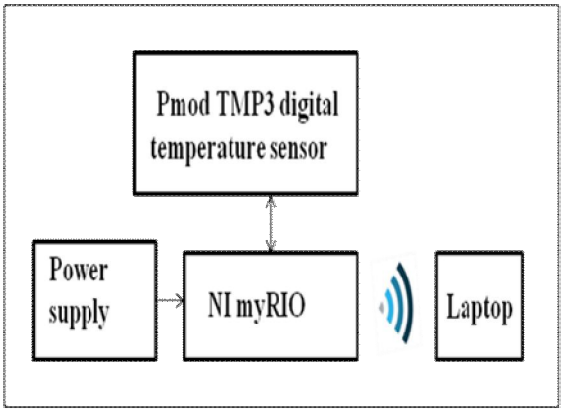

Fig.1 Block Diagram of the Hardware setup

B. Using NI MYRIO into the application

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Temperature sensor (PMOD TMP3)

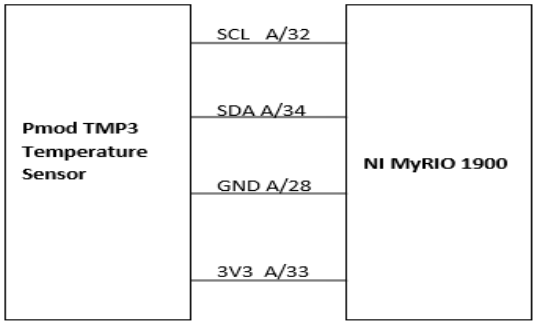

Fig.2 Temperature sensor connection to NI MyRIO

The PmodTMP3 is an ambient temperature sensor. The TCN75A on the PmodTMP3 acts as a slave device using I2C serial communication. To communicate with the PmodTMP3, the master device must specify a slave address (0x48-0x4F) and a flag indicating whether the communication is a read (1) or a write (0). In the LabVIEW program of this project, this slave address is given as input. This is followed by the actual data transfer. To read from a register the master must write the desired register address to TCN75A, then send an I2C restart condition, and send a read request to the TCN75A. The I2C interface standard uses two signal lines. These are I2C data (SDA) and I2C clock (SCL). On the TCN75A, both SDA and SCL are open-drain pins with are connected to the analog I/O pins of myRIO in this project. For communication to be established, both JP4 and JP5 which are the jumpers and act like pull-up resistors must be shorted to establish communication via I2C. In this paper, this sensor, is interfaced with the NI myRIO through I2C communication protocol. It gives ambient temperature of the environment in which the hardware setup is placed. For 9-bit resolution, the LabVIEW code of this paper has been calibrated by shifting the temperature register data to the right seven bits and multiplying by 0.5 to obtain the temperature in degrees Celsius.

C. Buzzer Circuit

The buzzer circuit consists of a AC 1006G RPA-LF buzzer. The fig.3 displays the buzzer circuit. It is a magnetic transducer. The buzzer has a speaker which operates at a nominal voltage of 5V. The sound output from the speaker is 90dB.

The fig .4 displays the connection of the buzzer circuit to the NI myRIO. The buzzer requires 5V digital output for direct control and it is given from the myRIO. The buzzer circuit diagram consists of a signal diode 1N3064, NPN transistor 2N3904 and a 1 kohm resistor. The PWM input is given from the B port 27 pin of the myRIO. The 5V supply to the buzzer is given from the myRIO b port 1 pin. The emmiter of the NPN transistor is connected to the gnd 6 pin of the myRIO.

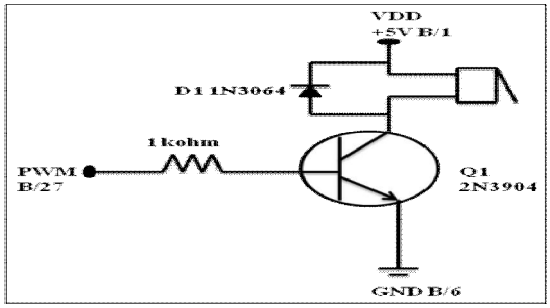

Fig.3 Circuit diagram of the buzzer

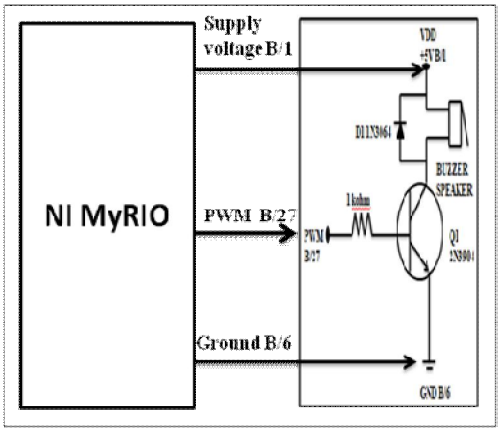

Fig.4 Buzzer Circuit connection to NI myRIO

III. METHODOLOGY

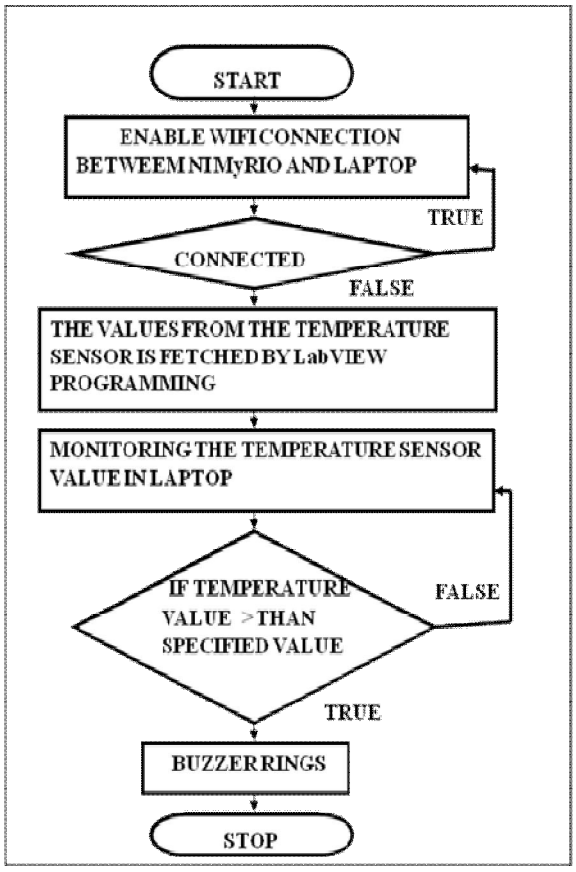

Fig.5 Methodology

The system operation starts with establishing the wifi connection between the myRIO and the laptop. The myRIO acquires the temperature sensor value continuously and transmits the value over the wifi. The transmitted values are monitored in the laptop. If the temperature value is greater than the specified value an alert signal is given using the buzzer.

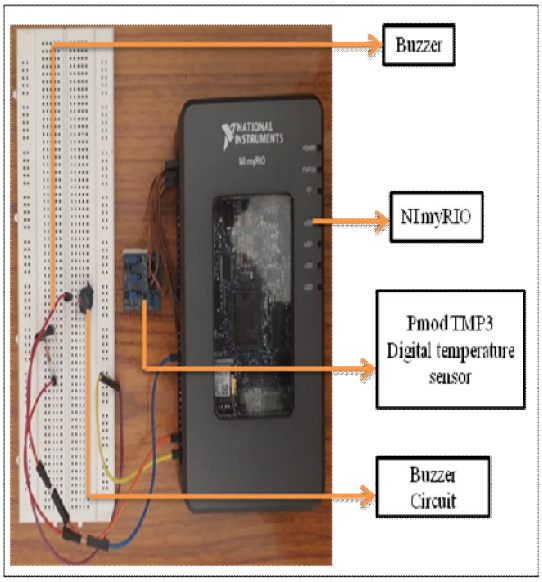

Fig.6 Schematic of the Hardware Setup

The hardware setup consists of a NI myRIO controller, temperature sensor and a buzzer circuit. The myRIO establishes the wfi connection with laptop when it is powered using the power supply. After establishing the wifi connection with the laptop the myrio acquires the sensor values and transmits it over the wifi. The temperature sensor is used to acquire the temperature value. It is interfaced to the MyRIO using the I2C protocol. The labVIEW code is developed for acquiring the temperature sensor value by the myRIO. The temperatures sensor senses the ambient temperature value and gives the data to the MyRIO. The acquired temperature value when transmitted over the wifi is monitored tin the laptop. Any variation in the temperature sensor value can viewed in the laptop. Thus the temperature value can be continuosly monitored. The hardware setup also consists of a buzzer circuit. If the temperature sensor value goes beyond a specified value the buzzer rings an alert signal in order to alert the rise in the temperature value. The buzzer circuit consist of a signal diode, NPN transistor and a 1 kohm resistor. The supply for the buzzer circuit is given from the myRIO. The buzzer circuit requires a 5V digital signal for continuos operation which is supplied from the myRIO B port pin number 1.The PWM signal is given to the transistor through a 1kohm resistor to the transistor for on off operation. The buzzer circuit is interfaced to the NI myRIO and labVIEW code is developed for operating the buzzer. The code is developed in such away that when the temperature value rises beyond the specified limit the buzzer rings. The buzzer has a speaker through which the sound output comes. By varying the frequency of the PWM the signal the range of sound output can be vaired. Thus the user gets an alert signal when the temperature value is high.

IV. RESULT

The temperature value is obtained using the Pmod TMP3 temperature sensor. The NI myRIO controller acquires the temperature value. The labVIEW is developed for acquiring the temperature sensor value. The NI myRIO gives transmits the acquired sensor value over the wifi.The temperature value is continuously monitored in the laptop. If the temperature value goes about the specified value an alert signal is given using the buzzer. The buzzer is connected to the NI myRIO and is programmed using the labVIEW. The fig.7 given below displays the temperature value and the alert message.

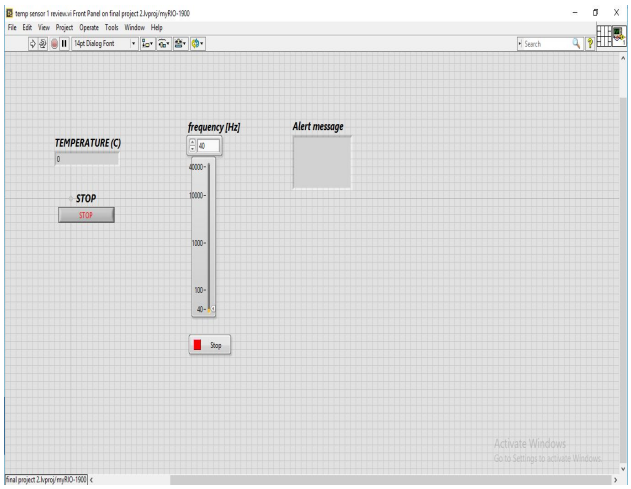

Fig.7 Front Pannel of Output

V. CONCLUSION

The temperature monitoring system is developed with the NI myRIO. An efficient approach for monitoring the temperature is developed using the Pmod TMP3 temperature sensor. The alert signal is given using the buzzer. Both the temperature and buzzer provides a efficient solution for temperature monitoring and alert system

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