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Temperature Monitoring System Using LabVIEW

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Abstract

Temperature monitoring in the industrialized and domestic applications is important and many complications can occur due to absence of improper temperature monitoring method. In this project we will monitor the temperature by using the NI my RIO Embedded Systems Kit temperature sensor based on the MicrochipTCN75A temperature sensor with I2C-bus serial communications. In many industries where heaters and coolers are used so in order to measure the temperature man resources is utilized as the major drawback. In this project we are using the Internet of Things concept like a cloud platform the sensor data will be commonly stored in the cloud so that anywhere and anytime the data can be accessed via the internet. This project model will continuously measure and monitor the temperature level of the room or any device which is operated. This model will continuously senses the current temperature data and send to the my RIO Embedded Systems Kit for processing and the processed digital data is send in a wireless medium to the cloud server which is the Think speak protocol where it is the medium all the data are stored and accessed at any time. In Think speak the data can be viewed in graphical representation and display format is also viewed. This project can be implemented in various industrial sectors such as automotive industries, air conditioning, power plant and other industries that need the data to be saved and analyzed.

Keywords: Temperature,Continuous Monitoring, MicrochipTCN75A, I2C-bus, Internet of Things, my RIO Embedded Systems Kit, ThinkSpeak.

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1. Introduction

The scheme suggests a well-organized application for IoT (Internet of Things) used for monitoring room temperature via World Wide Web Temperature monitoring system uses the handy devices as a user edge. They can connect with temperature monitoring system through an Internet protocol, by means of low power communication devices like Zigbee, Wi-Fi etc. Existing project aims at controlling room temperature via android app using Wi-Fi as communication protocol and node MCU as server system. NodeMCU is an open source IoT platform where the user will directly use the system through a android interface device with the web server where the room temperature is remotely controlled through over a cloud based method. The worker will be interfaced with hand-off equipment circuits that control the gadget for controlling the temperature. It offers chance to interface physical world with PC based frameworks. IoT improves effectiveness, precision, monetary advantages alongside diminished labor. IoT structures help for the collaboration between "things". A climate station is an innovation that gathers information identified with the climate and condition utilizing distinctive gadgets sensors. It contains different sensors and contraptions that cooperate yet in explicit manners to communicate appropriate and exact information of the climate boundaries. It is very precarious to employments of WEB worker based climate station to non-specialized people groups, so we are giving web worker based UI just as Android application. We are notable today most versatile units running on Android OS, and numerous people groups are not able to utilize the android telephone. In this way, our application is valuable for such reason. This gadget is about IoT based Live Weather information Monitoring Using myrio.

1.1 Internet Of Things

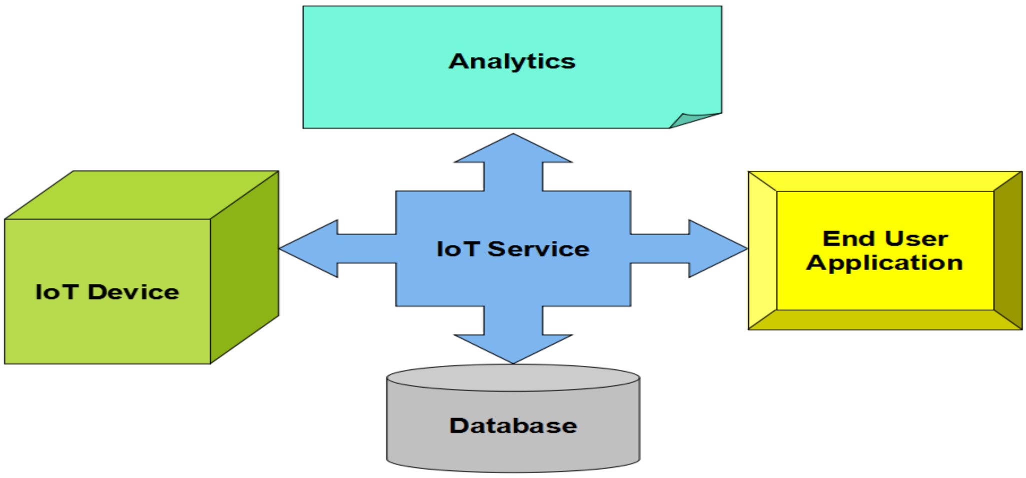

Figure.1. Schematic of the System

The Internet of Things(IoT) is a system of 'connected things'. The things generally comprise of an embedded operating system and an ability to communicate with the internet or with the neighboring things. One of the key elements of a generic IoT system that bridges the various 'things' is an IoT service. An interesting implication from the 'things' comprising the IoT systems is that the things by themselves cannot do anything. At a bare minimum, they should have an ability to connect to other 'things'. But the real power of IoT is harnessed when the things connect to a 'service' either directly or via other 'things'. In such systems, the service plays the role of an invisible manager by providing capabilities ranging from simple data collection and monitoring to complex data analytics. The below digram illustrates where an IoT service fits in an IoT ecosystem: One such IoT application platform that offers a wide variety of analysis, monitoring and counter-action capabilities is 'ThingSpeak'.

1.2 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. We will consider each of these features in detail below.The core element of ThingSpeak is a 'ThingSpeak Channel'. A channel stores the data that we send to ThingSpeak and comprises of the below elements: fields for storing data of any type - These can be used to store the data from a sensor or from an embedded device. location fields - Can be used to store the latitude, longitude and the elevation. These are very useful for tracking a moving device. status field - A short message to describe the data stored in the channel. To use ThingSpeak, we need to signup and create a channel. Once we have a channel, we can send the data, allow ThingSpeak to process it and also retrieve the same. Let us start exploring ThingSpeak by signing up and setting up a channel.

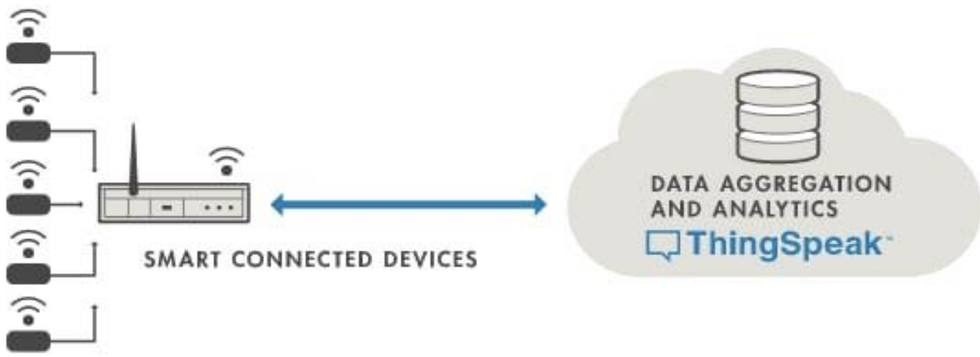

Figure.2. ThinkSpeak

1.3 myRIO

Figure.3. myRIO

myRIO is a portable device and students can easily use it for the design and control of robots and may other systems quite efficiently. It operates on the frequency 667 MHz. myRIO has dual core ARM cortex A9 programmable processor. It has a Xilinx Field Programmable Gate Array (FPGA). FPGA support in myRIO helps the students to design real life developing systems and to solve real problems quite faster as compared to the other micro controllers. Using FPGA support we can avoid the complicated syntax used in C language and in many other. We just have to create logic instead of writing the complicated code with the proper syntax. So, it has reduced the student's difficulties while designing complicated systems. It is student friendly device and is very easy to use. The processing speed of myRIO is quite higher than the standard micro controllers. So, it can be used t solve real life problems and it can be easily used in efficient systems which need a quick output response. It supports different languages e.g. C, C++ and graphical language (FPGA). The further detail about NI myyRIO will be provided later in this article.

1.4 Temperature Sensor

A temperature sensor provides a useful indication of environmental conditions. Figure 33.1 pictures the NI myRIO Embedded Systems Kit temperature sensor based on the Microchip TCN75A temperature sensor with I2C-bus serial communications. The sensor offers ±1 ◦C accuracy over the range −40◦C to +125◦C, nine to twelve bits resolution, and conversion times from 30 to 240 ms. The sensor also provides an "alert" output that triggers when the measured temperature exceeds a user-adjustable limit. Figure 33.1: NI myRIO Embedded Systems Kit temperature sensor. Learning Objectives: After completing the activities in this chapter you will be able to: 1.

Describe the continuous conversion, one-shot, and shutdown operating modes, 2. Configure the ALERT output polarity, comparator, and interrupt modes, and 3. Read and interpret the ambient temperature. 33.1 Component Demonstration Follow these steps to demonstrate correct operation of the temperature sensor. • Jumper wires, F-F (5×) Build the interface circuit:

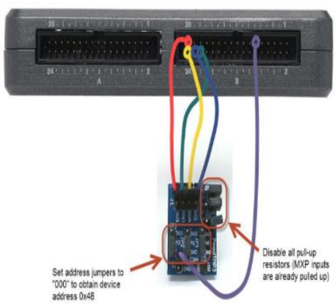

Figure.4. Interface unit

Refer to the schematic diagram shown in Figure 33.2 on page 153; the temperature sensor requires five connections to NI myRIO MXP Connector B (see Figure A.1 on page 233): 1. +3.3-volt supply → B/+3.3V (pin 33) 2. Ground → B/GND (pin 30) 3.

Serial data (SDA) → B/I2C.SDA (pin 34) 4. Serial clock (SCL) → B/I2C.SCL (pin 32) Ensure that all PmodTMP3 jumpers are set exactly as shown.

2. Software Description

2.1. Introduction

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming environment which has become prevalent throughout research labs, academia, and industry. It is a powerful and versatile analysis and instrumentation software system for measurement and automation.

It's graphical programming language called G programming is performed using a graphical block diagram that compiles into machine code and eliminates a lot of the syntactical details.

LabVIEW offers more flexibility than standard laboratory instruments because it is software-based. Using LabVIEW, the user can originate exactly the type of virtual instrument needed and programmers can easily view and modify data or control inputs.

The popularity of the National Instruments LabVIEW graphical dataflow software for beginners and experienced programmers in so many different engineering applications and industries can be attributed to the software's intuitive graphical programming language used for automating measurement and control systems.

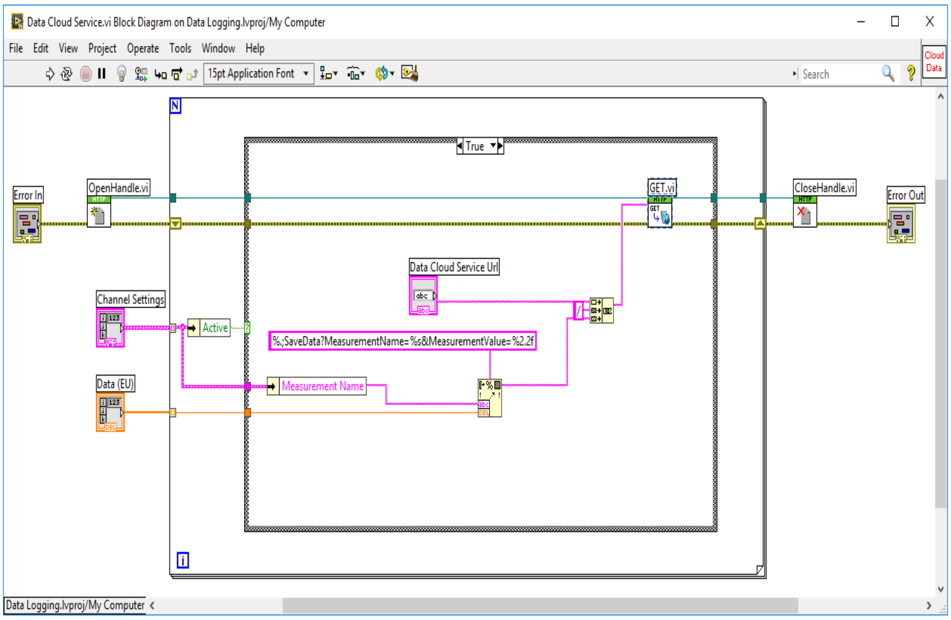

Figure.5. Block Diagram window of LabVIEW

2.2. Schematic of the System

The schematic of the system is shown below, myRIO and Temperature sensor.

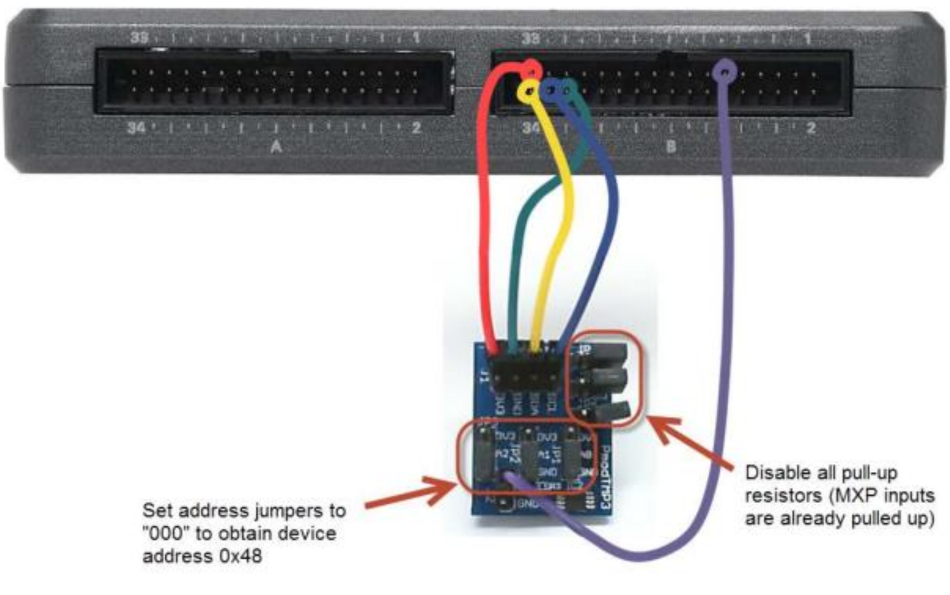

Figure.6. Schematic of the System

2.3. Circuit Connection

The below circuit shows the connection among the LABVIEW myRIO, Temperature sensor.

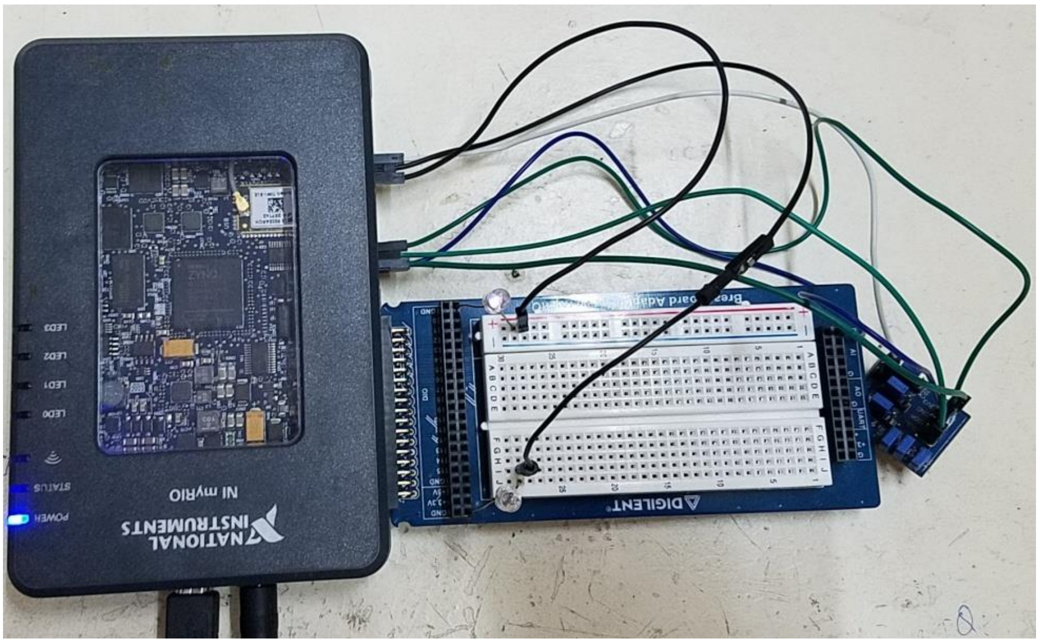

Figure.7. Circuit Diagram

2.4. Experimental Setup/Hardware Prototype

The below figure depicts the hardware prototype that has been developed to realize the proposed methodology. The tests were conducted using the below experimental setup.

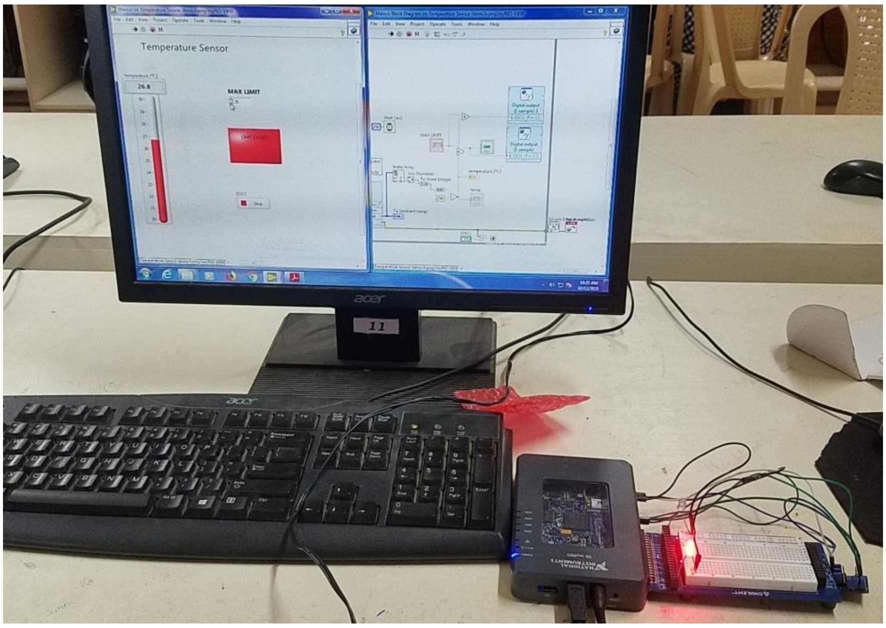

Figure.8. Experimental Setup

3. Operation

Open the project Temperature Sensor demo.lvproj contained in Temperature Sensor demo, Expand the hierarchy button (a plus sign) for the myRIO item and thenopen Main.vi by double-clicking, Confirm that NI myRIO is connected to your computer.

Run the VI either by clicking the Run button on the toolbar or bypressing Ctrl+R.

Expect to see a “Deployment Process” window showing how the select the “Close on successful completion”option to make the VI start automatically.

4. Result

4.1. Validation of the Temperature Sensor

The VI displays the ambient temperature in degrees Celsius as measured by the Microchip TCN75A temperature sensor with an accuracy of ±1 ◦C; expect to see a temperature reading that matches your room temperature. Double-click the maximum and minimum values of the thermometer indicator to change its display range. Try heating the sensor by a finger touch or by using a drinking straw or hair dryer to blow warm air on the thermistor.Use a plastic sandwich bag filled with an ice cube or crushed ice. Surround the temperature sensor with ice and you should observe the measured temperature going down. The alert LED indicator displays the state of the TCN75A "ALERT" output Observe that the alert indicator asserts when the temperature exceeds 26◦C and then de-asserts when the temperature falls below 24.5±1 ◦C. Click the Stop button or press the escape key to stop the VI and to reset NI myRIO.

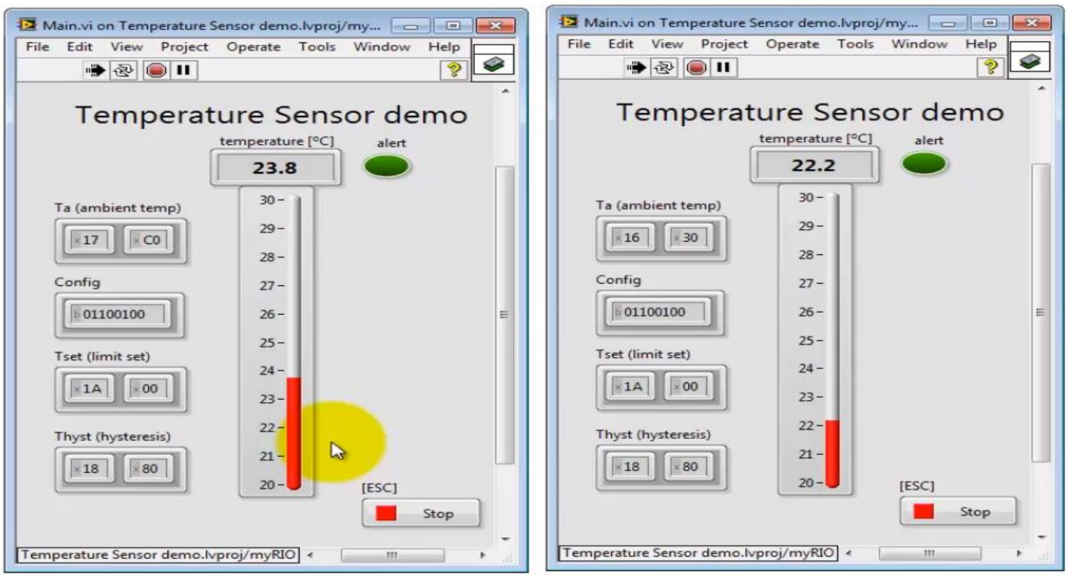

Figure.9. Output Indicator

4.2. Live Monitoring On ThinkSpeak

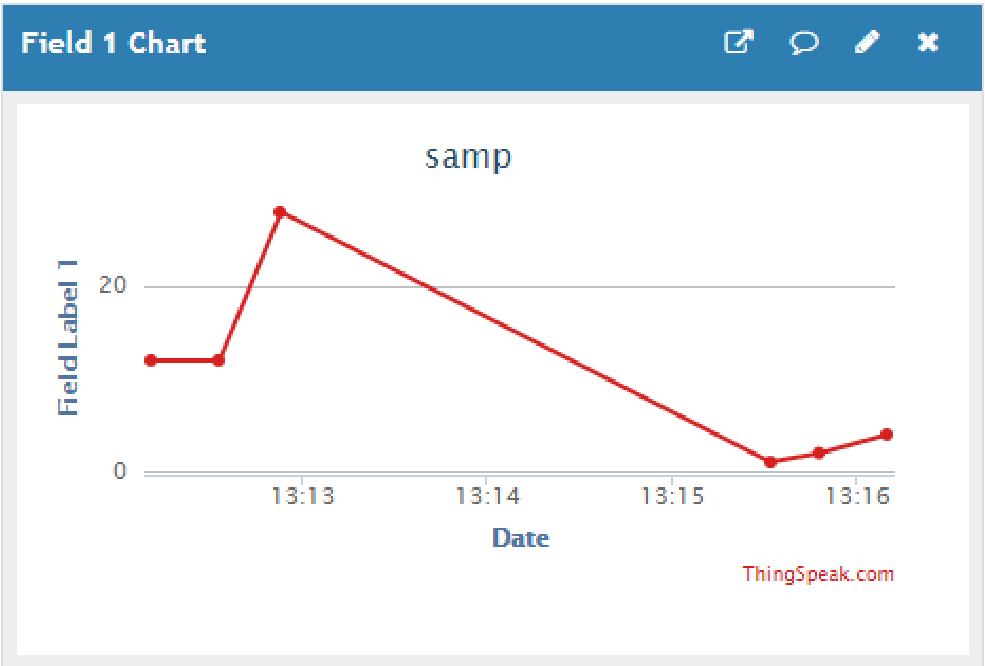

Figure.10. Live Monitoring On ThinkSpeak

5. Conclusion

As a conclusion, the ThingSpeak IoT on Real Time Temperature Monitoring System has successfully been developed which shows an alternative to ease the monitoring process of atmosphere. The temperature sensor used in this system can detect the temperature and send the information through the website of ThingSpeak platform and a smart phone application. The used of smart phone application are the additional feature of the available system in the market which is an advantage to this project. Furthermore, the remote-access feature in this system made it convenient to the user especially to the room admin as they can monitor the atmosphere anywhere if they are connected to the internet.

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