Monitoring of Temperature and Humidity Using LIFA

K P J Pradeep, Research Scholar, Dept of Instrumentation, Sri Krishnadevaraya University, Anantapur.
K Sai Prasad Reddy, Research Scholar, Dept of Electronics, Sri Krishnadevaraya University, Anantapur.
D Hanumesh Kumar, Research Scholar, Dept of Instrumentation, Sri Krishnadevaraya University, Anantapur.
K Nagabhushan Raju, Professor, Dept of Instrumentation, Sri Krishnadevaraya University, Anantapur.
C Nagaraja, Professor, Dept of Instrumentation, Sri Krishnadevaraya University, Anantapur.

ABSTRACT

The current state of the atmosphere plays a major role in the field of agriculture, forestry, marine, utility companies etc. Due to the recent advancements in technology functionality of many home appliances is being controlled based on the conditions of weather. The program is designed using LabVIEW. In this we use an Arduino board with LabVIEW interfacing different sensors placed in local environment to measure temperature, humidity. This paper involves the measuring and the monitoring of the humidity and temperature using Virtual Instrumentation-LabVIEW.

Keywords: Temperature, humidity, Arduino, LabVIEW.

I. INTRODUCTION

Humidity is one of the important parameters in the atmospheric gases. The natural air can contain humidity and varies from season to season. Humidity indicates the likelihood of precipitation, dew, or fog. There are three main measurements of humidity: absolute, relative and specific. Absolute humidity is the water content of air.[1] Relative humidity, expressed as a percent, measures the current absolute humidity relative to the maximum for that temperature. Specific humidity is a ratio of the water vapor content of the mixture to the total air content on a mass basis.

The temperature is a numerical measure of hot and cold in a body that is in its own state of internal thermal equilibrium. Its measurement is by detection of heat radiation or particle velocity or kinetic energy, or by the bulk behavior of a thermometric material. Temperature is important in all fields of natural science, including physics, geology, chemistry, atmospheric sciences and biology.

Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. It's an open-source physical computing platform and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino has some advantages for educational and interested recreational over other systems like Inexpensive, Open source and extensible software, extensible hardware[2].

LabVIEW (short for Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. The software is perhaps the most important component of the system. The main routine, or VI, provides a front panel interface that allows the operator to control and monitor the system. It calls to perform functions that gather analog input, send analog output.

The front panel is what allows the operator to control and monitor the process. It includes software controls and indicators that mimic physical controls such as buttons, sliders, LEDs, and charts. The block diagram is a graphical representation of the underlying software program. It consists of icons that represent typical programming elements such as constants, variables, subroutines, and loops.

The LabVIEW Interface for Arduino (LIFA) allows users to control sensors and acquire data through an Arduino microcontroller using the graphical programming environment LabVIEW. Arduino microcontroller acts as an I/O engine that interfaces with LabVIEW VIs through a serial connection. This helps to move information from Arduino pins to LabVIEW without adjusting the communication, synchronization. Using the common Open, Read/Write, Close convention in LabVIEW, we can access the digital, analog, pulse-width-modulated, I2C, and SPI signals of the Arduino microcontroller. The LabVIEW software package from National Instruments is used to develop the custom data acquisition. The program measures the temperature and humidity from the process[3].

II. INTERFACING OF LM35 & SY-HS-220 TO ARDUINO

Temperature measurement is performed by an integrated circuit temperature sensor LM35 [6]. The output voltage of sensor is linearly proportional to temperature with a
gradient of 10mV/°C and able to operate in the range -55°C to +150°C with an accuracy of ± 0.5°C. These make LM35 good choice for patient temperature monitoring. The LM 35’s low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supply, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in air. The LM 35 sensor has three terminals, the first terminal is connected to 5 Volts Vcc supply and the third terminal is grounded. The centre terminal is terminal two and this is the output terminal Vout that gives the output voltage corresponding to the sensed temperature. The centigrade temperature is converted to Fahrenheit temperature and displayed [4,6].

Fig 1. Block diagram of the system

LM35 is a transducer or temperature sensor that converts heat energy into electrical energy i.e. it senses the temperature and gives an output voltage corresponding to the sensed temperature. The Fig (1) shows the hardware interfacing of LM35 and SY-HS-220 sensors to the Arduino board.

Humidity measurement is performed by the humidity sensor SY-HS-220. This sensor module converts relative humidity (30-90%RH) to voltage and can be used in weather monitoring application. The SY-HS-220 series are linear voltage output vs % RH. Operating Humidity Range of 30-90% RH with an accuracy of ±5%RH at 25°C. SY-HS-220 has three terminals. The red terminal is connected to 5 Volts Vcc supply and the blue terminal is grounded. The centre terminal white terminal two and this is the output terminal Vout that gives the output voltage corresponding to the sensed temperature [5,7].

III. MODELLING AND SIMULATION OF THE SYSTEM

The program has been developed for sensing the voltage from sensor, process data and display the room temperature and humidity. The software language LabVIEW is used to develop the program. LabVIEW (Laboratory Virtual Instrument Engineering Workbench) uses dataflow programming, where the flow of data through the nodes on the block diagram determines the execution order of the VIs and functions [8]. The block diagram contains this graphical source code, also known as G code or block diagram code. Front panel objects appear as terminals on the block diagram [9].

Fig 2: Block diagram of Temperature and Humidity measurement

The output of the LM35 sensor is connected to the pin A0 of the Arduino. Using LIFA (LabVIEW Interface For Arduino) the Arduino Uno board is interfaced to LabVIEW. And the output of SY-HS-220 is connected to the pin A1 of the Arduino. In the very first step Arduino was initialized. The temperature sensor reads the temperature of the particular environment, which we want to measure and converts the temperature into corresponding electrical signal. Then the analog value is converted into digital by means of analog to digital converter in order to read microcontroller. From the Arduino resource by using analog read.vi we can read the values of temperature and humidity in terms of the voltage. To end the process we had to place the Arduino close for the process. The temperature is measure in Degree Celsius (°C) and Humidity is measured with respect to perfect vacuum (%RH)

IV. RESULTS AND DISCUSSION

Fig 3: Front panel of the Humidity measurement
We have obtained observations of temperature and humidity from the Arduino blocks in LabVIEW. This inexpensive system is designed for Industries, having analog I/Os to measure and record the processes in industries. This work has considered two important parameters to measure temperature and humidity as being mostly measured parameters in industries. The presented system can be useful for studying behaviour of humidity and temperature even at remote location.

Fig 4: Front panel of the Temperature measurement

REFERENCES