Temperature Monitoring of Server Room Using Matlab and Arduino

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Abstract

This paper illustrates the use of MATLAB along with ARDUINO for monitoring of the temperature of the server rooms. The ARDUINO platform has become so versatile that it has developed many software to support many different application on it, it also has developed software to support MATLAB , which allows to obtain and plot Real Time data directly from within the MATLAB command window from Arduino. This real time data can be use to automate the AC of the server room according to sensor behavior.

1. Introduction

The server room can be called as the most important room in the office. In the server room the computers network, connect and get powered. As server rooms are the high-sensitivity room, so they need to be maintained at the appropriate temperature continuously. So a continuous temperature monitoring is important in the server rooms to make the server rooms to work efficiently.

The computers kept in the server room are subjected to overheating. The system gradually stop working or get hang, if it turns hot. Sometimes system also gets crash due to overheat which could result in a loss of the important data. So temperature monitoring in the server rooms plays a vital role. The temperature of the server room depends on the many factors, such as the company of the server, climatic condition of the place where server room is located, thus countries which have favorable weather conditions, such as: Canada, Finland, Sweden, and Switzerland attracts more companies to site their server rooms there. The temperature of the server room shouldn't be low beyond a certain range, as, if server room becomes too cold, the machines won't run effectively. The recommended server room temperature is 20C. The server room has been shown [1] in fig 3.

Generally temperature monitoring in server room is being done by using the temperature sensor and through temperature sensor the AC is being automated.

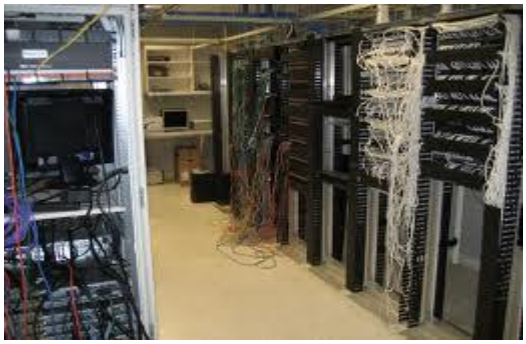

Figure 1. Server room

Sometimes when the whole system is not working properly, generally it takes long time for engineers to find out the source of the problem, through data acquisition of the sensor, the problem can be sorted out in a less amount of time. So data acquisition of sensors becomes important. Therefore, in this paper a server room temperature monitoring system, based on real time data acquisition, monitored by MATLAB is adopted.

Data acquisition is very important because through it, the accurate behavior of sensors can be known. Data acquisition involves gathering of signals from measurement sources and digitizing the signals for analysis, storage, and presentation on a PC.

Through Data acquisition we can measure physical phenomenon. The physical phenomenon could be the temperature of a room, the intensity of a light source in the room, the pressure, the force applied to any object, or many other things.

2. Methodology

In this paper, the main emphasis is given on automation and data acquisition. The data acquisition is obtained through the MATLAB, simply through programming, without using of the tool box and simulink, so this would be more user friendly and would be cheaper way of obtaining real time data acquisition.

On the other hand the automation is obtained with the help of ARDUINO UNO and MATLAB, by interfacing the DC motor and LM35 (temperature sensor) with the arduino.

The block diagram has been shown in fig 2.

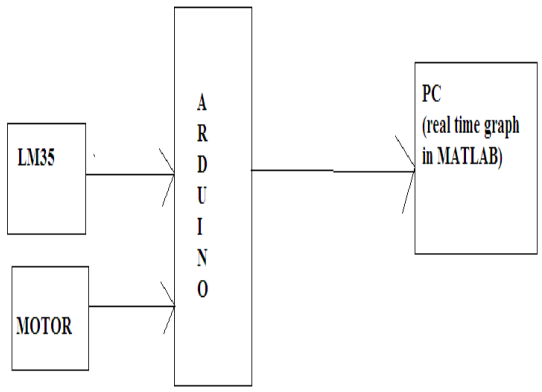

Figure 2. Block diagram of temperature monitoring Server room

The ARDUINO UNO which has been used in this project, is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which we can use 6 pins as PWM outputs), 6 analog inputs, a ceramic resonator of 16MHz, a USB connection, a power jack, and a reset button. In our project we have use ARDUINO UNO because, it has an advantage of being open source, because of which any user can debug it easily. It has an easy USB interface. This board is cheap and easy to find so if any fault arises in this board, the board can be replaced by another new board very easily.

The temperature sensor LM35 is selected for this project rather than using thermistor because through LM35 we can measure temperature more accurately. The hardware of the project has been shown in fig 3.

Procedure: For interfacing Arduino with MATLAB and plotting real time temperature data we need to go to http://www.mathworks.com/matlabcentral/fileexchange /32374 [4] to download the MATLAB support package for Arduino. Then click on the "Download Submission" button that will make the arduino files accessible to the MATLAB. Then connect the Arduino to the computer and open the Arduino IDE and then check which COM port the Arduino is using.

Then upload the adiosrv.pde file to the arduino board. This program tells the Arduino to send data to and receive data from the computer such that it can be controlled by MATLAB.

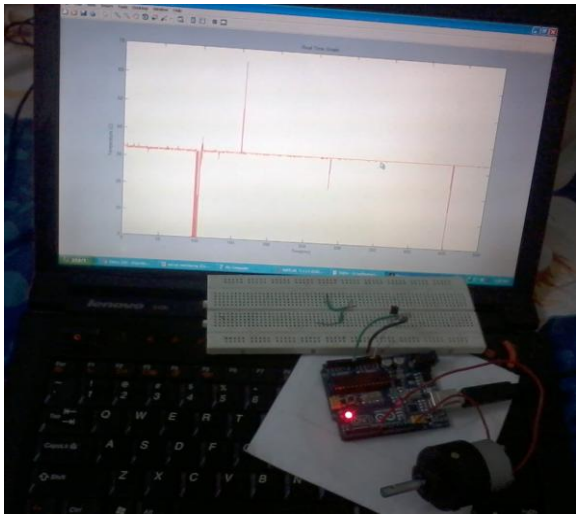

Figure 3. Hardware of temperature monitoring Server room

Then in the MATLAB command window, create a new Arduino object 'a' by entering

a = arduino ('COMX');

Where, X has to be replaced by the COM port number that the Arduino is using. When the Arduino will get connected successfully, it will show result as following text given below:

Attempting connection.....
Basic I/O Script detected!
Arduino successfully connected!

Now MATLAB can utilize all of the functions specified by the arduino.m library so as to perform digital and analog I/O functions. Then write a script to read and plot analog values from a temperature sensor and will automate the DC motor according the real values obtained.

The value of the temperature sensor can be set to any point in the Matlab, now when the set value will be reached, the DC motor will get on, means AC will get ON, and after sometimes because of AC, the room temperature will come down, then the AC will turn OFF automatically.

The connection of Matlab with Arduino in Matlab window is shown in fig 4.

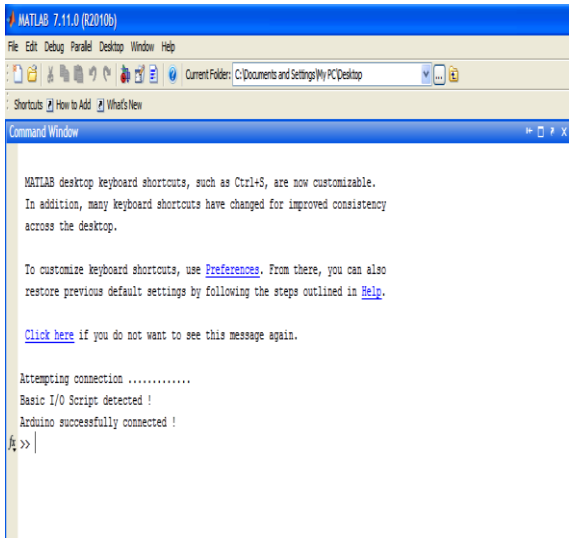

Figure 4. MATLAB connecting to the ARDUINO

3. Result

In this research, a real time graph of temperature sensor has been obtained as shown in figure 5. In the graph, temperature is being plotted against time. The temperature is taken on y-axis and its unit is Celsius and time is taken on x-axis and its unit is ms.

Now by using the real time data, which has been received from the graph, we can determine whether the sensor is working properly or not.

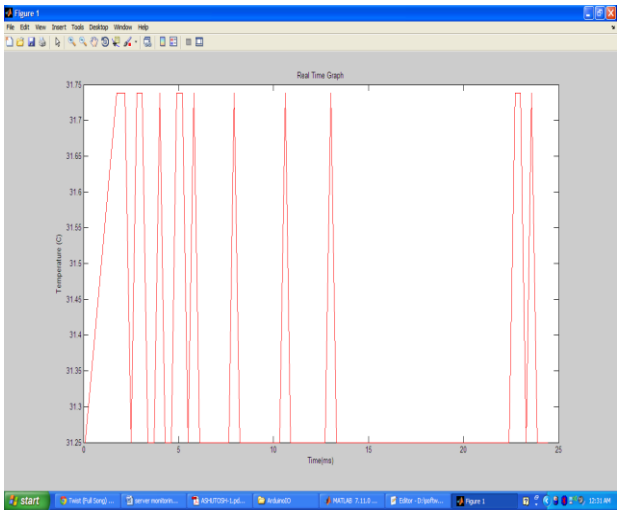

Figure 5 . Real Time Graph of LM35

4. Conclusion and Future scope

By using MATLAB with ARDUINO, data acquisition and automation, becomes very easy. MATLAB can be interface with any analog device using ARDUINO, to gets the reading of the sensor and could save the data for the future use. Since, this project didn't use simulink and any other tool boxes, so this is cheaper and more users friendly.

Further in this project more sensors can be added for example PIR sensor along with IR sensor, to automate the whole server room, through PIR sensor the motion of any person can be detected and the information of presence of someone in the room can be sent to the head of the office, or through PIR sensor the lights and other devices can also be controlled according to the motion detected, and through the IR sensor as long as someone is there in the room the light will remain ON, and the moment server room becomes empty, the room's light will automatically get turn off. And the behaviour of the sensors can be gained through the MATLAB by using real time plots.

5. References

[1] www.hannonhill.com

[2] Kush Singh, "Data Acquisition and Processing through MATLAB AND ARDUINO", 9 May 2013 .

[3] Introduction to Data Acquisition, Publish by National Instruments , July 2 ,2012

[4] http://www.mathworks.com/matlabcentral/fileexchange/32374