

## DATA ACQUISITION SOFTWARE FOR SYSTEM TEMPERATURE MONITORING

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**Abstract-***The main goal of this paper was to Develop User friendly and low cost master monitoring software for DAQ of various temperature sensors of any type. This application will be useful to measure the outputs of the temperature sensors implemented in any control system or hardware to visualize the measured data graphically (on charts) on software monitor, in digital output form in different labels for different sensors and to show measured data in different data loggers against present time. The measured data are automatically saved in a excel sheet and in a text file located in a predefined location. This software can be used easily to show the variation of different physical parameters not only temperatures but also voltage, velocity, current, humidity, vibration etc. And the saved data can be used for further calculation or manipulation. In the development of such type arrangement, we used Visual studio2010 in c#.NET framework 4. There are some issues here in this project like developing code in C# and designing forms to achieve the specified response from the Hardware.*

**Keywords:** DAQ software, Automatic DAQ monitor, System monitoring software.

### 1. Introduction

Objective of this paper is development of data acquisition software for system temperature monitoring. PC based data acquisition software uses a combination of modular hardware and flexible software to transform computer into a user- defined measurement or control system<sup>[1]</sup>. The ability of a data acquisition system to measure different properties depends on sensors that are suited to detect the various properties to be measured. A sensor data vary when the environmental conditions (such as temperature) get changed. DAQ Software is the flexible part of a DAQ system. In my project, master control software was built in visual studio 2010 on C#.NET platform. And here this software is the only output platform of various sensors. This DAQ soft will communicate through com port. After selecting the port on GUI (Graphical User Interface), communication starts. And sensor's analog value start coming to ADC port then converted (via ADC) digital output is sent to master DAQ software. Then received data are spitted into different channels. Then on GUI whole data package is shown graphically. Thus one can easily understand the situation of that system by seeing the variation of data input. For manual data acquisition system, it can be subject to errors. Readings may not be taken at the prescribed times. The problems become worse if a large number of readings need to be taken, as timing may become more of an issue, along with the volume of work required. To overcome this, the simple answer is to use user friendly and low cost computer controlled DAS (Data acquisition software) to perform the data acquisition. As technology has progressed, this type

of process has been simplified and made more accurate, versatile, and reliable through electronic equipment. For the people of Developing country like Bangladesh, low cost & user friendly DAQ system is much more beneficial in control Engineering.

### Software Required for DAQ:

Development of this “system Temperature monitoring software” was done in Visual Studio2010 On C# .NET framework. This software will perform real time Data acquisition as well as can be used for long term stability measurement.

### Hardware Description for DAQ:

Data acquisition is the process of sampling signals that measure real world physical conditions and converting the resulting samples into digital numeric values that can be manipulated by a computer [2]. Data acquisition systems typically convert analog waveforms into digital values for processing. The components of this data acquisition systems Include:

(a) Signal conditioning circuitry to convert sensor signals into a form that can be converted to digital values [3].

(b) Analog-to-digital converters, which convert conditioned sensor signals to digital values. Data acquisition applications are controlled by software programs developed using various general purpose programming languages such as Visual C#, Visual Basic. Master control software use serial port of PC to communicate the data acquisition system. A master slave topology based command structure has been developed to give the set point and collect data from Microcontroller 18F4550.

### Specialty of DAQ Software:

Aim of this data acquisition Software is collecting data (Temperature) or information that describes the given situation of any system. This software can be used for versatile application not only to measure temperature but also to measure pressure, voltage, current, humidity. The emphasis is therefore on getting the value which I'm getting from my hardware.

### Specialty of this data acquisition software:

1. The main specialty is low cost, availability & user friendly graphical interface.
2. A graphical representation of received data, mainly sine curve or range column will show variation in input temperature.
3. A real time data logger which logs data according to time in different textboxes.
4. A real time data monitor, which only shows the digital output.
5. An automatic data saving option, which will save data in a text file in .txt format.

### Block Diagram of data flowing from sensors:

Multi functional activities & data transmission lines from sensors to this DAQ software are given in figure: 1.

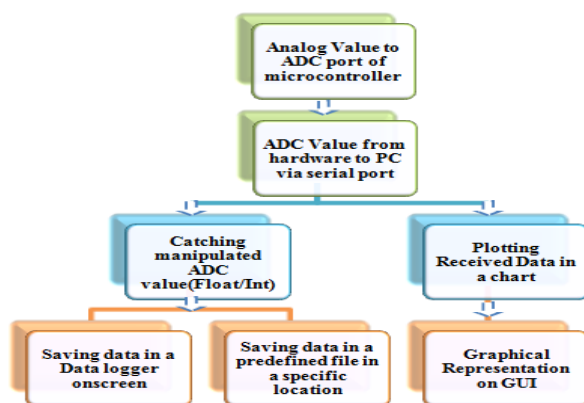


Figure 1: Block Diagram of the functions of DAS

### 2. NET framework architecture

The .NET Framework in Visual studio 2010 is a software framework developed by Microsoft that runs primarily on Microsoft Windows. It includes a large library and provides language interoperability across several programming languages. Programs written for the .NET Framework execute in a software environment, known as the Common Language Runtime (CLR), an application virtual machine that provides services such as security, memory management, and exception handling. The class library and the CLR together constitute the .NET Framework [4].

Visual Studio 2010: Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. I used VS 2010 to develop DAQ graphical user interface as Windows form application in visual C#, on .NET Framework 4. Visual Studio includes a code editor supporting IntelliSense as well as code refactoring [5]. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, designer, class designer, and database schema designer. Visual Studio supports different programming languages by means of language services, which allow the code editor and debugger to support nearly any programming language, provided a language-specific service exists. One second into the serial port. It will receive 8-bit digital data corresponding to the analog signal received from temperature sensors.

### 3. Layout of DAQ Software(Results)

Layout of DAQ Software developed in visual studio 2010 in c# on .NET framework 4 is in figure: 2. As while simulating in protius we are getting constant data from sensors for why outputs are same.

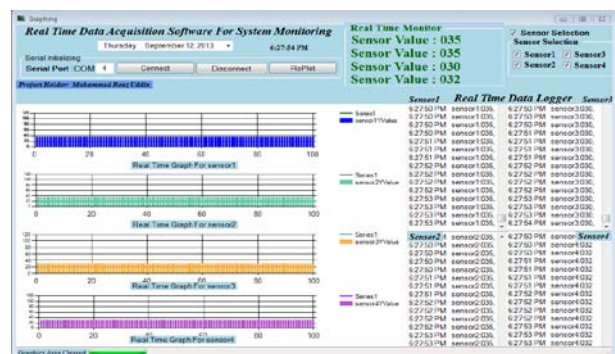


Figure 2: final Layout of DAQ Software

### Options for selecting sensors

Operator of DAQ software can select any sensor from DAQ software interface via check boxes. If any check box is checked then that sensors visualization window, data logger & real time monitor will show on C# GUI. And if unchecked then it will work vice versa.



Figure 3: Options for selecting sensors

Real Time Monitor

Real time monitor will show all the received data in a group box of all the existing sensors as figure: 4.

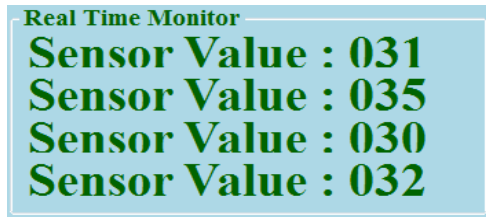


Figure 4: Real time monitor

Data visualization window:

Separate labels I have used which will show the real time data in a specific group box in different labels. And there I used four boxes where incoming data will be stored in accordance with date & time

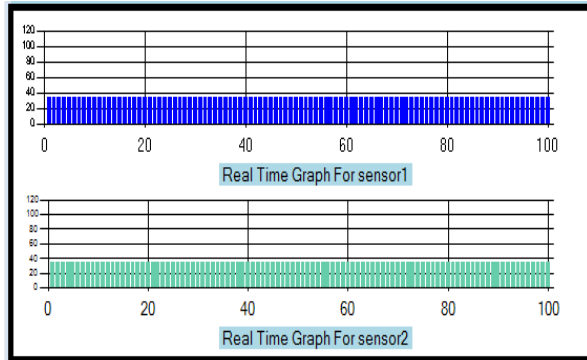


Figure 5: Data visualization window

Microsoft Excel database management

The Data which transmit to the computer can be saved in text file from DAQ Software, which can be transferred to Excel sheet automatically for further manipulation as an example a simple layout is given in figure 6. As data are coming, data are saving in Excel sheet at the same time.

	A	B	C	D
1	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
2	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
3	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
4	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
5	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
6	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
7	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
8	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
9	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
10	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
11	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
12	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
13	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
14	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
15	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
16	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM
17	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
18	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
19	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
20	3:56:44 AM	sensor1:077, 3:56:44 AM	sensor2:014, 3:56:44 AM	sensor3:092, 3:56:44 AM
21	3:56:45 AM	sensor1:077, 3:56:45 AM	sensor2:014, 3:56:45 AM	sensor3:092, 3:56:45 AM
22	3:56:43 AM	sensor1:077, 3:56:43 AM	sensor2:014, 3:56:43 AM	sensor3:092, 3:56:43 AM

Figure 6: Microsoft Excel database

Onscreen Data Logger

The received data which is coming from Hardware are shown in 4 text boxes which can be easily saved in a log file. The view of data logger is in figure: 7.

Real Time Data Logger			
Sensor1			Sensor3
6:31:35 PM	sensor1:035,	6:31:36 PM	sensor3:030,
6:31:36 PM	sensor1:035,	6:31:36 PM	sensor3:030,
6:31:36 PM	sensor1:035,	6:31:36 PM	sensor3:030,
6:31:36 PM	sensor1:035,	6:31:36 PM	sensor3:030,
6:31:37 PM	sensor1:035,	6:31:37 PM	sensor3:030,
6:31:37 PM	sensor1:035,	6:31:37 PM	sensor3:030,
6:31:37 PM	sensor1:035,	6:31:37 PM	sensor3:030,
6:31:37 PM	sensor1:035,	6:31:37 PM	sensor3:030,
6:31:38 PM	sensor1:035,	6:31:38 PM	sensor3:030,
6:31:38 PM	sensor1:035,	6:31:38 PM	sensor3:030,
6:31:38 PM	sensor1:035,	6:31:38 PM	sensor3:030,
6:31:39 PM	sensor1:035,	6:31:39 PM	sensor3:030,
6:31:39 PM	sensor1:035,	6:31:39 PM	sensor3:030,
6:31:39 PM	sensor1:035,	6:31:39 PM	sensor3:030,
6:31:39 PM	sensor1:035,	6:31:39 PM	sensor3:030,

Figure 7: Data Logger window

Background Data Logger

The received data which are shown in 4 text boxes are saved in a text file according to time. The view of data saved file is in figure: 8.

Figure 8: Saved Data file

#### 4. Discussion & Conclusion

Reading and recording the analog signal coming from the hardware unit in digitalized form has been tested with the compatible hardware. The developed software is working satisfactory at anywhere. The main objectives of my project were to make it user friendly & low cost DAQ software where it is being widely used in all the sectors of automation industry. The low cost DAQ Software will facilitate the spread of the use of automatic measurement & control system in all types of plants. Since the financial resources of third world countries, like Bangladesh are limited, low cost solutions are always welcome to contribute to a greater intensity. In the developed DAS, multifunctional activities are done by just GUI coding in code window. Data acquisition involves many techniques and skills. There are many

different components to a data acquisition system including sensors, communication links, signal processors, computers, databases, etc. All these items have to operate together to make a successful data acquisition software. This software is a prototype of industrial data acquisition software. Using PLC and much more precise transducer sensor this same project is applicable to many industries. The same GUI setup can be used to measure pressure, humidity by using respective sensors.

## 5. References

- [1] International Journal of Electronics Communication and Computer Engineering: Volume 4, Issue 1, ISSN (Online): 2249-071X, ISSN (Print): 2278-4209
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