Low Cost Data Acquistion System Using LABView

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Abstract— In today's engineering education the demand of quality projects and quality research at the student level is increasing. To make a good hardware project most of the time we need to acquire real time data. This acquisition is done through the device which is called Data Acquisition System. In india there is not a single company which produces these device. Because of these we have to import these devices from other countries. It results in a high cost for the student. Hence there is need to provide Data Acquisition system which has a low cost and suits according to their proposed work. In these paper we designed and implemented a prototype data acquisition system (DAQ) using AVR microcontroller. The software required for the DAQ system is LABView. This device has been tested for different tasks and different environment conditions.

Keywords— Data Acquistion System, LABView, AVR microcontrolle.

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I.   INTRODUCTION

The data acquisition device is important for engineering collage as well as various industry. DAQ devices are used to send the real words physical data to computer. DAQ device converts real words physical or analog signal into the machine code and send towards the computer for data manipulation. The DAQ system device is interfaced with the LABView software which can show the variation of the analog quantity with varying parameters. Hence these can be used for teaching the basic concepts by showing practically the variation of any quantity like variation with temperature, Strain gauge response etc. There are lot of DAQ devices available in the market but the cost of the device is near about 3,00,000 INR. These cannot be affordable by the students.

The goal of this paper is to provide the basic idea of assembling the Data Acquisition system device which can be interfaced easily with the LABView. The DAQ device is very useful for the applications like a temperature monitoring, level monitoring, etc. The system meets the following requirements: (1) Suitable for educational purpose, (2) Low cost. (3) Easy to assemble (4) Able to run on different platforms

In these paper we have designed and assembled a data acquisition   system (DAQ) using the AVR ATmega 328 microcontroller. These device sends machine code to the computer via serial communication using RS232 connector. The output of these device we can see on the computer using a LABView software.

II.   ARCHITECTURE OF DAQ DEVICE

Data Acquisition system device consist of Transducer, sample and hold circuit, analog to digital converter, USART module and RS232 connector. Description of every block is given below. The block diagram of an architecture of DAQ system device is shown inn figure 1.

A.   Transducer

A transducer is a device that converts one form of energy to another. Usually a transducer converts a signal in one form of energy to a signal in another.[5] Type of transducer used in our Circuit are listed in below table.

TABLE 1.Transducer

Phenomena	Transducer
Temperature	Thermistor
Light	Photoconductive tubes
Sound	Microphones
Force and pressure	Strain gages

B. Sample and Hold circuit

The main function of sample and hold circuit is to sample the input signal. The sampling frequency of the circuit should be follow by nyquist criteria of the sampling theorem.

C. Analog to Digital converter

Analog and Digital converter is used to convert the analog signal into digital sequence. The analog to digital converter took the instantaneous analog voltage value from the sample and hold circuit and converts it to the appropriate digital sequence depending the reference voltage.
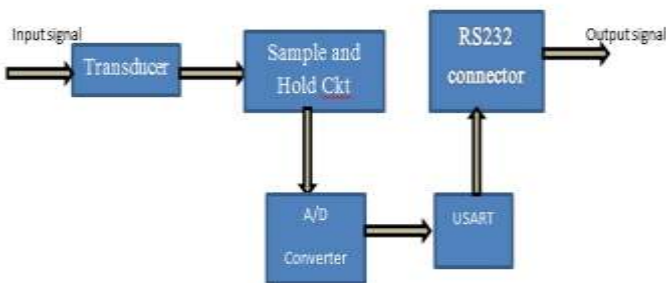
The AVR ATmega 8 has an a inbuilt ADC in microcontroller.

Fig1: Architecture of DAQ device

D. USART

USART stands for universal Synchronous Asynchronous Receiver transmitter. It is sometimes called the serial communication interface or SCI. it is a type of device that can be programmed to communicate asynchronously or synchronously. It is an inbuilt unit under the microcontroller and it is used to transfer the signal serially to the computer.[4] It took digital sequence from the analog to digital converter and according to baud rate specification it transfers the data to the computer.

E. RS232 connector

In telecommunication RS232 is a standard for serial communication transmission of data . it formally defines the signal connecting between DTE(data terminal equipment) such as a computer terminal, and DCE(data circuit terminating equipment) such as a modem. The RS232 standard commonly used in computer serial ports.[3]

When we connect the RS232 connector cable to the computer. The operating system of the computer assigns a port number to the RS232 port. These port number used in the programing to identify the data from coming serial port.
The Baud rate of DAQ device an computer is must be same.

III. DAQ HARDWARE

The DAQ device is based on AVR microcontroller. In our circuit we used Atmega 328 AVR microcontroller. It is an high performance, low power Atmel AVR 8 bit microcontroller. Technical specification of the ATmega328 microcontroller is given below.

- o Operating Voltages
  1. 1.8-5.5V
  2. 4.5-5.5V
- o Temperature Range
  -40ºc to 85ºc
- o Speed Grade
  1. 0-4Mhz
  2. 0-10Mhz
  3. 0-20Mhz
- o Power Consumption at 1Mhz, 1.8v, 25ºc
  1. Active Mode:0.2mA
  2. Power down Mode:0.1µA
  3. Power save Mode: 0.75µA
- o I/O and Packages
  1. 23 programmable I/O lines
  2. 28 pin PDIP
- o Peripheral Features
  1. Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
  2. One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  3. Real Time Counter with Separate Oscillator
  4. Six PWM Channels
  5. Programmable Serial USART
  6. Interrupt and Wake-up on Pin Change

AVR ATmega 8 comes with on chip analog to digital converter and USART module. For storing the embedded program the AVR microcontroller comes with an 8k on chip flash program memory. The Baud rate of an USART can be adjust using a program. We have to program it according to our requirement.[2]

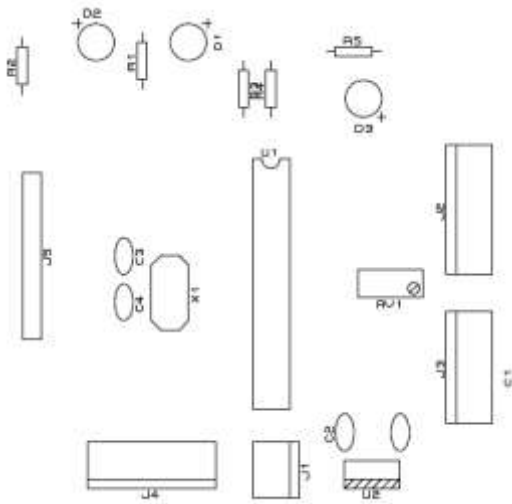The following figure shows the layout of hardware
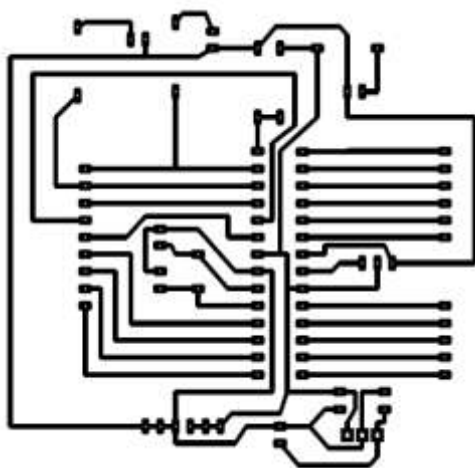
Fig. 2: Hardware layout from front side

Fig 3: Hardware layout from Back side

IV.   SOFTWARE

To display the output of DAQ device we use LABView software. LABView is very famous for its easy to use graphic user interface. It well performed in real time. The LABView software is very easy to use.

The DAQ device sends data throw RS232 cable. LABView receives these data from the device manipulate these and shows the output. Snapshot of an output shown by labview is showed in following figure.
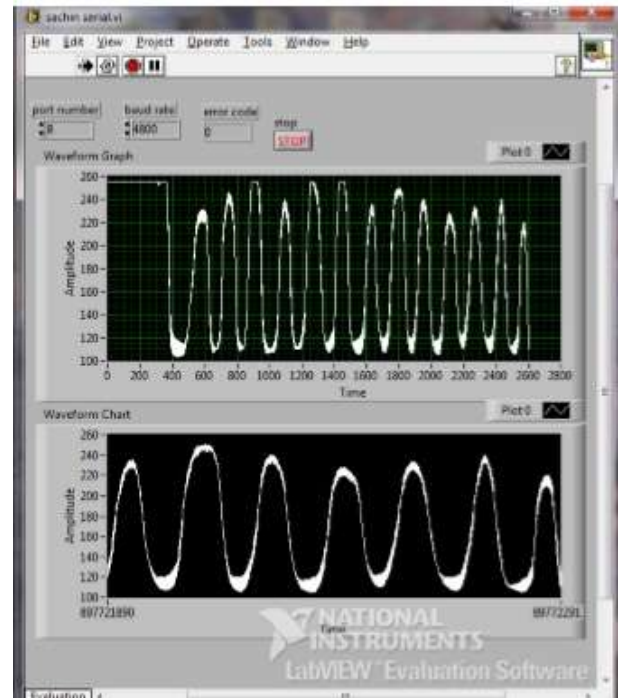

Fig 4: Front Panel of the DAQ device Program in Labview

V.   RESULT

The result of the output of LABView shown in figure 4.These shows that the DAQ device worked satisfactory. It works for temperature monitoring and level monitoring.

VI.   CONCLUSION

A low cost DAQ system device has been implemented and tested. It gives satisfactory response. These device can be used in for various application at collage level as well as industry level. The Daq device can used in biomedical also.

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