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GPS AND DAC CARD INTERFACING USING VISUAL C SHARP

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Abstract

The objective of this paper is to implement GPS and DAC card interfacing using Visual c sharp .Microsoft Visual Studio2010 is used as a developing IDE programming and is done in C#(C sharp). The purpose of this paper is to develop a GUI based application in C sharp. Fetch data from different files and perform USB based data acquisition. Serial port communication and also Derive latitude, longitudes from $GPGGA and $GPRMC type NMEA(National Marine Electronic association)Sentence in GPS and display them.

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INTRODUCTION

The development of the above stated paper work has features involved knowledge about file handling in C#, designing a graphical user interface , perform data acquisition using USB 205 [1]and serial port communication .Various classes already defined in C# have been used to implement the software requirements.This paper is to implement GPS and DAC card interfacing using Visual c sharp .Microsoft Visual Studio2010 is used as a developing IDE programming is done in C#(C sharp).

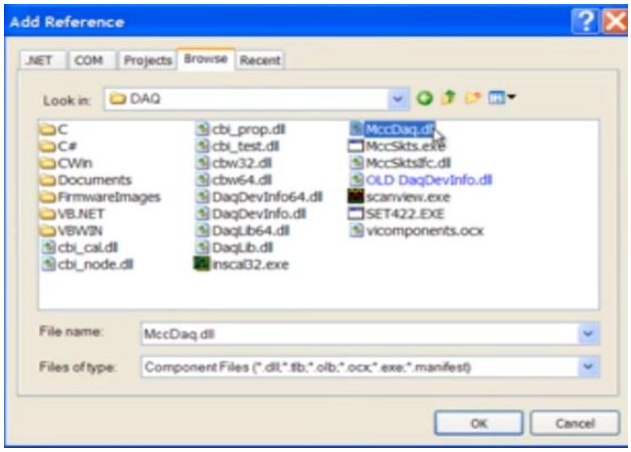
The purpose of this paper is to develop a GUI based application in C sharp. Fetch data from different files and perform USB based data acquisition . Serial port communication and also the Derive latitude longitudes from $GPGGA and $GPRMC type NMEA(National Marine Electronic association)Sentence in GPS and display them.

The .NET Framework is a software framework that runs primarily on Microsoft Windows. It includes a large library and supports several programming languages which allows language interoperability (each language can use code written in other languages). The .NET library is available to all the programming languages that .NET supports. Programs written for the .NET Framework execute in a software environment (as contrasted to hardware environment), known as the Common Language Runtime (CLR), an application virtual machine that provides important services such as security, memory management, and exception handling.

II.WORKING PRINCIPLE

2.1 DAC CARD INTERFACING

To perform DAC card interfacing in C# application following steps are performed. We add references by right clicking the reference node in the Solution Explorer.



DAC CARD INTERFACING

2.2 DAQ CARD INTERFACING

To perform DAQ card interfacing in C# application following steps are performed.
We add references by right clicking the reference node in the Solution Explorer
Initialization-The MccBoard class provides access to all of the methods for data acquisition and properties providing board information and configuration for a particular board.The following code examples demonstrate how to create a new instance of the MccBoard class with the board number passed to it:
privateMccDaq.MccBoardDaqBoard = new MccDaq.MccBoard(BoardNumber);

2.2.1 Analog Input-The MccBoard class contains close to 80 methods that are equivalents of the function calls used in the standard Universal Library. The MccBoard class methods have virtually the same parameters set as their UL counterparts. The following code examples demonstrate how to call the AIn()method of the MccBoardobject.Collect the data by calling AIn member function of MccBoard object *DaqBoard.AIn(Chan, Range, out DataValue);*

2.2.2 Parameters: Chan-the input channel numberRange-the Range for the board.DataValue-the name for the value collected
4.Convert raw data to Volts by calling ToEngUnits (member function of MccBoard class) DaqBoard.ToEngUnits(Range, DataValue, out EngUnits

2.2.3 SERIAL PORT

C# provides the serialPortobject for managing COM port connections and is located inside the toolbox where it can be dragged onto a form.

2.2.4 Connection.
In order to open the serial port, the user must first set the PortName,BaudRate, Handshakeand

StopBits**properties**.Once the connection properties have been set, the port can be opened using the **Open()** routine.
ComboBox1.Text is used to store the available ports.
ComboBox2.Text is used to store the baud rate entered after converting it into the range of Int32.
SerialPort1.Open is used to open the port.

2.2.5 sending data

Data is transmitted from the PC to the serial port via the **Write()** routine.

```
serialPort1.WriteLine (textBox1.Text);
                textBox1.Text = "";
```

write line method is used to write the data on the console or some file etc. here in this above code mentioned textbox1 text is being written to the serial port via the write line() routine,

2.2.6 Reading data

Data is read from the serial port using the **ReadByte()** or **ReadLine()** routine.

```
textBox2.Text = serialPort1.ReadLine();
```

Read Line method to read input that is redirected from a serial port. The read operation terminates when the method returns **null**, which indicates that no lines remain to be read.
And after reading the data from the serial port it is stored in textbox2.

2.3 SYSTEM DESCRIPTION

The purpose of data acquisition is to measure an electrical or physical phenomenon such as voltage, current, temperature, pressureorsound.PC-based data acquisition uses a combination of modular hardware, application software and a computer to take measurements. While each data acquisition system is defined by its application requirements, every system shares a goal of acquiring, analyzing and presenting information. Data acquisition system incorporate signals, sensors, actuators, signalconditioning, data acquisition devices and application software

2.4 SIGNAL CONNECTIONS:-

Analog input-We can connect up to 8 single-ended inputs to screw terminals CH0 to CH7. The input voltage range is ±10 V. Single-ended mode requires two wires; connect one wire to the signal you want to measure (CHx), and connect a second wire to the analog ground reference (AGND).
External clock I/O-The USB-205 provides one external clock input (AICKI) and one clock output (AICKO) for the analog input pacer. Connect the external clock signal to AICKI.
When using an external clock, AICKO outputs the pulse generated from AICKI.
When using the internal clock, AICKO outputs the ADC scan clock.
Analog output-The USB-205 has two 12-bit analog outputs (AOUT0 and AOUT1). Both outputs can be updated simultaneously at a rate of 125 S/s per channel. One output can be updated at a rate of 250 S/s. The output range is fixed at 0 V to 5 V. The outputs default to 0 V when the host

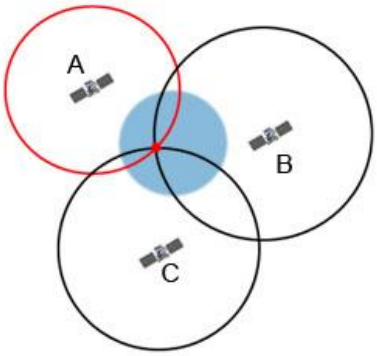
computer is shut down or suspended, or when a reset command is issued to the device.

2.5 APEM 700100 (JOYSTICK)

APEM introduces a range of professional joysticks for industrial applications. APEM joysticks are easy to use, reliable, and designed for extremely long service lives. Four series are offered based on different technologies: switch joysticks, proportional joysticks, and contactless joysticks.APEM 700100 is a two Axis Inductive Joystick andhas robust quality design.

III. WORKING OF GPS

The Global Positioning System (GPS) is a network of about 30 satellites orbiting the Earth at an altitude of 20,000 km. The system was originally developed by the US government for military navigation but now anyone with a GPS device, be it a Sat Nav, mobile phone or handheld GPS unit, can receive the radio signals that the satellites broadcast. Wherever you are on the planet, at least four GPS satellites are 'visible' at any time. Each one transmits information about its position and the current time at regular intervals. These signals, travelling at the speed of light, are intercepted by your GPS receiver, which calculates how far away each satellite is based on how long it took for the messages to arrive. Once it has information on how far away at least three satellites are, your GPS receiver can pinpoint your location using a process called trilateration.



Imagine you are standing somewhere on Earth with three satellites in the sky above you. If you know how far away you are from satellite A, then you know you must be located somewhere on the red circle. If you do the same for satellites B and C, you can work out your location by seeing where the three circles intersect. This is just what your GPS receiver does, although it uses overlapping spheres rather than circles.
The more satellites there are above the horizon the more accurately your GPS unit can determine where you are.

3.1 NMEA GPS STRINGS

GPS modules typically put out a series of standard strings of information, under something called the National Marine Electronics Association (NMEA) protocol.
$GPGGA: Global Positioning System Fix Data
$GPGSV: GPS satellites in view
$GPGSA: GPS DOP and active satellites
$GPRMC: Recommended minimum specific GPS/Transit data
$GPRMC,092750.000,A,5321.6802,N,00630.3372,W,0.02,31.66,280511,,,A*43
$GPGGA,092751.000,5321.6802,N,00630.3371,W,1,8,1.03,61.7,M,55.3,M,,*75
$GPGSA,A,3,10,07,05,02,29,04,08,13,,,,,1.72,1.03,1.38*0A
$GPGSV,3,1,11,10,63,137,17,07,61,098,15,05,59,290,20,08,54,157,30*70

Fig 7: GPS NMEA strings

Interpretation of GPRMC String
$GPRMC,225446,A,4916.45,N,12311.12,W,000.5,054.7,191194,020.3,E*68

225446	Time of fix 22:54:46 UTC
A	Navigation receiver warning A = Valid position, V = Warning
4916.45,N	Latitude 49 deg. 16.45 min. North
12311.12,W	Longitude 123 deg. 11.12 min. West
000.5	Speed over ground, Knots
054.7	Course Made good, degrees true
191194	UTC Date of fix, 19 November 1994
020.3,E	Magnetic variation, 20.3 deg. East
*68	mandatory checksum

In GPRMC latitude can be obtained at index number 3 and longitude at index number 5 and in GPGGA at index 2 and 4 respectively after splitting the NMEA strings obtained.

3.2 SERIAL PORT

In computing, a serial port is a serial communication interface through which information transfers in or out one bit at a time (in contrast to a parallel port). Throughout most of the history of personal computers, data was transferred through serial ports to devices such as

modems, terminals and various peripherals.
While such interfaces as Ethernet, FireWire, and USB all send data as a serial stream, the term "serial port" usually identifies hardware more or less compliant to the RS-232 standard, intended to interface with a modem or with a similar communication device.RS232 is the communication line that transmits data by using only three wire links, which are used for 'transmit', 'receive' and 'common ground.'
Serial ports also known as COM (communications) ports were extensively used earlier. Serial communication was popular because most computers had one or more serial ports. All you needed was a cable to connect the instrument to the computer or two computers together.

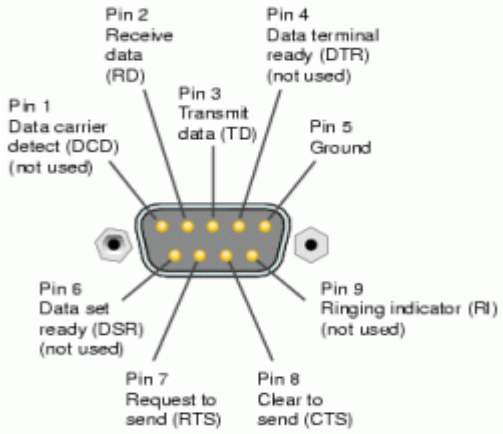


Fig 8: A male DE-9 connector used for a serial port

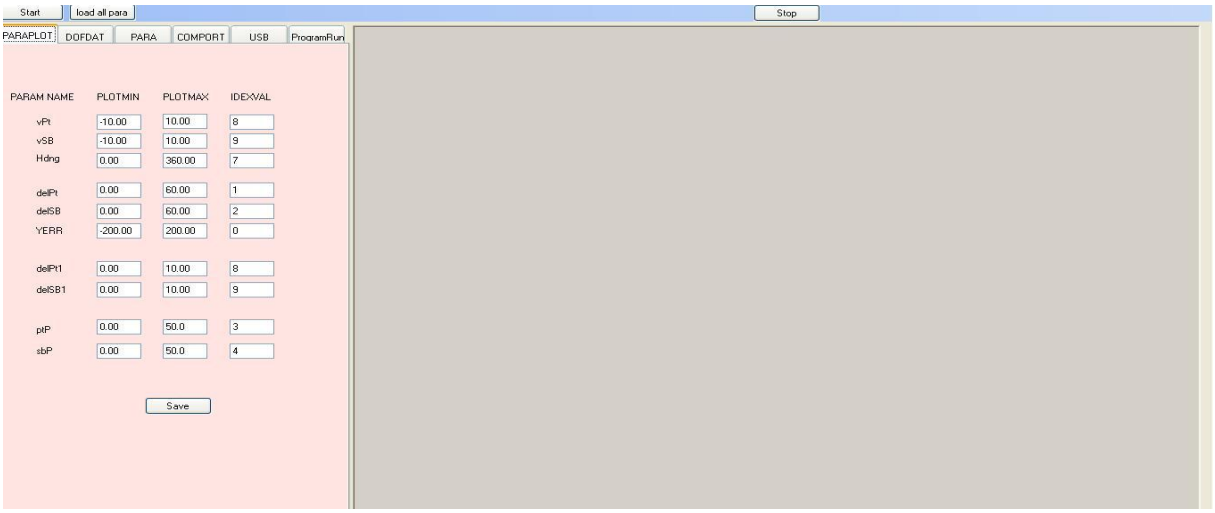
3.3 DEVELOPING SOFTWARE:

Main objective is to create a smooth GUIthat can perform GPS and DAQ card interfacing along with reading and loading different files into separate tabs designed for each file. User can view all input parameters of three different files by reading all the files through a single button.

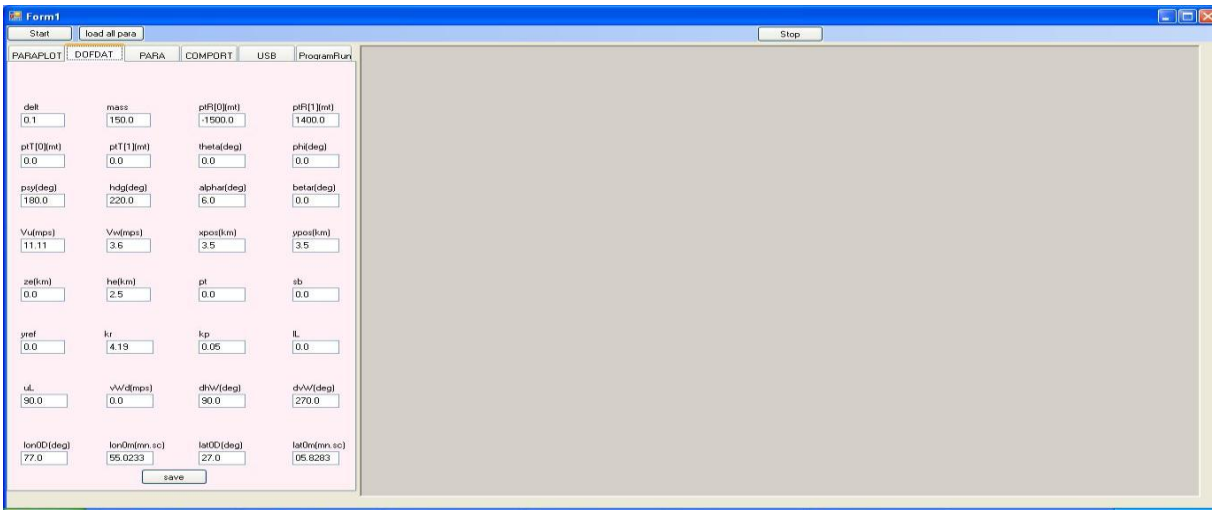
Software used :	Visual Studio 10, GPS simulator.
Language used :	C#
Operating System :	Microsoft XP
Hardware required :-	MCC DAQ USB 205 , APEM 700100 , Serial port connector

IV RESULTS

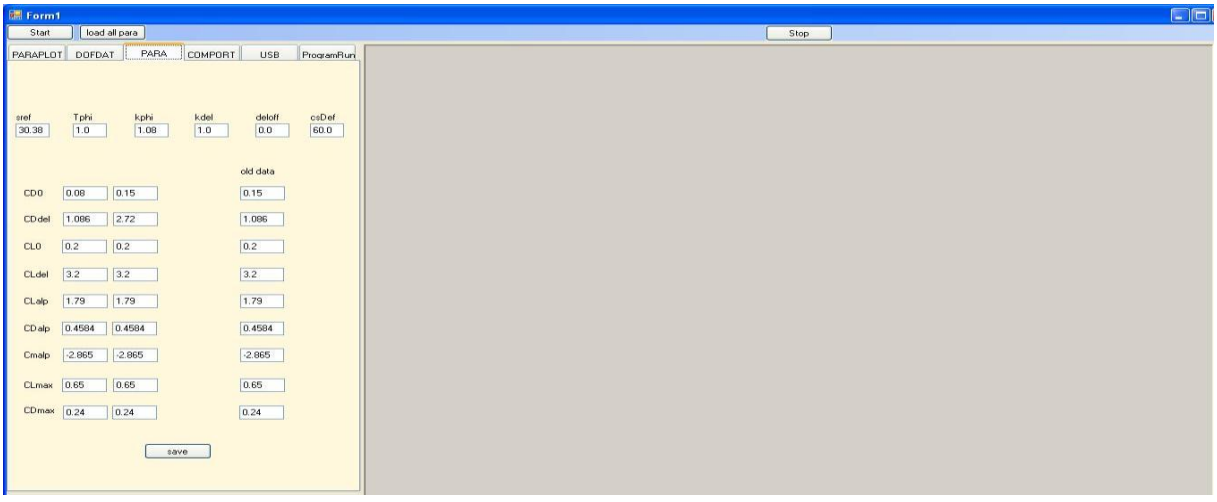
GUI has been successfullydeveloped in Visual C Sharp to perform GPS and DAQ card interfacing. Click on load all para button which opens Comport tab by default and loads all the input files in the tab



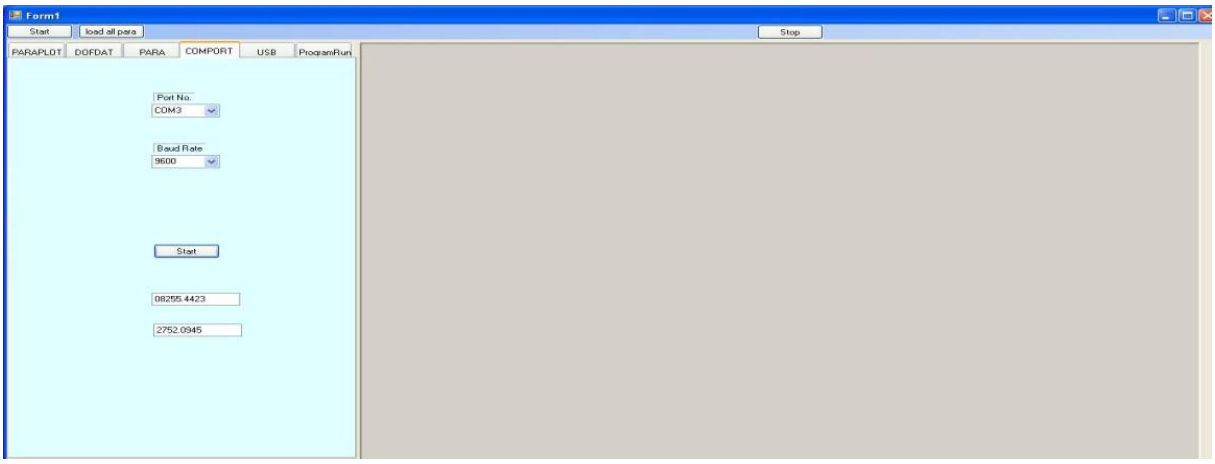
paraplot tab after clicking on load all para button



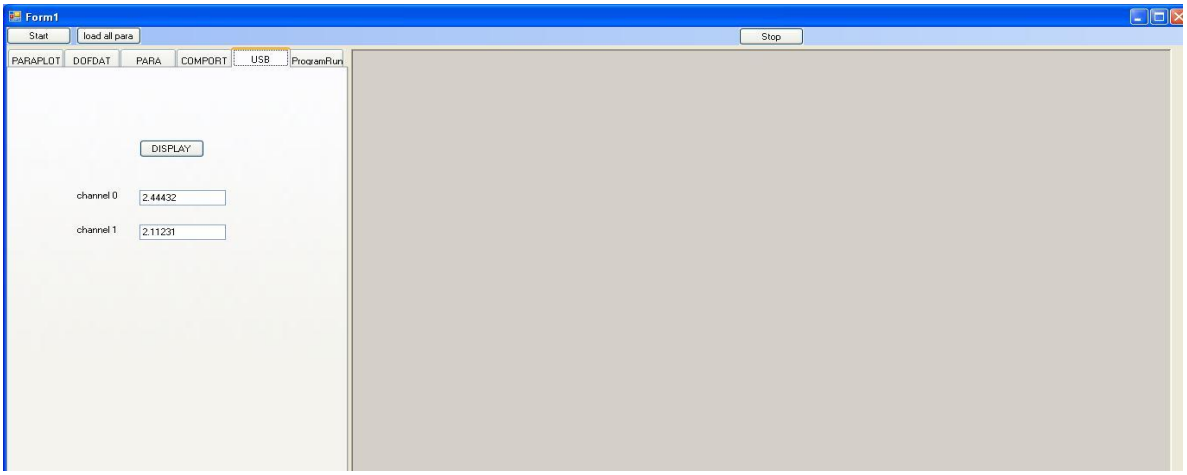
dofdat tab after clicking on load all para button



para tab after clicking on load all para button



Comport tab displaying latitudes and longitudes



USB tab displaying results of DAQ interfacing

V CONCLUSION

The project "GPS And DAQ Card Interfacing Using Visual C Sharp" successfully performs the required task of performing USB based data acquisition*i.e* reading analog voltage from the joystick and displaying it on the textbox using DAQ device which is used as an analog to digital converter and Derive latitudes and longitudes from $GPGGA and $GPRMC type of NMEA(National Marine Electronics Association)sentences in GPS data and display them. The Project has been developed as per the requirements and specifications given.In the project,we learned how to use Microsoft Visual STUDIO 2010 IDE and how to write program in C Sharp.This was our first practical exposure to developing a software using the actual software engineering techniques and following them step by step to lead us to a fully working software.. We also gained practical experience of working in Dot net platform and C Sharp. On the whole, this project turned out to be not only informative but also a Practical and encouraging experience. The knowledge and experience gained during this project work will definitely prove to be very

useful in future.

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Biography of Authors (10pt)

	Doing B.Tech in S.R.M University,Kattankulathur,Chennai.Completed my Internship in the title "GPS and DAC Card Interfacing using Visual C#" From DRDO for 1 month duration.Completed my Internship in HCL also in the title as " Advanced Java " concept.My Area of Research interest is Computer Networks,Wireless Sensor Networks and Network Security etc.
	Completed M.E under AnnaUniversity of Technology,Chennai in the year 2012.Doing PhD Currently in S.R.M University,Kattankulathur,Chennai.My areNetworks,and Security in IOT.My publication details are "A Collaborative Approach to Enhance Security in Location Based Services by Answering Range Queries in WSN "published in IJEDR in the year March 2015." A Novel approach for Enhancing Security in JOSSO mechanism in Distributed Computer Networks" published in IJETR in the year May 2014. "**SECURED DEDUPLICATION WITH ENHANCED RELIABILITY IN CLOUD STORAGE SYSTEM" in IJCTA Journal, and SECURING LIFE BY DIGITALLY CONNECTING HOSPITALS in the same Journal.**
	Completed M.E under S.R.M University,Chennai in the year 2012.Doing PhD Currently in S.R.M University,Kattankulathur,Chennai.My area of interest including BigData and Software Engineering.My publication details are "**SECURED DEDUPLICATION WITH ENHANCED RELIABILITY IN CLOUD STORAGE SYSTEM" in IJCTA Journal, and SECURING LIFE BY DIGITALLY CONNECTING HOSPITALS in the same Journal.**