Fabrication Techniques for Mems-based Sensors: Clinical Perspective

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Lecture – 41
Function generator, Multimeter, Sampling, LabVIEW, NI-CDAQ

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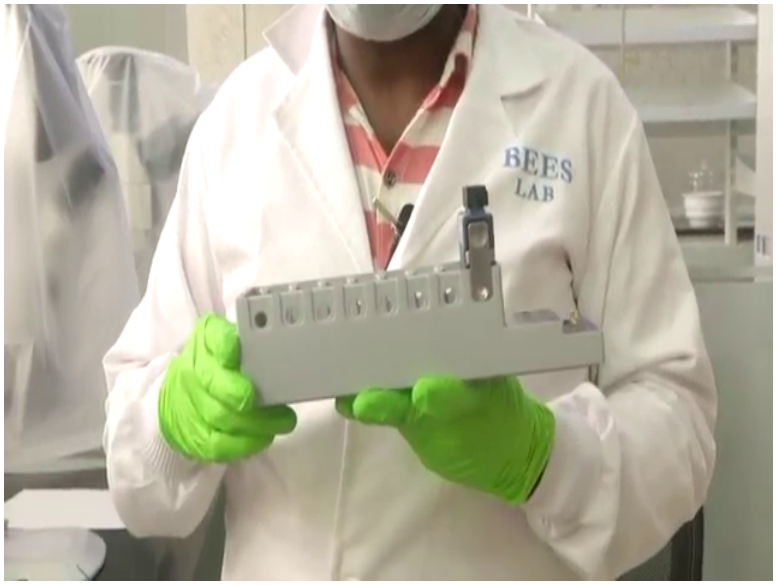

Welcome to the module. So now, we are going to introduce to do to our, another unit which is available in our lab which is C DAQ, which is called compact DAQ. So, the advantage of this DAQ, when compared to that particular device is that even it can perform the same, but much more advanced manner; it has better accuracy, better resolution and better sampling rate too.

So, that even a smaller signals that is required to be acquired, can be acquired using this device.

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So, this I am going to place it on our anti vibration table. So, here we can see the both the devices. One is the previous device, which I have explained you virtual beach and the compact DAQ, I am going to place on my anti vibration table. So, this is an anti vibration table you can see. So, that even any vibration it cannot effect of the system, that is being measured and on top of it, you can see different channels, modules those are called different varieties of modules, which are available for the data acquisition unit itself.

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So we can see here, one is analogue input channel. So, where it can be used for input current as well as input voltage too and it has an onboard ADCs as well as amplifiers everything and this is for you know bridge kind of circuit, it can perform both half bridge and full bridge. So in case, when we are dealing with 4 sensors are strain gauge based force measurement unit. So, since this is are these are resistive type of sensors, one way is you required to convert your resistance change to a voltage output.

So, one way to do is either a half bridge connection or full bridge connection. So, full bridge connection will always have very good sensitivity as well as very less linearity error, when compared to that of your half bride or something so in order to construct that. So, if we have a précised, if we have a very sensitive signal conditioning unit. So, it gives you more accuracy on your measured voltages. So, one way to do is, if we have an onboard data acquisition with a onboard signal conditioning unit, it helps very very good.

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So how to place in this in the sense? So, if you see to the chasses it contains different number of channels. So, simply select the required or required signal conditioning unit or they call it as a module and place it on the appropriate channel.

So, the advantage is that it can be interchange, it need not to be fix only to that particular channel even, it can be fix to the last channel anywhere, wherever it is required.

So, we also have analogue output say, it can produce up to 20 milliamps of current and it is a 16 bit analogue output too. So, even this you can use it in the same chasses itself and all units can be performed at the same time and other one is a quarter bridge analogue unit. The difference between the previous module which, I showed to this module is by making use of the previous module, you can perform the quarter bridge half bridge and a full bridge, but by using this module, we cannot perform half bridge as well as you know full bridge.

This is only meant for quarter bridge applications. So, even this I can place it on the module on the chasses, just simply plug and play very easy to connect it and this is another one which, I already told you, it is analogue input either voltage as well as current can be taken as an input to the system. So, even this I am connecting it here.

Now, once I plug in, so if I want to visualize and if I want to acquire the data in a PC. So, what we have to do? Is that, so since it is a compact that, it should always be connected to a PC, one way of connection is either directly connecting the LAN connection to the PC or it if it can connect to the same network, if it can connect to the same network the purpose can be served. So now, I am powering it up. So we can see here, the power has been powered up and it is connected to using a LAN right.

So, what I will doing is that, I will take few wires by using this virtual bench, I will connected to the DC power supply and if I vary the signal from the DC power supply. We can observe, the signals being generate being acquired using this C DAQ in our monitor, no signals can be generated using PC from the virtual bench and the same signals can be acquired using another compact DAQ and can be acquired into this data acquisition device to the PC using this data acquisition device and even that, we can visualize in between there is another software called LabVIEW.

So, what we can do? Is that whatever the data that is being acquired using this particular device, that can be acquired using the device and can be done a further processing using that device or if I want to make use of the same device for controlling even, we can do that. So now, what I will do? Is that in order to make understand our self? So, I will connect power supply unit to this.

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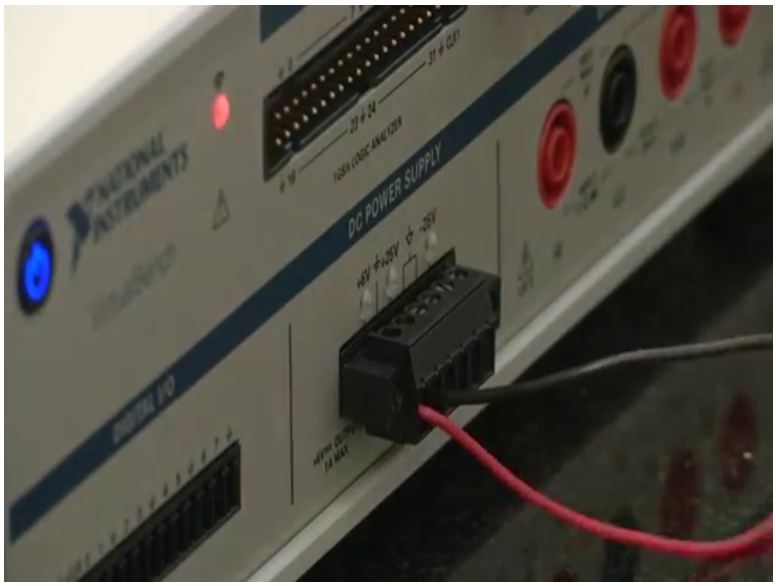

And this is a positive. So, what I am doing is, I am unplugging this device. So here, if I see A 0 plus and 0 minus so, the first channel.

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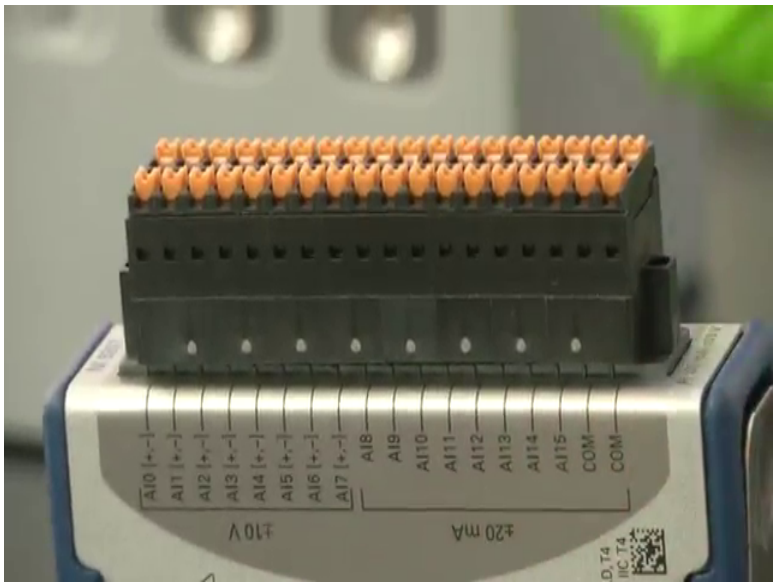

So, here if you see there is different number of channels starting from 0 to 7. So, total it has 8 channels for analogue acquisition, which can measure up to plus or minus 10 volts. So, it has both positive terminal and negative terminal, what it does? Is that it can measure a differential input. Some cases where when you are using a quarter bridge or

when you are using a half bridge or full bridge, whatever the voltage signal, it is being generated from the bridge signals are not a independent voltage, it is a differential output voltage. So, if I want to make use of a differential input, one way to do is that we have to make use of this device. So, what I do is that, I will connect this is some kind of a spring connection.

So, to the first channel, it need not to be only to the first channel, it can be connected to any channel. So right now, I am connecting to the first channel. So since, it is a spring device, I have to press it and place this connect it then, to the negative. So, I will pressing it, I will connect it. So now, we see how do, we connect your negative. So, since it is also spring so, I am pressing it, I am placing it into the hole, remember it.

So now, it is connected once it is connected, I am placing it into the chasses. So, the number is this 9207, whatever I am using is 9207 right. So, from the hardware point of view we have done all the connection necessary connections required, to acquire the data using the C DAQ and to generate data using voltage signals using this voltage source from the wire points, now how do we acquire? How do we visualize a signal in the software? That we will see there. So, last time we have already seen how to generate a data using national instruments workbench.

Now, we will see generation in the software and the acquisition using this level. So once, we finish our hardware connection, now we will look into the software. So, first of is, generation of voltage signal. So, to generate that first, I have to open the virtual bench software, which we have seen in the last time. So, right now it is being connected using Wi-Fi device that, we can see here and I am going to virtual bench software. Start an N max, this is for C DAQ just to touch the device has been connected and whether it is working or not.

So, here we can see since it is connected using a LAM in a server here, we can see what are all devices in being NIC devices is being connected in a max and here if I click on to the network devices, we can see the device name which is connected NIC DAQ 9189. So, on top of it if I refresh it, what are all the channels is being connected can be tested it here, can be seen here. So, here we can see the device under the network devices, we can see what are all devices is being connected on the same chasses, what are all different modules are being connected.

So right now, we are making use of the module 4, which is connected at the fourth channel, which is NI 9207, which is being connected to that. So, if I go to the test panels here to just test whether the module is working or not. So, we can make use of the test panels and we can work through.

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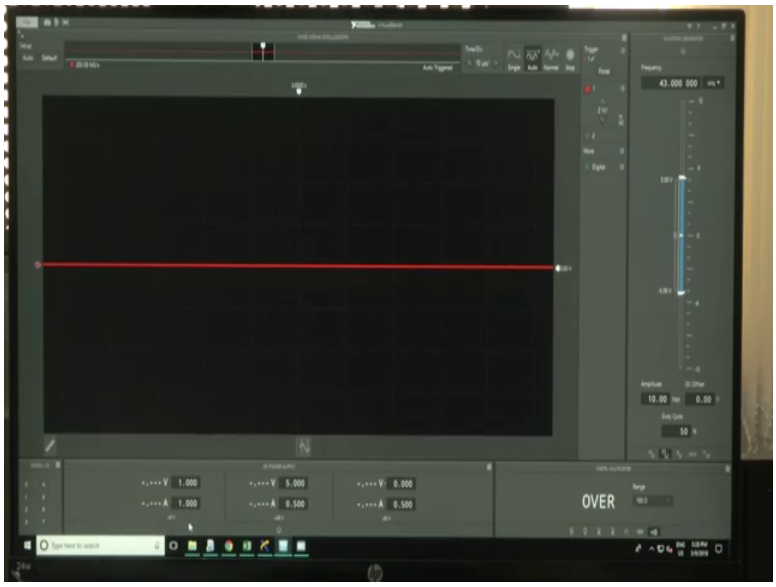

So, I will go through the continuous acquisition and the channel whatever, I been connected is was A I 0. So, I am selecting A I 0 channel and the samples to rate is 10 samples and sampling rate is 28, if I say, what I will do is from the virtual bench software, which we seen last time.

Since, I have connected DC power supply of 0 to 6 volts to an input to this particular module NI 9207. So here, I will be switching on this module. So right now, applying 0 to 1 volt, in the test panels, in the text panels, if I started so then we see here. So, the input voltage being applied is 1 volt, we can easily seen the test panels, I changed to 2 volts, changed 3 volts, but why it is low? Because the sampling rate whatever, I used as of 2 8.

Suppose, if I make it as some 1 kilo. So, we can see very fast change in the input voltage too. So, the maximum is 6 volts. So, this is the one way to check whether the test panels are whether to check whether the particular device is being acquired or whether the device is working or not by using the test panels, but if I want to do some further processing, you cannot do any further processing using this particular test panels.

So, how to do? In the sense, we have to write a program or write an algorithm in a LabVIEW software. So, I can open LabVIEW. So, once we open it. So, this is how the LabVIEW one looks like. So new here. So, here we can acquire the data using measurement type of or we can go to express and I can make use of single input data assist, acquire signals analogue input voltage by using module 4, A I 0, this is where we have connected to 9207 just finish it.

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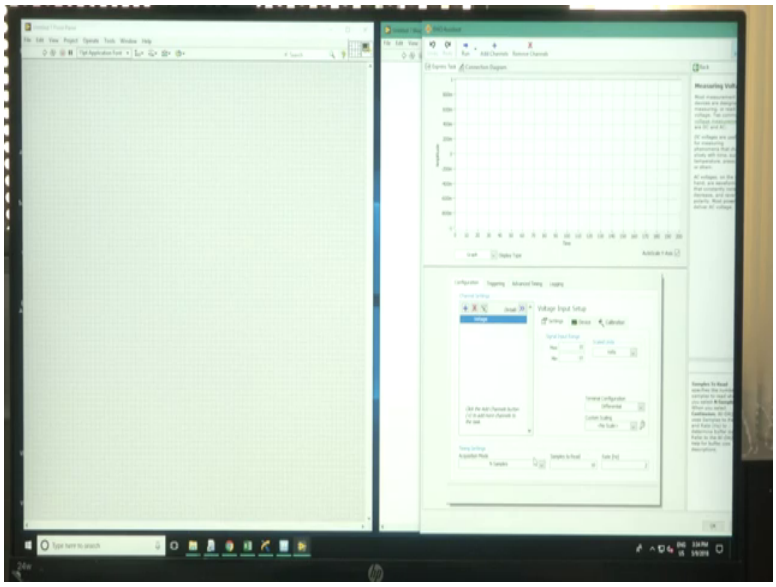

After this so how many number of samples that we need? Or I can make as continuous samples, then samples read rate at is of 10 k or 1 k, we can keep and the samples to read and making it as 100 samples to read yes.

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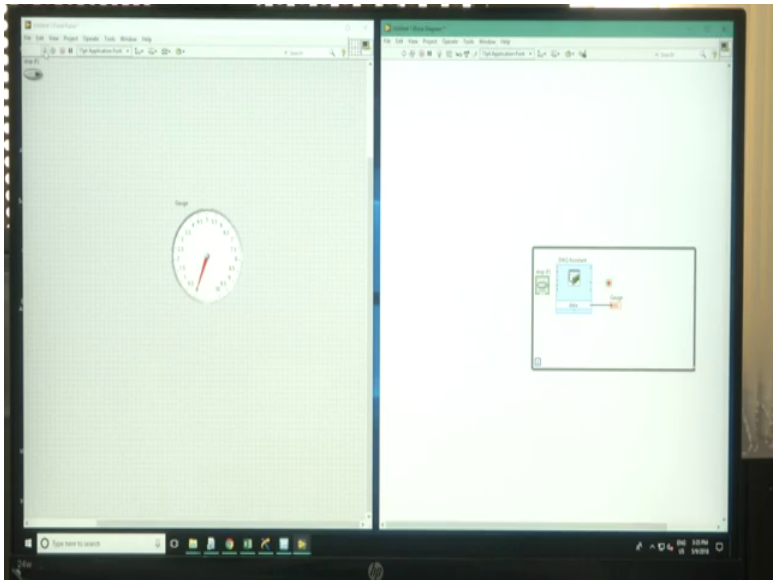

So, the data whichever is being acquired I will be displaying it on the front panel by using a meter or some gauges. So, I am connecting it to the gauge, this is a gauge and connecting it to the data. So, if I run the PC system. So, let me switch of I will enable distal display to this 2 distal display. So, that easy to visualize the distal data and I am switching it on. Once, I switches on we can see 3 volts, 3 volts, 2, 1 right.

So, whatever the data that is required, we can acquire using this particular software and using the software with a different functionalities, that are available with the software like different loopings, that you want to do array functionalities, numeric any other applications like, control, logical and activation of something, everything can be implemented here and again we can give it back to any plant. So, this is how this can be useful for acquiring as well as a monitoring or a acquisition of the signals from a processor and to do the processing using that.

Thank you.