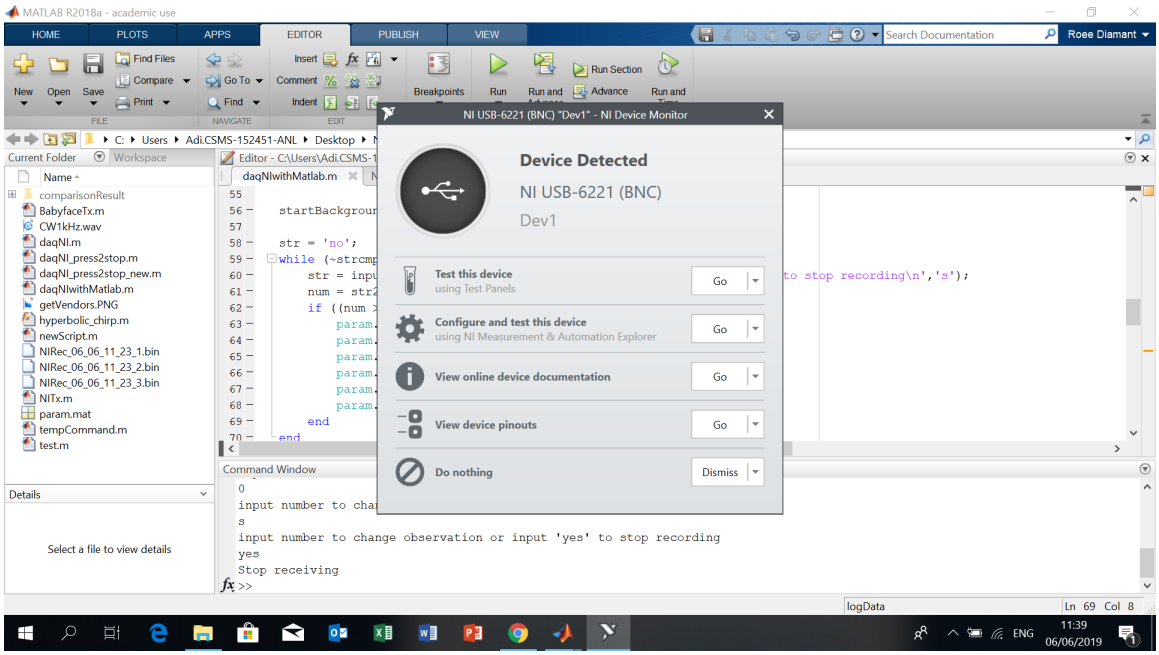
How to use the NI for recording

The National Instrument can be used to record signals with maximum of 8 channels and transmit signal with maximum of 2 channels. The maximum sample rate of this device is 250kS/s (samples per second). It is shared by all the channel activated. So, if 6 channels are assigned, the maximum sample rate for a single channel is 40kHz (actually it is 41.66kHz precisely). Also, there is only one analog to digital converter in the device, and it is shared by all the channels. So, there is one sample time difference between adjacent channels. That means, CH2 is one sample behind CH1, and CH3 is two samples behind CH1, etc. DO consider this part if your application requires strict time synchronization.

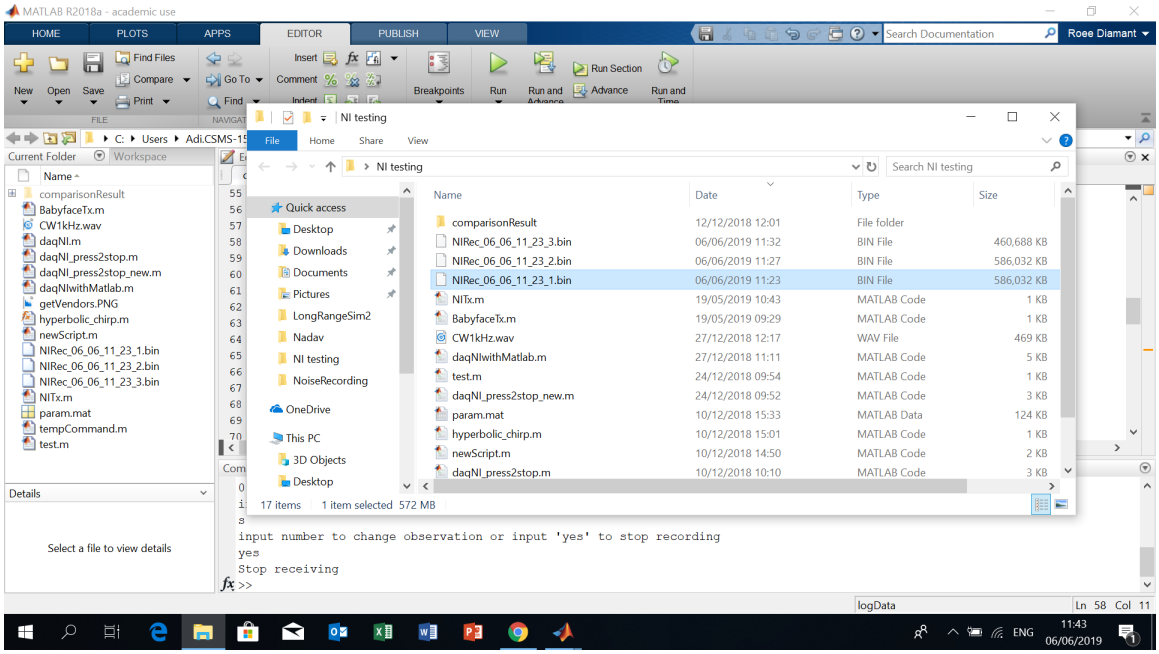
A script is written to record from NI with 6 channels. The name of the script is daqNIwithMatlab, and it is located in the black computer 'Desktop/NI testing/' folder. This script records the signal from NI, and start a new file when the previous one is larger than certain size automatically.

Here are some instruction for using this script.

When NI is connected to the laptop, a window will show up. Make sure you see the window before start recording. If not, there must be some problem of the connection.



To start recording, simply run the matlab script. The recording files will be saved in the same direction as the script, with the name of the following format $NIRec\_DD\_MM\_hh\_mm\_nn.bin$. Where DD is the date, MM is the month, hh is the hour, mm is the minute and nn is the sequence. For the first file, nn = 1. When this file is larger than the maximum size, the script start a new file with the same format, but nn = 2. And then nn = 3, etc. the maximum size of the file can be specified by the variable $param.maxLen$ in the script. So far, it is set to 600,000,000. That is roughly 586MB. An example of the recorded files is shown in the following figure.

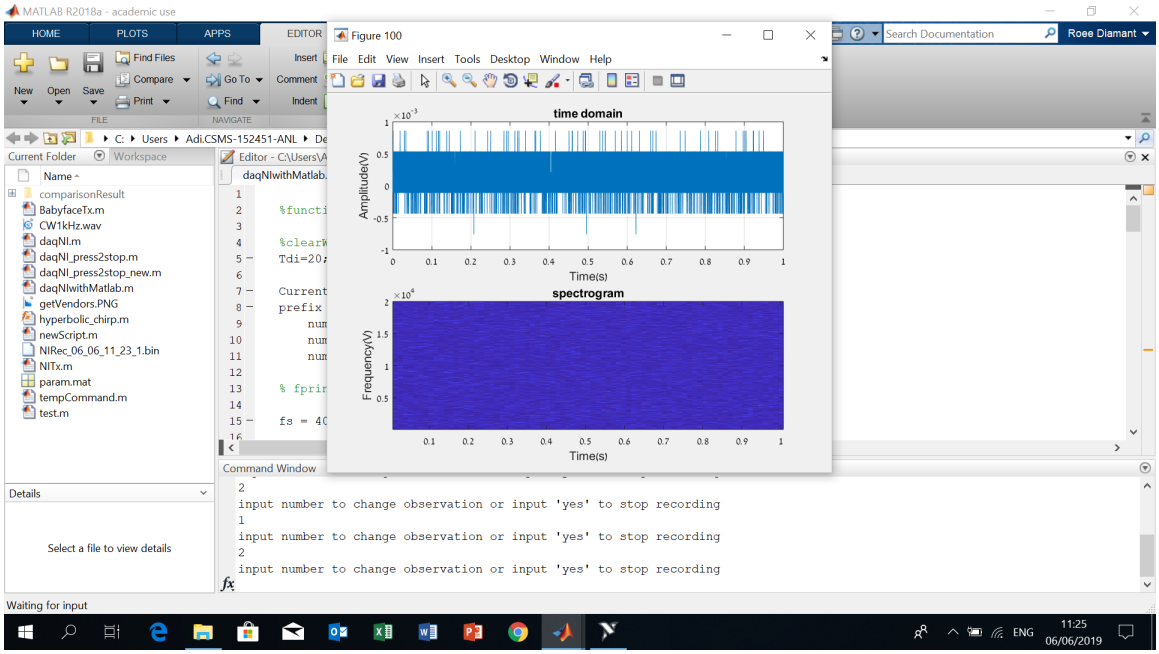


The other parameter you can change is the sample rate. There is a variable fs in the script marks the sample rate. DO remember that for 6 channels situation, fs should not be larger than 40k.

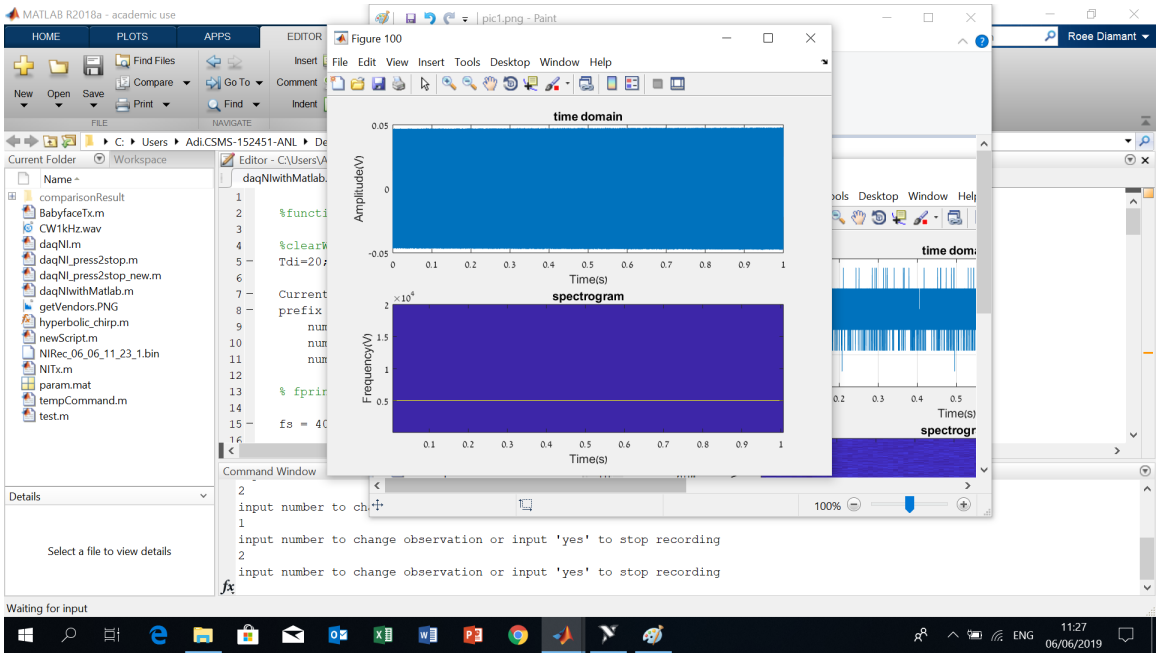
show different channel

While recording the signal, the script shown the waveform and the spectrogram of the signal in real time. In this case, you can see what are you recording on the fly. By default, it shows the first channel. You can enter a number in matlab command window to change to other channels. For this script, you can enter '1' to '6'.

The following figure is an example when there is no signal input. The amplitude is 1mV, and no pattern in spectrogram can be found.



And when there is 5kHz CW signal input. The amplitude is around 50mV, and 5kHz signal can be found in spectrogram.



stop recording

To stop the recording, simply enter the word 'stop' in matlab command window. Otherwise, the script will keep recording until the local disk is filled up.

The script will ignore any input other than '1' to '6' and 'stop'. This is designed to avoid error input in the keyboard.

read the bin file

The following matlab command is used to read the bin file.

$fid = fopen(filename,'r');$

$sig = fread(fid,[Nchannel, Len],'double');$

$fclose(fid);$

Set $filename$ to the corresponding file, $Nchannel$ = 7 (the first channel marks the time stamp, and following 6 are the 6 recording channels), Len equal to the number of samples you want to read.