ME 3200 Mechatronics I Laboratory

Lab 2: Lab View Computer Systems

Introduction

The purpose of this lab is to introduce the basics of data collection and analysis using Lab View. Lab View is a visual programming language capable of creating specialized graphical user interfaces that can collect, analyze, and save data in a wide variety of applications. In this lab you will create a Lab View program that will capture an AC signal, calculate the frequency and amplitude of the signal, and export the data to a data file.

Lab Procedure

Get Acquainted with Lab View

1) Open Lab View via start menu

2) Select the "New VI" button to create a new Lab View program.

    a) Opening a new program in Lab View creates two windows that are related, but serve two different purposes. A description of each is listed below:

        i) Panel Window: The panel window is the graphical user interface (GUI) for the program you have just opened. Right now this window is empty, but in this lab you will fill it with controls that will collect data and displays that show the results of the operations performed on the data collected.

        ii) Diagram window: The diagram window is the meat of data acquisition programs created in Lab View. This window is where you place blocks that represent functions that Lab View can perform. These blocks are then connected by wires that tell Lab View the order that operations are performed. A completed program looks like a circuit diagram with different colored wires and various functional blocks.

3) Take a moment to look around in at the different tools available to you in each window (right click in the window to show the menu for each window) (show context help).

Create Your Program

4) Right click in the diagram window to show the functions menu and select the case block from the structures sub-menu.

5) Draw a square by clicking then dragging. Fill the whole window—you'll need the space.

6) Select the wiring tool from the tools pallet (looks like a little spool) and right click on the green square on the left of the box to open a context menu.

7) Select 'Create' > 'Control' and a green box labeled "Boolean" appears to the left of the case block attached with a green wire.

8) Select the Panel Window and notice the button that Lab View placed in this window. This button is the start button for your program.

9) Select the text tool from the tool window and change the text on the button from 'Boolean' to 'Start'.

10) Right click in the Diagram window and select 'Data Acquisition' > 'Analog Input' > 'AI Acquire Waveform.vi.'

11) When you select 'AI Acquire Waveform.vi.' the cursor turns into a hand that "picks up" the block.

12) Move the cursor into the diagram window and drop the AI Acquire Waveform.vi in the case block.

13) Select the wiring tool and right-click the purple 'lead' and select Create > Control.

14) Repeat step thirteen for the blue and orange leads on the left of the block.

15) Switch to the panel window and notice that there are now three controls on in this window corresponding to the ones you just created in the diagram window.

16) Use the position/size/select tool to rearrange the three inputs you just created so that their wires and labels are easy to follow and read.

17) Repeat step four, but use a "for loop" instead of "case loop".

18) Right click in the diagram window to show the functions menu and select the for loop block from the structures sub-menu.

19) Draw a square in the upper left quarter of the case loop by clicking and dragging as in step five (refer to top figure on page 6).

20) Using the wire tool, left click on the number of samples block and connect it to the blue N lead of the for loop (sets the number of iterations for the loop).

21) In the functions menu, select from the "Numeric" menu the "Reciprocal" block and place it inside the for loop.

22) Select the "Multiply" block from the "Numeric" menu and put it in the for loop.

23) Find the "Array" menu and pick the "Build Array" block (second row, second column) and place it into the for loop.

24) Using the position/size/select tool, grab the bottom corner of the "Build Array" block and drag it down until the block has two inputs.

25) Using the wire tool, connect the sampling rate block to the reciprocal block input (on the left side)

26) Connect the reciprocal output to the "x" input of the multiply block, and the "i" block to the "y" input of the multiply block.

27) Connect the multiply output to the top input of the build array block.

28) Connect the wave form output of the "AI Acquire Waveform Block" (brown lead) to the bottom input of the build array block (inside the for loop)

29) From the structures menu, select the case block and fill the top right corner.

30) Right click the question mark and select create control.

31) In the "File I/O" menu select the "Write to Spreadsheet" block and put it into the case block.

32) Using the wire tool, connect the output from the build array block in the for loop to the 2D data input lead on the "Write to Spreadsheet" block.

33) In the Functions Toolbox, point to "Analyze" > "Waveform Measurement" and select the "Extract Single Tone Information" block. Place this block into the lower right corner of the large case block.

34) Using the wire tool, connect the output of the AI Acquire Waveform block (brown lead) to the time signal input of the Extract Single Tone Information block (top left lead).

35) Right click on the "detected frequency" output lead of the extractor block and select Create > Indicator.

36) Repeat step thirty-five for the "detected amplitude" output lead of the extractor block.

37) Now, if you're not totally lost, go to the panel window (window > show panel or click in the gray window).

38) Right click on the gray area of the panel to open the Functions menu, point to the Graph menu, select a Waveform Graph, and place it on the panel.

39) Go back to the diagram and, using the wire tool, connect any brown wire to the waveform graph (not the brown wire in the for loop).

40) Go back to the panel and use the position/size/select tool to move the switch labeled Boolean to an aesthetically pleasing location.

41) Right click the Boolean you just moved, select Replace, and choose a rocker, toggle, or slide switch from the Boolean menu.

42) Right click the switch again and select Visible Items > Uncheck Label.

43) Using the edit text tool, (it's a letter A) type the words "Don't Save" to the left of the switch and the word "Save" to the right of the switch.

44) Using the pointer tool (looks like a hand), right click on the start button, select mechanical action, and choose switch until released.

Note: At this point your program is finished. Refer to the figures on page 6 if you have questions about your program.

45) Save your program to a disk that you will take with you. Make sure each lab partner gets a copy of the program.

Testing the Program

46) Locate your signal generator and turn it on.

47) Locate a BNC/Banana connector and a BNC cable.

48) Attach one end of the BNC cable to the output of the signal generator and attach the opposite end to the BNC/Banana connector.

49) Insert the red banana lead to the AI_CH0 port of the DAQ card on the bench and the black lead to the AI_GND.

50) Select Run Continuously from the tool bar on the top of the panel window.

51) Click on the start button of the panel you just created, and look at your data displayed on the waveform graph.

    a) If you have done everything correctly you should see the waveform in the Waveform Graph display on your GUI.

    b) Test your program with the "Don't Save"/"Save" switch in both positions.

        i) Verify that your data is saved in a format that can be opened in Excel.

52) Demonstrate to your TA that your setup works correctly.

53) Answer the lab questions on the following page.

54) Clean up your station.

    a) Return cables and connectors to their respective homes.

    b) Turn off power to the signal generator.

    c) Exit Lab View and log off your computers.

Questions

1) What is the purpose of each the following structures in the diagram window of Lab View?

   a) Case Loop

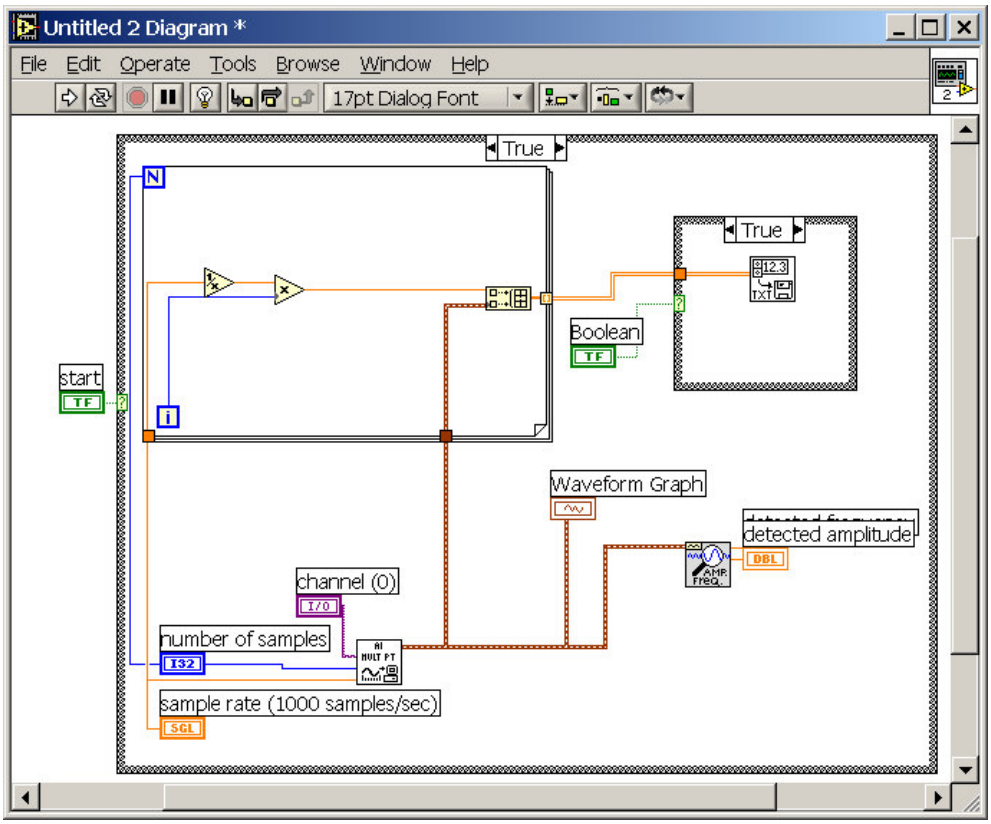
   b) For Loop

2) Explain the difference between a Lab View display and control.

3) Using the help menu, list each of the possible colors of wires in the diagram window and what kind of information each symbolizes.

4) What does the for loop in your program do? Why do we need to include it in the program?

5) Suggest two possible applications for Lab View.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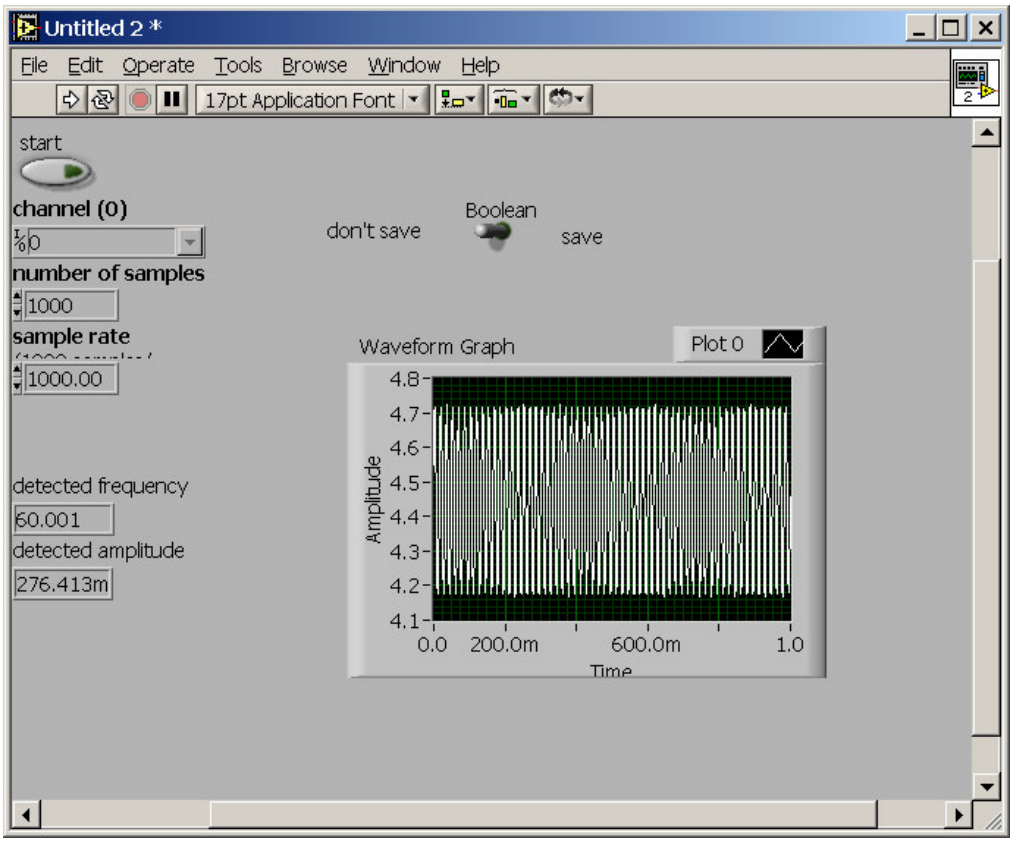
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