AOE 3054

LabView Programming
Today’s Lab Overview

1. LabView Fundamentals
   • Quick overview of the basics
2. Programming practice exercises
   • Two programming problems
3. Ex 6 preparation and programming time
   • Work in your groups to prepare your experiment and programs for Experiment 6.
Lab View Fundamentals

- Strings
- Numeric
- Waveforms
- Dynamic Data Type
- Loops
  - While Loops
  - For Loops
  - Accessing previous node Data
- Arrays
- Clusters
- Decisions
  - Select function
  - Case Structures
Getting Help With LabView

• Context Sensitive Help
  – Help menu, Show Context Help.
• Find Examples
  – Help menu, Find Examples…
• Right Click item on Block Diagram
  – Select Help
• Tools Pallet Search
• NI.com
  – Search Support
Finding problems

- Broken run button
- Find Errors
- Probes
- Breakpoints
- Highlight Execution
- Pause button
Project

• Write VI that will control the frequency output of the function Generator
• Go over different labview concepts with the program
For Loop

- For loop causes parts of the vi to run repeatedly a specific number of times.
- The For Loop is located on the **All Functions, Structures** pallet.

Executes 10 times and stops.
While Loop

- While loop causes parts of the vi to run repeatedly until a condition is met, usually the stop button.
While Loop

• Watch for floating objects that are not really in the loops code segment, but merely laying on top of it.

DAQ Assistant is outside the while loop!
Graph cursors, legends, etc.

- **Graphs:**
  - Can have multiple scales.
  - Values can be changed.
  - Auto scaling enabled or disabled.

- **Cursors can be added to graphs**
  - Assist in viewing data points.
  - Can be assigned to different plots.
  - Lock to plot to help reading data.

- **Legends**
  - Automatically named.
  - Allow changing data plots while running.
  - Can be assigned to different scales.
Graph Cursors
Add Tone Measurement

Add indicators for Amplitude and Frequency output
Dynamic Data Types

• Contain any sort of data.
• Can be converted to specific types using **To DDT** or **From DDT**.
• Split and merge to separate or combine elements.
• This is the data type most of the express vi’s use.
Waveforms

- Special data type that combines
  - An array of numbers
  - Start Time
  - Delta Time
Arrays

- Contain lists of numbers or strings.
- Can be multidimensional, but cannot be arrays of arrays.
- Must have the same data type for each element.
Numeric Data Types

- Numeric data types hold all numbers and can be of many forms and represented by orange (float) or blue (Integer) data wire.
  - Floating point
    - Extended, Double and Single Precision
  - Signed and Unsigned Integer
    - 32, 16 and 8 bit
  - Complex
    - Extended, Double and Single Precision
Numeric Data Types

- Lab view will convert data types as it sees appropriate. (represented by a dot.)

- Creating data by right clicking, create… will usually create the proper data type.

- To select, Right click numeric on block diagram and select Representation.
Indicators

• Display values on the front panel.
Create DAQ output

Express->
Output->
DAQ Assistant
Works just like DAQ assistant for input. Select analog output.
Select 1 sample on demand output
Digital World

Create a numeric control for the DAQ output data.

Connect stop button to DAQ out.

Real world

Hook AO0 and AO GND to multimeter with DC voltage settings using grabber cables
Controls

- Input values or conditions on the front panel.
Front Panel Objects

• Numerics
  – Thermometer
  – Gages
  – Knobs (control)
  – Dials (indicator)
• Graphs
• Charts
Sizing

• Most front panel objects can be resized. Look for the handles as the cursor hovers over objects.
• Block diagram loops and case structures can be resized.
• Some block diagram components need to be resized, like split signals.
Add a numeric control for the Target Frequency.

Subtract target frequency from measured frequency to get difference. (This requires conversion of DDT to single scalar)
Constants

• Can only be placed on the block diagram.
• Good method for setting a value that never changes, like unit conversions.

Test the string constant

2.2

2
Automated control

Add multiplication for gain.
Create a constant for gain value
Add a Shift Register to get the old output voltage. Add this to the correction from the frequency difference and gain.

Initialize the shift register to 0.
Feedback Nodes

Operate just like shift registers, but display differently.
Error Clusters

Wire Error outputs to Error inputs on all express vi’s.

This is good programming practice to ensure the program stops when an error occurs.
Clusters

- Clusters are vaguely similar to arrays.
- They can contain various data types, including arrays.
- The error cluster is the most common use.
- Many data types can be bundled together as an input to a vi thereby reducing the terminals on a vi.
Charts

- Similar to graphs.
- Plots single values like a strip chart recorder.
- Not best for plotting waveforms.
Limiting out of range voltage

In the Comparison palette get the In Range and Coerce vi. This limits its output to a specified range. Wire this up to the input of the DAQ output, and set the range to +-10.
Add a status output

Add the selector function, two string constants, and a string indicator.

• Selector function selects from two inputs based on Boolean value.
Strings

- Represent characters like letters and numbers as ASCII codes and represented by a pink data wire.
- Many operations can be performed like searching strings and inserting and deleting characters.
- Can be added to the comment of the write LVM file.