

LabVIEW Introduction



Adapted from a presentation prepared by

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<http://www.cim.mcgill.ca/~paul/LabviewTut.pdf>

Outline

- Introduction
- LabVIEW Introduction
- Data Acquisition (DAQ)
- Features of LabVIEW
- Example .vi
- LabVIEW Interface
- Lab Equipment
- Goals of this UT LabVIEW Lab
- List of Typical Measurements
- Conclusions.

LabVIEW

- Product of National Instruments (NI)
- Software for Virtual Instrumentation (.vi)
- Data Acquisition (DAQ)
- Graphical Programming
- Data Storage and Analysis for wide range of applications

Data Acquisition (DAQ)

Time dependent Signal Recording (Acquisition)

Components of DAQ:

- Physical value typically converted to voltage
- Signal conditioning (e.g., a filter – nowadays can be built-in with DAQ card)
- DAQ Card (can be USB)
- DAQ Software (DAQmx, LabVIEW)

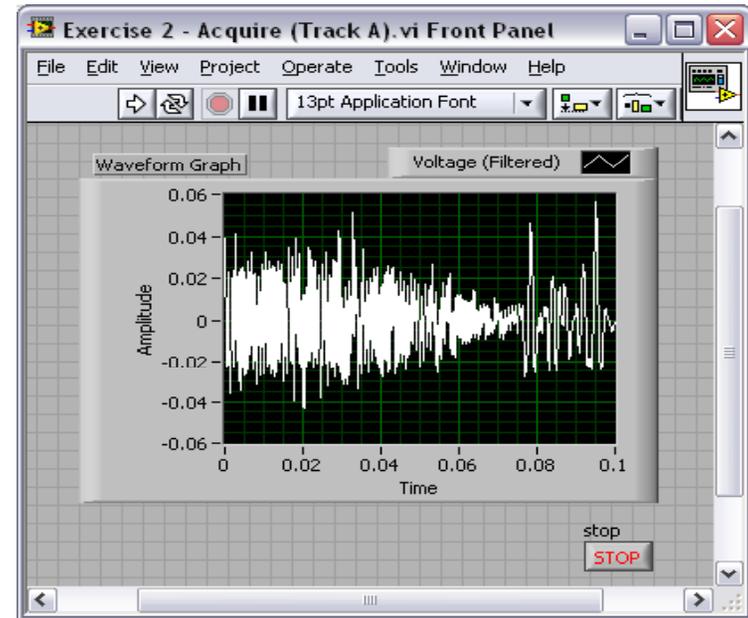


Features of LabVIEW

- **Design**
 - Signal and Image Processing
 - Embedded System Programming
 - (PC, DSP, FPGA, Microcontroller)
 - Simulation and Prototyping
 - And more...
- **Control**
 - Automatic Controls and Dynamic Systems
 - Mechatronics and Robotics
 - And more...
- **Measurements**
 - Circuits and Electronics
 - **Measurements and Instrumentation**
 - And more...

Example

Sound Signal Acquisition



A screenshot of a Microsoft Excel spreadsheet titled "Microsoft Excel - Book1". The spreadsheet has a menu bar (File, Edit, View, Insert, Format) and a toolbar. The active cell is C8. The data is organized in a table with the following content:

	A	B	C
1	Sno.	Time	Amplitude
2	1	0.01	3.5
3	2	0.02	3.1
4	3	0.03	3.7
5	4	0.04	

This can help Design a Tuning Device for Musical Instruments.

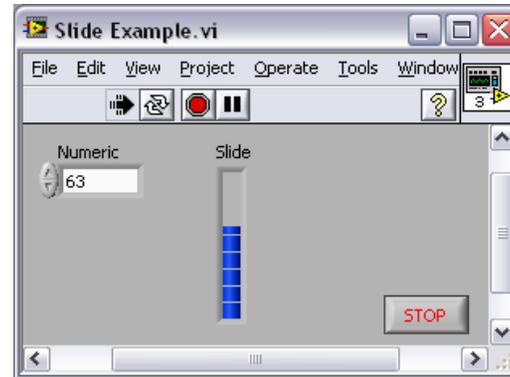
LabVIEW Interface

Each Virtual Instrument (VI) has 2
Windows

Front Panel

- User Interface (UI)
 - Controls = Inputs
 - Indicators = Outputs

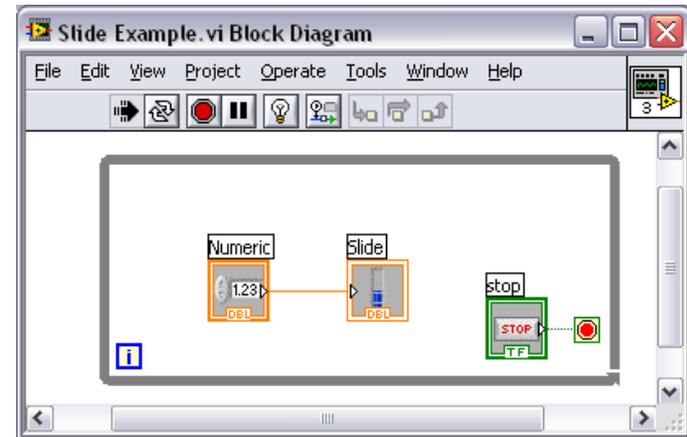
Front Panel



Block Diagram

Block Diagram

- Graphical Code
 - Data travels on wires from controls through functions to indicators
 - Blocks execute by Dataflow

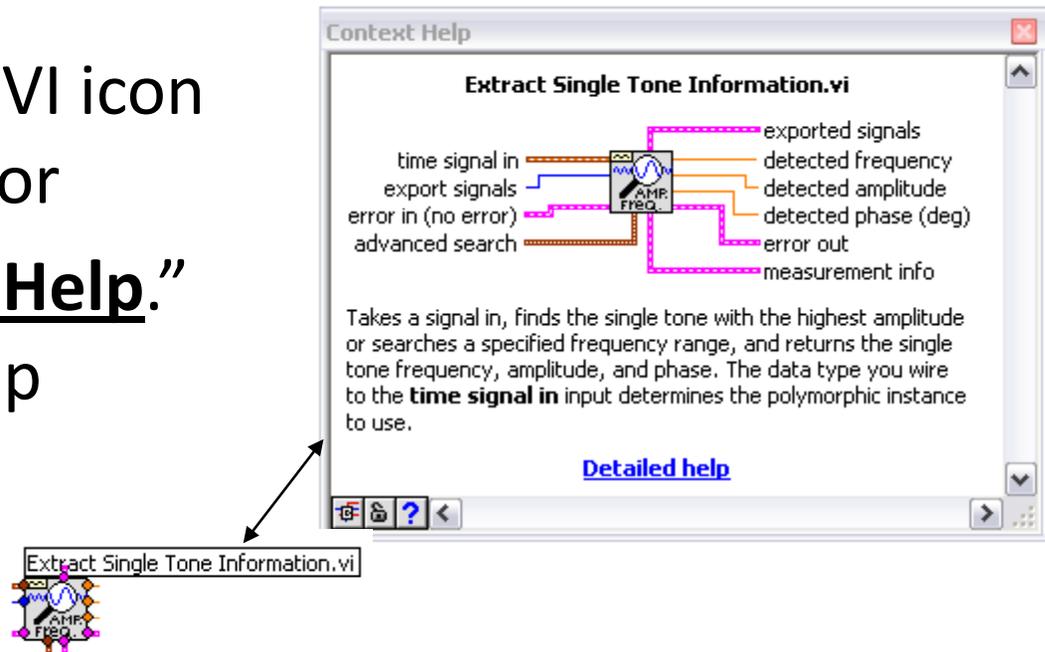


LabVIEW Interface (Contd)

- **Help»Show Context Help**, press the <Ctrl+H> keys
- Hover cursor over object to update window

Additional Help

- Right-Click on the VI icon and choose **Help**, or
- Choose “**Detailed Help.**” on the context help window



LabVIEW Interface (Contd)

Controls Palette (Controls & Indicators) (Place items on the Front Panel Window)

The image displays the LabVIEW interface with two windows. The 'Controls' palette window is on the right, showing various control and indicator icons. The 'Slide Example.vi' window is on the left, showing a front panel with a numeric control and a numeric slide indicator. Arrows point from the palette to the front panel elements.

Control: Numeric (points to the numeric control in the front panel)

Indicator: Numeric Slide (points to the numeric slide indicator in the front panel)

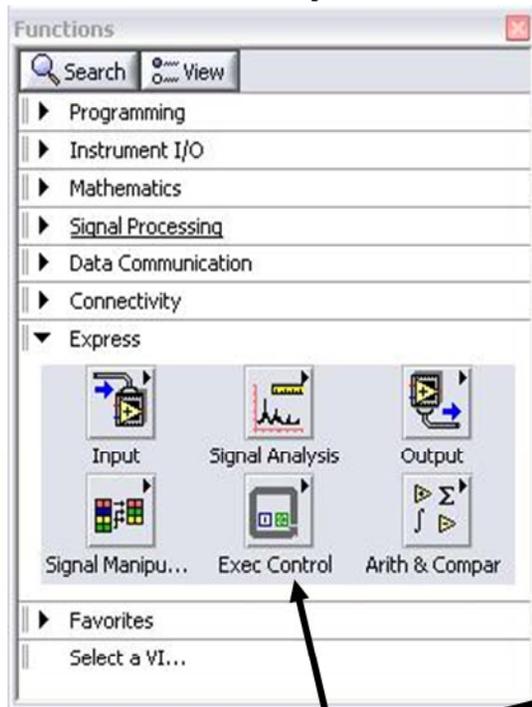
Customize Palette View (points to the 'View' button in the Controls palette)

The 'Controls' palette window includes a search bar, a 'View' button, and a list of control categories: Modern, System, Classic, Express, and .NET & ActiveX. The 'Express' category is expanded, showing sub-categories: Num Ctrls, Buttons, Text Ctrls, Num Inds, LEDs, and Text Inds. The 'Num Ctrls' sub-category is further expanded, showing a numeric control icon.

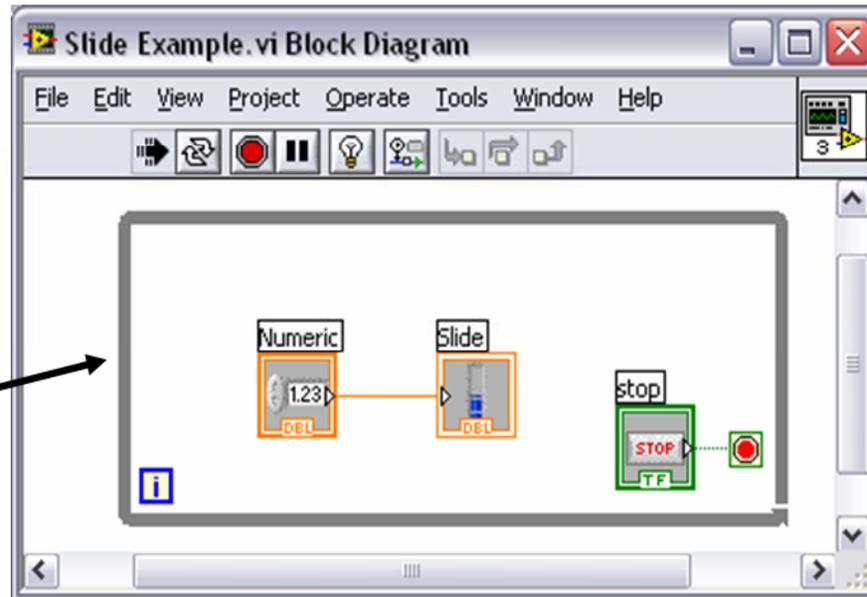
The 'Slide Example.vi' window has a menu bar (File, Edit, View, Project, Operate, Tools, Window) and a toolbar with icons for Run, Stop, and Help. The front panel contains a 'Numeric' control with the value 36 and a 'Slide' indicator with a blue bar. A 'STOP' button is located at the bottom right of the front panel.

LabVIEW Interface (Contd)

Functions (and Structures) Palette



(Place items on the Block Diagram Window)



**Structure:
While Loop**

LabVIEW Interface (Contd)

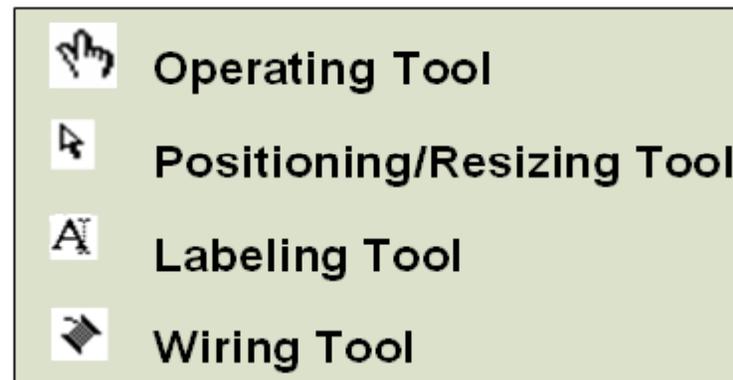
Tools Palette



- Recommended: Automatic Selection Tool
- Tools to operate and modify both front panel and block diagram objects

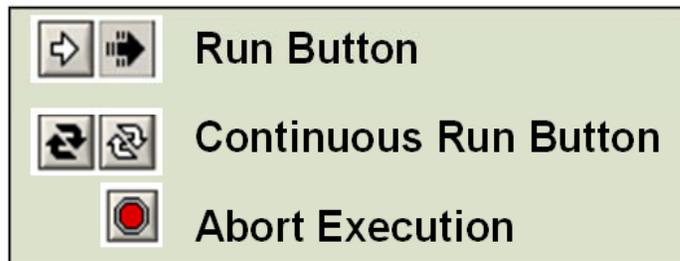


Automatically chooses among the following tools:

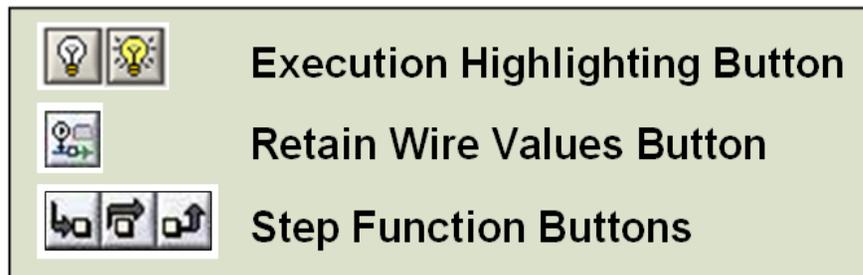


LabVIEW Interface (Contd)

Status Toolbar



Additional Buttons on the Diagram Toolbar



Lab. Equipment

- Oscilloscope



Universal Measuring Instruments

- Function Generator



Signal Generator

- Digital Voltmeter (DVM)



Goals of this week's Lab

- Introduce LabVIEW
- Experience DAQ
- Use of Electronic instruments:
Oscilloscope, Function Generator
Digital Volt-meter (DVM).

Measurement Examples

1. Instrumentation Overview.
2. Introduction to LabVIEW.
3. Data Sampling.
4. Time Constant.
5. Stress and Strain.
6. Transducer Sensitivity (Part 1)
7. Transducer Sensitivity (Part 2) and Linearity
8. Pressure Transducer Calibration and Jet Profile
9. Thermocouples: Calibration and Manufacturing

What you should know about LabVIEW being a physicist

- Selection of DAQ system for an application
- Communicating with instruments (drivers, GPIB, other)
- Modularity of programming approaches: making your .vi's flexible and adaptable

References

- www.ni.com
- Using the oscilloscope
<http://www.doctrionics.co.uk/scope.htm>