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 The George W. Woodruff School of Mechanical Engineering  College of Computing

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Introduction to LabVIEW

October 14, 2008

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Goals for Today

- Get everyone up and running with LabVIEW
 - Install LabVIEW
 - Install the NXT Toolkit
- LabVIEW overview
- Introduction to the NXT Toolkit

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Installing LabVIEW

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Installing LabVIEW

- **Windows** (XP, Vista tried)
 - Insert CD, click **setup.exe**
- **Mac** (Not tried - yet)
 - Insert CD, **copy** to app folder
- No **Linux** support for toolkit :(





Installing LabVIEW

- Hopefully everyone has done this...
- If not, you should get started (we can help)
- Did anyone have any problems/thoughts? (that everyone should know about)
- Notable fringe cases? (Mac, Vista, Linux, under virtualization?)





Installing the NXT Toolkit

1. Connect to wireless network **maria**
2. Open a browser (Firefox, IE, etc.)
3. Type **sara**, hit **enter**
4. Download either **win.zip** or **mac.zip**
5. Download **patch.zip** (for later)
 - If you can't figure that out, I've also got CDs
 - Or you can download from <http://zone.ni.com/devzone/cda/tut/p/id/4435>





Installing the NXT Toolkit

- 1. Unzip the toolkit
- 2. Close LabVIEW
- 3. Windows
 - 1. Click **setup.exe**
- 4. Mac
 - 1. Mount image
 - 2. Read instructions (no idea)

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Installing the NXT Toolkit

Patch for 8.5

- 1. Unzip **patch.zip** and open the directory where LabVIEW is installed
C:\Program Files\National Instruments\LabVIEW 8.5\
- 2. Copy **vi.lib** directory and paste it into the LabVIEW directory
- 3. In the copy warning dialog box, select **Yes to All**

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Installing the NXT Toolkit

Mass Compiling

- 1. Launch LabVIEW
- 2. Select **Tools >> Advanced >> Mass Compile**
- 3. Browse to
LabVIEW 8.5\vi.lib\addons\NXTToolkit
and select **Current Folder**
- 4. Click **Mass Compile**
- 5. Wait ...

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LabVIEW Overview

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What is LabVIEW?

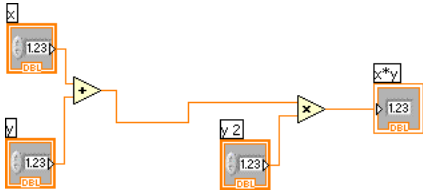
- LabVIEW is a graphical programming language
- Intuitive
- Used in research, industry and education (that's us!)
- Instrumentation



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Data Flow



- Graphical programming language
- *Data Flow* language

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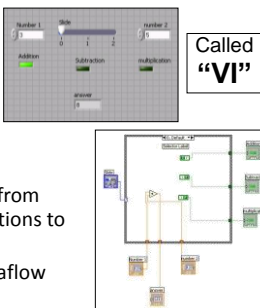
LabVIEW Virtual Instruments

Front Panel


- User Interface
 - Controls = Inputs
 - Indicators = Outputs


Block Diagram

- Data travels on wires from controls through functions to indicators
- Blocks execute by dataflow



Called
"VI"

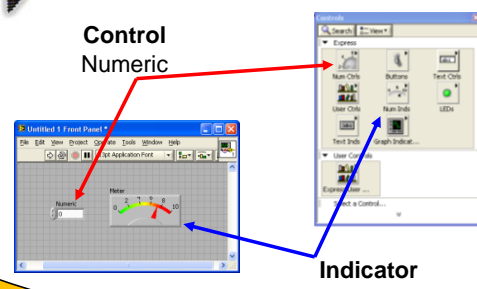






Controls Palette

Control
Numeric

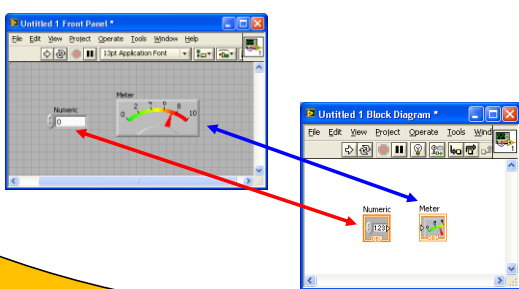
Indicator
Meter









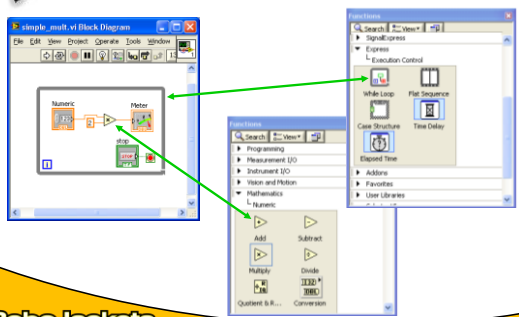
Front Panel Block Diagram Mapping









Functions and Structures Palette











Types of Functions

- **Express VIs:** Interactive VIs with configurable dialog page (blue)
- **Standard VIs:** Modularized VIs customized by wiring
- **Functions:** fundamental elements of LabVIEW (yellow)

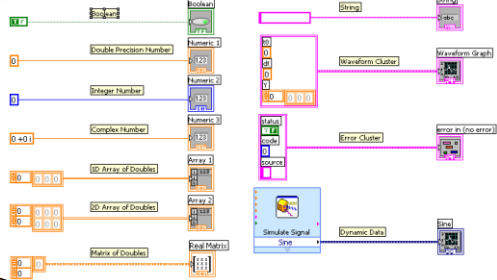



















Variables










Status Toolbar





**Run Button**


**Continuous Run Button**


**Abort Execution**


Additional Buttons on the Diagram Toolbar

**Execution Highlighting Button**

**Retain Wire Values Button**


**Step Function Buttons**










It's Broken :(


- Finding Errors**

 Click on broken **Run** button.
Window showing Error appears.
- Execution Highlighting**

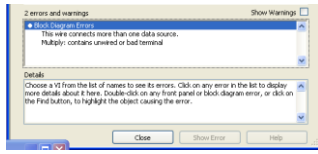
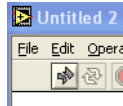
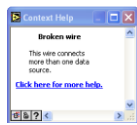
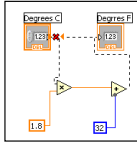
 Click on **Execution Highlighting**; data flow is animated using bubbles. Values are displayed on wires.
- Probes**


 Right click on a wire to display a probe which shows data as it flows through the wire segment.
 You can also select the probe tool from the Tools palate and click on a wire.





Broken Example :(





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Protips

- <Ctrl+H> – Context Help
- <Ctrl+E> – Toggle Between Front Panel and Block Diagram
- <Ctrl+Z> – Undo
- <Ctrl+B> – Remove Broken Wires from Block Diagram

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NXT Toolkit

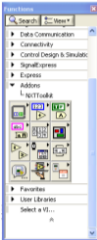
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NXT Toolkit



- Only blocks in the NXT Toolkit can be used with the NXT
- Math, motor control, flow control (while loops etc), sensors, readouts...

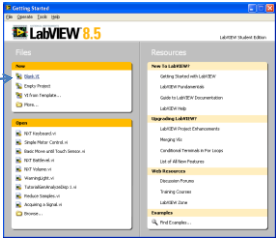


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NXT Toolkit Activity

Make a new VI

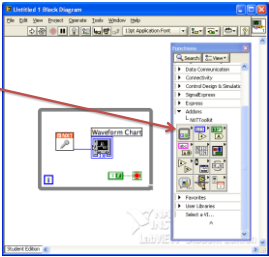


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NXT Toolkit Activity

Add a **while loop**
NXTToolkit>>
Structures>>While Loop

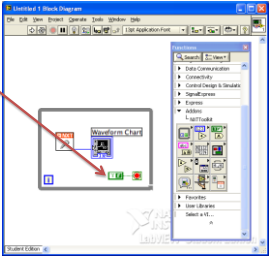


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NXT Toolkit Activity

Create a **constant**
for the loop

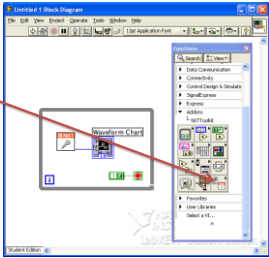


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NXT Toolkit Activity

Add a **Sound Sensor**
NXTToolkit>> NXT Library>>
Input>> Sound Sensor

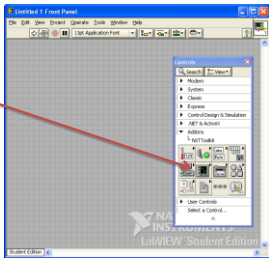


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NXT Toolkit Activity

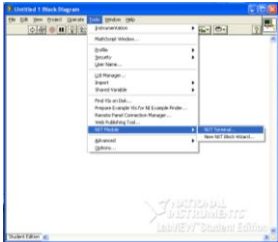
Add **Waveform Chart**
(On the front panel)
NXTToolkit>> Graph>>
Waveform Chart



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Running a VI on the NXT



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Running a VI on the NXT



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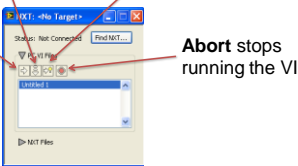


Running a VI on the NXT

Compile and Download the VI without running it

Debug – compile, download and run the VI while maintaining a link to the host computer

Compile, Download and Run without maintaining a link to the host computer



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Further Reading

- Checkout our wiki
http://wiki.robojackets.org/w/LabVIEW_Resources
- See
<http://www.ni.com/labview/try/daq.htm>
to check out LabVIEW
- Send me an email
andyb@gatech.edu



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