

# LabVIEW for FRC

## Session 1: Introduction to LabVIEW

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# Objectives

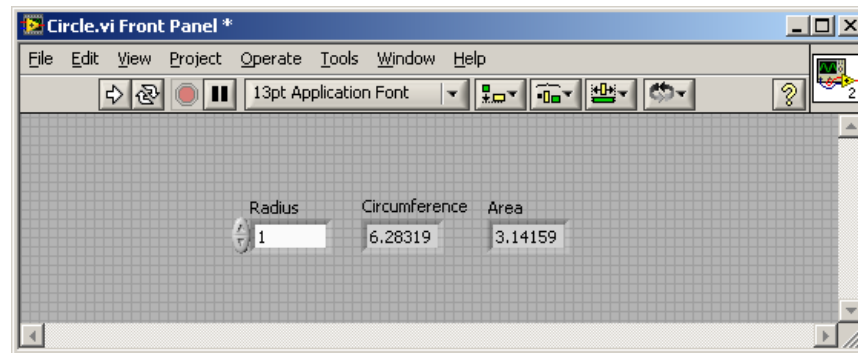
- Gain a basic understanding of how LabView works
- Create a simple program that can be run on a PC

# The Basics

- Front Panel
- Block Diagram
- Navigation tips
- Tools Palette
- Controls Palette
- Functions Palette
- Your first Virtual Instrument (VI)

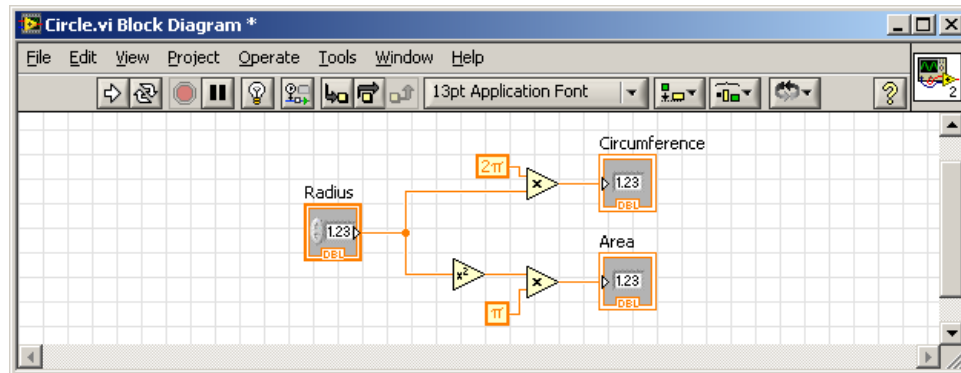
# Front Panel

- Input / output interface of a VI or program
- Objects are generically referred to as **Terminals**
  - **Controls** allow input (see **Radius**)
  - **Indicators** show output (see **Circumference, Area**)
- Click the **Run** or **Run Continuously** buttons to execute the VI



# Block Diagram

- Code is entered here
- Functions are executed based on wiring sequence
- **Controls** are referred to as **Sources**
- **Indicators** are referred to as **Sinks**

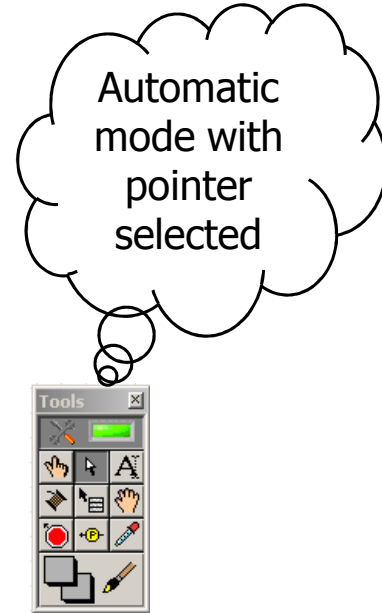


# Navigation Tips

- **Ctrl+E** – Switch between Front Panel and Block Diagram for the open VI
- Right click a terminal in the Front Panel and select **Find Terminal** to jump to that object in the Block Diagram
- Right click a control or indicator and select **Find Control** (or **Find Indicator**) to jump to that object in the Front Panel
- The faster you move, the faster you can code!

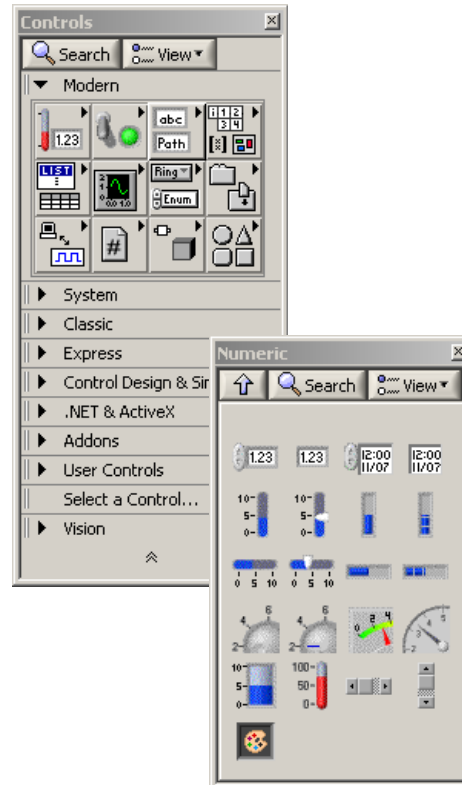
# Tools Palette

- Used in **Block Diagram** and **Front Panel** windows
- Selects type of action to be performed
- Automatic mode attempts to determine what you want based on context (fast, but can be tricky), or you can select specific task (slow, but accurate)



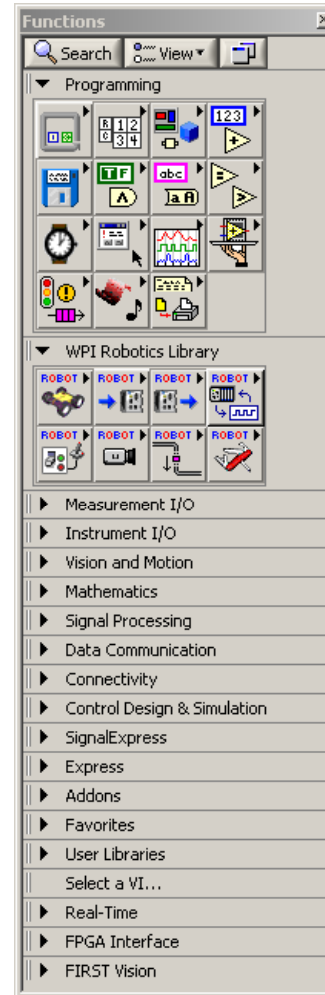
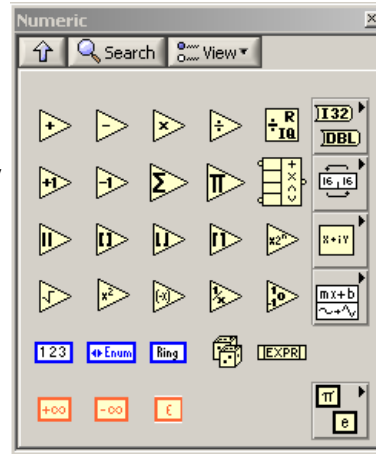
# Controls Palette

- Used in **Front Panel** window
- Select **Controls** to define VI inputs
- Select **Indicators** to define program outputs
- Right click a Control or Indicator and select **Properties** to customize
  - Data ranges
  - Display format
  - Data type
  - Many others...



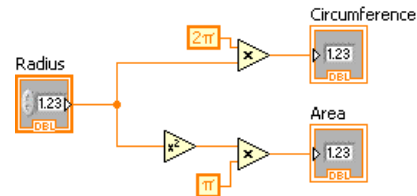
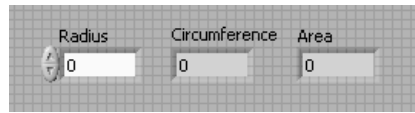
# Functions Palette

- Used in **Block Diagram** window
- **Programming**
  - Loops and case blocks
  - Basic math functions
  - Logical operations
  - Timers
- **WPI Robotics Library**
  - Actuators
  - Sensors
  - Driver station
- **Select a VI...**



# Putting It All Together...

- Click **File** > **New VI**
- Add control and rename to **Radius**
- Add indicators and rename to **Circumference** and **Area**
- Switch to Block Diagram and wire it up
  - Hint: everything you need is in **Programming** > **Numeric**
- Run the VI and verify the output

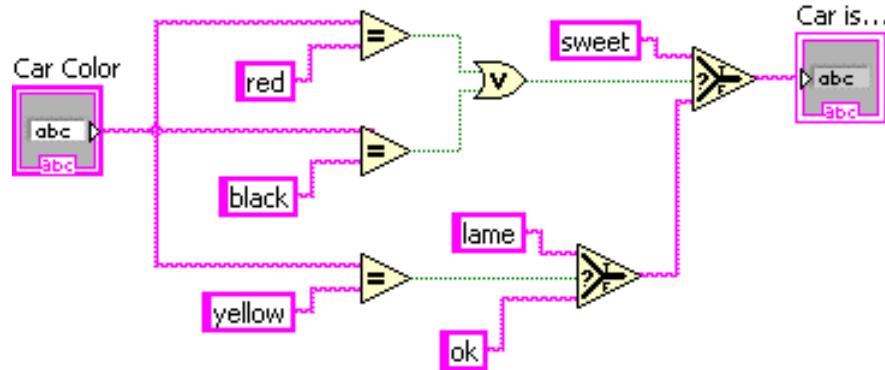


# Conditional Statements

- Control robot decisions based on user or sensor inputs
  - If... Else If... Else...
  - Case Structure
  - While Loop
  - For Loop

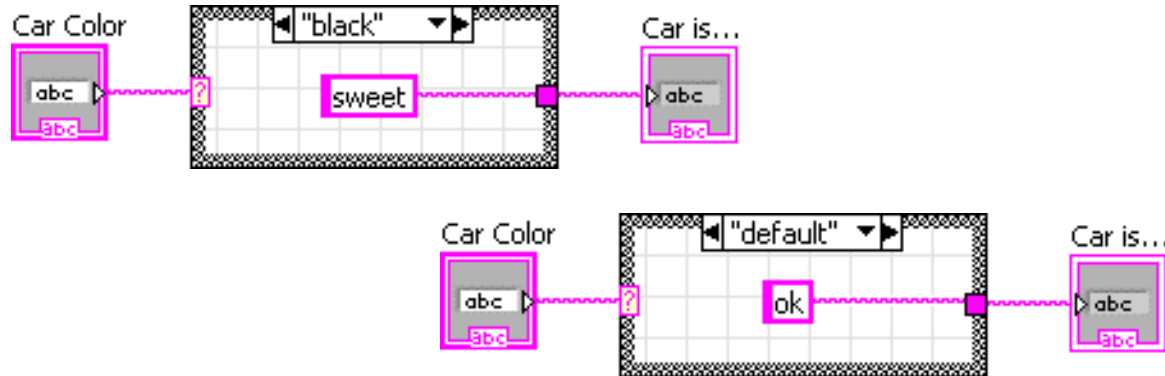
# If... Else If... Else...

- Basic building block of program decision making
- Make decision about the color of a car...
  - If red or black, car is sweet
  - If yellow, car is lame
  - Otherwise, car is ok



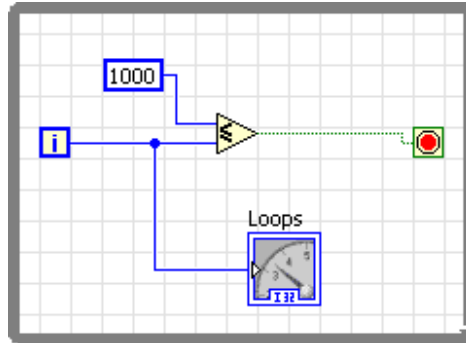
# Case Structure

- Only execute if exact match, otherwise "default"
- Easy to understand each little piece, but understanding the whole thing is difficult due to lack of transparency



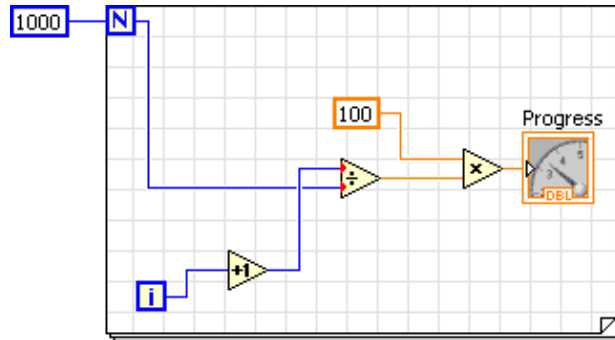
# While Loop

- Keeps running the same code over and over until exit condition is met
- Count **i** starts at zero and is incremented every loop
- Need to be careful with While loops... if the exit condition is never met, you'll get stuck there forever!



# For Loop

- Executes the same code **N** times
- Count **i** starts at zero and is incremented every loop
- Safer than a While loop, because it is guaranteed to end
- Can be terminated early, if desired (see **Help**)



# LabVIEW for FRC

End of Session 1

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