ET 438b Sequential Control and Data Acquisition

Department of Technology

LESSON 2: INTRODUCTION TO CONTROL PROGRAMMING USING LABVIEW

LEARNING OBJECTIVES

After this presentation you will be able to

- Identify the sections of the LabVIEW development environment.
- Identify the variable types in LabVIEW
- Identify and utilize control structures in LabVIEW.
- Construct a user interface using LabVIEW.
- Link programs to data acquisition hardware using MAX driver software
- List the types of I/O available on data acquisition hardware

CONTROL PROGRAMMING AND DATA AQUISITION USING LABVIEW

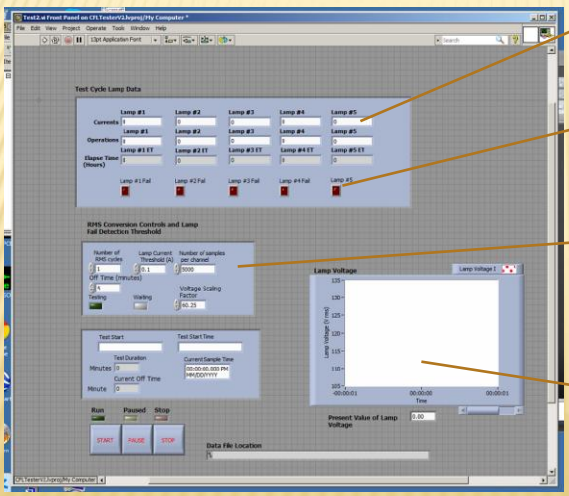
LabVIEW is a graphical programming language that allows rapid development of programs that:

- Read analog input signal data
- Read switch input (digital) signal data
- Process and store data
- Display data and system status
- Write analog output signals
- Write digital output signals for on/off control

3

LABVIEW EXAMPLE

Compact Florescent Light Testing Controller



Analog inputs read lamp currents

Digital outputs control lamp operation

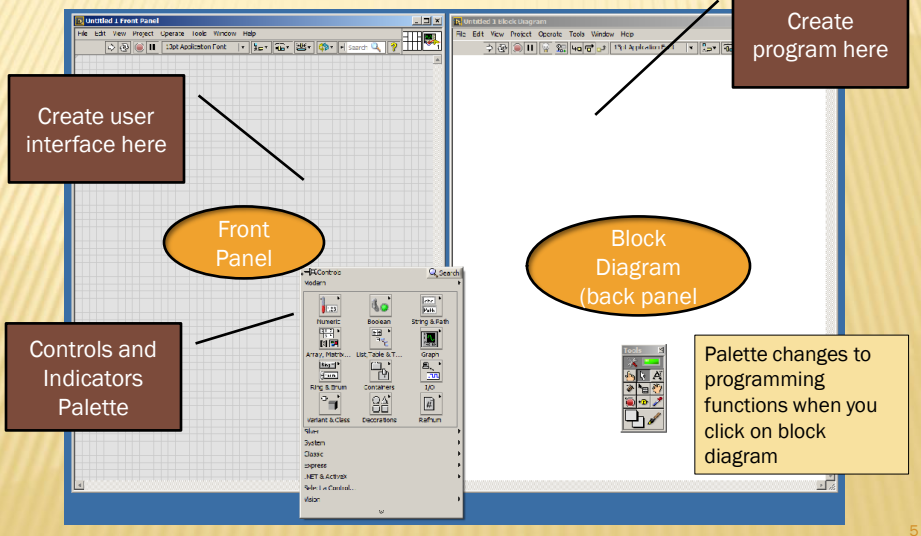
Analog samples processed to give RMS V and I values

Plot monitors lamp voltage over time

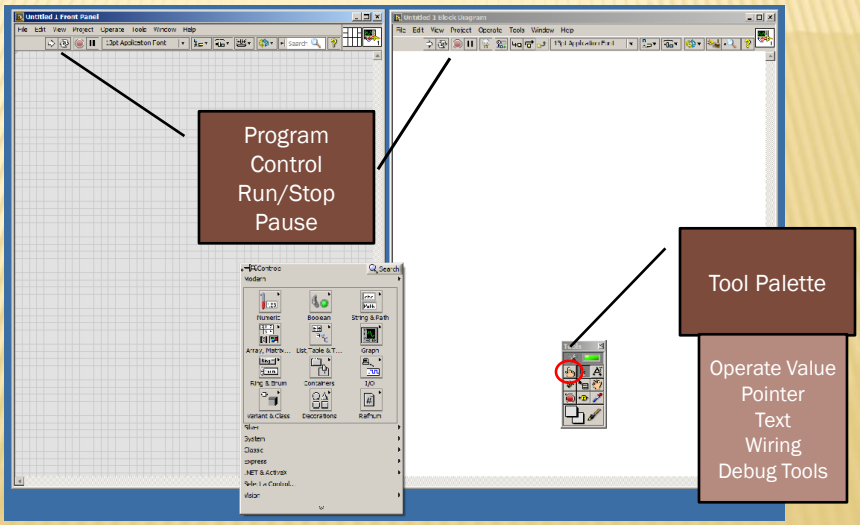
4

LABVIEW PROGRAMMING ENVIRONMENT

LabVIEW is a graphical programming environment

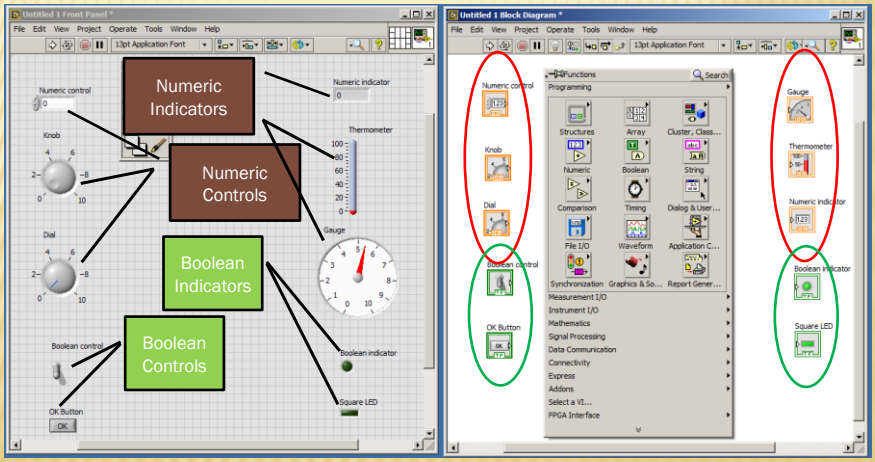


LABVIEW PROGRAMMING ENVIRONMENT



LABVIEW PROGRAMMING ENVIRONMENT

In LabVIEW Input variables = controls Output variables = indicators



LABVIEW PROGRAMMING ENVIRONMENT

Other data types in LabVIEW

Integers
(Signed and Unsigned) I32 I16 I8 U32 U16 U8

Strings
Arrays of characters

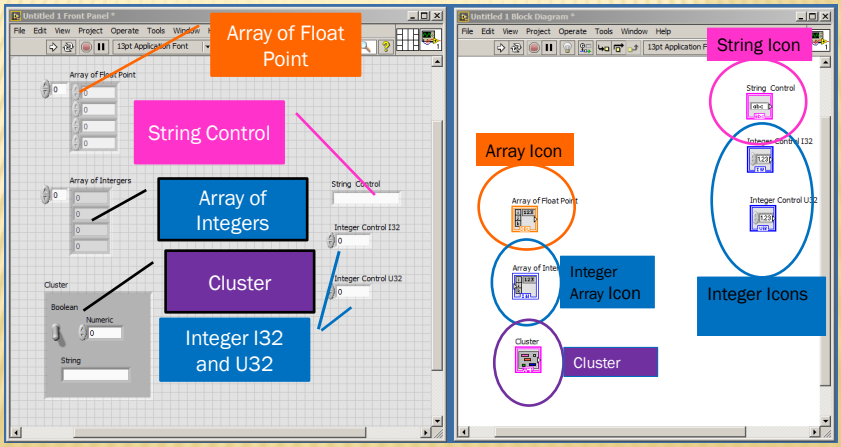
Data Structures in LabVIEW Programming

Arrays
Collect data of the same type. 1-D and multi-D Indexing begins at 0

Clusters
Collect data of dissimilar data same types. Only include indicators or controls

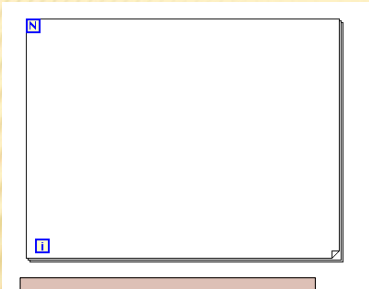
LABVIEW PROGRAMMING ENVIRONMENT

Data Types and Structures in LabVIEW Programming

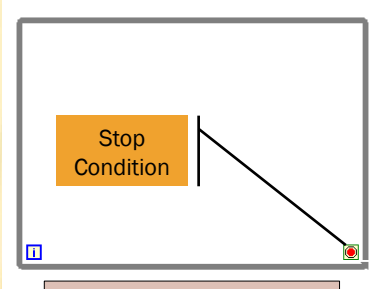


LABVIEW PROGRAMMING STRUCTURES

Graphical Programming Structures



FOR Loop – Repeats enclosed instructions for a predetermined amount of iterations (N)

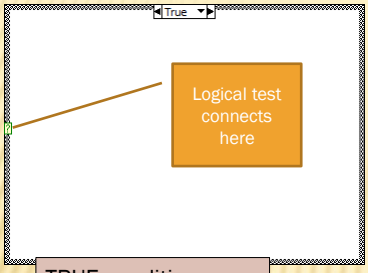


WHILE Loop – Repeats enclosed instructions until stop condition is met

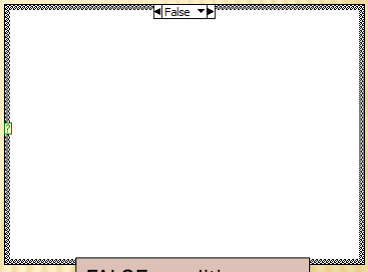
Index, i, in both structures holds current iteration number

LABVIEW PROGRAMMING STRUCTURES

Graphical Programming Structures



TRUE condition executes these items

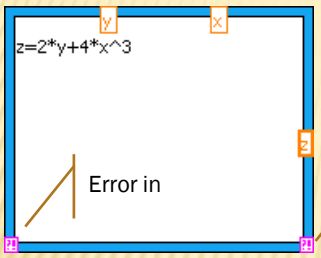


FALSE condition executes these items

IF-THEN/CASE Executes enclosed based on logical test (TRUE/FALSE) or Index (CASE)

LABVIEW PROGRAMMING STRUCTURES

Computed nodes, when written code is simpler

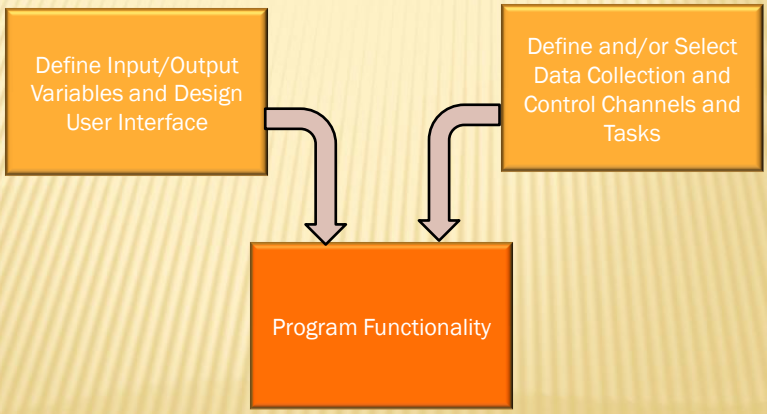


MathScript Node
Write code in syntax similar to Matlab. Define I/O variable. Allows error checking from other blocks.

Formula Node
Write code in syntax similar to C . Define I/O variable like MathScript

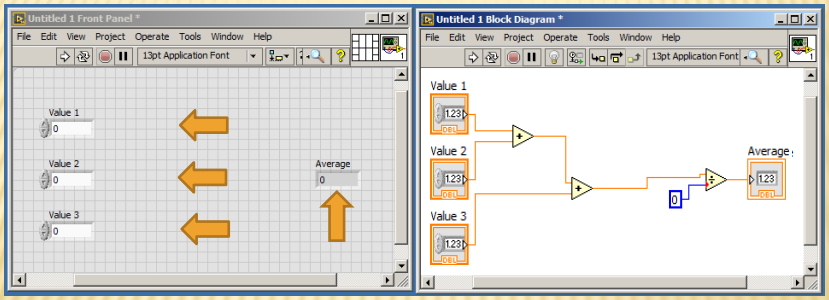
PROGRAMMING IN LABVIEW

Control and Data Acquisition Programming



PROGRAMMING STEPS

Define the I/O and design the interface



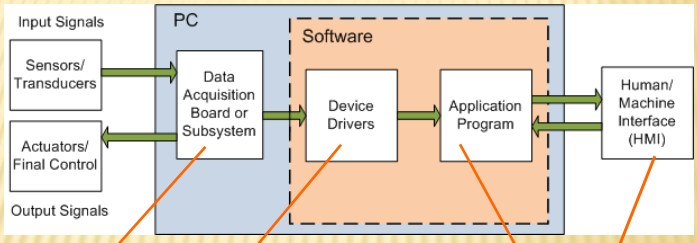
Place the programming blocks on back panel

Wire the programming blocks on back panel to make a functional program

See more programming examples on the course website and in D2L

DEVELOPING DATA ACQUISITION AND CONTROL PROGRAMS IN LABVIEW

Overview of Data Acquisition and Control Program Structure



Hardware
NI-6024
NI 6221

Measurement and Automation Explorer

Define I/O Tasks and channels

LabVIEW Program

DATA ACQUISITION IN LABVIEW

Connecting to the outside world with Measurement and Automation Explorer (MAX)

Define Types of Signals to Measure

Analog input signals
Transducer inputs (V, I)
Digital inputs signals
Binary inputs
Switches

Create Measurement Channels and Tasks Using (MAX)

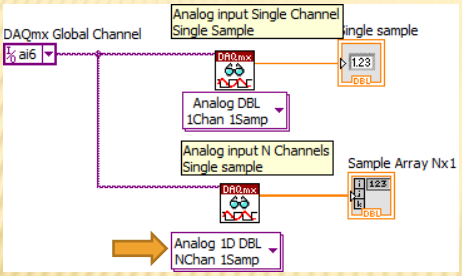
Analog input signals
Differential, Ground Referenced
Digital inputs signals
Ports (8-bits)
Digital lines (1-bit)

Access Channels and Tasks Using DAQmax in LabVIEW

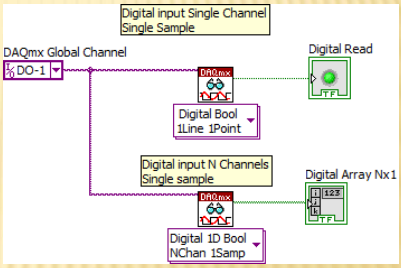
Analog/Digital
Read/Write
Single/Multi-sample

DATA ACQUISITION IN LABVIEW

Reading Analog Inputs



Reading Digital Inputs



Access the DAQ functions from the Measurement I/O choice on the programming palette

Polymorphic Virtual Instrument (VI). Click to change nature.

ET 438b Sequential Control and Data Acquisition

Department of Technology

END LESSON 2: INTRODUCTION TO CONTROL PROGRAMMING USING LABVIEW