

微电子器件实验

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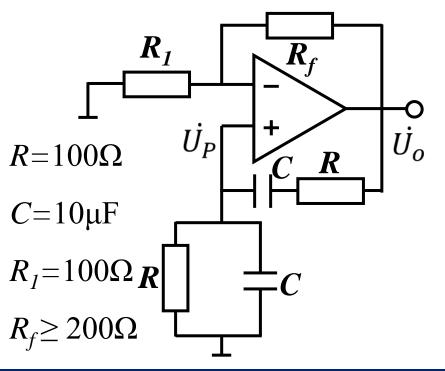
回顾:波形发生器

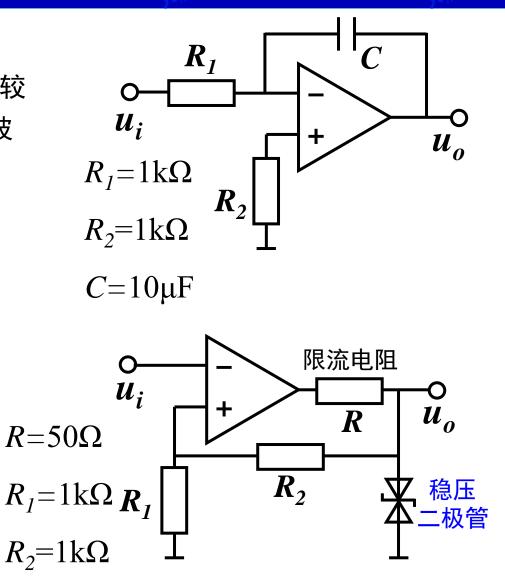


■ 从方波到三角波(选做)

搭建RC桥式正弦波振荡电路、滞回比较器和积分电路,测量得到正弦波、方波和三角波

注意:单个器件实现了双向稳压功能





虚拟仪器(VI)的概念

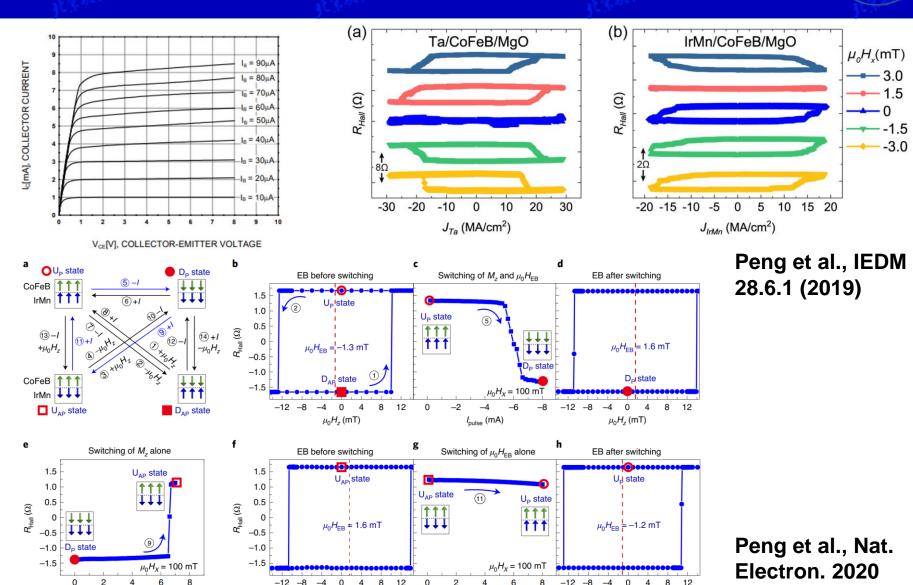


所谓虚拟仪器(Virtual Instrument,简称VI)是指以通用计算机为核心的硬件平台,配以相应测试功能的硬件作为输入/输出的接口,利用仪器软件开发平台在计算机的屏幕上虚拟出仪器的面板和相应的功能,然后通过鼠标或键盘操作的仪器。软件是构成虚拟仪器的核心,可以说软件就是仪器。

LabVIEW (Laboratory Virtual Instrument Engineering Workbench)

虚拟仪器(VI)的意义





I_{pulse} (mA)

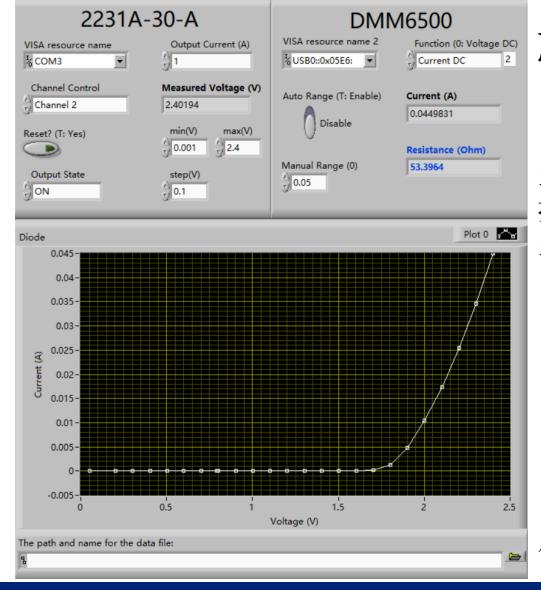
 $\mu_0 H_z$ (mT)

 $\mu_0 H_z$ (mT)

I_{pulse} (mA)

虚拟仪器(VI)的意义



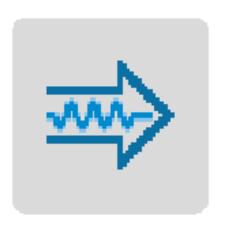


二极管直流特性曲线测量

显示测量结果数据 显示测量结果 图

保存测量结果数据

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) LabVIEW可以方便地实现采集、分析、显示







采集

LabVIEW用以下 接口实现采集

GPIB, Serial,USB, Ethernet, VXI, PXI Instruments, Data Acquisition (DAQ) 等

分析

LabVIEW有丰富的 信号处理函数

差分、最优化、 曲线拟合、微分 、统计、滤波、 频谱分析等

显示

LabVIEW有多种显 示方式

图形、图表、图 片控制、3D图形 、报告、网络 -网页发布工具等

虚拟仪器程序Virtual Instruments (VIs)

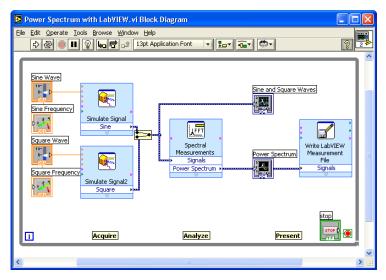
Front Panel 前面板

- Controls = Inputs 控制
- Indicators = Outputs 指示

Block Diagram 程序框图

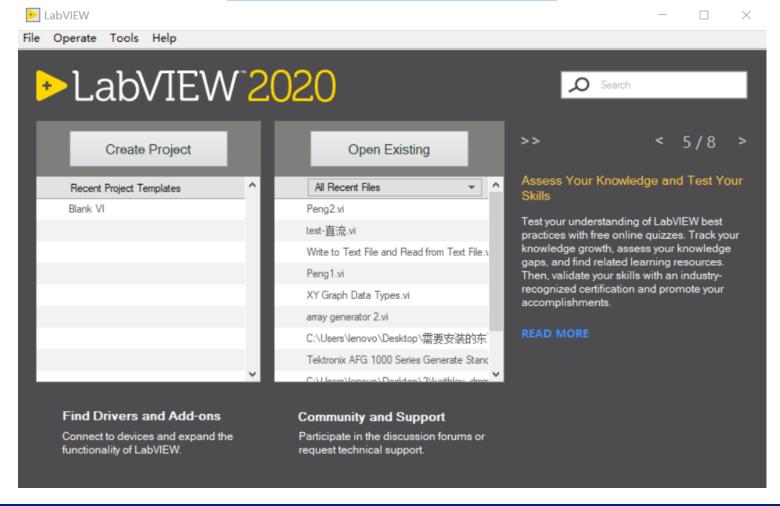
- Accompanying "program"
 for front panel 与前面板对应
- Components wired together 把对象连接起来
- 控制程序的代码



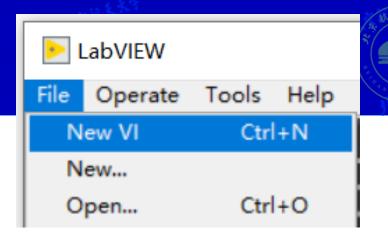


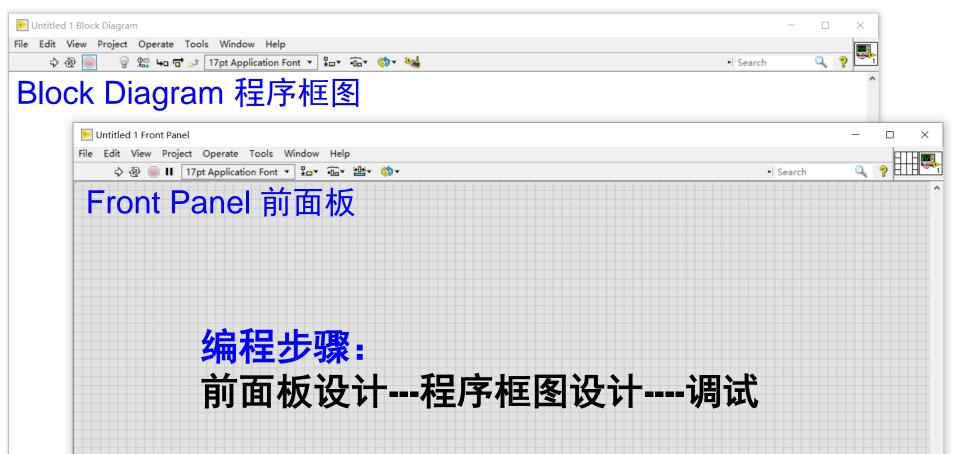
LabVIEW 界面(NI LabVIEW 2020 (64-bit)





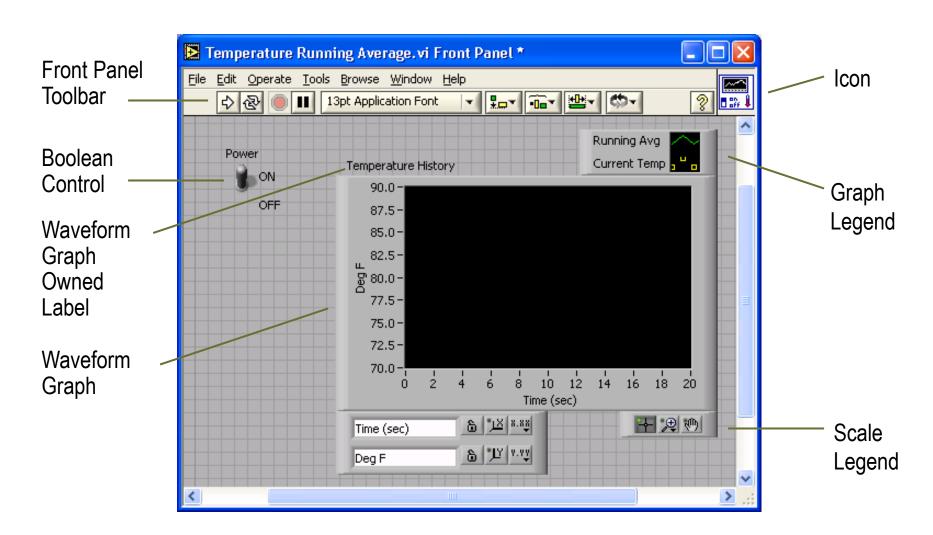
创建一个新的VI





Front Panel 前面板

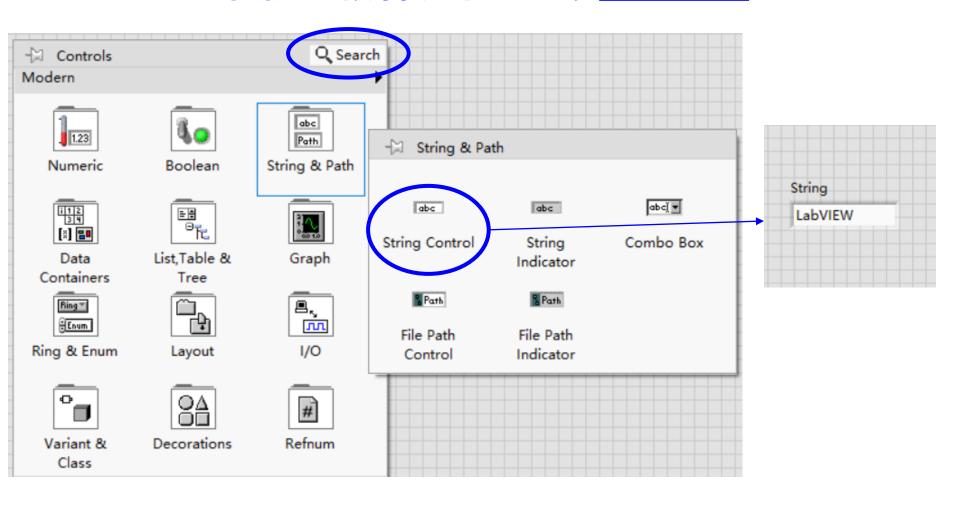




前面板 Front Panel - Controls Palette

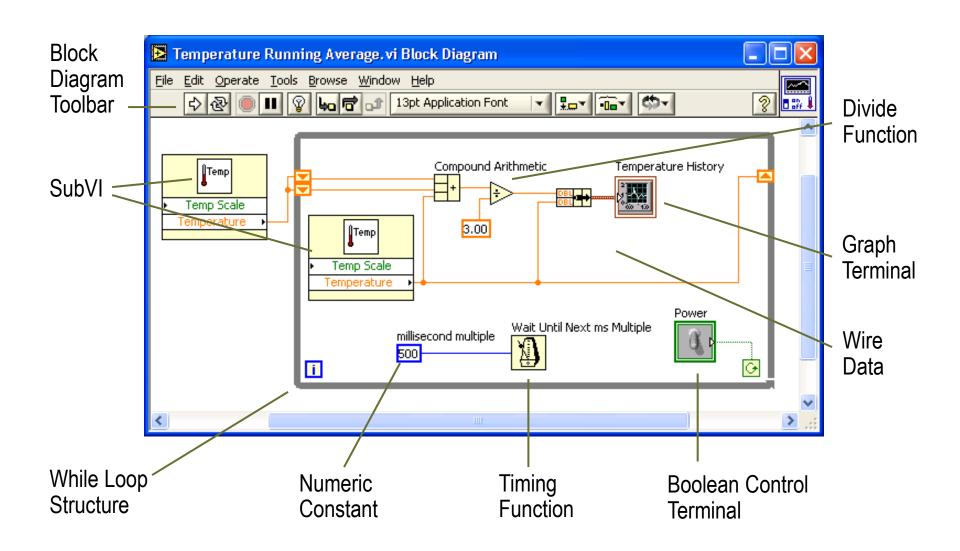


在前面板右键单击显示常用控件:



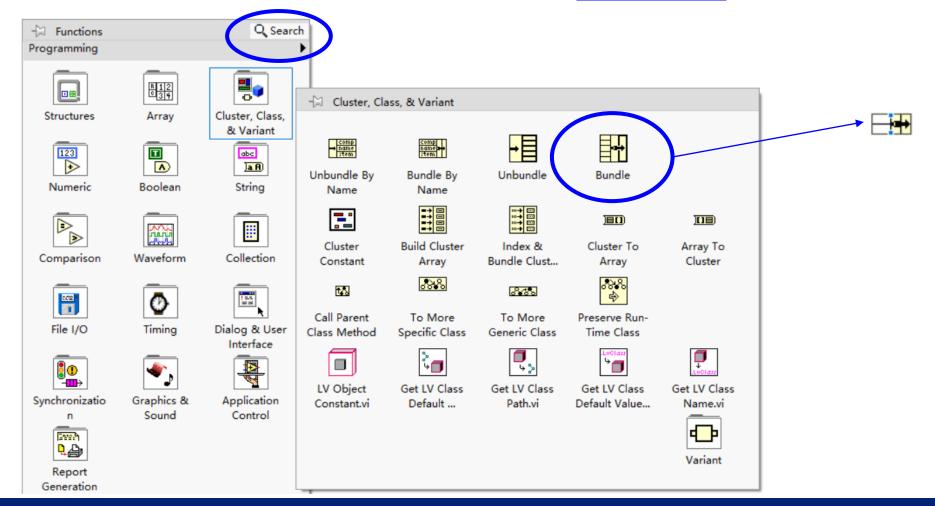
Block Diagram 程序框图





程序框图Block Diagram - Functions Palette

前面板与程序框图切换快捷键: Ctrl+E 在程序框图右键单击显示<u>常用函数</u>:



前面板和程序框图工具栏





Run button

Continuous Run button

Abort button

Pause/Continue button









Additional Buttons on the Block Diagram Toolbar

Font ring

Alignment ring

Distribution ring

Resize ring

Reorder ring

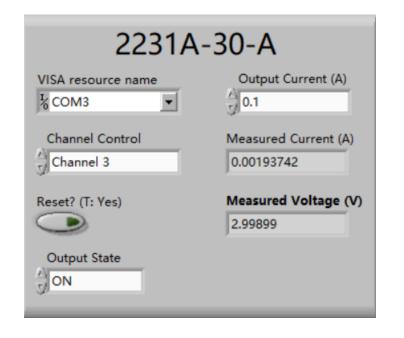
Context Help Button

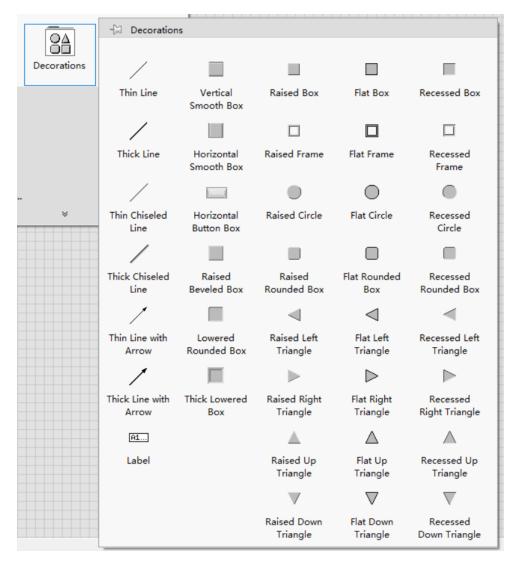
- Execution Highlighting button
- Step Into button
- Step Over button
- Step Out button

前面板设计-修饰



• 使用修饰控件,如 方框、线条、箭头 等来组合或分隔前 面板上的对象

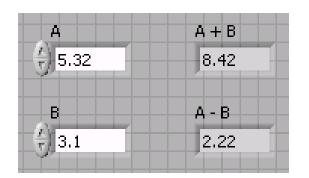


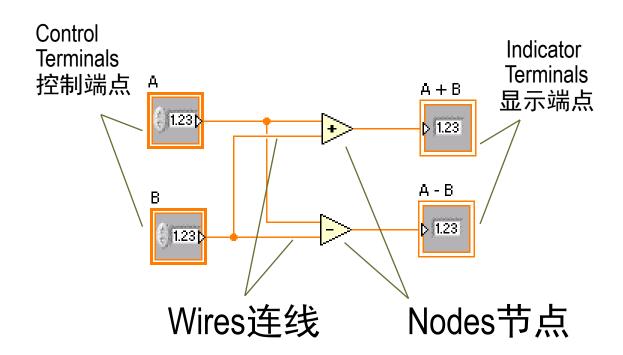


创建框图程序 Creating a VI Block Diagram

程序框图

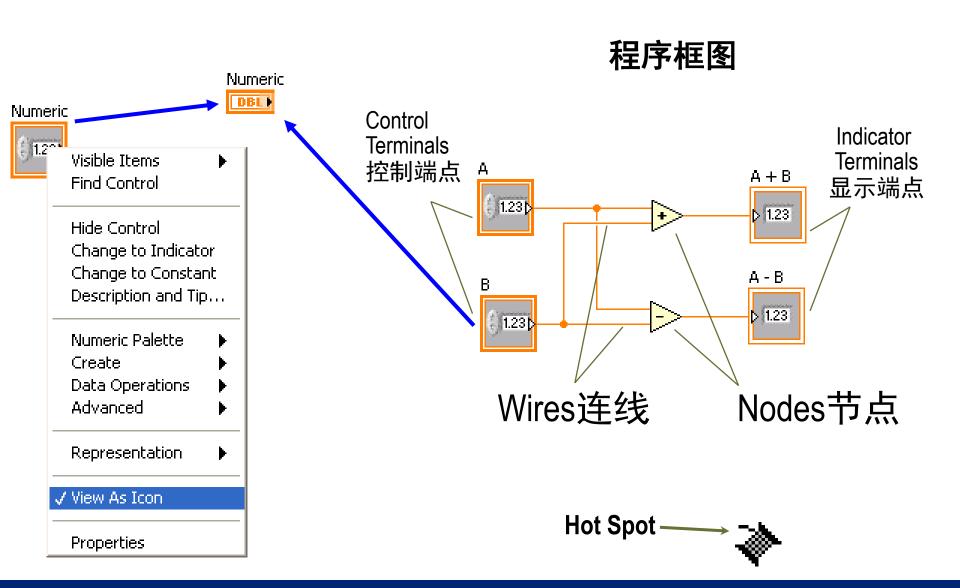
前面板





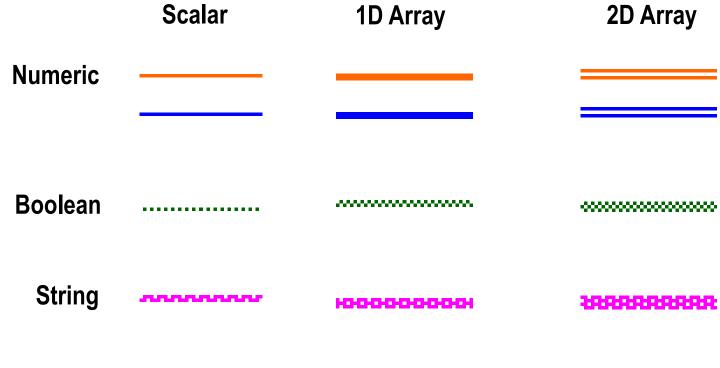


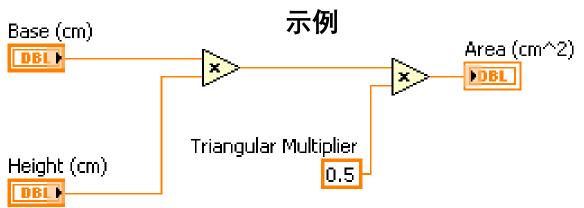
创建框图程序 Creating a VI Block Diagram



连线 Wiring the Block Diagram

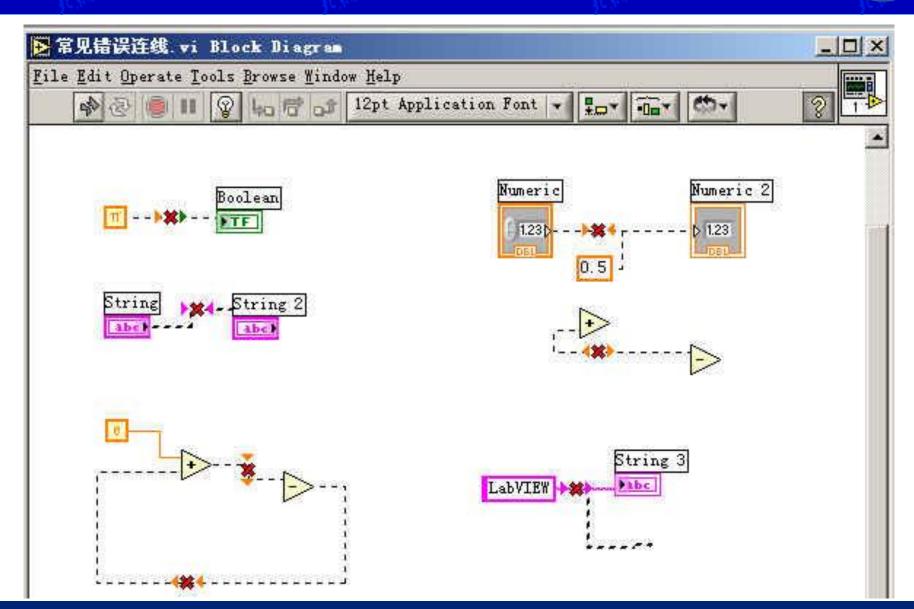






连线错误





调试技术Debugging Techniques





查找错误Finding Errors



Click on broken Run button. A window showing the error appears

高亮运行Execution Highlighting





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

帮助 Context Help

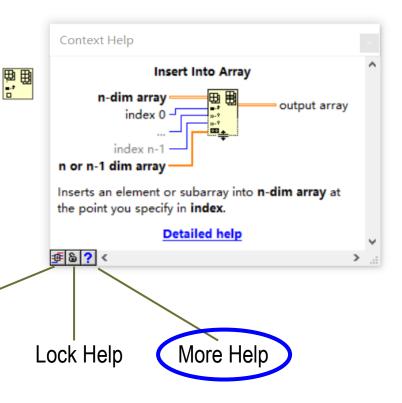


X

 To display the Context Help window, select Help»Show Context Help

Simple/Detailed Context Help

- Move cursor over object to display help
- Connections:
 Required bold
 Recommended normal
 Optional dimmed



▶ | Search

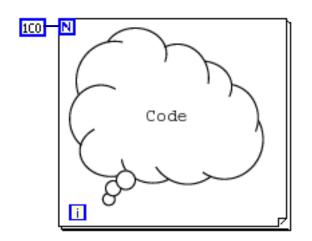
控制程序运行的结构

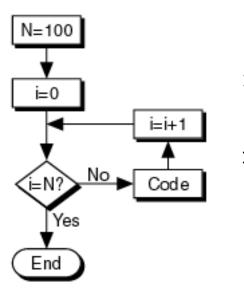


- A. While 循环
- B. For 循环
- C. 顺序结构
- D. 选择结构

For循环 For Loops







```
For i=0 to N-1;
  Excute (code; i=i+1);
End;
```

LabVIEW For Loop

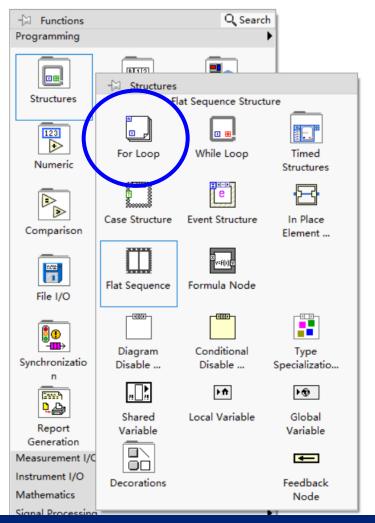
Flow Chart

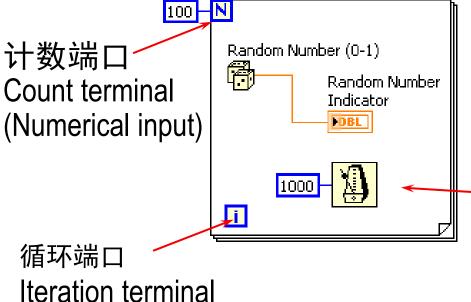
Pseudo Code

For循环 For Loops



• 执行指定次数的框图内代码





Wait Until Next ms 时延

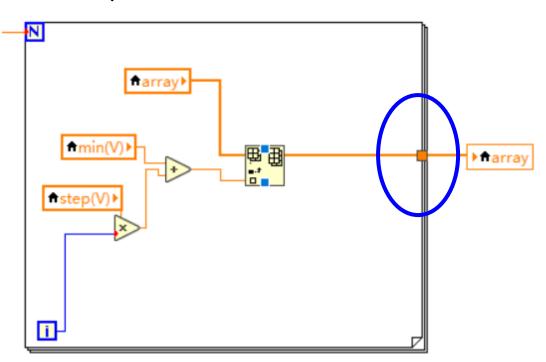
For循环一隧道



- 隧道用于接收和输出结构中的数据
- 隧道会根据连入隧道的数据类型改变颜色
- 循环终止后,数据才会从循环中传出

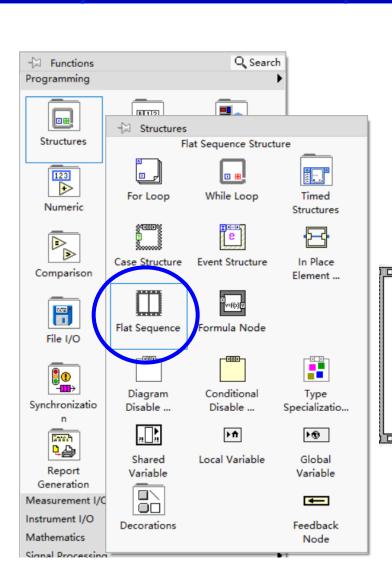
•数据从隧道输入循环时,只有在数据到达隧道之后循

环才开始执行

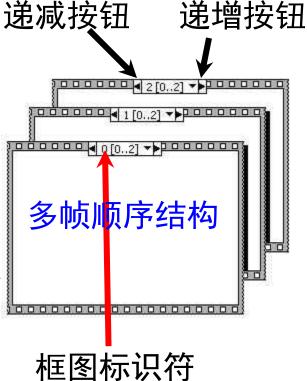


顺序结构Sequence





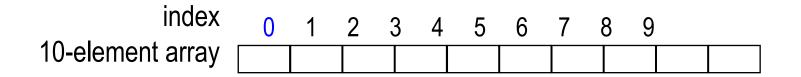


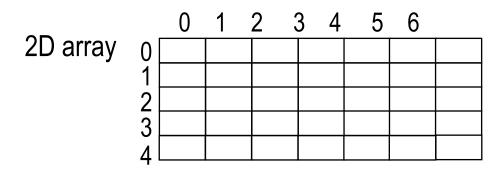


数组 Arrays



- •相同类型数据的集合
- •一维或多维,每一维可达231元素
- 通过数组索引访问; 第一个元素的索引值为 0

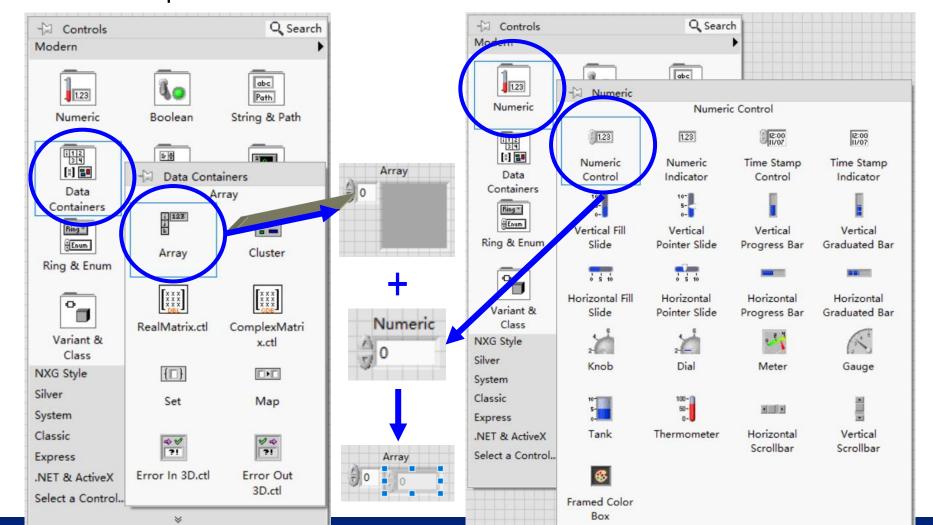




数组控件 Array Controls and Indicators

1. Select the **Array** shell from the Controls palette

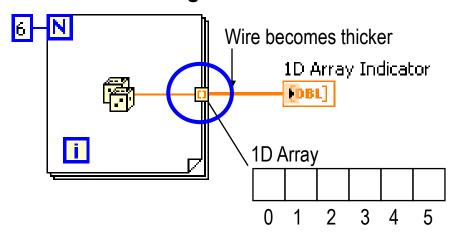
2. Place data object inside shell



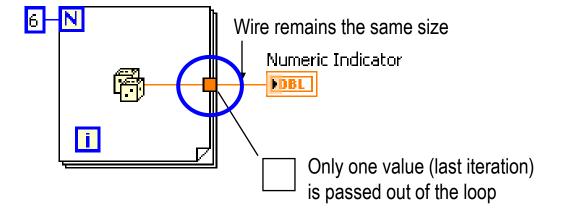
自动索引Auto-Indexing

- 自动索引可以使数据 累加成一个数组,或 者使数组成员逐个进 入循环框内
- For 循环默认自动索引
- While 循环默认为不能 自动索引,输出最后 一个数据
- 数据通道上右击,可选择自动索引或禁止自动索引

Auto-Indexing Enabled



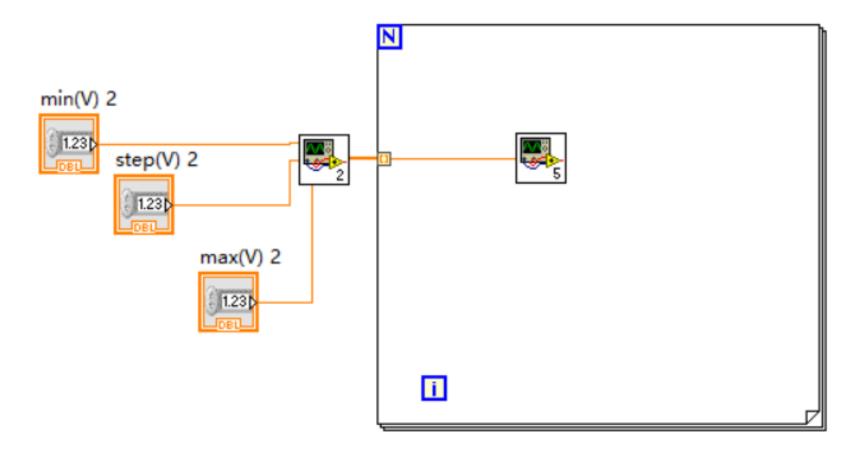
Auto-Indexing Disabled



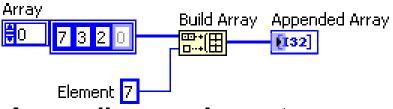
自动索引输入Auto-Index Input



- · 数组可以用来设置For循环的计数端口
- 循环次数等于数组元素个数

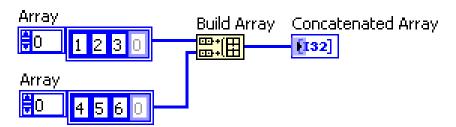


创建数组函数The Build Array Function



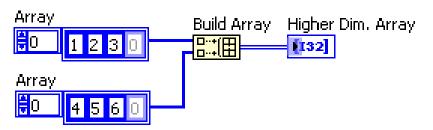


Appending an element





Concatenate Inputs



Building a higher dimension array



default

簇Clusters



- •不同数据组成的集合体
- •数据可以是不同类型
- •元素必须都是控制或指示
- •可以想象成一束通讯电缆



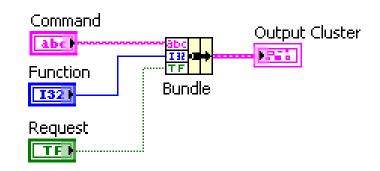
簇函数一合成 Cluster Functions - Bundle

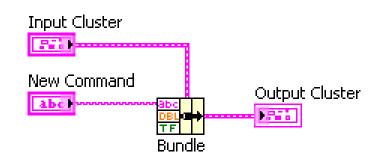


Create new cluster

Modify existing cluster

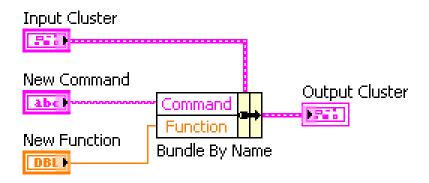
Bundle



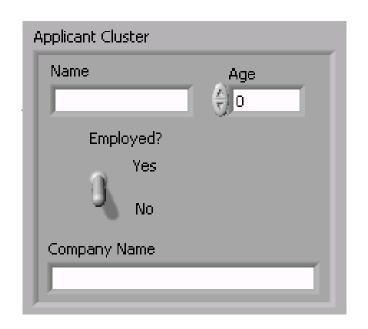


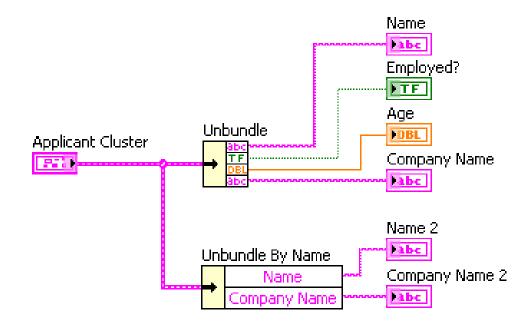
Bundle By Name

Must have an existing cluster to use this function.



簇函数一解析Cluster Functions - Unbundle





Unbundle



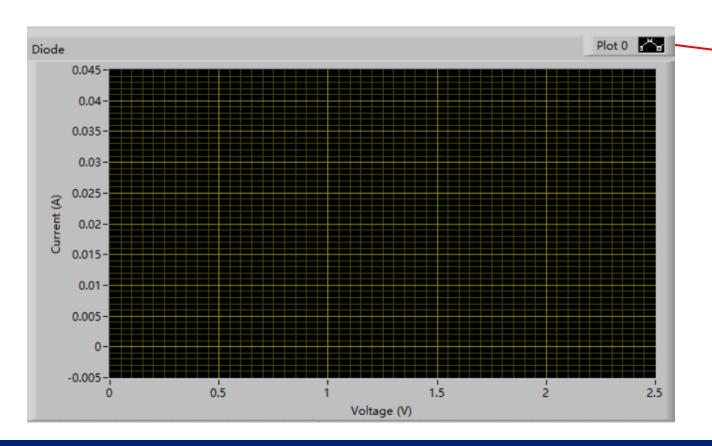
Unbundle By Name



波形图 Graphs



- ·从Graph 子模板添加
- Waveform Graph 画出与序号对应的一组数据
- XY Graph 画出一个数组对另一个数组的图形



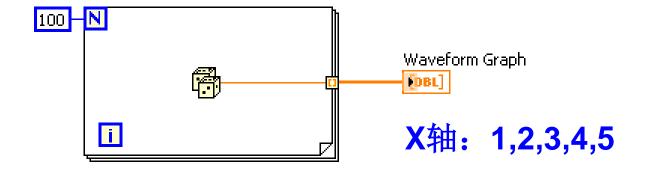
·图例 Plot Legend (point and line styles)

单条波形图 Single-Plot Waveform Graphs

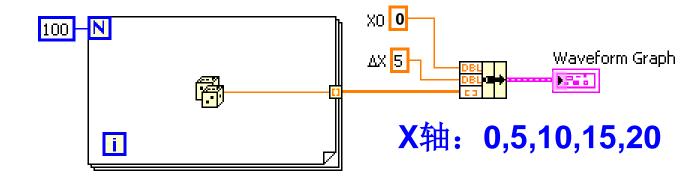
Uniform X axis

Initial X = 0.0

Delta X = 1.0

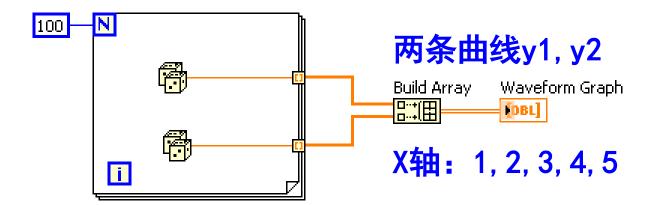


Uniform X axis you specify point spacing

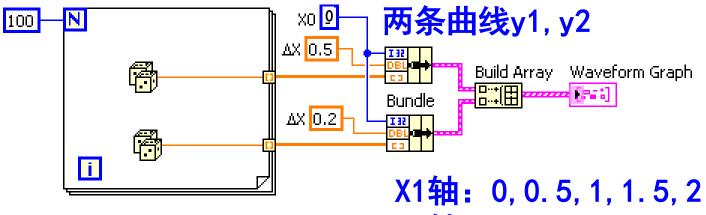


多条波形图 Multiple-Plot Waveform Graphs

Each row is a separate plot: Initial X = 0Delta X = 1



Each row is a separate plot: Bundle specifies point spacing of the X axis

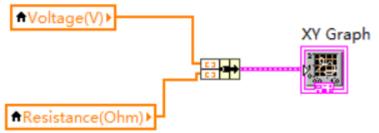


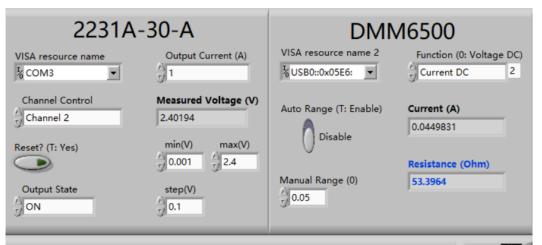
X2轴: 0, 0. 2, 0. 4, 0. 6

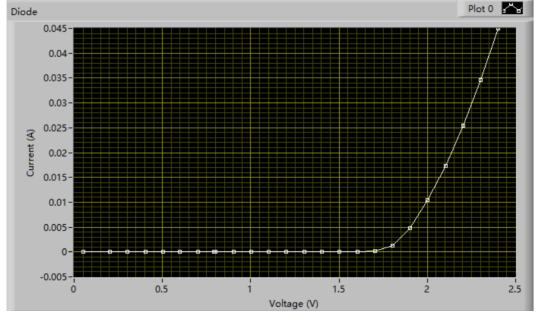
二维波形图 XY Graphs



- · X 轴不是序号
- ·独立的X和Y数组定义点 (x,y)





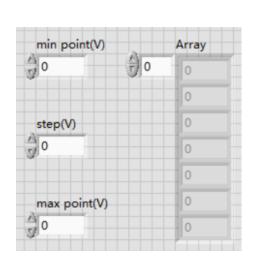


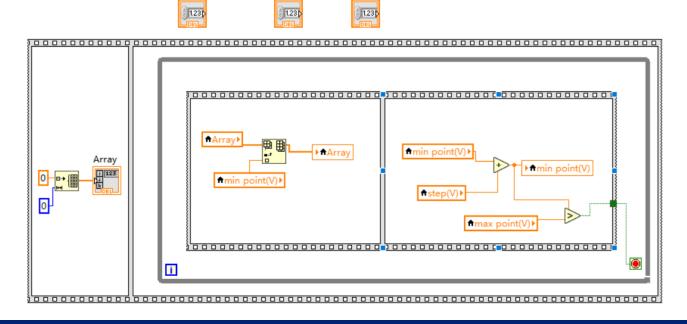
什么是模块化? - 子VI



- · 当一个VI应用在其它VI中,则称为子VI
- •子VI相当于文本编程语言中的子程序
- 在前面板窗口和程序框图窗口的右上角都可以看到该\I的图标

min point(V)





max point(V)

什么是模块化? - 子VI

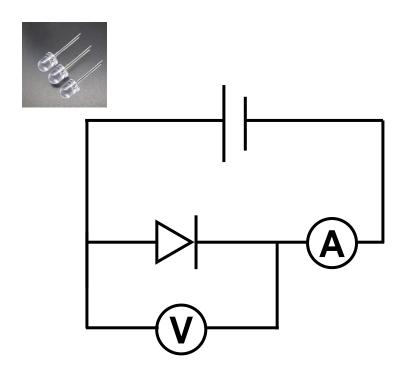


函数代码	调用程序代码
<pre>function average (in1, in2, out) { out = (in1 + in2)/2.0;</pre>	<pre>main { average (point1, point2, pointavg)</pre>
} 子VI的程序框图	调用VI的程序框图
in1 out in2 DBL 2	in1 DBL Point Avg DBL DBL

回顾: 二极管直流特性测量实验

1952 - 19

二极管直流特性



■ 注意事项

- 1. 请测量发光二极管(小心烫手)
- 2. 正向电压不要超过2.5V
- 3. 反向电压大要超过-30V (无需测到反向击穿)



电压源 产生电压



台式万用表 测量电流



手持式万用表 测量电压

LabVIEW入门实验

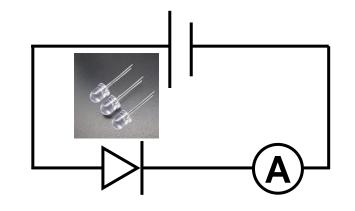


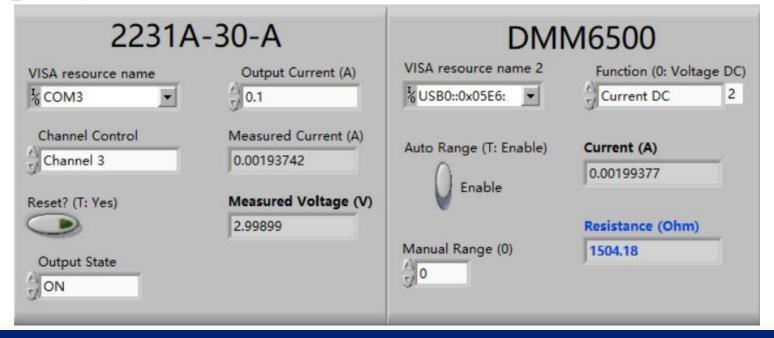
■ 单个阻值测量

搭建发光二极管直流特性测量电路(将电压源电压近似为二极管两端电压),编写LabVIEW程序,实现如下功能:

向程序输入一个正电压,测量电流并显示

电流和电阻阻值





京旅客旅天大學 北京旅客旅天大學 小女旅客旅天大學



谢谢!