第七章、计算机虚拟仪器技术

本章学习要求：

1. 了解虚拟仪器的构成和工作原理

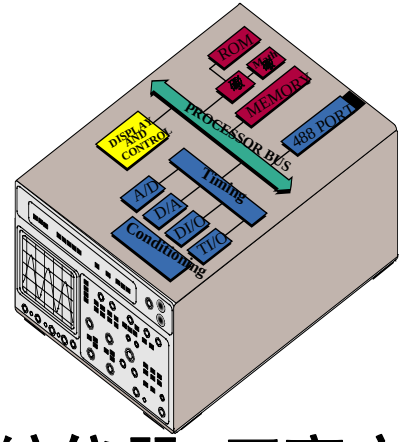
2. 了解常用的虚拟仪器开发平台

1. 虚拟仪器定义

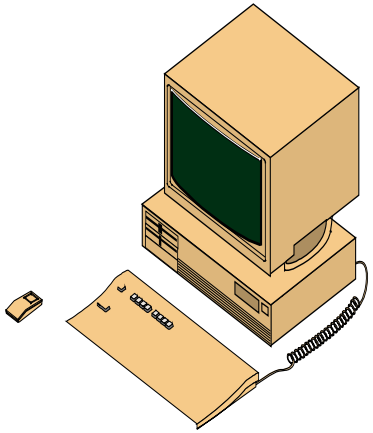
虚拟仪器是在计算机上显示传统仪器面板，它将硬件电路完成的信号调理和处理功能由计算机程序完成，这种硬件功能软件化是虚拟仪器的一大特征。

2. 虚拟仪器技术的发展过程

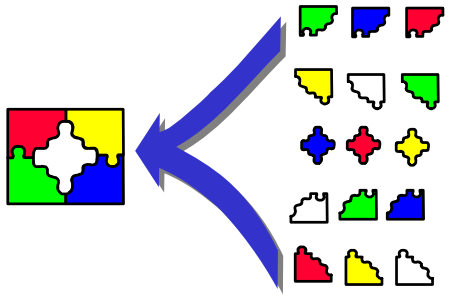
3. 仪器定义和功能的转变



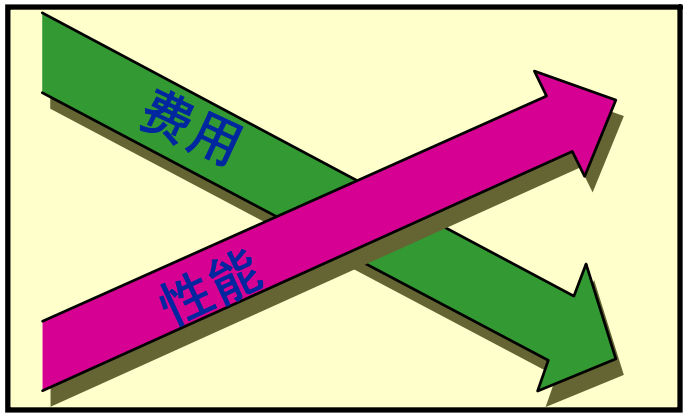
传统仪器:厂商定义



虚拟仪器:用户定义

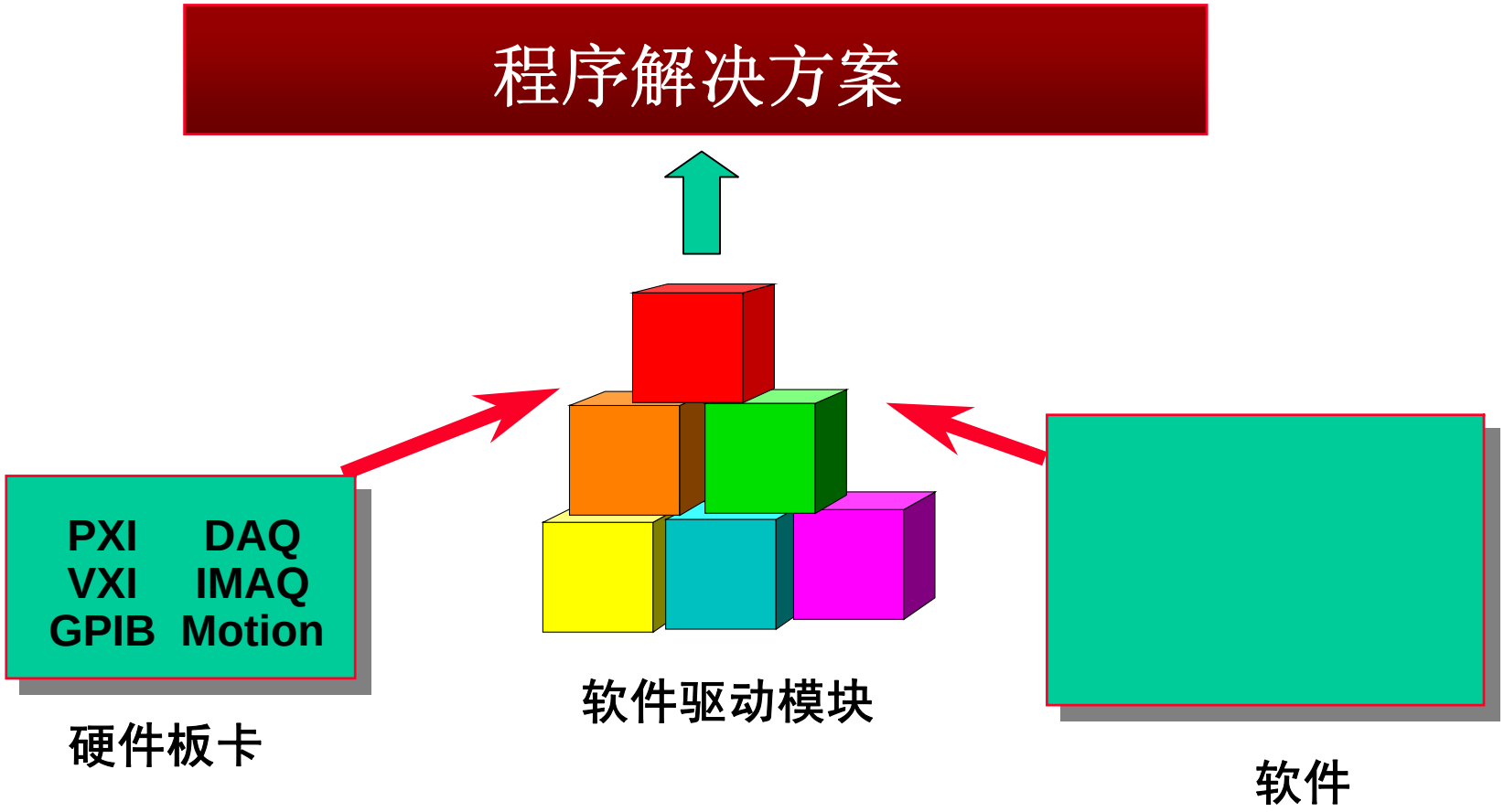


用户定义虚拟仪器的优点:

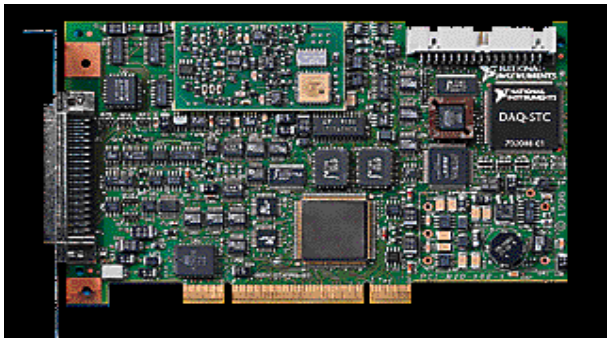


- 用户定义
- 低费用
- 灵活
- 可再用性
- 可重新配置

4. 虚拟仪器的组成

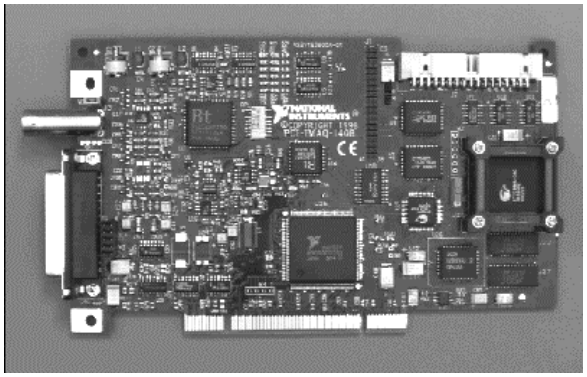


5、常用虚拟仪器板卡

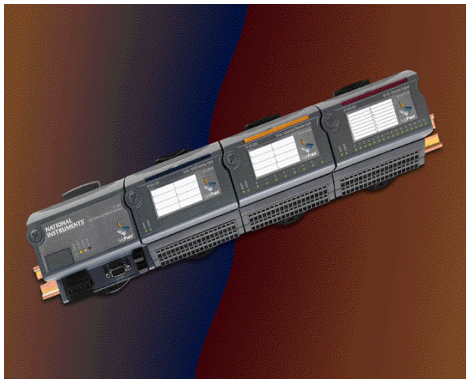


DAQ Card

Motion Control Card



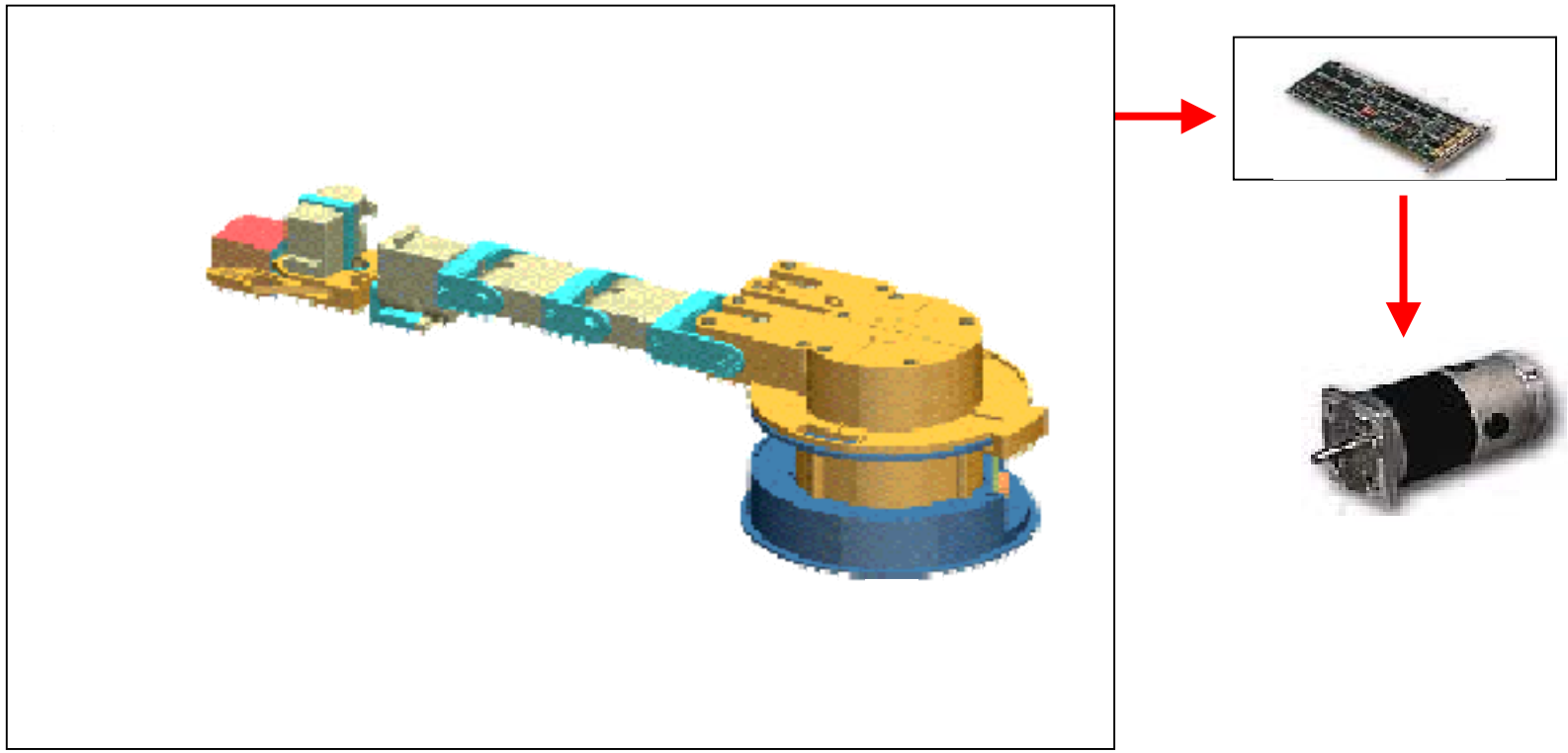
IMAQ Card



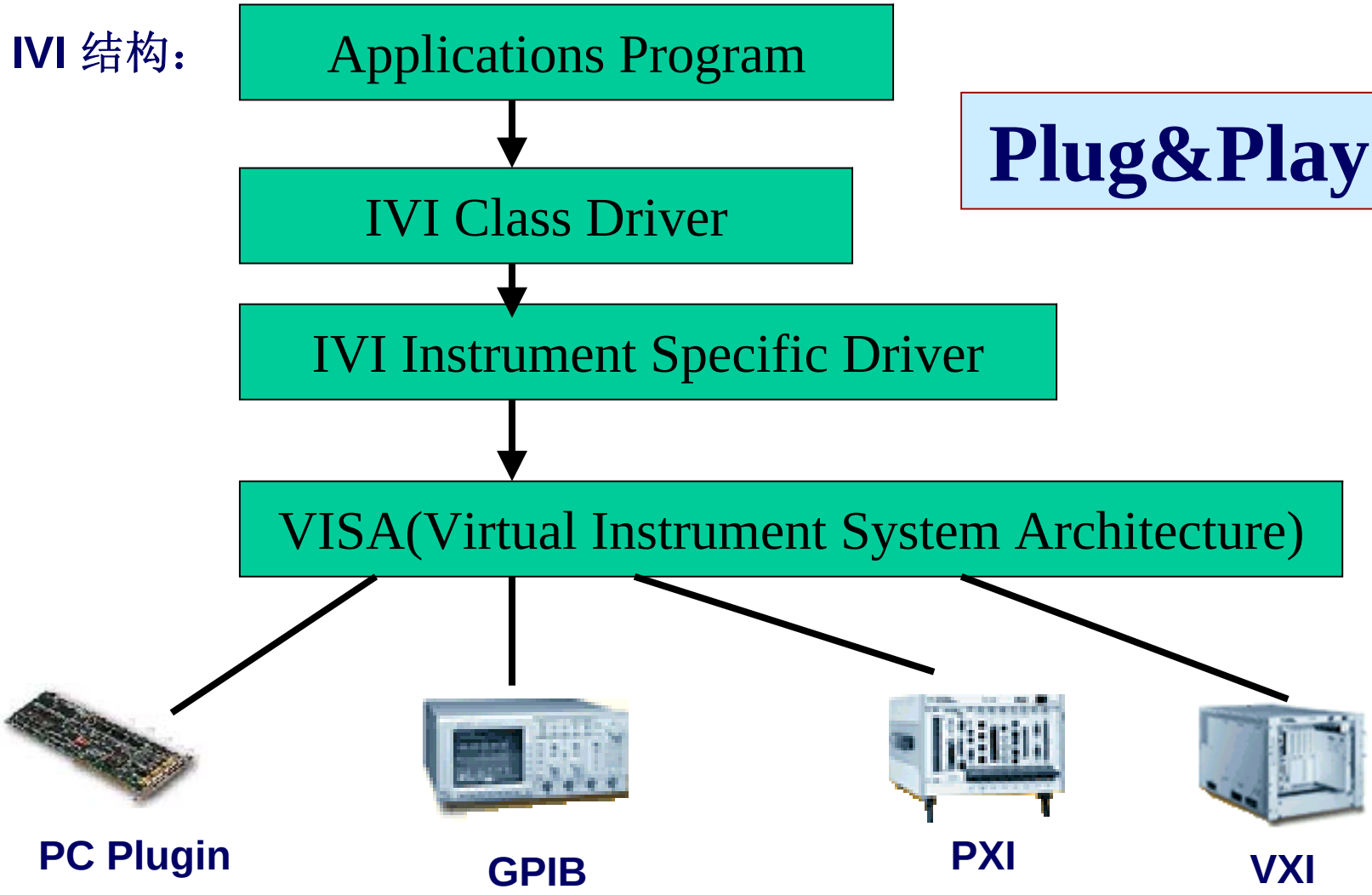
Field Point

6、虚拟仪器软件驱动模块

为简化硬件板卡编程和控制，NI和Agilent标准化了数百种常用仪器、板卡的驱动，它们已成为虚拟仪器开发平台的一部分，开发时可直接复用这些硬件驱动代码。

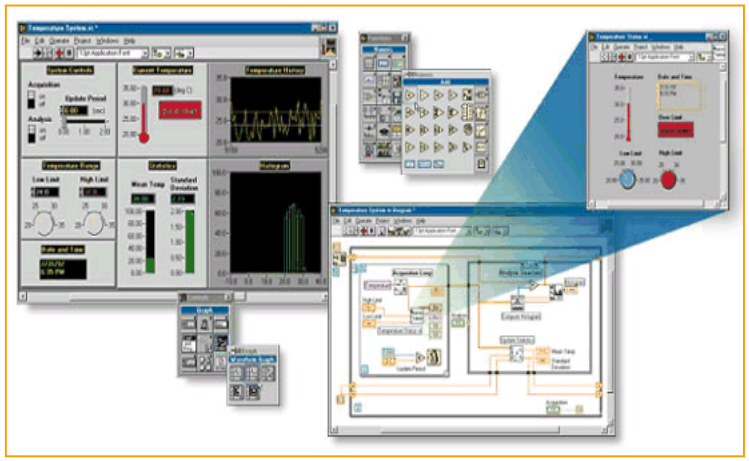


IVI 结构：

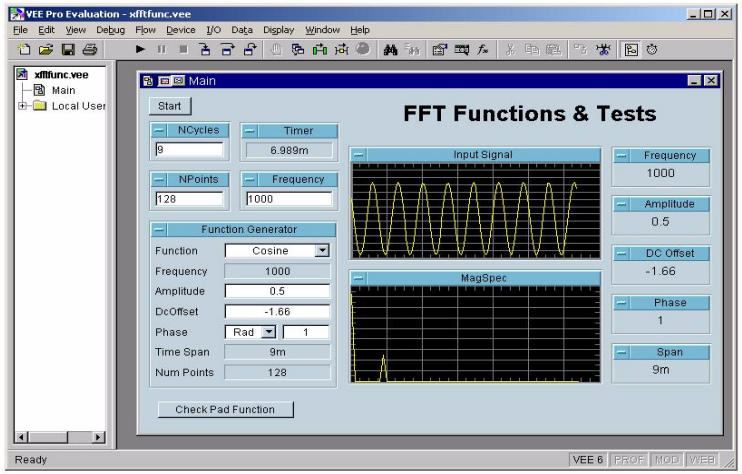


Plug&Play

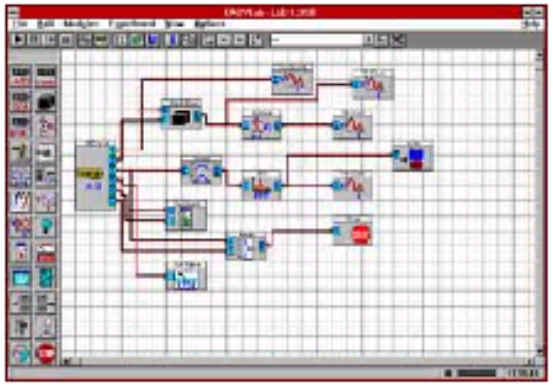
7、常见的虚拟仪器软件平台



LabView

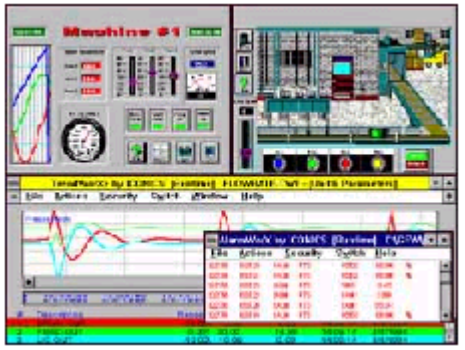


Agilent VEE



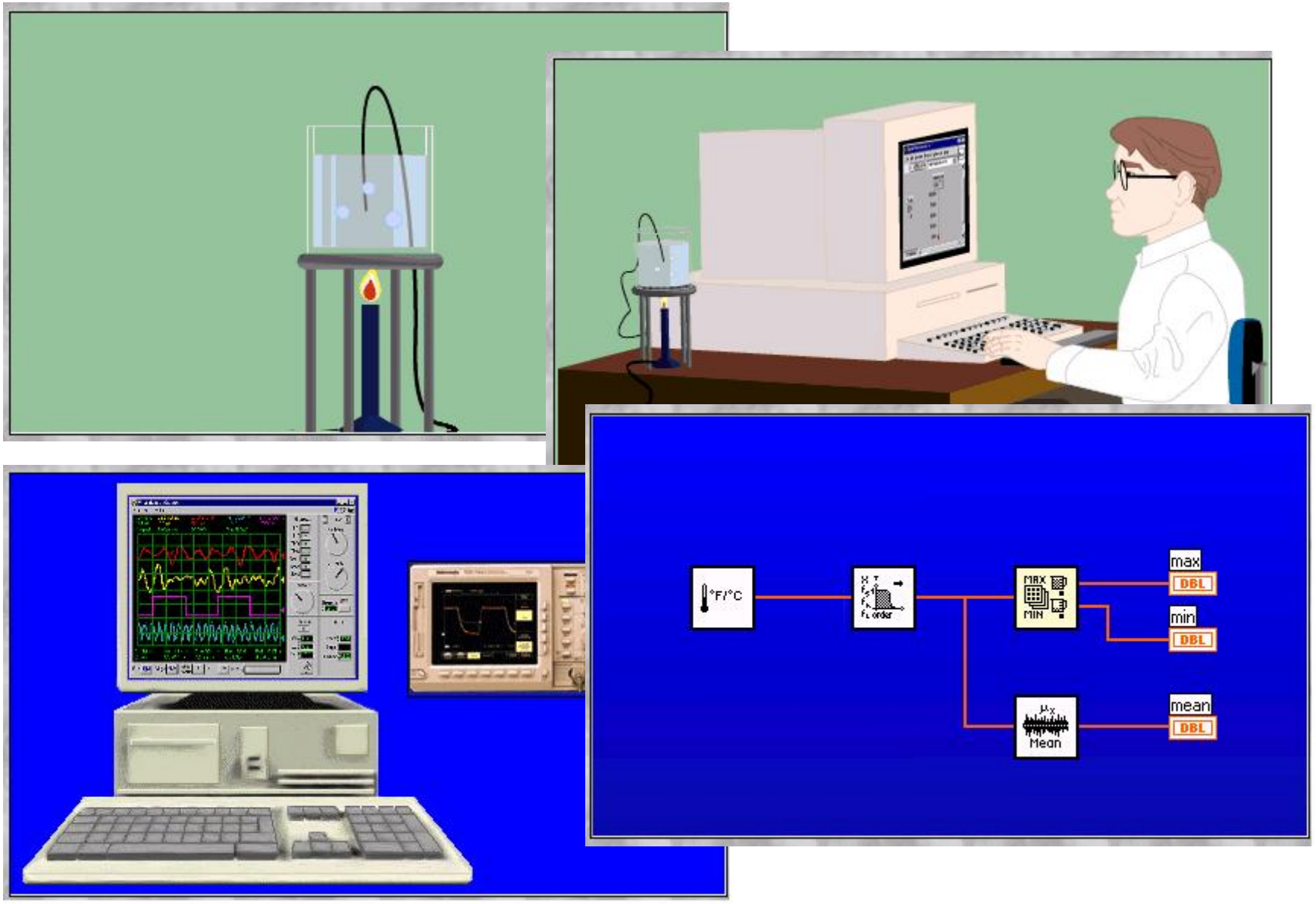
DASYLab

DirectView



ProcessControl

LabView


°F/°C
max
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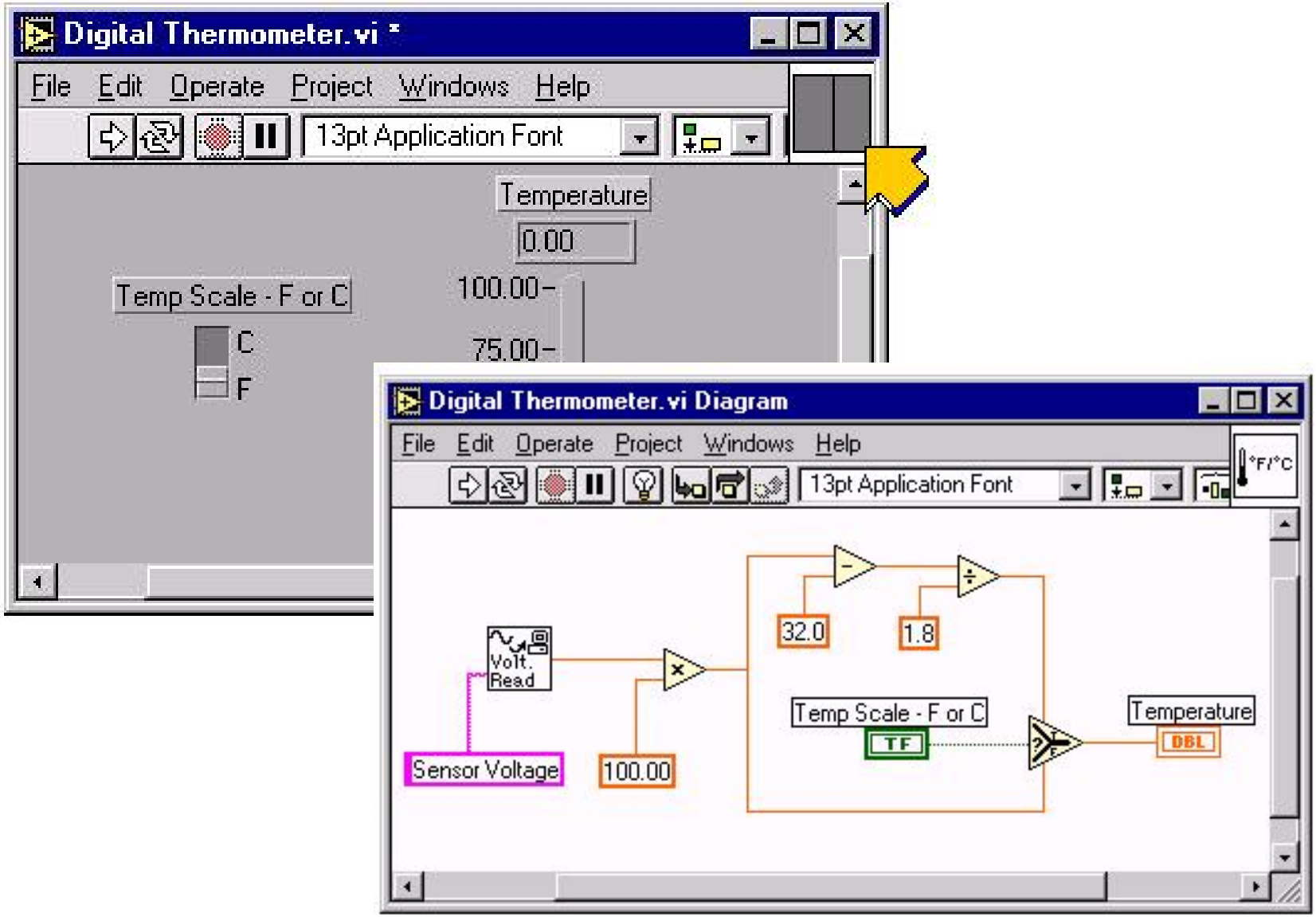
DBL
mean
DBL
MAX
MIN
Mean


Digital Thermometer.vi *
File Edit Operate Project Windows Help
13pt Application Font
Temperature
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100.00
75.00
Temp Scale - F or C
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F
Digital Thermometer.vi Diagram
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Volt. Read
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DBL
Sensor Voltage
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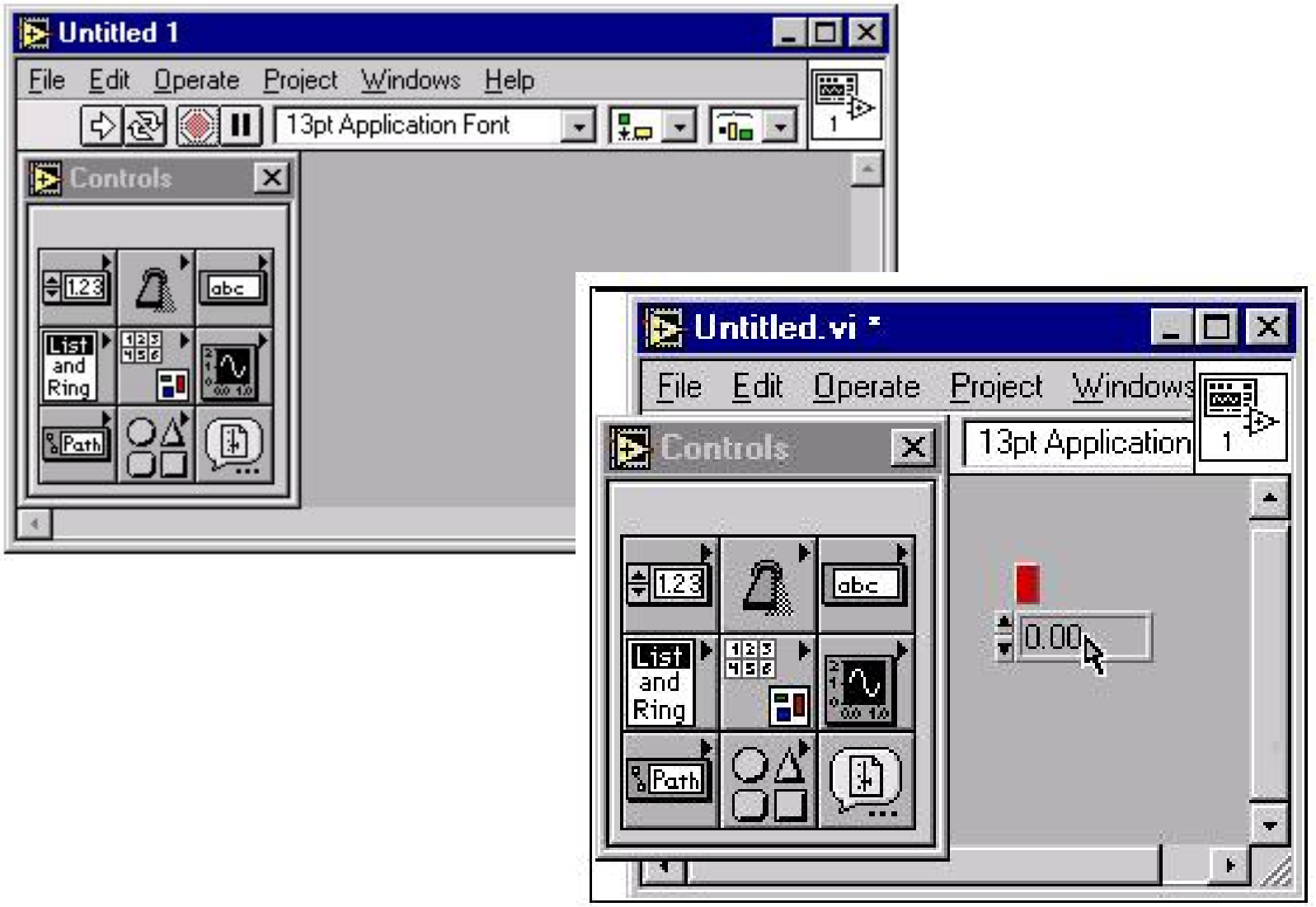
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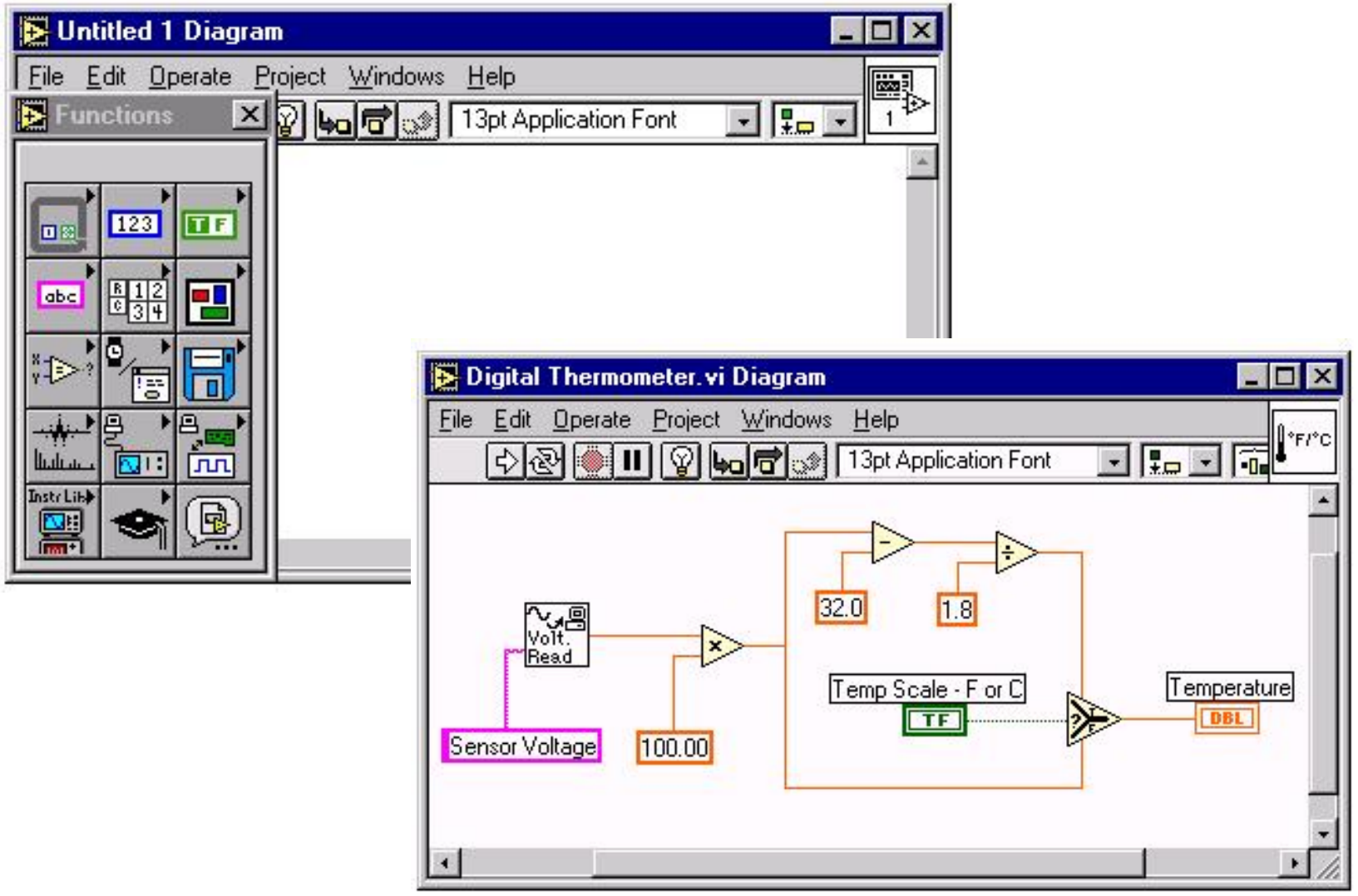
Untitled 1 Diagram
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Digital Thermometer.vi Diagram
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Temp Scale - F or C
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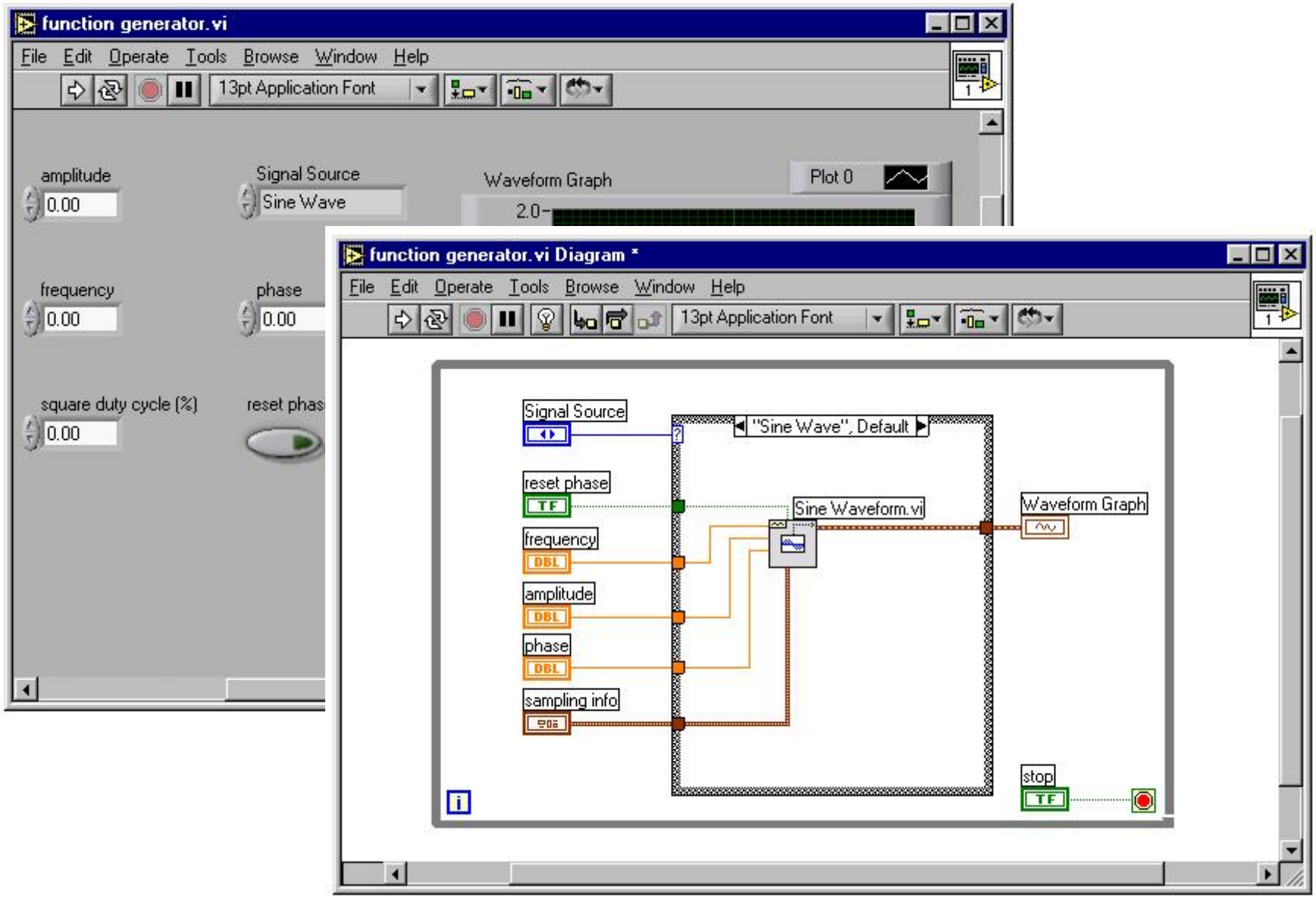
Temperature
DBL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File Edit Operate Tools Browse Window Help
13pt Application Font
amplitude
0.00
Signal Source
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Waveform Graph
Plot 0
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frequency
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phase
0.00
square duty cycle (%)
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function generator.vi Diagram *
File Edit Operate Tools Browse Window Help
13pt Application Font
Signal Source
"Sine Wave", Default
reset phase
TF
Sine Waveform.vi
Waveform Graph
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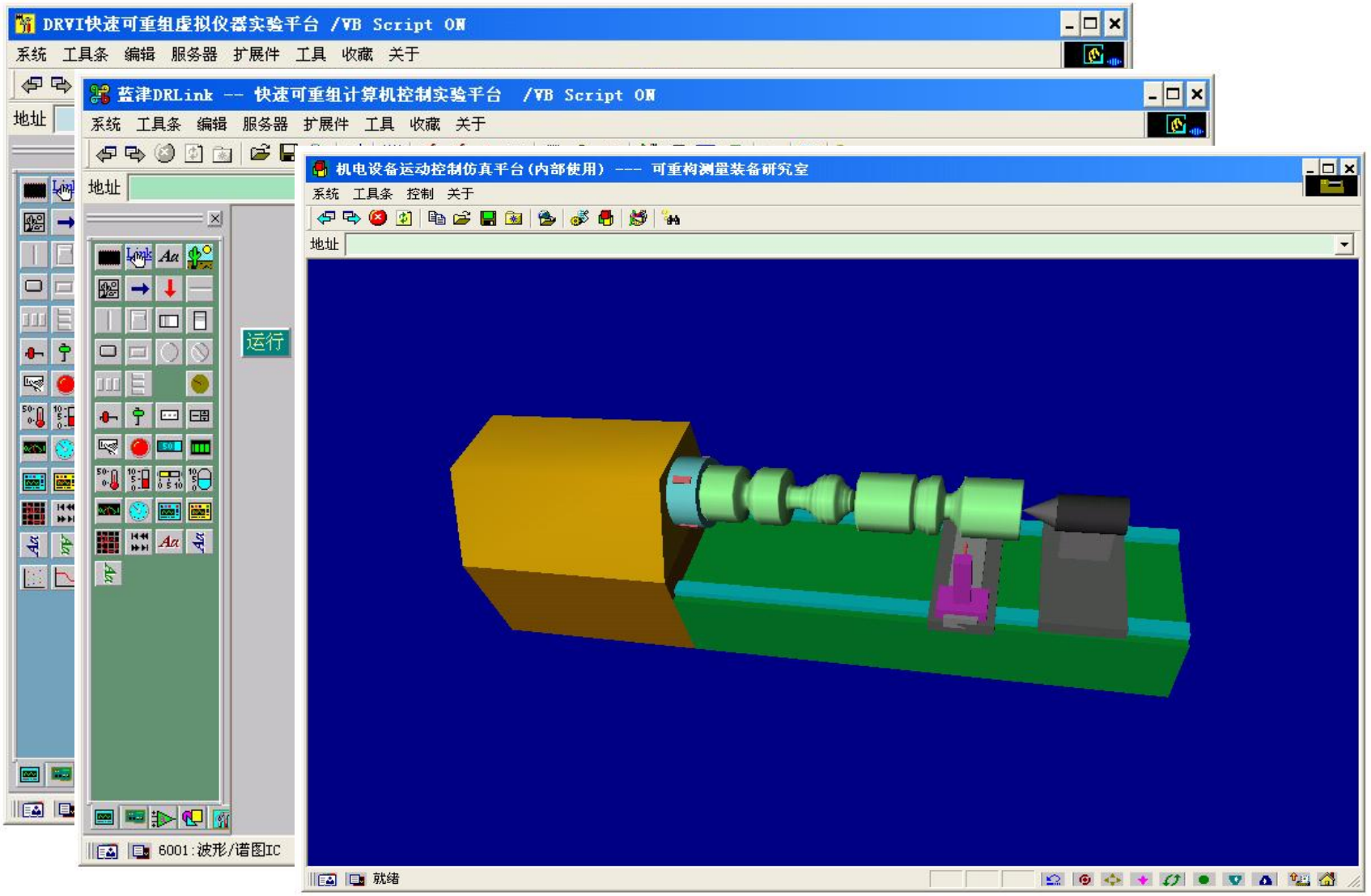
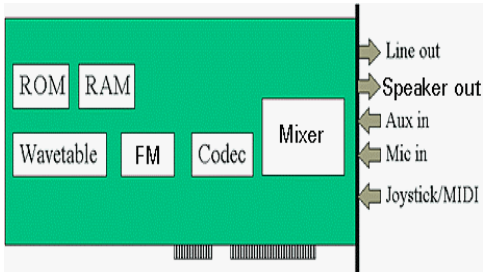
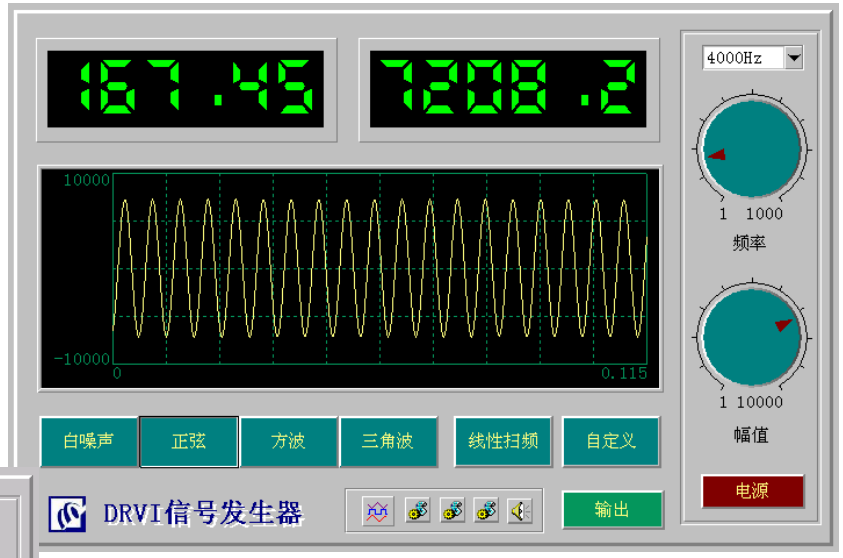
DBL
amplitude
DBL
phase
DBL
sampling info
stop
TF

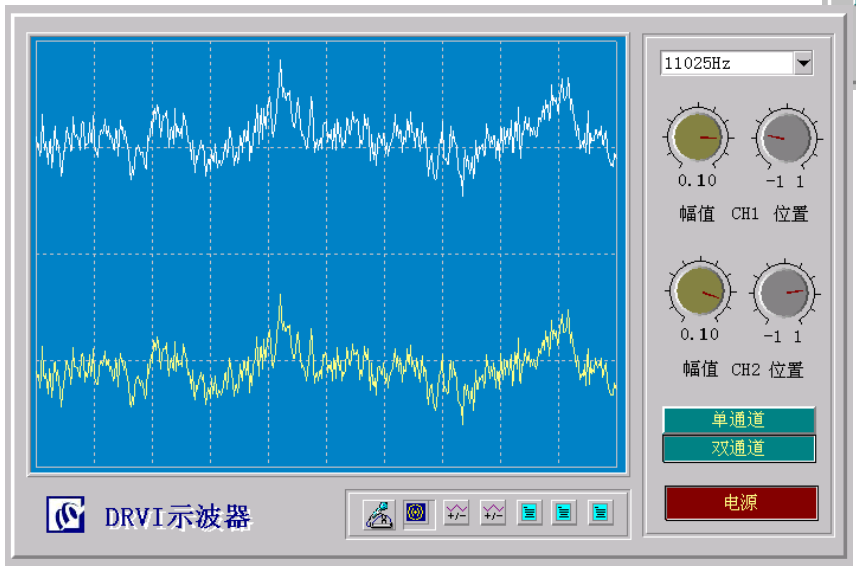
我们项目组开发虚拟仪器平台

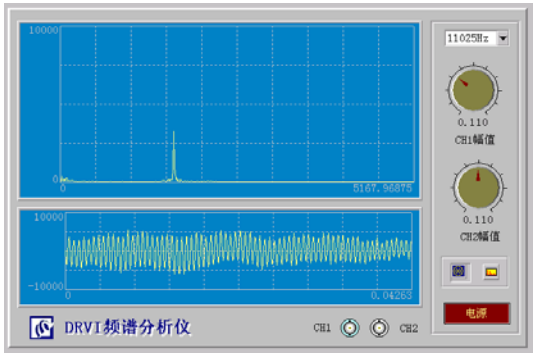


实验：数码摄像头图像虚拟仪器采集和分析系统设计

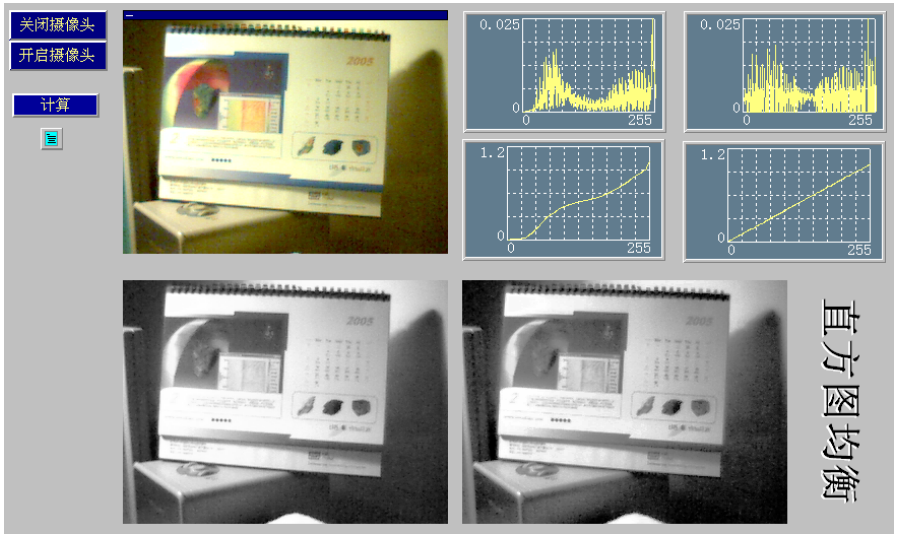








实验：数码摄像头图像虚拟仪器采集和分析系统设计

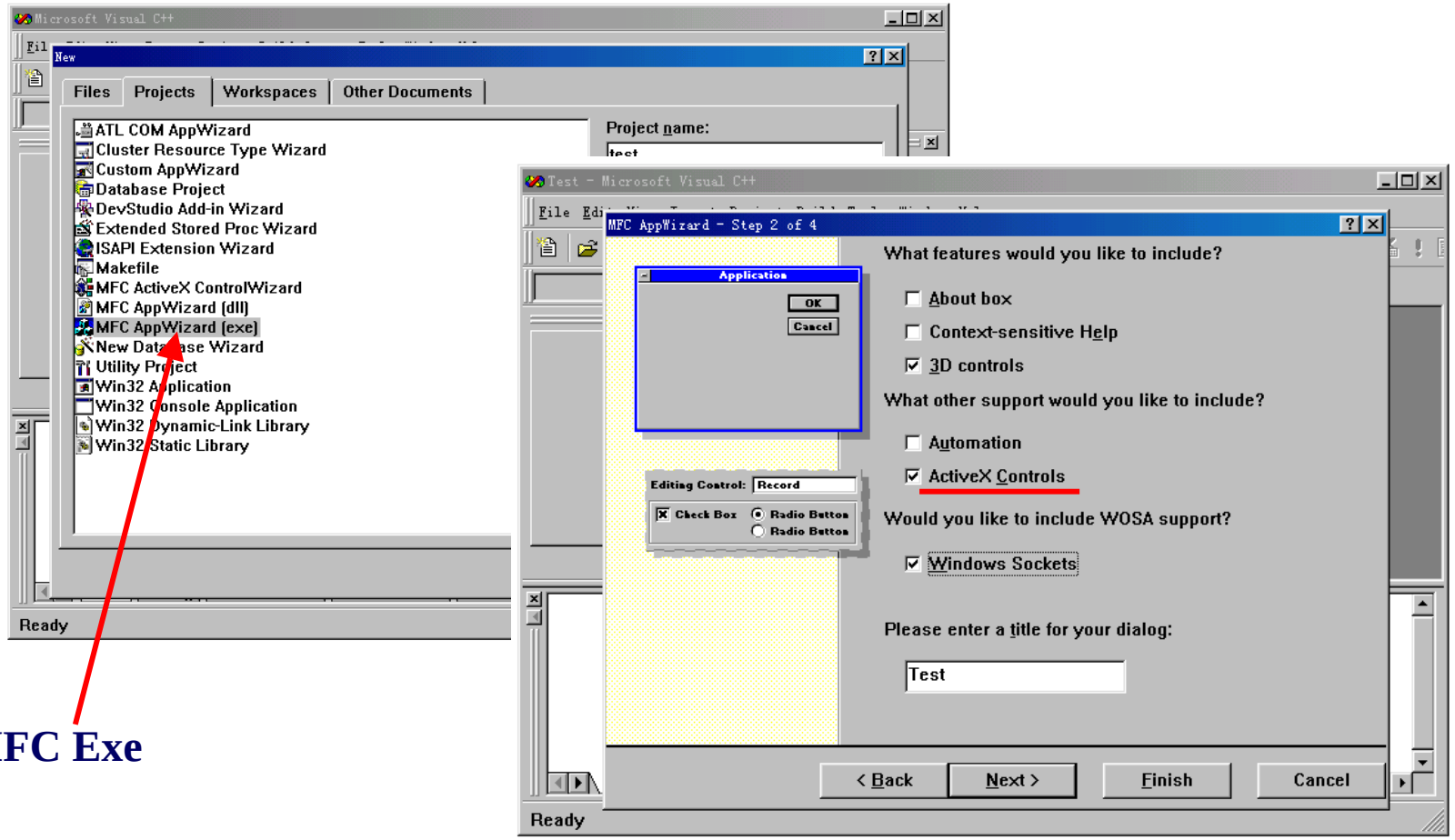


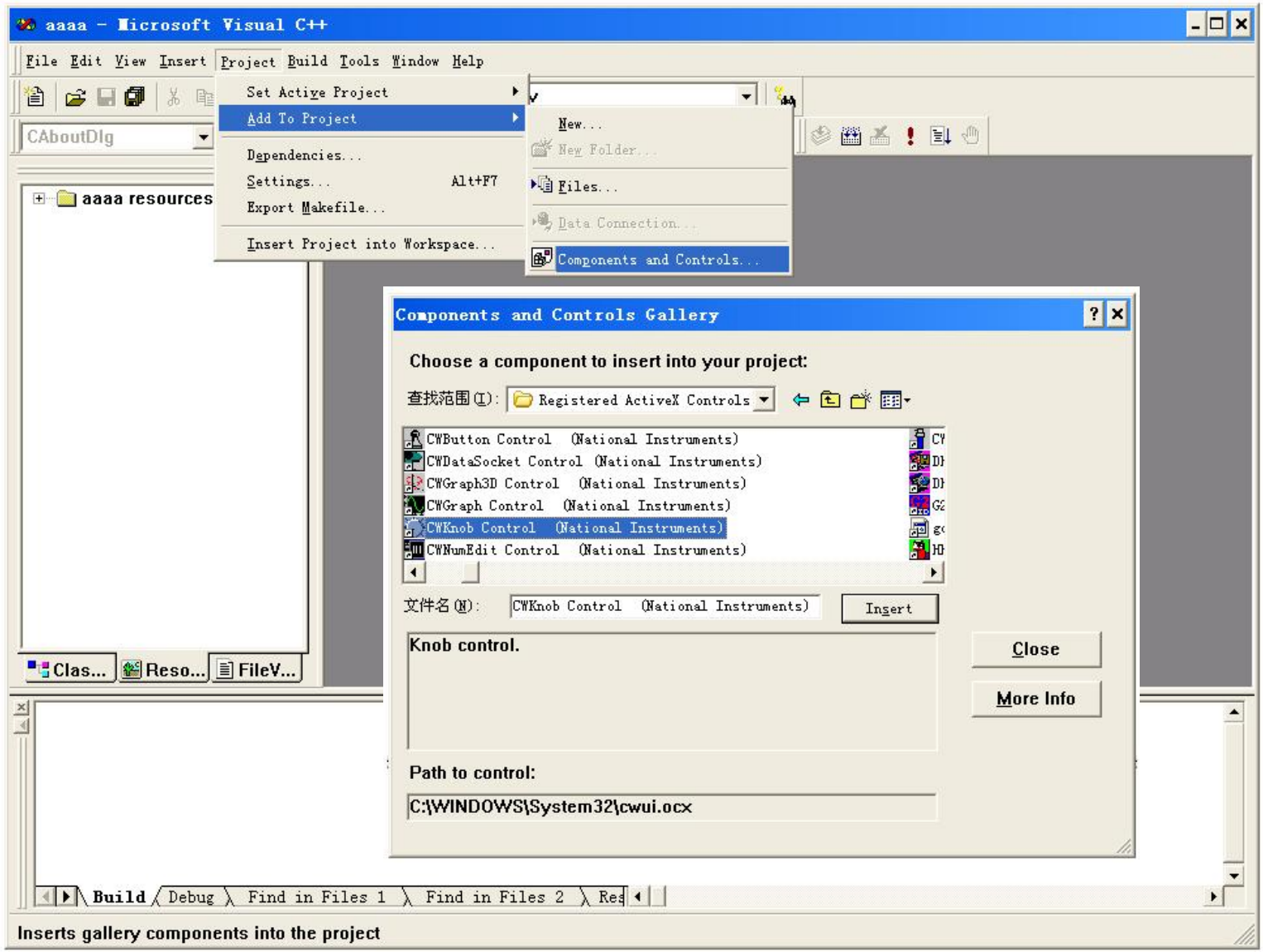
8、小型虚拟仪器系统开发

虚拟仪器为计算机在工业领域中的应用提供一项很好的技术解决方案，在制造业中我们可以借鉴它来进行机床操作面板设计等工作。

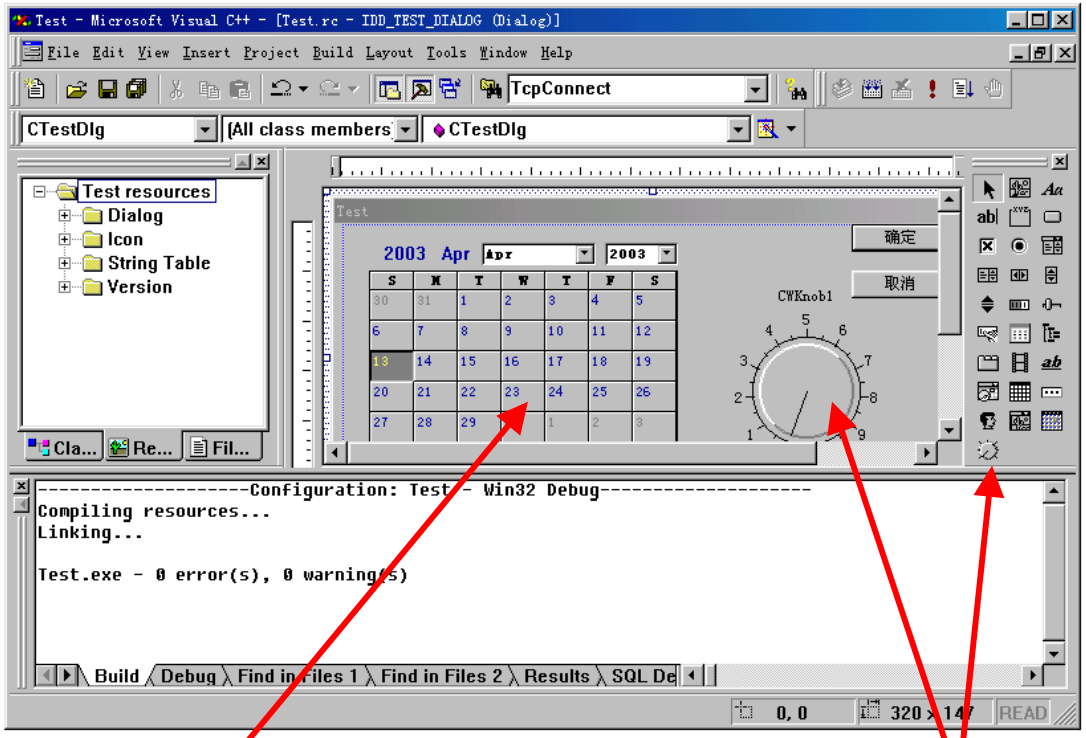
目的：LabView，VEE过于庞大，不适合在现场使用，缺乏面向某一特定领域的专用控件。

1） 虚拟仪器主体程序设计(COM容器)



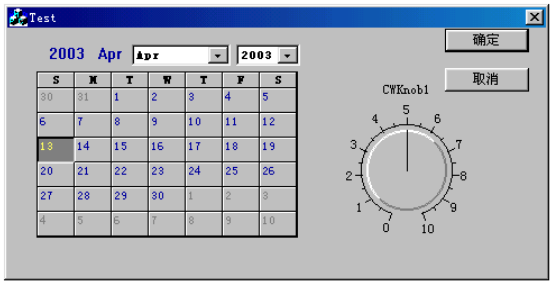

aaaa - Microsoft Visual C++
File Edit View Insert Project Build Tools Window Help
Set Active Project
Add To Project
Dependencies...
Settings... Alt+F7
Export Makefile...
Insert Project into Workspace...
New...
New Folder...
Files...
Data Connection...
Components and Controls...
CAboutDlg
aaaa resources
Clas... Reso... FileV...
Components and Controls Gallery
Choose a component to insert into your project:
查找范围(I): Registered ActiveX Controls
CWButton Control (National Instruments)
CWDataSocket Control (National Instruments)
CWGraph3D Control (National Instruments)
CWGraph Control (National Instruments)
CWKnob Control (National Instruments)
CWNumEdit Control (National Instruments)
文件名(N): CWKnob Control (National Instruments)
Insert
Knob control.
Close
More Info
Path to control:
C:\WINDOWS\System32\cwui.ocx
Build Debug Find in Files 1 Find in Files 2
Inserts gallery components into the project

该简单的样例程序就可以插入任何ActiveX控件(COM组件)，如下图所示：



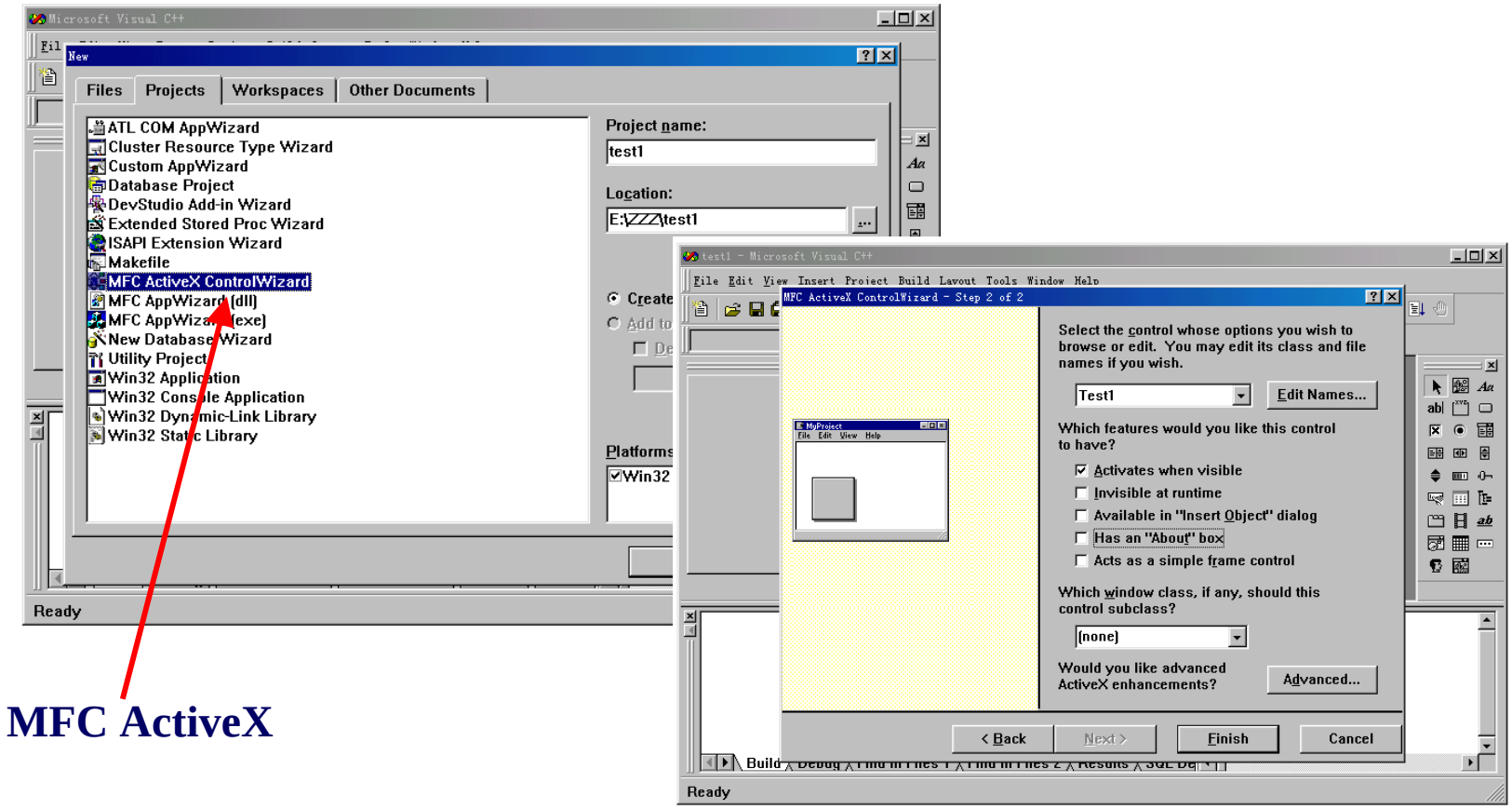
Windows日期控件

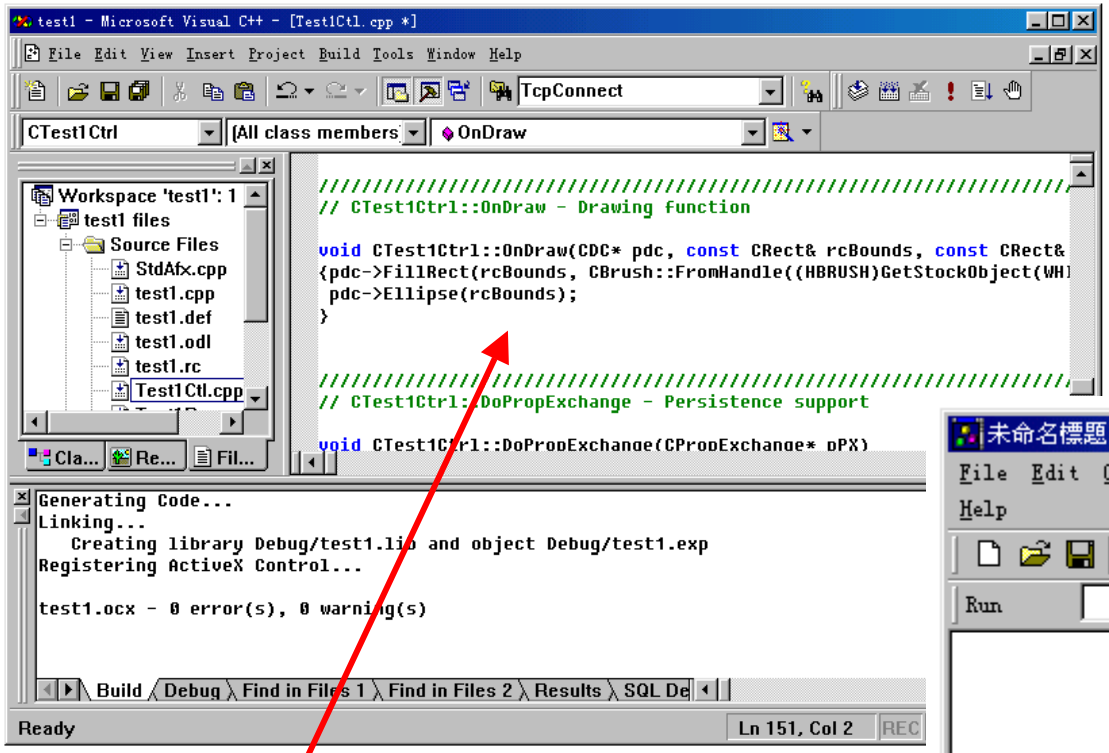
LabView选钮控件

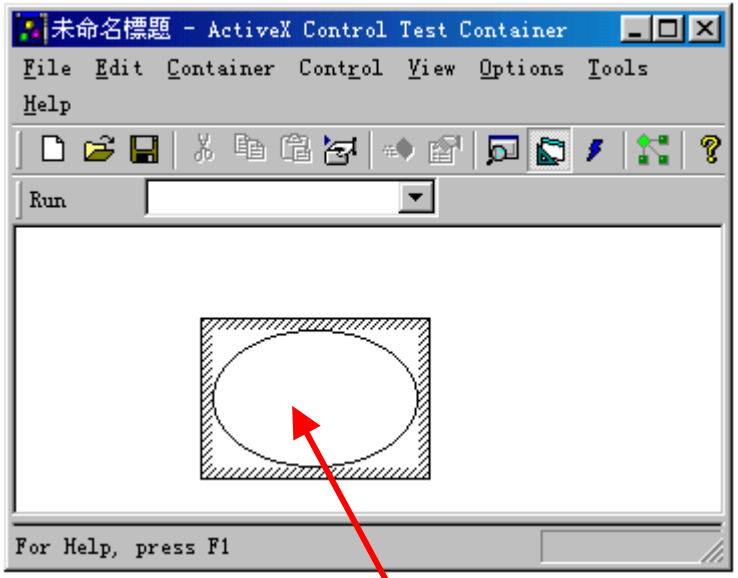


设计完成的容器程序

2) 虚拟仪器控件设计(COM组件)



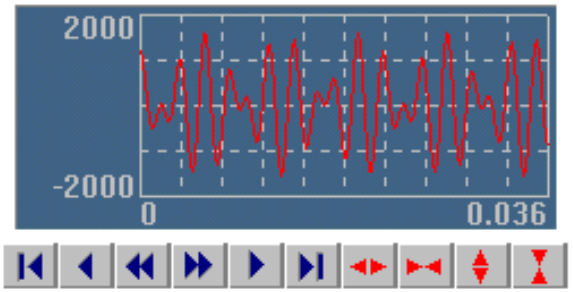


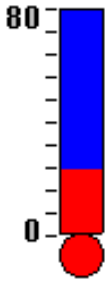


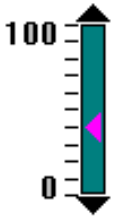
重载绘图方法部分

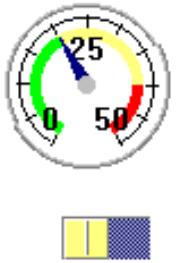
设计完成的控件

3) 虚拟仪器图形控件设计简介

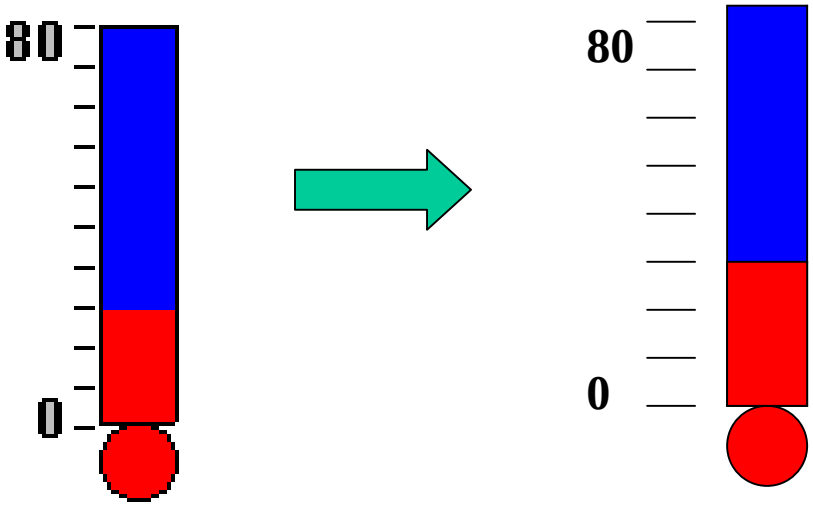








绘图过程分解：



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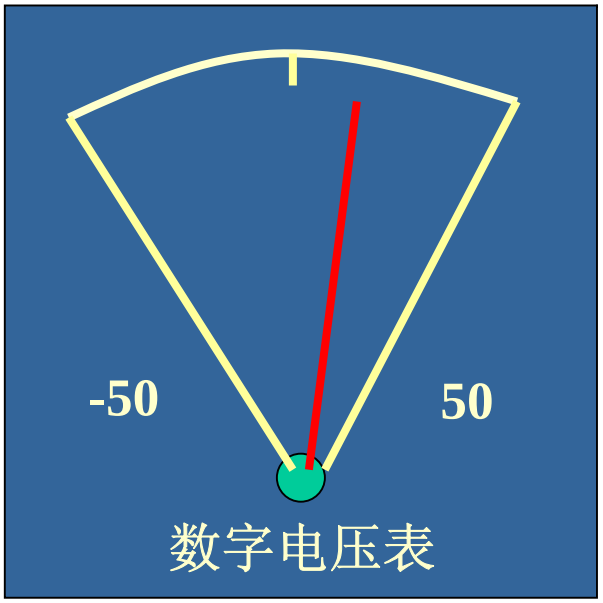


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Fillcircle x+70,y+90,4,14
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Line x+70,y+100-10,x+127,y+27,14
Line x+70,y+5,x+70,y+15,14
Textout x+30,y+70,15,"-50"
Textout x+90,y+70,15,"50"
Textout x+35,y+100,15,"数字电压表"
Line x,y,x+140,y,15
Line x,y,x,y+120,15
Line x+140,y,x+140,y+120,8
Line x,y+120,x+140,y+120,8
Line x+70,y+100-10,x+100,y+20,12
Line x+71,y+100-10,x+100,y+20,12
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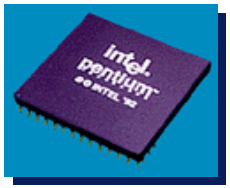
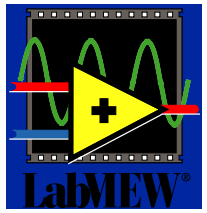
9、催生虚拟仪器的土壤

芯片



硬件

软件

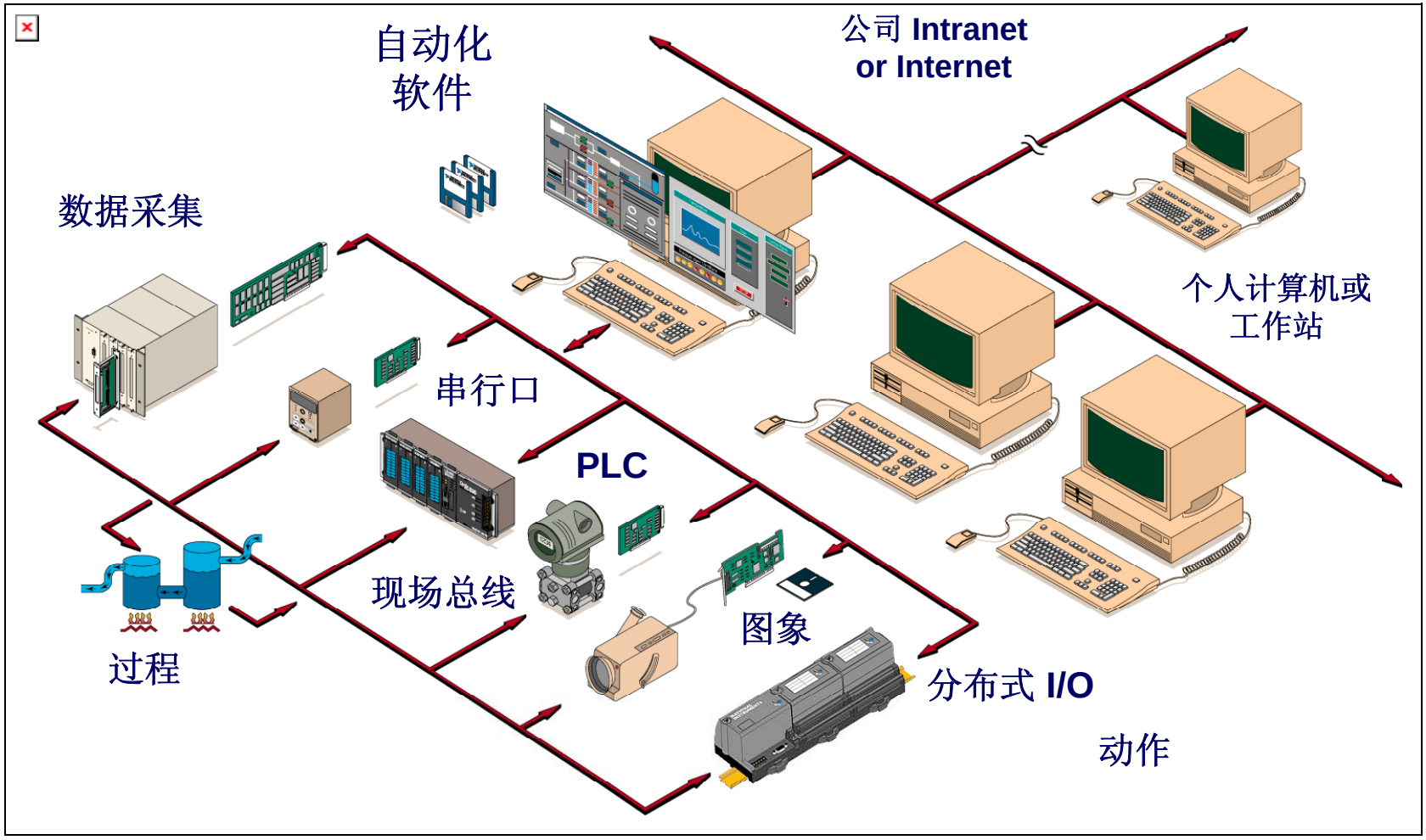


网络 LANs

总线 AT

计算机技术的进步

10、基于虚拟仪器的新型工业测控系统架构



11、虚拟仪器技术的优点

VI	传统仪器
软件使得开发与维护费用降至最低	开发与维护开销高
技术更新周期短(1～2年)	技术更新周期长(5～10年)
关键是软件	关键是硬件
价格低、可复用与可重配置性强	价格昂贵
用户定义仪器功能	厂商定义仪器功能
开放、灵活，计算机技术同步发展	封闭、固定
与网络及其它周边设备互联	功能单一的独立设备

12、虚拟仪器技术的主要应用领域

测试和测量

通讯
- AT&T, Alcatel, Ericsson

计算机
- IBM, Apple, Dell

半导体
- Motorola, TI, Thomson-CSF

汽车
- Ford, Chrysler, Nissan, Toyota

电子
- Sony, Siemens

工业自动化

石油化工
- Shell, Mobil Research

纺织
- Instron, Dupont, Eli Lilly, Albany International

制造
- Ericcson, Duracell

食品加工
- Sara Lee, Ben & Jerry担, Shiner

医药
- Johnson & Johnson, Proctor & Gamble

动手做：

用“个人测试实验室”设计一个简易声级计。

我们项目组开发虚拟声级计 (Visual Sound Instrument)