

# Graphical object-oriented programming with LabVIEW

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Programming with graphical languages implements a completely new type of man-machine interface. Conventional text-based programming is an inherently linear process that forces engineers and scientists to think and express their ideas in terms constrained by the programming language. The ability to visualize graphically a process or algorithm allows them, however, to express their ideas in a more intuitive, natural way. This is true, particularly for parallel processes. LabVIEW is such an icon-based graphical programming system that provides a powerful alternative for scientific and engineering programming – it offers the significant productivity gains of a graphical environment with no sacrifice in performance or flexibility. Typical scientific applications include process control, automation, instrumentation, motion control, simulation, and a number of other technical disciplines.

## 1. Introduction

Computer programming can be very interesting and even challenging for scientists and engineers, however programming is not necessarily their main task. Typically, scientists and engineers employ computers and programming languages as tools for solving scientific problems and creating instrumentation systems. In the past, there was a tremendous gap between the time required to build an instrumentation system and the time it takes to develop the software for that particular system. Today, computer technology is radically changing instrumentation systems and offering greater accuracy and flexibility. The key to an instrumentation system model is the software. On the one hand, instrumentation software should support all aspects of an instrumentation system, including data acquisition and control, data analysis, and data presentation. On the other hand, it should offer the ability to create so-called “virtual instruments” that exactly match a particular application for those who lack the time, education, or skills to program using conventional text languages.

One of the most popular trends in application software is the graphical programming environment. Graphical virtual instrumentation development has been around since the introduction of LabVIEW in 1986. LabVIEW departs from the sequential nature of traditional programming languages and features a graphical, object-oriented programming environment and all tools needed for data acquisition, analysis, and

presentation. In this paper we introduce LabVIEW as a general-purpose programming tool for engineers and scientists to create integrated instrumentation systems for a wide variety of applications. In particular, we focus on how LabVIEW addresses key issues such as programming structures, hierarchy, input/output, graphical compiler, and graphical user interfaces.

## 2. Graphical programming

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a powerful and flexible instrumentation and analysis software for PCs running Microsoft Windows, Sun SPARC stations, and Apple Macintosh computers. In contrast to traditional, sequential programming languages, LabVIEW features a graphical programming environment using a block diagram approach, the natural design notation of scientists and engineers.

LabVIEW programs are called “virtual instruments” (VIs). VIs have three main parts: the *front panel*, the *block diagram*, and the *icon/connector*. Analogous to a front panel of a real instrument, the front panel features the user interface for interactive operation and specifies the inputs called *controls* and outputs known as *indicators*. The programmer can employ a variety of controls and indicators, such as knobs, switches, buttons, charts, graphs, etc. to create a easily understandable virtual operating environment. Each front panel has a corresponding block diagram, which defines the actual data flow between the inputs and outputs. The icon/connector graphically repre-

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# Graphical Object Oriented Programming In Labview

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