Digital Signal Processing System Design: LabVIEW-Based Hybrid Programming

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Preface

The previous edition of this book, titled *Digital Signal Processing System-Level Design Using LabVIEW*, showed how LabVIEW^{TM} graphical programming can be used to build and analyze digital signal processing (DSP) systems in an interactive manner and in relatively shorter times as compared to text-based programming. The motivation for writing the previous edition was derived from the observation that many students taking DSP lab courses, in particular at the undergraduate level, often struggle and spend a fair amount of their time debugging C and MATLAB® codes in lab sessions instead of placing more effort into analyzing and thus understanding signal processing systems.

In this second edition of the book, graphical and textual programming are combined to provide a hybrid programming approach toward achieving a more effective mechanism to build and analyze DSP systems. Textual programming and graphical programming have their own merits and demerits from a programming point of view. In general, math operations are found to be easier to code in textual mode. For example, MATLAB provides a rich set of built-in functions for performing signal processing vector and matrix-based math operations. On the other hand, graphical programming offers an easy-to-build interactive and visualization environment and a more intuitive approach toward building signal processing systems.

In an effort to bring together the preferred features of textual and graphical programming, the labs in the previous edition have been redesigned by incorporating MATLAB code blocks or modules into the LabVIEW graphical programming environment via its new MathScripting feature. In other words, the coding for math-oriented modules is now done using M-files, while interactivity, visualization, and modularity are maintained by using LabVIEW.

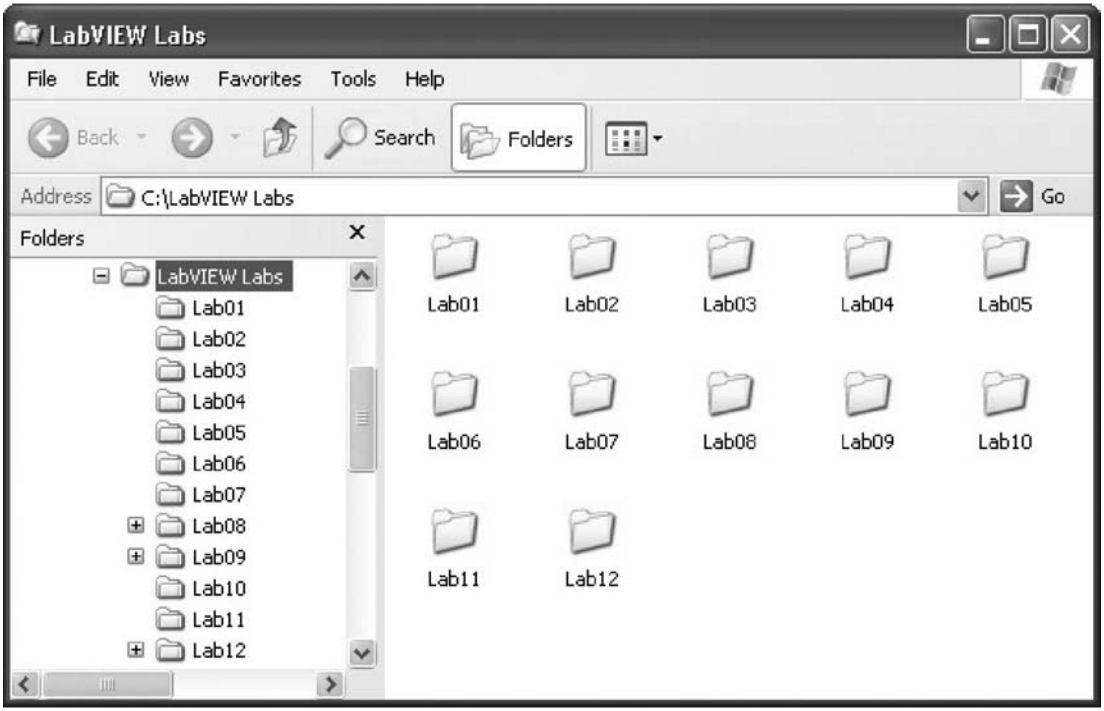
In addition to the hybrid programming approach adopted in this second edition, the labs have been redesigned based on the latest release of LabVIEW (LabVIEW 8.5) at the time of this writing instead of LabVIEW 7.1, which was utilized in the first edition.

I would like to express my appreciation and gratitude to National Instruments, in particular the Academic Marketing Division, for their support of this book.

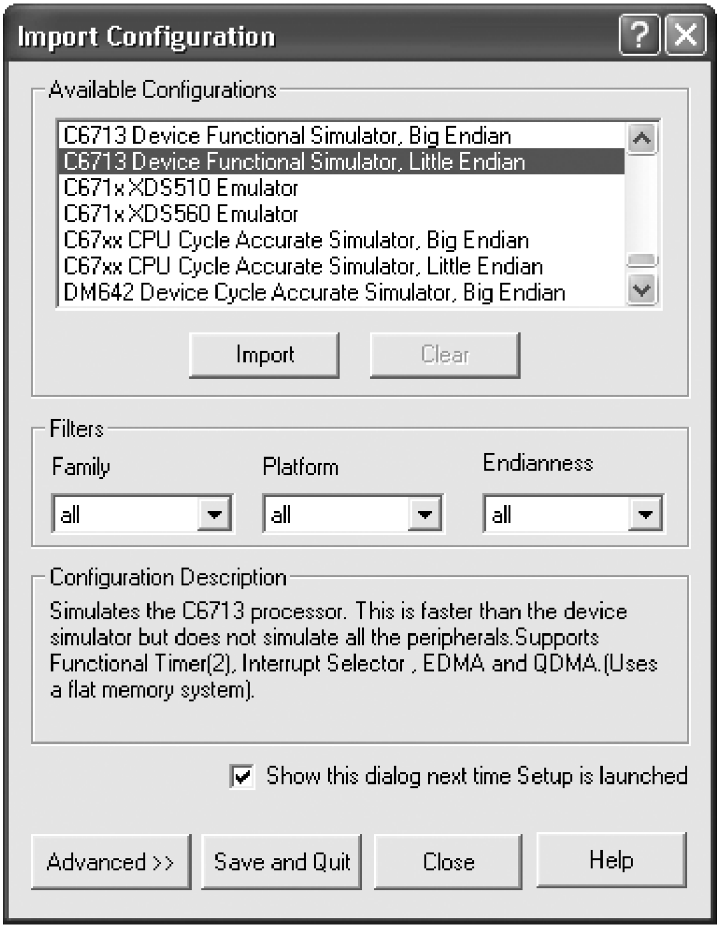
Nasser Kehtarnavaz
December 2007

What's On the CD-ROM?

- The accompanying CD-ROM includes all the lab files discussed throughout the book. These files are placed in corresponding folders as follows:
  - Lab01: Getting Familiar with LabVIEW: Part I
  - Lab02: Getting Familiar with LabVIEW: Part II
  - Lab03: Sampling, Quantization, and Reconstruction
  - Lab04: FIR/IIR Filtering System Design
  - Lab05: Data Type and Scaling
  - Lab06: Adaptive Filtering Systems
  - Lab07: FFT, STFT, and DWT
  - Lab08: Getting Familiar with Code Composer Studio
  - Lab09: DSP Integration Examples
  - Lab10: Hybrid Programming of Dual Tone Multi-Frequency System
  - Lab11: Hybrid Programming of 4-QAM Modem System
  - Lab12: Hybrid Programming of Cochlear Implant Simulator System
- To run the lab files, the National Instruments LabVIEW 8.5 is used and assumed installed. The lab files need to be copied into the folder "C:\LabVIEW Labs\", as shown in the following figure.



- For Lab 8 and Lab 9, the Texas Instruments Code Composer Studio^{TM} (CCStudio) version 3.0 is used and assumed installed in the folder "C:\CCStudio\". The subfolders correspond to the following DSP platforms:
  - DSK 6416
  - DSK 6713
  - Simulator (configured as DSK6713 as shown in the following figure)



Available Configurations

- C6713 Device Functional Simulator, Big Endian
- C6713 Device Functional Simulator, Little Endian
- C671x XDS510 Emulator
- C671x XDS560 Emulator
- C67xx CPU Cycle Accurate Simulator, Big Endian
- C67xx CPU Cycle Accurate Simulator, Little Endian
- DM642 Device Cycle Accurate Simulator, Big Endian

Filters

Family	Platform	Endianness
all	all	all

Configuration Description

Simulates the C6713 processor. This is faster than the device simulator but does not simulate all the peripherals.Supports Functional Timer(2), Interrupt Selector , EDMA and QDMA.(Uses a flat memory system).

☑ Show this dialog next time Setup is launched