

Tools for Designing, Analyzing, and Simulating Adaptive Filters

NI LabVIEW Adaptive Filter Toolkit **NEW!**

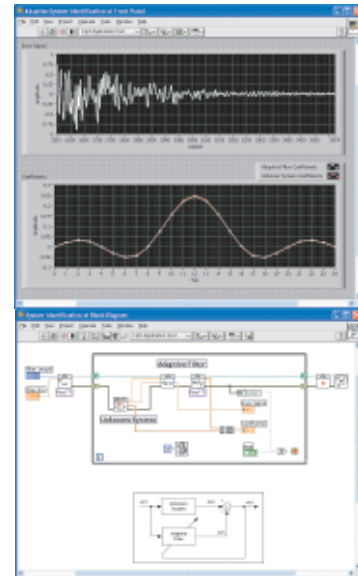
- General finite impulse response (FIR) adaptive filter algorithms including LMS, normalized LMS, leaky LMS, fast block LMS, sign LMS, RLS, and QR-RLS
- FIR filtered-x LMS and normalized FIR filtered-x LMS algorithm for active noise/vibration control applications
- Application examples including adaptive noise/echo cancellation, adaptive system identification, active noise control, linear predictive coding (LPC), and road simulator
- Simulation and LabVIEW FPGA code generation for fixed-point FIR LMS adaptive filter

Operating System

- Windows Vista/XP/2000

Required Software

- LabVIEW 8.6 or later, Full or Professional Development System



Overview

The NI LabVIEW Adaptive Filter Toolkit provides tools for designing, analyzing, and simulating adaptive filters, including floating-point and fixed-point adaptive filters. You can use these tools to create adaptive filters with various adaptive algorithms, such as least-mean-square (LMS), recursive-least-square (RLS), and their variants. You also can apply the adaptive filters that you create to different applications, such as adaptive noise cancellation, adaptive echo cancellation, system identification, and so on. In addition, you can create and implement fixed-point adaptive filters on NI field-programmable gate array (FPGA) targets.

Design Adaptive Signal Processing Applications Quickly

The LabVIEW Adaptive Filter Toolkit features more than 20 top-level library VIs that you can use to build adaptive signal processing applications quickly. There are about 15 simple examples that help you get started using these library VIs. There are also comprehensive application examples that you can customize to fit your applications. The application examples include adaptive noise cancellation, active single-tone noise control, adaptive echo cancellation, adaptive channel equalization, adaptive system identification, waveform replication (road simulation), and adaptive order waveform extraction. Most application examples have both a simulation version that you can use to understand the algorithm and application and a hardware version, both of which are ready to run with NI data acquisition hardware or NI CompactRIO hardware.

Library of Functions and VIs

- AFT Create FIR LMS (Real and Complex)
- AFT Create FIR Normalized LMS (Real and Complex)
- AFT Create FIR Sign LMS (Real)
- AFT Create FIR Fast Block LMS (Real)
- AFT Create FIR RLS (Real and Complex)
- AFT Create FIR QR-RLS (Real and Complex)
- AFT Filter Signal and Update Coefficients
- AFT Filter Signal
- AFT Update Coefficients
- AFT Linear Prediction
- AFT Get Coefficients
- AFT Set Coefficients
- AFT Estimate Maximum Step Size for FIR LMS
- AFT Destroy Adaptive Filter
- AFT Create FIR Filtered-X LMS (Real)
- AFT Create FIR Normalized Filtered-X LMS (Real)
- AFT Destroy Filtered-X Adaptive Filter
- AFT Filtered-X Filter Signal and Update Coefficients
- AFT Get FIR Filtered-X Coefficients
- AFT Set FIR Filtered-X Coefficients
- AFT Simulate Fixed-Point FIR LMS Express VI
- AFT Load Fixed-Point Settings VI
- AFT Save Fixed-Point Settings VI

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Program Examples

Getting started examples demonstrate how to use the library

VIs to do the following:

- Implement adaptive filters with input data in point-by-point and block-by-block (array or waveform) mode
- Compute and display learning curve of different adaptive filter algorithms
- Compare the convergence speed and computation speed of different adaptive filter algorithms
- Simulate fixed-point LMS adaptive filter
- Explore finite precision effects of fixed-point adaptive filter
- Generate LabVIEW FPGA codes for LMS adaptive filter

Application examples demonstrate how to use the library

VIs in the following applications:

- Adaptive noise cancellation
- Active noise/vibration control
- Adaptive echo cancellation
- Adaptive channel equalization
- Fetal ECG extraction
- System identification
- Waveform replication (road simulation)
- Online order waveform extraction

Prototype and Deploy Your Applications Easily

Graphical system design is a revolutionary approach to solving design challenges that blends intuitive graphical programming and flexible commercial off-the-shelf (COTS) hardware to help engineers and scientists more efficiently design, prototype, and deploy embedded systems. With the graphical system design approach, you can use a single environment across all stages of design to increase productivity, save money, and deliver embedded technology to the domain expert.

National Instruments offers several types of prototyping and deployment platforms including CompactRIO that contain all of the basic building blocks of an embedded system. Analog I/O modules include direct connectivity to sound and vibration sensors as well as built-in signal conditioning. The adaptive filter algorithms in the LabVIEW Adaptive Filter Toolkit are compatible with multiple hardware platforms, including PCI, PXI, and CompactRIO. With this toolkit, you have a single graphical programming platform and COTS hardware to design, prototype, and deploy your adaptive signal processing applications.

Build High-Throughput Applications with Generated FPGA IP

The LabVIEW Adaptive Filter Toolkit can generate optimized LabVIEW FPGA code for FIR LMS adaptive filters. With generated LabVIEW FPGA code, you can take advantage of NI reconfigurable I/O (RIO) hardware to build high-throughput applications with sampling rates that range from several kilohertz to several hundred kilohertz. The maximum sample rate depends on the filter length of the adaptive filter. The FPGA code generation hides the complexity of embedded system design and deployment, thus increasing your productivity.

Ordering Information

NI LabVIEW Adaptive Filter Toolkit780227-03

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For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to ni.com/toolkits.

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