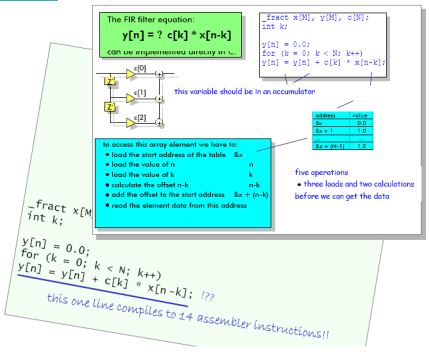
FIR digital filters class: a 1-day class

DSP Foundation

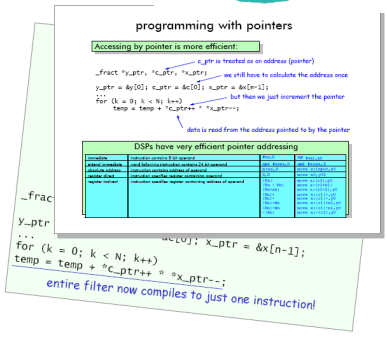
Benefits

- Understand FIR filters
- Design FIR filters
- Program FIR filters

Learn why and how to design, implement and use FIR filters: with a focus on efficient implementation using DSP hardware.



From poor design..



..to good design

Contents

In this class we explain how FIR filters are designed and used. We also give clear guidance on how to write programs for FIR filters that are efficient when implemented on typical DSP hardware.

FIR filter basics

We review the basics of FIR digital filtering, especially with regard to practical effects.

- Linear Filters
- Finite Impulse Response filter
- Filtering to smooth a signal

Analysis of FIR filters

We explain how to analyze the FIR filter operation, and how to calculate impulse and frequency responses.

- Fourier transforms
- Spectral analysis
- Fourier analysis of FIR filtering
- Filtering in frequency
- FIR frequency response
- Naive FIR filter design

Practical limitations

Understand the limitations and compromises faced in practical design situations.

- Effect of limited filter length
- Frequency resolution
- Broadening of frequency shape
- Frequency response leakage

Windowing

Windowing is an important design method for FIR filters. We explain how and why it works, and when it should be used.

- What windowing does
- Filter sharpening by windowing
- Window method of FIR design
- How windows shape the filter
- Problems of window designs
- Typical window design functions

FIR design by optimization

We introduce the idea of mathematical optimization methods of filter design, taking the Parks-McLellan design as an example.

- Window design as non-optimal
- Iterative FIR design optimization
- Parks-McLellan equiripple design

Filter programming

We develop an FIR filter program, from inefficient C to an optimal implementation in DSP assembly language.

- DSP processor operations
- A typical DSP core
- Naive FIR filter in C
- Efficiency gain of using pointers
- Using multiple memories
- Placing data in assembler
- Efficient C filter example
- Assembler multiply/accumulate
- Programming parallel operations
- Optimal DSP filter program

Time and arrangements

This class takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

DSP Foundation

'FIR digital filters' is self-contained but we recommend it be taken as part of our 4-day 'DSP Foundation' class that covers DSP, FIR and IIR filters, and C programming.

Contact us for details and advice:

chris@bores.com

Booking and questions

Call us by 'phone or send email to book or to ask questions.

- contact: Dr Chris Bore
- 'phone: +44 (0)1483 740138
- mobile: +44 (0)7921 153219
- email: chris@bores.com

About us

BORES Signal Processing train managers, engineers and programmers to understand and use DSP and streaming media processing.

- established 17 years
- excellent reputation
- worldwide activities
- www.bores.com

BORES Signal Processing, 'Fordwater', Pond Road, Woking, Surrey GU22 0JZ, England:
'Phone: +44 (0)1483 740138 Web site: www.bores.com email: chris@bores.com