

IIR digital filters class: a 1-day class

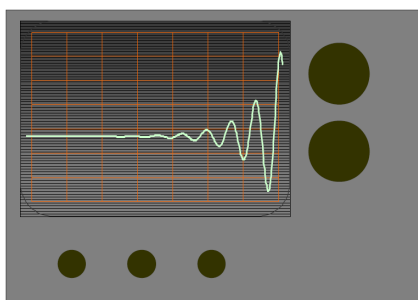
DSP Foundation



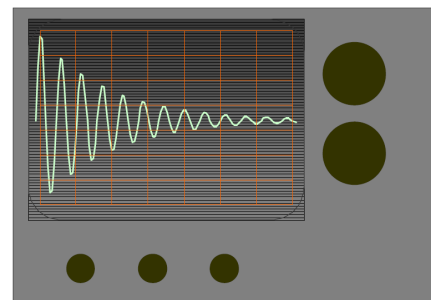
Benefits

- Analyze IIR filters
- Avoid common pitfalls
- Understand IIR implementation

Learn why and how to design, implement and use IIR filters: and how to make sure they really do work as you expect.



From 'should' work..



..to 'would' work

Contents

In this class we explain how IIR filters are designed and used.

IIR filter basics

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

- Linear IIR Filters
- Filtering to smooth a signal

Analysis of IIR filters

We explain how the IIR filter operation can be analysed, and show how the impulse and frequency responses are calculated.

- Fourier transforms
- Spectral analysis
- Fourier analysis of IIR filtering
- IIR frequency response

IIR filter design

We explain why the problem of IIR filter design has never been solved. We also give useful ways to relate filter response to poles and zeroes.

- Interpretation of z domain
- Poles, zeroes and filter response
- Design by impulse invariance
- Bilinear transform design

IIR filter programming

We present a program to implement an IIR filter, and show how this must be modified in order to actually work.

- A simple IIR filter program

Practical limitations

We analyse and explain the limitations and compromises faced in practical design situations, especially the difficult problems posed by implementing on hardware with finite precision arithmetic.

- Finite precision and quantization
- Fixed and floating point formats
- Precision and dynamic range
- The advantage of floating point
- Why floating point is faster too
- Quantization feedback
- Impracticality of high order filters

Design workarounds

We present ways to work around the practical limitations of implementing IIR filters, and show how the different implementation structures arise to address different problems.

- Why we use 2nd order sections
- effects of scaling and quantization
- Parallel and cascade structures
- group poles and zeros in sections
- How to order the sections
- Filters as block diagrams

Debunking nonsense

Some utter nonsense is talked regarding IIR filters. We review some dangerous notions and help to dispel some myths.

- Cascade & transposed structures
- The non-equivalence of structures
- Why most IIR filters go wrong

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

'IIR 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:

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Booking and questions

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

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About us

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

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