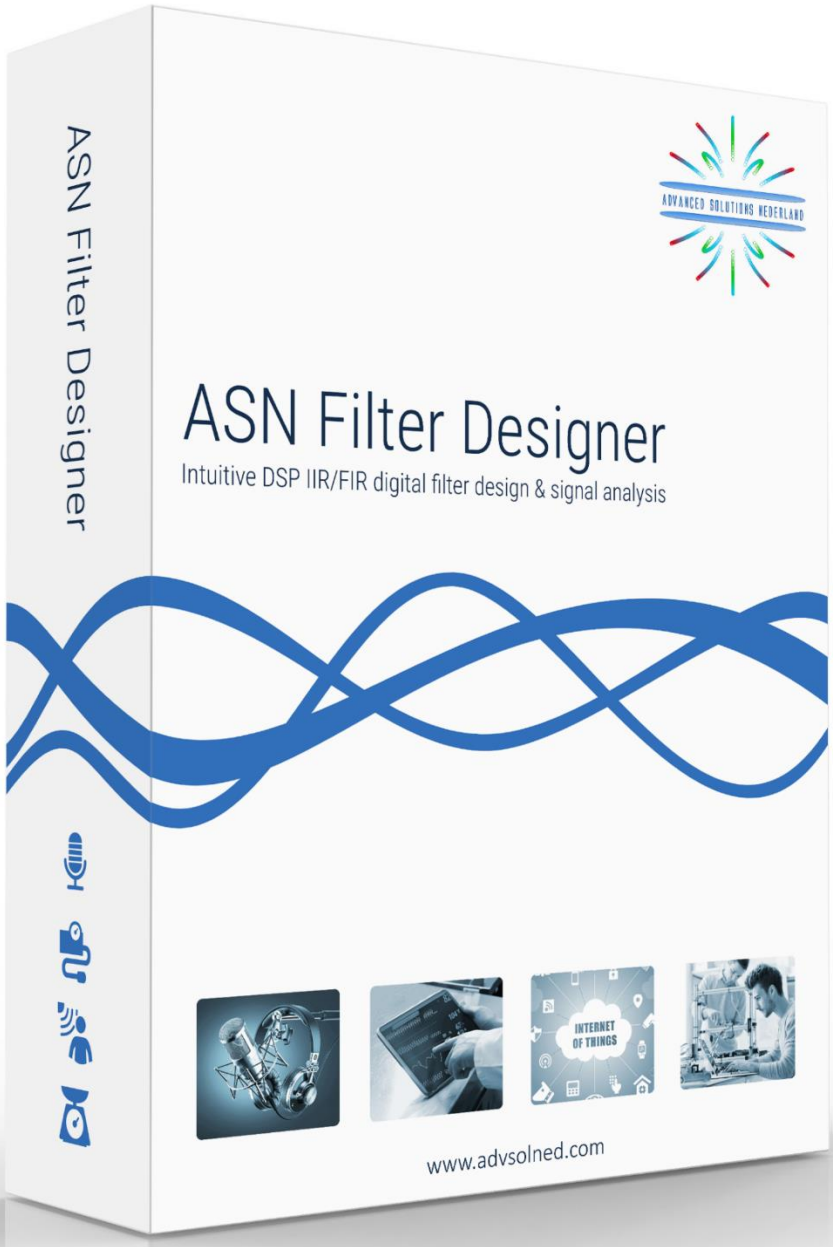


"An outstanding digital filter design application that appears to be the Swiss Army Knife of filter design software packages."

- Rick Lyons, Author of "Understanding Digital Signal Processing"

The ASN Filter Designer is a powerful real-time DSP experimentation platform that has helped many organisations cut their development costs by up to 75% !!

Sensor signal processing in the 21st century

Challenges for engineers

- 80% of IoT smart sensors are based on Arm Cortex-M processor technology
- Sensor signal processing is difficult
- Sensors have trouble with all kinds of interference and undesirable components
- How do I design a filter that meets my requirements?
- How can I verify my designed filter on test data?
- Clean sensor data is required for better product performance
- Time consuming process to implement a filter on an embedded processor
- Time is money!

What's the big deal with industry standard tooling?

What we have now

- ✗ Steep learning curve
- ✗ Traditional design paradigm based on entering specifications into a textbox and pressing a 'design' button
- ✗ No real-time feedback
- ✗ Inefficient way of testing designed filter on test data
- ✗ Limited automatic code generation
- ✗ No automatic design documentation

What we ideally want

- ✓ Fast, intuitive user interface
- ✓ Minimal amount of expert knowledge
- ✓ Real-time feedback
- ✓ Validation of designed filter on test data
- ✓ Auto code generation to industry standards, such as: C/C++, Matlab, Labview, Xilinx Vivado and Arm CMSIS-DSP
- ✓ Automatic design documentation

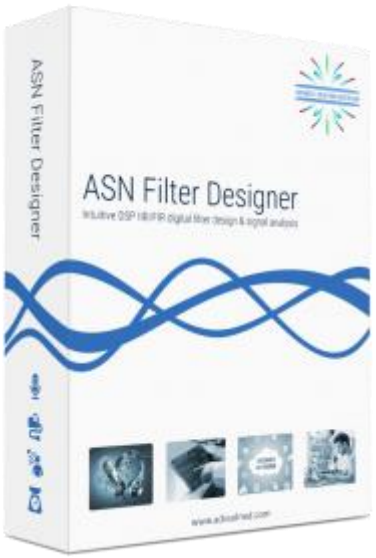
Welcome to the ASN Filter designer (ASNFD)

✔ Powerful DSP experimentation platform

Interactively design, validate and deploy your digital filter within minutes rather than hours.

✔ Real-time design feedback

No need to explicitly define technical specifications before you begin designing, just draw and fine-tune your requirements in real-time and let the tool fill in the exact details for you.



✔ Real-time signal analysis

Import your own datasets or use the inbuilt signal generator to generate test signals, and validate your filter performance in real-time via the advanced signal analyser.

✔ Live math scripting

Experiment in real-time with specialised symbolic mathematical expressions with ASN FilterScript.

✔ Deploy to Arm CMSIS-DSP, C/C++ & Matlab

Export any designed filters to industry standard software frameworks for your smart sensor application.

Awards, technology and partners

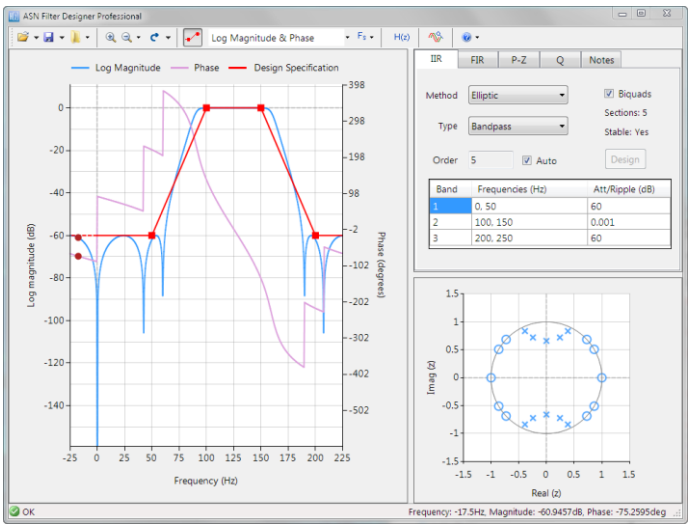
CMSIS COMPLIANT
ARM® Cortex™ Microcontroller Software Interface Standard

HOT 100 EDN 2016

arm

5 DSP tools in 1

Intuitive graphical FIR/IIR filter designer



- **Powerful DSP experimentation platform**
  Interactively design, validate and deploy your digital filter within minutes rather than hours.

- **Interactive real-time feedback design paradigm**
  No need to explicitly define technical specifications before you begin designing, just draw and fine-tune your requirements in real-time and let the tool fill in the exact details for you.

- **Fixed and floating point arithmetic**
  Three arithmetic options are available: double and signal precision and Fixed-point arithmetic. The latter may be used for designing filters in embedded applications between 8-32 bits.

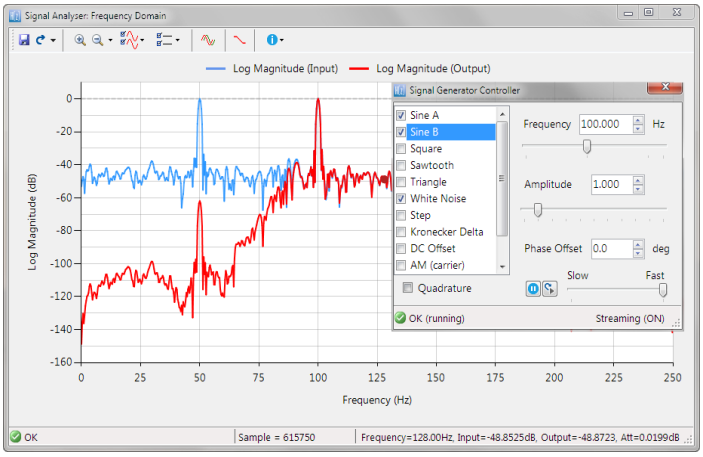
- **Interactive pole-zero editor**
  Zoom, pan and graphically fine-tune designs to your exact requirements, and see the effect on the frequency response in real-time.

- **Advanced data panning and zooming options**
  State-of-the-art algorithms and highly optimised DSP libraries allow for panning and zooming the frequency response chart in real-time with the mouse. The advanced zooming feature allows designers to quickly and simply obtain detailed frequency response information even when the sampling frequency is several hundred MHz via a specialized implementation of the Discrete Fourier Transform. Depending on the selected frequency range, this can be as detailed to a fraction of a Hertz!

5 DSP tools in 1

Real-time Signal Analyser

The signal analyser allows designers to test their design on audio, real (user) data or synthetic data via the built-in signal generator. Default data playback is implemented as streaming data, providing a simple way of assessing the filter's dynamic performance, which is especially useful for fixed point implementations.



- **Time and frequency domain analysis**
  Math methods: autocorrelation, real Cepstrum, Fourier, Windowing and trend removal.

- **Advanced time domain analysis**
  Zero-crossings detector, peak detector and a Savitzky-Golay filter.

- **Integrated signal generator**
  Generate a custom test signal: Sine/cosine, square, triangle, sawtooth, step, impulse, white noise, DC offset, AM, or load an external datafile or audio datafile.

- **3rd party testdata import**
  Import your own sensor test data (csv or txt) - a data import wizard is also available.

- **Streaming and Block based modes**
  For per sample data evaluation and real-time frame based analysis.

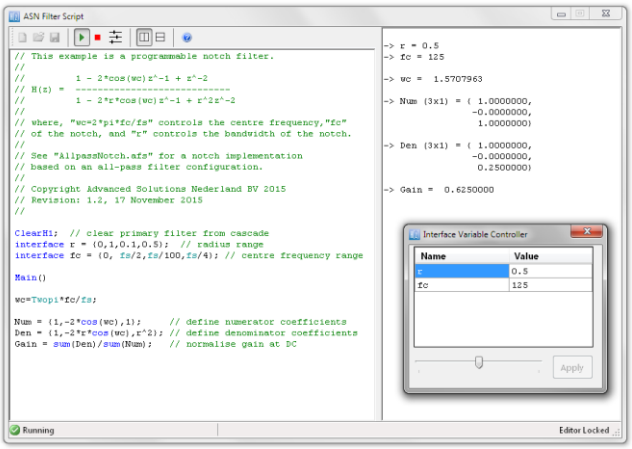
- **Audio support**
  Stream *wav* audio files up to 48kHz and listen the filtered results in real-time.

Both frequency domain and time domain charts are fully supported, allowing for design verification via *transfer function estimation* using the cross and power spectral density functions. As with all other charts, the signal analyser chart fully supports advanced zooming and panning, as well as comprehensive chart data file export options.

5 DSP tools in 1

Live math scripting

ASN FilterScript allows designers to implement IIR/FIR symbolic mathematical expressions directly. These may be definitions taken directly from textbooks, technical standards or even reference designs.



- **Symbolic math scripting language IDE**
  Math parser language and simulation IDE (integrated development environment).

- **Over 65 scientific commands**
  Trigonometrical, vector, general math and filter design methods.

- **Laplace transform support**
  Analog-to-digital transforms: Bilinear and matched z-transform.

- **IIR design methods**
  Butter, Cheby1, Cheby2, Ellip and Bessel, notch and dcremover.

- **FIR design methods**
  movaver, firwin, firarb, firkaiser, firgauss, and savgolay.

- **Intellisense help**
  Get help on commands within the IDE

The 'live IDE' offers designers the unique and powerful ability to modify parameters on-the-fly with the so-called interface variables, allowing for real-time updates of the resulting frequency response.

$$H(z) = \frac{1 - 2\cos w_c z^{-1} + z^{-2}}{1 - 2r\cos w_c z^{-1} + r^2 z^{-2}}$$

2nd order IIR notch

```
wc=Twopi*fc/fs;              // Hz to radians

Num = {1,-2*cos(wc),1};      // numerator coefficients
Den = {1,-2*r*cos(wc),r^2}; // denominator coefficients
Gain = sum(Den)/sum(Num);    // normalise gain at DC
```

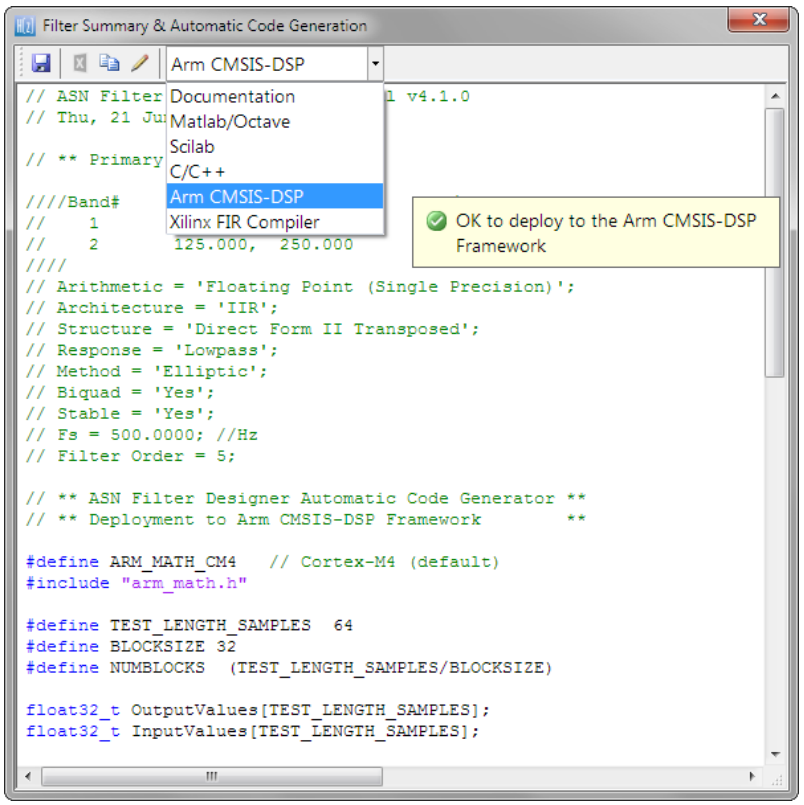
FilterScript code

5 DSP tools in 1

Automatic code generation

Deploy to Arm CMSIS-DSP, C/C++, Matlab and more

Easily integrate your designed filter blocks with your other algorithms in other domains. Export designed filters to industry standard software frameworks, such as: Arm CMSIS-DSP (Keil uVision), Matlab, Octave, Scilab, Xilinx Vivado and C/C++ using provided royalty free software development frameworks. The C/C++ development framework supports both real and complex coefficient filters and speeds up deployment to a DSP, FPGA or micro-controller, and is supported by in-built analytics that provide designers working on resource critical applications with a full implementation cost report.



- **Automatic code generation**
  One click export to Arm CMSIS-DSP (easy integration to Keil uVision), Matlab, Octave, Scilab, Xilinx Vivado or C/C++

- **Microsoft Excel support**
  Export coefficients to Microsoft Excel for quick integration into 3rd party tools, such as SigmaStudio and Code Composer Studio.

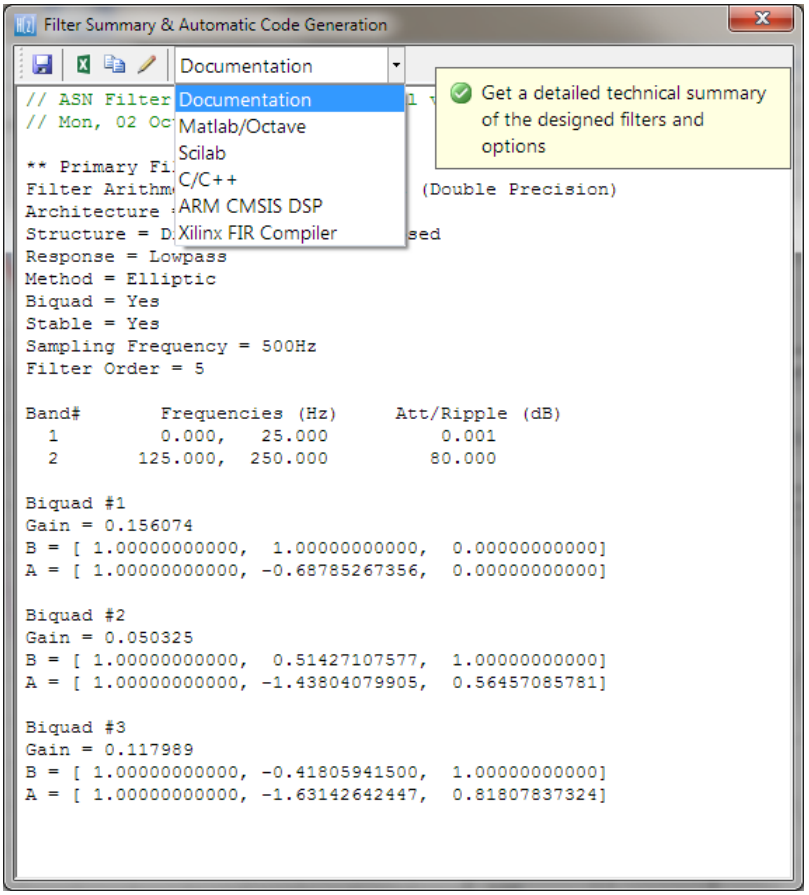
- **Royalty free deployment**
  Deploy your designs to your applications with our tried and tested royalty free 3rd party deployment frameworks.

5 DSP tools in 1

Automatic documentation

Let the tool help you with your design documentation. Get an automatic generated detailed specification report of all designed filter blocks for official project documentation, which may be pasted directly into any text editor. Enrich your documentation with high resolution plots, that can easily be exported and combined with the specification report for presentation in Microsoft Powerpoint/Word.

- **Automatic technical specification**
  Get an automatic generated detailed specification report of all designed filter blocks for official project documentation.



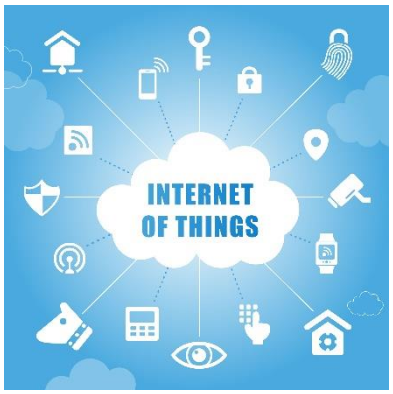
Application areas

Biomedical signal processing

Our biomedical reference designs provide designers with a complete front-end filtering solution for both ECG and EMG applications. Simply import your datasets into the tool and interactively fine-tune the filter cut-off frequencies in real-time in order to suit your application requirements.

Deploy the fine-tuned reference design to Matlab, Arm CMSIS-DSP or C/C++ via the provided software development frameworks for quick integration with your other algorithms and proceed with your algorithm data analysis.

The tool is also invaluable for those activity involved in extracting pertinent VLS (vital life signs) data from radar data, and Lab-on-a-chip measurement applications.



IoT/IIoT smart sensors

Easily design, analyse and implement filters for a variety of IoT or IIoT smart sensor applications, including: loadcells, strain gauges, torque, pressure, flow, temperature, microphones, geophones, vibration, infra-red gas and ultrasonic sensors and assess their dynamic performance in real-time for a variety of input conditions.

Perform detailed time/frequency analysis on captured test datasets and fine-tune your design. Our Arm CMSIS-DSP and C/C++ code generators and software frameworks speed up deployment to a DSP, FPGA or micro-controller.

Speech and audio

Experiment with a variety of equalisation, noise cancellation and sound effect audio filtering algorithms. Perform data analysis in the frequency domain and via specialised methods, including Cepstral analysis on the streaming data.

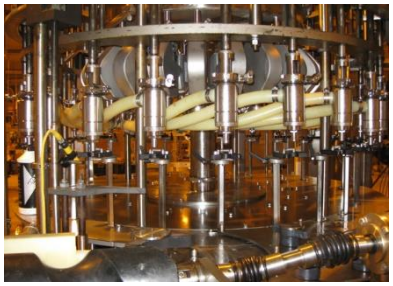
Import your own wav audio files (mono or stereo up to 48kHz) for streaming and modify the filter characteristics in real-time while listening to the filtered audio stream.

Application areas

Oil, gas and flow measurement

Experiment with a variety of filters and measurement method for high precision Coriolis flow and gas concentration measurement applications. Easily build and experiment with Hilbert, Complex coefficient filters and specialised post filters via the Live math scripting engine.

MWD (measurement while drilling) oil well exploration: analyse mud pulse signal detection pressure sensor signal and build noise reduction filters.

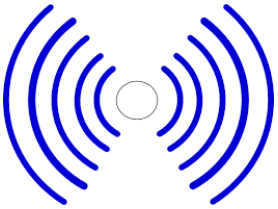


Process control (food and drink)

Perform data analysis on temperature, level, pressure, flow, turbidity sensors data and interactively customise your filter characteristics in real-time on captured datasets. Filter out any interference and obtain excellent measurement performance and reliability for your Turbidity measurement application with our broad range of digital filtering IP blocks.

Radar and ultrasound

Build pulse shaping filters, envelope filters and lowpass, bandpass filters for many types of radar (e.g. FMCW, CW and UWB) and ultrasonic measurement applications, including biomedical vital life signs (VLS) and machine automation proximity and level detectors.



Academia (classroom companion)

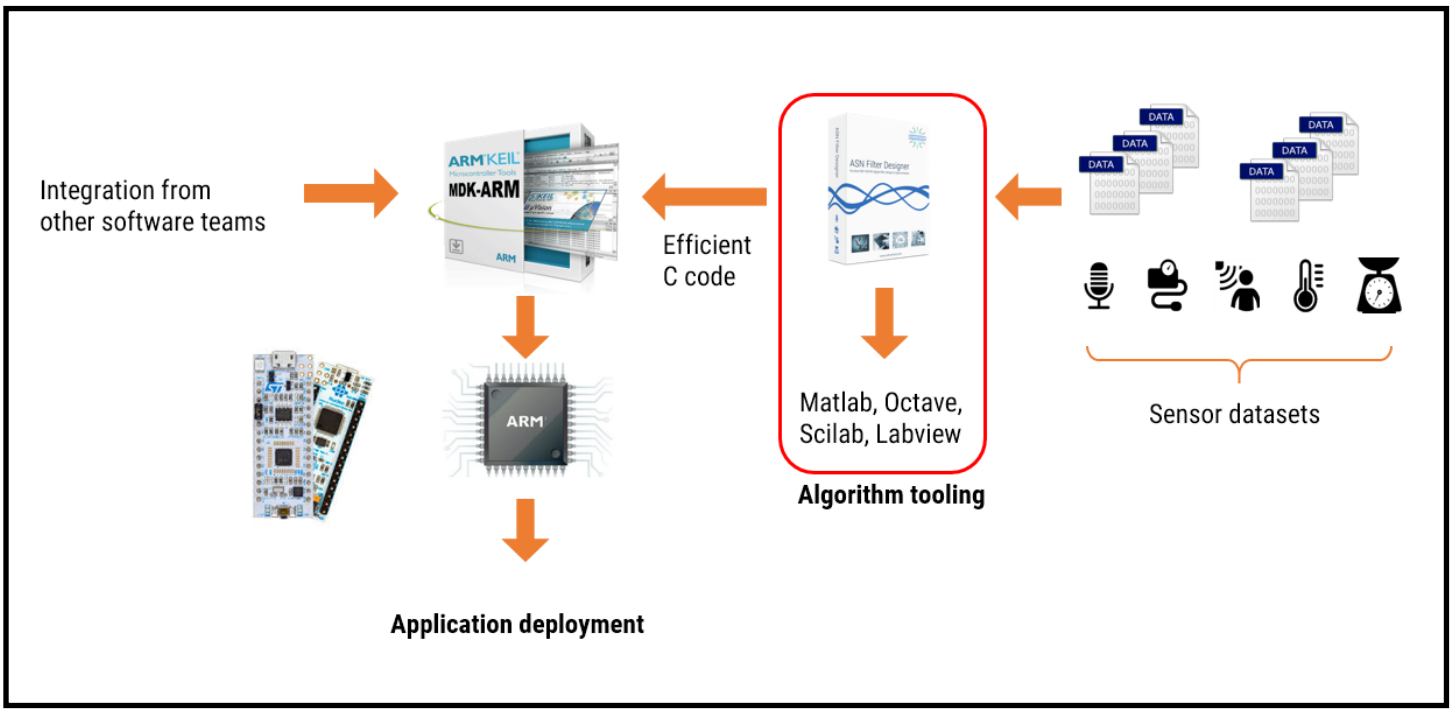
A powerful learning platform suitable for many international Bachelors and Masters programmes in Electrical Engineering and Applied Sciences. The supporting user guide and application notes provide many practical examples, which can easily be integrated into tutorial exercises or classroom examples.

A low cost educational version of the designer is available, allowing academics to experiment with the examples and tailor make study material suitable for student tutorial sessions. The tool is also an invaluable research experimentation platform and provides researchers and post docs with a hassle-free way of quickly converging to an optimal solution and presenting the results in professional form suitable for journal publications.

IoT/IIoT smart sensor design eco system

Ease integration into your existing design workflow and toolchains

Simply load your sensor data into the signal analyser and perform a detailed analysis. After identifying the wanted and unwanted components of your signal, design a filter and test the performance in real-time on your test data. Export the designed design to Arm MDK, C/C++ or integrate the filter into your algorithm in another domain, such as in Matlab, Python, Scilab or Labview.



RAD for Arm Cortex-M microcontrollers

Use the tool in your RAD (rapid application development) process, by taking advantage of the automatic code generation to Arm's CMSIS-DSP software framework, and quickly integrate the DSP filter code into your main application code.

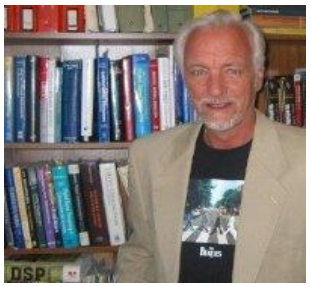
Praise from industry experts

"The ASN Filter Designer is a powerful DSP experimentation platform"

-Arm/Keil, *World leading IP silicon vendor for IoT solutions*

"An Astounding Digital Filter Design Application … the *Swiss Army Knife* of filter design software packages"

-Rick Lyons, *Best selling international author in DSP*



ASN Filter Designer featured in EDN's Hot 100 products of 2016

- EDN network, *International trade magazine for hi-tech*

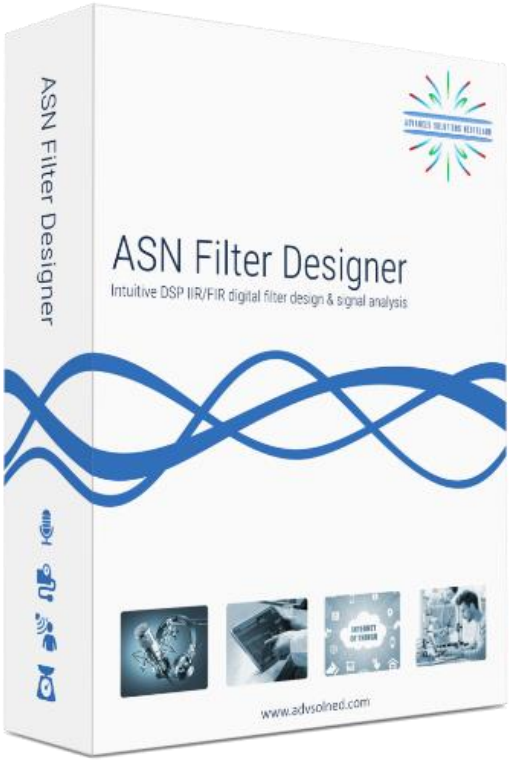
"ASN's biomedical workshop is a great example of how our BSc. students can get hands on involvement of an innovative product, that is set to advance the development of biomedical signal analysis and filter design"

-Prof dr. ir. Bert-Jan van Beijnum, *University of Twente*

Licencing options

	Licence type	Demo	Educational	Professional
Filter design	Max IIR filter order (*design method*)	10	20	100
	Max FIR filter order (*design method*)	64	200	499
	Max num poles/zeros (*design method + script*)	100	200	500
	Max all-pass filters	2 biquads	4 biquads	10 biquads
	FIR Multiband	4 bands	5 bands	8 bands
GUI functions	Save project	✗	✓	✓
	Save analyser data	✗	✓	✓
	Re-optimise design	✗	✓	✓
	Export to Excel	✗	✓	✓
	Data file import wizard	✗	✓	✓
	Export charts	✗	✓	✓
Automatic code generation	Documentation	✗	✓	✓
	Matlab, Octave and Scilab	✗	✓	✓
	ARM CMSIS DSP, C/C++ and Xilinx	✗	✓	✓
ASN FilterScript	Max interface variables	3	6	20
	IIR design methods (max filter order)	✗	10	20
	FIR design methods	✗	✓	✓
	Laplace transforms (analog)	✗	✓	✓
	Licence	non-commercial use	non-commercial use	commercial use

- Licences are perpetual licences or subscription based.



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