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For immediate release

EC-LIB now with Butterworth, Bessel, and Chebyshev of Higher Order

In version 2.7.0, the functional range of EC-LIB, the well tested library of mathematical and electrotechnical functions for microcontrollers, has been expanded significantly: It is now possible to implement complex filters with Butterworth, Bessel, or Chebyshev characteristic even on microcontrollers without floating-point arithmetics, as well as to compensate PT1-elements in closed-loop controlled systems affected by high-frequency noise. Due to extensive testing, functional safety can be guaranteed; the functions are ready for direct application within software systems.
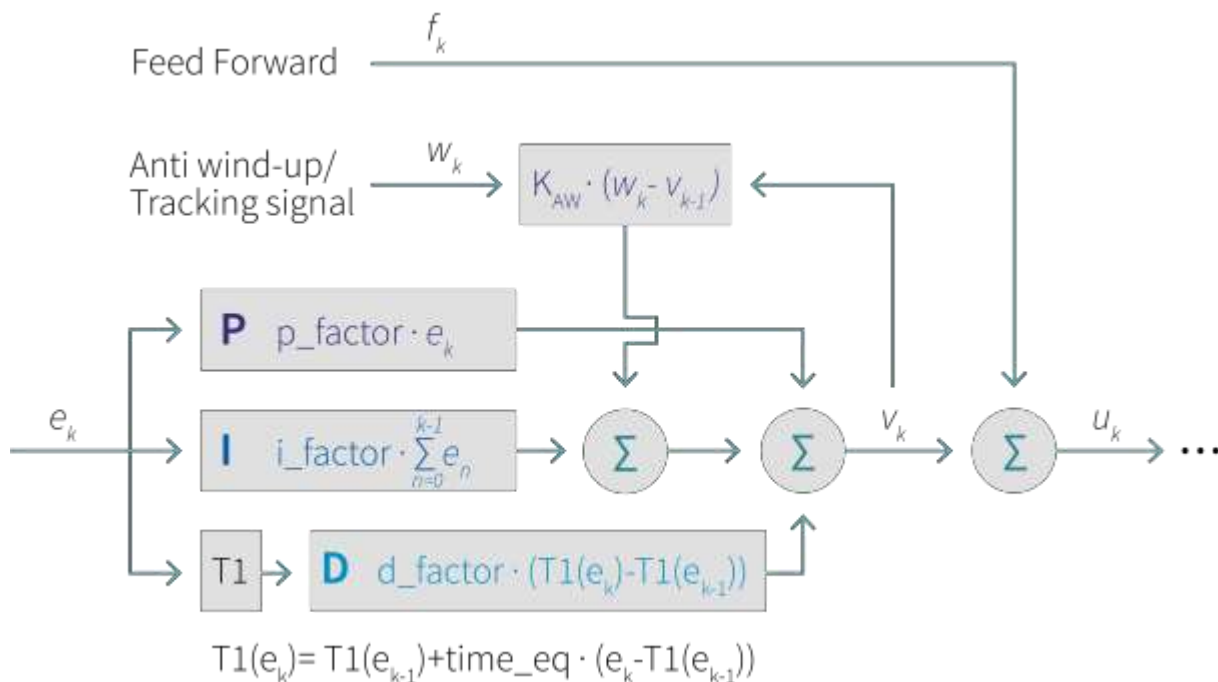
Complete block diagram of a PID controller with PT1 compensation in the D component. © Eclipseina

So far, EC-LIB already contained functions such as moving average or high- and low-pass filters of first order. Now new filter functions were added, which are realised as IIR filters (IIR = infinite impulse response). Filters of this type are linear and shift-invariant.

Butterworth filters show a maximally flat frequency-response in the passband and roll off sharply after the cut-off frequency (20 dB/decade per order). Filters of this type can be applied for instance to significantly reduce the point density of a curve without altering its general course. For example, this is used in animations or in edge computing to reduce the data volume.

An even steeper roll off at the cut-off frequency can be realised by using Chebyshev filters. However, this comes at the cost of a rippled frequency-response– either in the passband (Type I) or the stopband (Type II).

Unlike Butterworth and Chebyshev filters, Bessel filters have a maximally flat group delay, preserving the waveform of the filtered signals in the pass band. However, the transition from the passband to the stopband is considerably slower than with other filters.

For all filter characteristics, a tool for parameter determination is available and included in the software package of the EC-LIB.

The closed-loop controller functions have also been expanded. One new feature is a PT1 compensation in the D-component. By means of a corresponding PD element, designed in EC-LIB, it is possible to fully compensate elements with a delay time (e.g. a low-pass of first order) in such a way that the closed-loop controlled system becomes less complex and thus managing it becomes much easier.

Using the EC-LIB allows software authors to work considerably more efficiently: Instead of programming allegedly trivial functions for each processer anew, software authors profit from uniform function calls and identical interfaces, as well as from the extensive documentation of the functions contained in the EC-LIB. All information is available in Doxygen format and thus can be directly copied into the development documentation.

The EC-LIB is available either as a cost-efficient pre-compiled version or as source code in C with fully clarified license rights. As an additional feature, Eclipseina offers a design-in-support and quick and easy communication with the developers. If customers feel like they are missing some functions, these can either be realised customer-specific or provided to all customers as a free update.

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Eclipseina GmbH

Eclipseina GmbH in Regensburg lays the foundation for embedded software developers to fully concentrate on their key tasks: by offering well-thought out seminars on system development and software development as well as tests within the Embedded Academy, by providing hands-on consulting on efficient development processes and on functional safety according to IEC 61508 or ISO 26262, and with clever products such as the EC-LIB which is a comprehensive, debugged and extensively documented library of mathematical electrotechnical functions in C for fixed-point arithmetic.

Since March 2020, Eclipseina GmbH is certified in accordance with ISIS12 and TISAX. A quality management system in accordance with DIN ISO 9001:2015 has already been introduced in 2018 for the whole company, without any exclusions.

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