

*The use of time series filters in numerical instability control*

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The use of the standard time series filters of signal processing to control numerical instability is investigated. Two main categories of filter are considered: (i) finite impulse response (FIR or non-recursive) filters, e.g. the Gragg filter in the Gragg-Bulirsch-Stoer Method, and (ii) infinite impulse response (IIR or recursive) filters, e.g. the discrete Butterworth filter. The known properties of such filters are numerically reinterpreted as order preservation, approximate energy preservation, and the filtering out of oscillatory unstable components. The design and construction of filters is considered. Computations are presented for both stiff and energy conserving problems. Two main types of filtering strategy are considered: (a) filtering after the main computation is complete (passive filtering) and (b) intermittent filtering, with filtered solutions fed back into the main computation (active filtering).