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Using Wavelets to Remove Unwanted Noise from RTS Signals
BENJAMIN HENDRICKSON, RALF WIDENHORN, MORLEY BLOUKE, Portland State University, DENIS HEIDTMANN, Retired, ERIK BODEGOM, Portland State University — We propose a novel method to remove white and (1/f) noise from discrete 1-D signals. This method, which was developed for the analysis of random telegraph signal (RTS) noise, utilizes the discrete wavelet transform (DWT) and simple arithmetic to construct a noise free approximate representation of the original signal. There are two central aspects to the method, amplitude and time. The DWT creates a details vector that tracks the amplitude of the changes of the original signal sample to sample, similar in application to the derivative. These changes are then measured against the Universal Threshold (UT). If a change in the signal is larger than the UT the change is kept, if not, the change is set to zero. This ensures that large sudden changes are preserved, while small differences are disregarded. We also employ a temporal screen to disregard transient events that may have resulted from measurement error or unexpected single events such as cosmic rays. Our method is notable since it is completely arithmetic and time based, making it far more intuitive than many analytical techniques.

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