

Features Signalanalysis

Assumption:

If a pulsed wave is reflected or backscattered from an object, its surface alters the shape of the incident signal. Hence, the reflected signal (pulse, echo) is distorted compared to the incident signal. Possible approaches to derive features correlated with these distortions might be (among others):

Shape-related features in Time-Domain:

- Slope of the envelope of reflected signal from begin to maximum (rising time) and/ or of tail (falling time).
- Length of envelope.
- SINAD (Signal to noise and distortion ratio), THD (Total harmonic distortion), THD+N (Total harmonic distortion and noise).
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Shape-related features in Frequency-Domain.:

- Mean (=Mean frequency), Variance (=Bandwidth), Skewness, Kurtosis, ...
Reason: Spectra can be dealt with like a probability density function. Moments (such as mean etc.) are applied in stochastics for characterizing stochastic processes.
- Any measurement of alternation of frequency spectrum from Gaussian (if incident spectrum is assumed as Gaussian) such as peaks etc.
- (Normalized) amplitudes at selected or all frequencies.
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Parameter-estimation features:

- If reflected signal is regarded as the output of a system, a system model can be developed and its parameters be estimated. This corresponds to a system identification of the incident pulse convoluted with the object surface.