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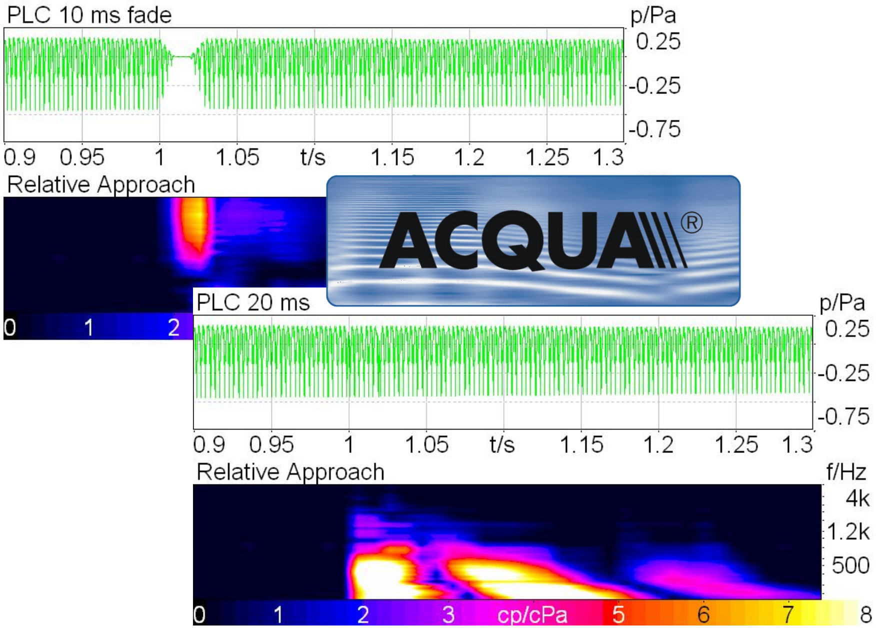
DATA SHEET

ACOPT 17 (Code 6839) "Relative Approach"



"Relative Approach" analysis results of PCL implementations by comparison

Overview

The "Relative Approach" is an analysis method developed and patented by HEAD acoustics for the assessment of audible disturbances in the time and frequency domain.

As a hearing model-based, psychoacoustic method the "Relative Approach" visualizes dominant temporal and spectral structures based on the sensitivity of the human ear regarding these signal characteristics.

The algorithm generates an estimated value of the signal history which represents an expectation of the human hearing. This value is then compared with the real sound event.

The "Relative Approach" is available as license option ACOPT 17 for all variants of the communication analysis system ACQUA.

DESCRIPTION

The human ear reacts particularly sensitively to quick changes in acoustic signals and to spectral structures with distinct maxima and minima. Stationary and quasi-stationary signals with constant or slowly varying sound curves over time and slow changes of frequency do not trigger increased attention after listening for some time.

The same applies to transmitted speech or background noise. Unexpected events, however, such as clicks by impaired transmission in VoIP scenarios or spectrally distinctive components in background noise - e.g. by algorithms for noise reduction in mobile hands-free terminals - are regarded as unpleasant and disturbing on the receiver side.

The basic idea of the "Relative Approach" therefore is to calculate an estimated value based on the current signal history. This estimated value represents the expectation of human hearing. This value is then compared with the real sound event.

The estimated value can be primarily and simplified interpreted as an average of past signal values. The difference between the actual value and the estimated value is a measure of the variation of the signal.

An aurally-accurate spectroscopy provides the basis for this method. A time -frequency analysis of the time signal is required to cope with the characteristics of human hearing. In addition, the non-linear relation between sound pressure and subjectively perceived loudness (cf. auditory model of Sottek) must be taken into account by applying an aurally-accurate level transformation. After the spectral analysis and the non-linear level transformation the estimated value calculation for the current signal value and the difference is conducted.

The setting of the "Relative Approach" can be adapted in many ways to the respective task. Analyses of dominant temporal structures start with the integration over the output signals of the aurally-accurate filter bank. At dominant spectral structures it starts with the time domain at the output of each filter before the spectral representation.

Any test signals with slowly varying temporal and spectral structures can be used, e.g. Sweep signals or voiced speech sounds. A concrete application is e.g. the measurement of hands-free terminals in vehicles, where typical vehicle sounds are used. The analysis parameters of the "Relative Approach" can be adapted to the assessed component.

BENEFITS

Main benefits of the "Relative Approach" analysis compared to other analyses are:

- The analysis requires only the measured signal. No reference signal is required.
- In addition to traditional analysis, noise and artifacts psychoacoustically perceived as unpleasant can be tracked aurally-accurate by the processing in the hearing model.

APPLICATIONS

- Clear representation of temporal and spectral structures for detecting conspicuous signal components, including those with low energy content
- Highlighting of pulse-like or clayey sounds, e.g. rub and buzz effect on speakers. Especially this parameter allows reliable detection of defective electroacoustic components such as misalignments of plunger coils.
- Quality control of electroacoustic components, e.g. sound transducers of mobile phones. The "Relative Approach"-analysis can be used for sorting out defective products.
- Optimization of PLC (Packet Loss Concealment) implementations, e.g. in VoIP applications. This analysis method has been successfully used in the ETSI VoIP Speech Quality Test Events for comparing different implementations of PLC in gateways and devices from different manufacturers.
- Optimization of algorithms for noise reduction and comfort noise injection, e.g. in mobile hands-free terminals. For the analysis of stationary or quasi-stationary background noise signals such as vehicle noise at constant driving conditions or office noise with low dynamic

changes the “Relative Approach” can also be used. Typical cases are e.g. the convergence characteristics of a background noise reduction algorithm, or the injection of “comfort noise”. Although without a reference signal, the spectral representation of the “Relative Approach” reveals important information.

SYSTEM REQUIREMENTS

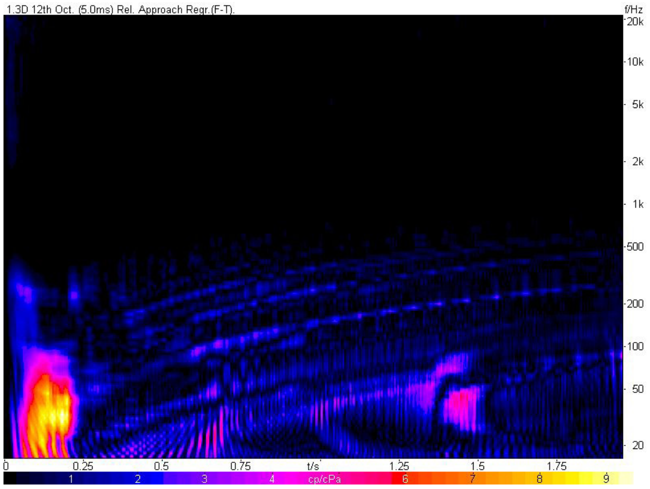
ACOPT 17 (Option Relative Approach) requires the following products:

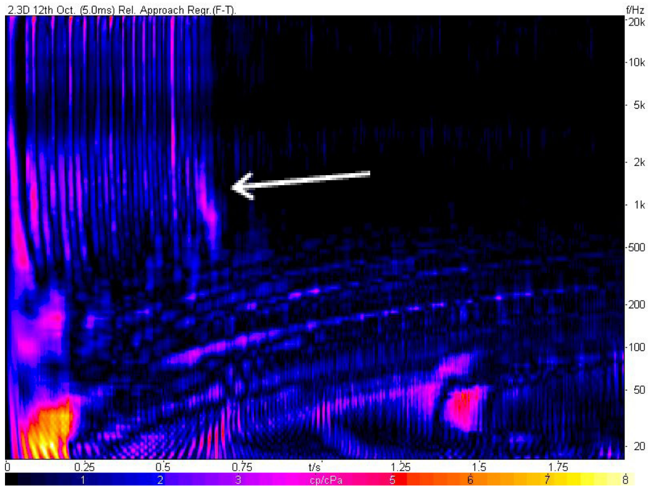
- **ACQUA (Code 6810 etc.)**, Advanced Communication Analysis System, latest Version
  Note: existing customers need a valid software maintenance agreement (SMA)

DELIVERY ITEMS

- Option “Relative Approach” (ACOPT 17), Code 6839, is delivered as V2C file for ACQUA dongles.

Application example: Speaker without rub & buzz (above) and with rub & buzz visible in the range 0 - 0.75 s (below)





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