Overview

The ArtemiS Advanced Psychoacoustic Module includes the psychoacoustic analysis functions Hearing Model, Relative Approach, and HSA, which are modeled after the special characteristics of subjective human signal processing.

In the analysis of a car interior sound, the Relative Approach analysis (lower diagram) exhibits the disturbing sound component much more clearly than the FFT analysis (upper diagram).

Applications

- Objectivation of subjective sound perception
- Sound Quality

Specifics

- Hearing Model

The hearing model is based on the physiology of the human hearing and allows special analysis functions in the frequency domain, where time and frequency resolution correspond to those of human hearing.

- Relative Approach

The Relative Approach Analysis is based on the hearing model and performs a time-frequency analysis of signal level curves in order to comply with the characteristics of human hearing.

- HSA (High-resolution Spectral Analysis)

The HSA method is a special signal estimation algorithm, which improves the analysis of tonal components in a signal. This applies especially to short signal sections, where HSA has great advantages compared to conventional FFT analysis.

Features

- Hearing Model spectrum vs. time
- Hearing Model Impulsiveness vs. time
- Hearing Model Roughness vs. Zeit
- Hearing Model Spec. Impulsiveness
- Hearing Model Spec. Roughness
- Hearing Model Spec. Impulsiveness vs. time
- Hearing Model Spec. Roughness vs. time
- Relative Approach 2D
- Relative Approach 3D
- High-resolution Spectral Analysis (HSA)
- HSA vs. time
- HSA vs. rpm

In comparison with an FFT analysis (upper diagram) the Hearing Model analysis (lower diagram) exhibits the temporal modifications of the frequencies more clearly and shows the level of the base frequencies and the harmonics abundantly clear.

ATP 06 (Code 5016)

ArtemiS Advanced Psychoacoustic Module

for special acoustic evaluation

ASM 16 (Code 5016) of the ArtemiS SUITE includes ATP 06.

In the analysis of a car interior sound, the Relative Approach analysis (lower diagram) exhibits the disturbing sound component much more clearly than the FFT analysis (upper diagram).
### Technical data

#### Hearing Model

- **Range:** 1 - 14000 Hz
- **Resolution (bandwidth):** 0.1 - 1
- **Frequency scale:** Bark / $\frac{1}{3}$ Bark / $\frac{1}{5}$ Bark / Lin/Log
- **Band pass:** 1st - 5th order
- **Low pass:** Off / 1st - 5th order
- **Spectral Weighting:** none / A / B / C / D Weighting
- **Calculation of the envelope:** Hilbert Transformation / Half wave rect. / Full wave rect.
- **Band pass shape:** asymmetric
- **Low pass frequency:** 1 - 5000 Hz

#### Hearing Model Impulsiveness vs. time

- **Frequency scale:** Hz / Bark

#### Hearing Model Roughness vs. time

- **Resolution:** 1/1 Bark / 1/2 Bark

#### Hearing Model Spec. Roughness vs. time

- **Frequency scale:** Hz / Bark
- **Resolution:** 1/1 Bark / 1/2 Bark

#### Relative Approach 2D / Relative Approach 3D

- **Base Analysis:** 1/n octave (Filter) / 1/n octave (FFT) / Hearing Model / Loudness (FFT/HEAD)
- **Spectral Weighting:** none / A / B / C / D / G / $W_d$ / $W_s$ / $W_h$ etc. Weighting
- **Variation analysis:** Regression / Prominence 3D
- **Reg. algorithm.:** Frequency Pattern / Time Pattern / Freq. + Time Pattern

##### 1/n Octave (Filter)

- **Band resolution:** Octave / 3rd Octave - 96th Octave
- **Time Weighting:** 0,1 - 50 ms

##### 1/n Octave (FFT) / Loudness (FFT/HEAD)

- **FFT Size:** $2^8$ - $2^{16}$
- **Overlap:** 0 - 99.9 %

### HSA / HSA vs. time / HSA vs. rpm

- **HSA**
  - **Window size:** 16 - $2^{16}$
  - **Increase of frequency resolution with HSA compared to FFT:** 1 - 16
  - **Window Function:** Rectangle / Hanning /Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
  - **Spectral Weighting:** none / A / B / C / D Weighting
  - **Calculation of the envelope:** Hilbert Transformation / Half wave rect. / Full wave rect.
  - **Band pass shape:** asymmetric
  - **Low pass frequency:** 1 - 5000 Hz
  - **Iterations:** 0 - 500
  - **Order Limit**
    - **Order Limit:** On / Off
    - **Range (Order):** 0.1 - 1000
    - **Advance**
      - **Overlap:** 0 - 99.9 %

The functionality of the ArtemiS Advanced Psychoacoustics Module (ATP 06) is extended by the ArtemiS Signature Analysis Module (ATP 03). Further information you will find in the data sheet of ATP 03.