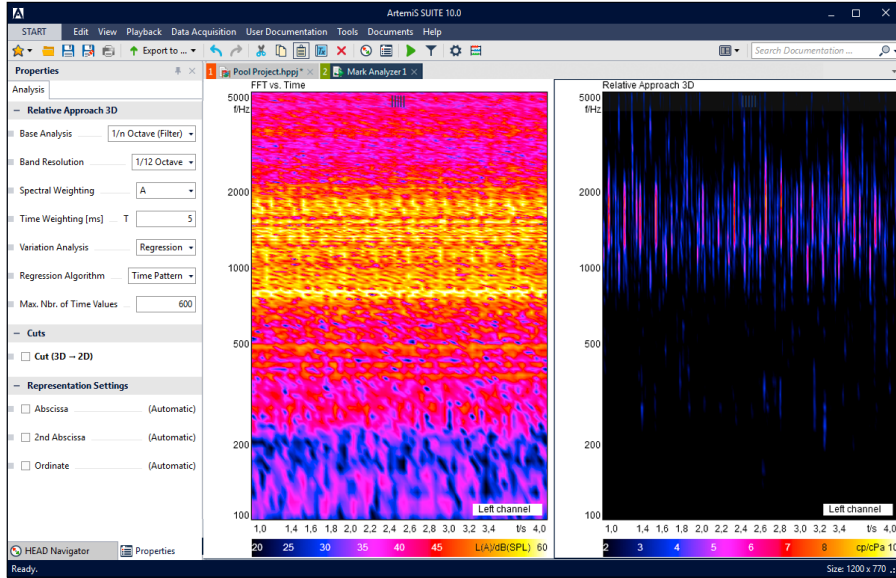


ArtemiS SUITE Advanced Psychoacoustics Module (Code 5016)

Expansion module for the evaluation of sound measurements with psychoacoustic parameters



Overview

The Advanced Psychoacoustics Module includes for example the psychoacoustic analysis Roughness, which is based on the hearing model, the analysis Relative Approach, which is modeled after the special characteristics of human signal processing, and the high-resolution spectral analysis HSA.

In addition, ASM 16 provides the Tonality analysis based on an improved Hearing Model of Sottek. This psychoacoustic calculation method for identification and evaluation of tonal components is part of the standard ECMA-74 15th edition (june 2018).

Features

- Expansion module of ArtemiS SUITE for the instrumental, analytical description of auditive-perceived sound quality with the analyses
- Specific Roughness (Hearing Model)
- Specific Roughness (Hearing Model) vs. Time
- Specific Impulsiveness (Hearing Model) vs. Time

Available analyses

- Tonality (Hearing Model) vs. Time
- Tonality (Hearing Model) Frequency vs. Time
- Specific Tonality (Hearing Model)
- Specific Tonality (Hearing Model) vs. Time
- Spectrum vs. Time (Hearing Model)
- HSA (average)
- HSA vs. Time
- Impulsiveness (Hearing Model) vs. Time
- Roughness (Hearing Model) vs. Time
- Relative Approach 2D
- Relative Approach 3D
- Specific Impulsiveness (Hearing Model)

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.

Tonality (Hearing Model)

The Tonality (based on the Hearing Model of Sottek) is a perception-based analysis method for the detection of tonal components and their characteristics in noise emissions.

The achieved results correlate far better with the actual perceived tonality than existing methods, so that tonal components of sounds, for example, from electric motors or drives, can be detected automatically, precisely, and without intervention.

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. It reacts to rapid changing temporal and spectral structures in signals and excellently correlates with the pattern detection capabilities of human hearing.

In comparison, the Relative Approach analysis exhibits the sound component conspicuous to the human hearing much more clearly than the FFT analysis (left diagram: FFT vs. Time, right diagram: Relative Approach)

HSA (High-resolution Spectral Analysis)

The HSA (High-resolution Spectral Analysis) 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.

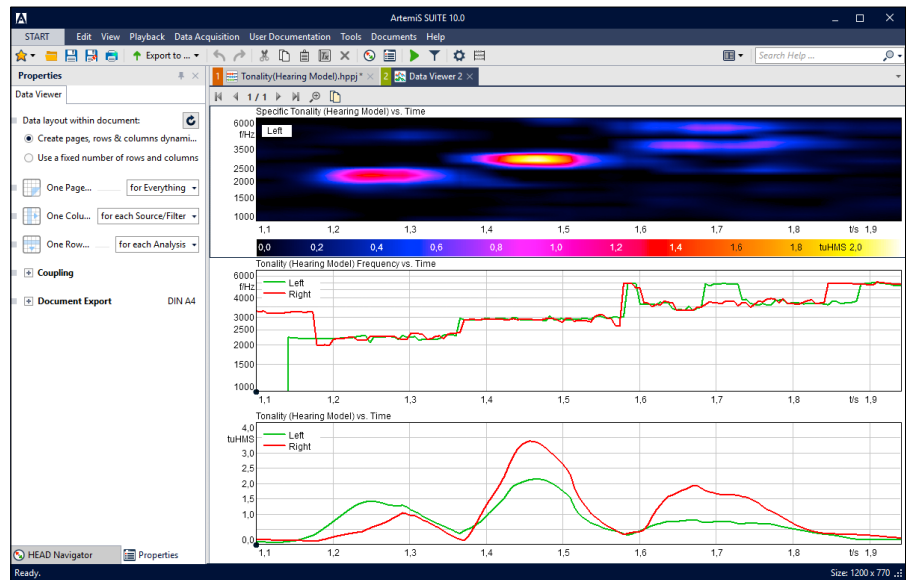
Tonality (Hearing Model)

With the psychoacoustic Tonality analysis based on the Hearing Model of Sottek for the first time a method to determine the actually perceived tonality of product sound quality is available.

For this purpose, the previous methods for determining tonal components such as Tone to Noise Ratio and the Specific Prominence Ratio analysis are less suitable. As hybrids they use the psychoacoustic concept of frequency groups, but work with conventional sound pressure level information instead of perceptual level information such as loudness. Thus, loudness based masking effects of sound perception and the hearing threshold are largely ignored.

In contrast, the Tonality analysis of ArtemiS SUITE bases on the psychoacoustic loudness as well as the Hearing Model of Sottek, which allows separating the loudness of tonal and non-tonal components. In addition, an inherent consideration of the hearing threshold, masking depending on loudness level, and frequency-dependent masking is achieved. Disturbing components, even in sounds with rapidly changing tonalities, are correctly detected.

The Tonality analysis maps linearly with the perceived tonality and shows an excellent correlation with the results of extensive jury tests.



The Tonality (Hearing Model) Frequency vs. Time analysis calculates the frequency of the highest tonality vs. time. The results are given in the unit tuHMS (tonality units according to the Hearing Model of Sottek).

Users can apply the Tonality analysis as well as any other analysis of the ArtemiS SUITE. The method can be used for judgments relating to electric motors or Information Technology for example.

Furthermore, the Tonality analysis is ideal for detecting tonal sound components using a metric - for users of the ArtemiS SUITE the Metric Project of the Calculation module (ASM 27) is available.

Technical Data

Hearing Model Spectrum vs. Time

Frequency Range [Hz]: Selectable
 Resolution Factor: Selectable
 Spectral Weighting: None / A / B / C / D
 Rectification: Hilbert Transformation / Half wave / Full wave
 Band Type: 1/1 Bark / 1/2 Bark / 1/3 Bark / 1/5 Bark / Lin/Log
 Frequency Scale: Hz / Bark
 Bandpass Order: 1 - 5
 Asymmetric Shape: Selectable
 Lowpass Order: Off / 1 - 5
 Envelope Lowpass [Hz]: Selectable
 Max. Nbr of Time Values: Selectable

Tonality (Hearing Model) vs. Time / Tonality (Hearing Model) Frequency vs. Time

Frequency Range [Hz]: Selectable
 Tonality Threshold [tu(HMS)]: Selectable

Specific Tonality (Hearing Model) / Specific Tonality (Hearing Model) vs. Time

Frequency Range [Hz]: Selectable
 Max. Nbr of Time Values: Selectable

According to Standard ECMA-74 15th Edition (June 2018)

Technical Data

Impulsiveness (Hearing Model) vs. Time / Specific Impulsiveness (Hearing Model) / Specific Impulsiveness (Hearing Model) vs. Time

Transient oscillation results can be suppressed

Frequency Scale: Hz / Bark

Max. Nbr of Time Values: Selectable

Roughness (Hearing Model) vs. Time / Specific Roughness (Hearing Model) / Specific Roughness (Hearing Model) vs. Time

Transient oscillation results can be suppressed

Resolution: 1/1 Bark / 1/2 Bark

Frequency Scale: Hz / Bark

Max. Nbr of Time Values: Selectable

HSA (average) / HSA vs. Time

Window Size: 16 - 2²³ Samples

Window Function: Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32

Spectral Weighting: None / A / B / C / D / G / Wd / Wk / Wh etc. Weighting / Equal Loudness

HSA Resolution

Enhancement: 1 / 2 / 4 / 8 / 16

HSA Iterations: Number of analysis iterations selectable

Suppress Background

Spectrum: Selectable

Order Limit: Minimum and maximum order selectable

Overlap: Selectable

Relative Approach 2D / Relative Approach 3D

Base Analysis: 1/n Octave (Filter) / 1/n Octave (FFT) / Hearing Model / Loudness (FFT/HEAD)

Band Resolution: 1/1 Octave / 1/3 Octave / 1/6 Octave / 1/9 Octave / 1/12 Octave / 1/24 Octave / 1/48 Octave / 1/96 Octave

Spectral Weighting: None / A / B / C / D / G / Wd / Wk / Wh etc. Weighting

FFT Size: Selectable for the calculation of Frequency Pattern (F) Time Pattern (T)

Overlap: Selectable

Time Weighting [ms]: Selectable for the calculation of Frequency Pattern (F) Time Pattern (T)

Variation Analysis: Regression / Prominence 3D

Regressions Algorithm: Time Pattern / Frequency Pattern / Frequency & Time Pattern

Weighting [Factor]: Selectable

Available for all Analyses

Representation Settings: Individual scaling of the axes in the analysis result

Add Tolerance Scheme: Display of tolerance curves with tolerance test of the analysis result (not available for the analysis Hearing Model Spectrum vs. Time)

Cuts: Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

Single Values

Available for all 2D analyses as well as for 3D analyses that have been reduced to two-dimensional curves using cuts.

Only Single Values

as Result: Selectable

Abscissa Range: Selectable

Options: Average / Sum / Min / Max / Percentile

Definition of threshold values for whose compliance the determined single values shall be tested for.

Quantity: Selectable

Unit: Selectable

Scope of Supply

- License file
 - ArtemiS SUITE Advanced Psychoacoustics Module (Code 5016)

Requirements

- ArtemiS SUITE Basic Framework (Code 5000)
- ArtemiS SUITE Basic Analysis Module (Code 5001)

Recommended

- ArtemiS SUITE Calculation Module (Code 5027)