OPTICOM

PEAQ – Perceptual Evaluation of Audio Quality

OPTICOM's PEAQ (Perceptual Evaluation of Audio Quality) provides accurate and repeatable estimates of audio quality degradation occurring through e.g. coding procedures. It compares the audio signal input to a device under test (DUT) with the corresponding (degraded) audio signal output from that device on a perceptual basis.

Being already widely used in active testing in lab environments, OPTICOM's PEAQ measurement has achieved a great reputation for its ease of use and its reliability of its results while avoiding the costs for expensive and time consuming listening tests.

PEAQ is fully compliant to ITU-R BS.1387 covering the applicability to high quality audio signals with sampling frequencies of 44.1-48kHz.

OPTICOM who is the leading provider of signal based perceptual measurement technologies and sole licenser for PEAQ offers algorithms for voice, audio and video quality measurements.

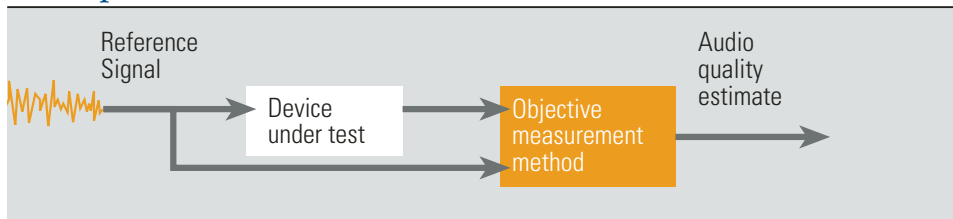| OPTICOM Product Line:	
Voice/Audio Quality	
PESQ	ITU-T P.862
3SQM	ITU-T P.563
PSQM	ITU-T P.861
ECHO	
PEAQ	ITU-T BS.1387
Video Quality	
PEVQ	
Network Quality	
VQmon	

Principle

The intention of a measurement tool like PEAQ is to evaluate the audio quality of an audio device under test, e.g. an audio codec. PEAQ compares the input and output audio signal of that device and outputs a quality score that represents the Basic Audio Quality of the output signal and therefore also the quality of the device. The comparison of the two signals takes only perceptual differences into account, while imperceptible distortions are neglected. In order to be able to distinguish between perceptible and imperceptible distortions PEAQ employs a multitude of perceptual measurement concepts using different ear models from which different signal representations are derived.

PEAQ in general comprises ear models based on the fast Fourier transform as well as on a filter bank. The output values of the models are based partly on the masked threshold concept and partly on a comparison of internal representations (also known as comparison in the cochlear domain). In addition, it also yields output values based on a comparison of linear spectra, which are not processed by an ear model.

The model outputs the partial loudness of non-linear distortions, the partial loudness of linear distortions (signal components lost due to an unbalanced frequency response), a noise to mask ratio, measures of alterations of temporal envelopes, a measure of harmonics in the error signal, a probability of error detection, and the proportion of signal frames containing audible distortions. Selected output values are mapped to a single quality indicator - the Objective Difference Grade (ODG) - by an artificial neural network with one hidden layer. The ODG indicates the measured basic audio quality of the signal under test on a continuous scale from -4 (very annoying impairment) to 0 (imperceptible impairment). Besides the ODG the model outputs a complementary quality value – the Distortion Index (DI). The DI is a quality indicator like the ODG except for its higher sensitivity towards very low signal qualities.

Key Features:

- Perceptual analysis of degradations in audio signals
- Well established, repeatable results
- Output score correlates very well with subjective tests
- PEAQ Basic for real-time measurements
- PEAQ Advance for more detailed quality analysis
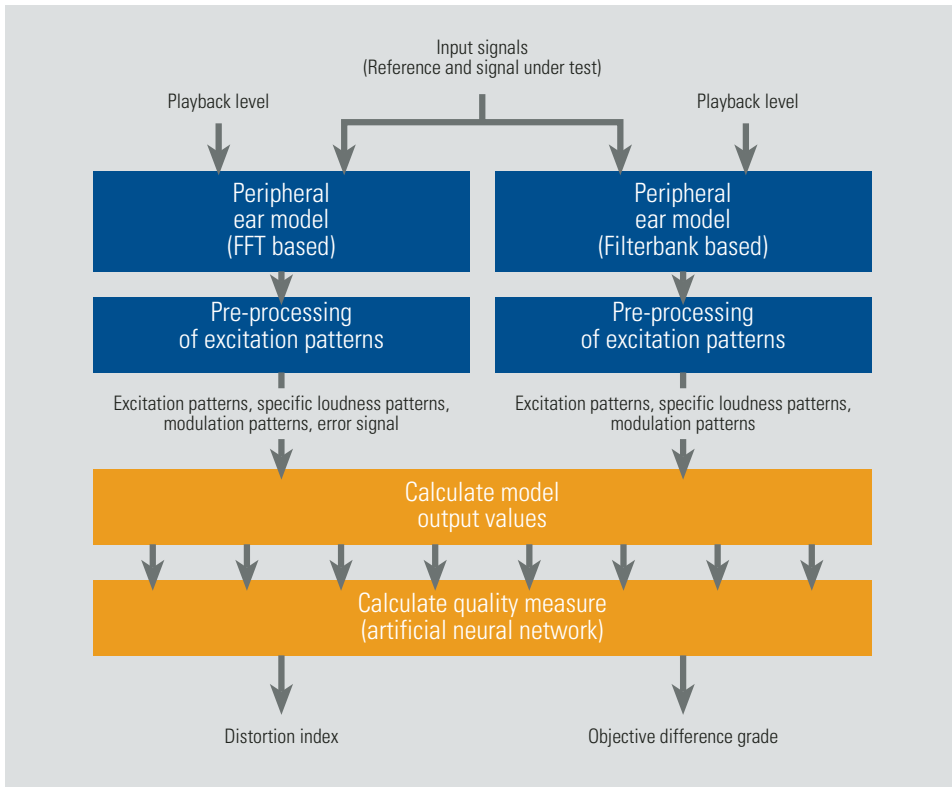
The Perceptual Quality Experts.

PEAQ comes in two versions: PEAQ Basic for real-time measurements and PEAQ Advanced for detailed analysis in non-real-time environments. The main difference of the two models lies in the used ear models and the set of module output values to calculate a final quality score.

Typical applications for PEAQ are: Assessment of implementations, perceptual quality line up, online monitoring, equipment or connection status, codec identification, codec development, network planning and aid to subjective assessment.

Specifications

PEAQ - Perceptual Evaluation of Audio Quality

Functionality

- ITU-R BS.1387-1 Perceptual Evaluation of Audio Quality, with mapping to ODG scale (0=imperceptible, … 4=very annoying)

Input

- 16 bit linear audio sampled at 44.1kHz and 48kHz
- Input audio files 10 to 20 seconds in length

Output

- Objective Difference Grade (ODG)
- Distortion Index (DI)
- PEAQ Basic Model Output Values: Modulation changes, loudness of distortions, Bandwidths of Signals, Frequency of audible distortions, Noise-to-mask ratio, Detection probability, Harmonic structure of error

- PEAQ Advanced Model Output Values: Loudness of distortion, Changes in modulation, Linear distortions, Noise-to-mask ratio, Harmonic structure of error

Complexity

- PEAQ Basic real-time
- PEAQ Advanced needs about four times the computational resources as PEAQ Basic
- Floating point library required

Platform

- Windows

(others on request)

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