Proposal for a Master studentship (f/m)

Title: Measurements of auditory time-frequency masking kernels for various masker frequencies and levels.

Duration: 6 months, working time = 20 hours/week.

Starting date: ASAP.

Closing date for applications: until the position is filled.

Description:

Background

Over the last decades, many psychoacoustical studies investigated auditory masking, an important property of auditory perception. Masking refers to the degradation of the detection of a sound (referred to as the "target") in presence of another sound (the "masker"). In the literature, masking has been extensively investigated with simultaneous (spectral masking) and non-simultaneous (temporal masking) presentation of masker and target. The results were used to develop models of either spectral or temporal masking. Attempts were made to simply combine these models to account for time-frequency masking in perceptual audio codecs like mp3. However, a recent study on time-frequency masking conducted at our lab [1] revealed the inaccuracy of such simple models. The development of an efficient model of time-frequency masking for short-duration and narrow-band signals still remains a challenge. For instance, such a model is crucial for the prediction of masking in time-frequency representations of sounds and is expected to improve current perceptual audio codecs.

In the previous study [1], the time-frequency masking kernel for a 10-ms Gaussian-shaped sinusoid was measured at a frequency of 4 kHz and a sensation level of 60 dB. A Gaussian envelope is used because it allows for maximum compactness in the time-frequency domain. While these data constitute a crucial basis for the development of an efficient model of time-frequency masking, additional psychoacoustical data are required, particularly the time-frequency masking kernels for different Gaussian masker frequencies and sensation levels.

The proposed work is part of the ongoing research project POTION: "Perceptual Optimization of audio representaTIONs and coding", jointly funded by the Austrian Science Fund (FWF) and the French National Research Agency (ANR).

Aims

The first goal of the work is to conduct psychoacoustical experiments to measure the time-frequency masking kernels for three masker sensation levels (20, 40, and 60 dB) and three masker frequencies (0.75, 4.0, and 8.0 kHz) following the methods in [1]. This part will consist in experimental design, programming, and data collection.

The second goal of the work is to interpret the data and compare them to literature data for maskers with various spectro-temporal shapes. This step shall involve the use of state-of-the-art models of the auditory periphery to predict the data.

Applications

The data will be used to develop a new model of time-frequency masking that should later be implemented and tested in a perceptual audio codec.

Required skills: Qualification for a Master's thesis, knowledge in psychophysical methods and

psychoacoustics, experience with auditory models would be a plus, Matlab programming, good communication, proper spoken/written English. Because our Institute does not have the ability to deliver the Master's degree, the candidate must be affiliated with a University.

Gross salary: 948.80€/month.

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Reference:

[1] T. Necciari. *Auditory time-frequency masking: Psychoacoustical measures and application to the analysis-synthesis of sound signals*. PhD thesis, Aix-Marseille I University, France, October 2010. Available online at: https://hal.archives-ouvertes.fr/tel-00553006