Perceptual Coding of High-Quality Digital Audio

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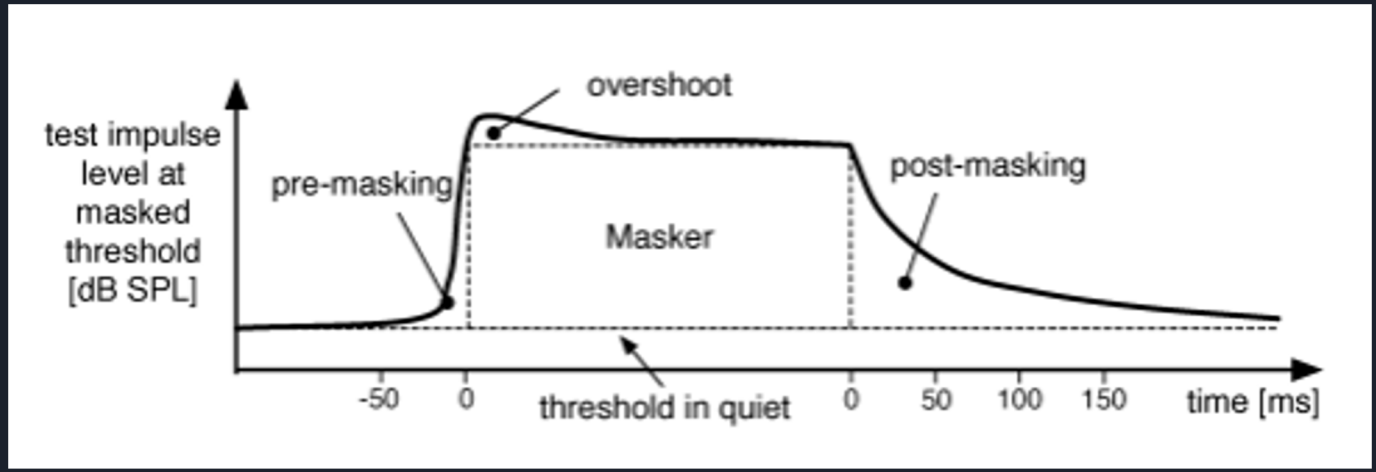
If bored, watch me float up the screen a bit more each slide

Introduction

"The objective of audio coding is to reduce the rate by not coding information multiple times, and by not coding what you cannot hear."

Psychoaucustics

- Auditory Masking



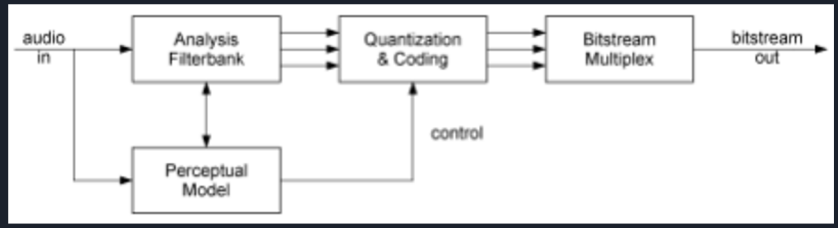
Psychoaucustics cont.

- Stereo Coding Issues

Psychoaucustics cont.

- Further Word Regarding Psychoaucustic Models in Audio Coding

Time/Frequency-based Audio Coding



- Filterbanks
  - Array of bandpass-filters
  - Used to decompose input signals.
  - Goal: Extraction & separation of signal components
- Perceptual model
  - Using input (time-domain) or output (filterbank)
  - Estimates masking threshold
- Quantization and coding (next slide)
- Bitstream multiplex
  - Contains quantized and coded spectral coefficients

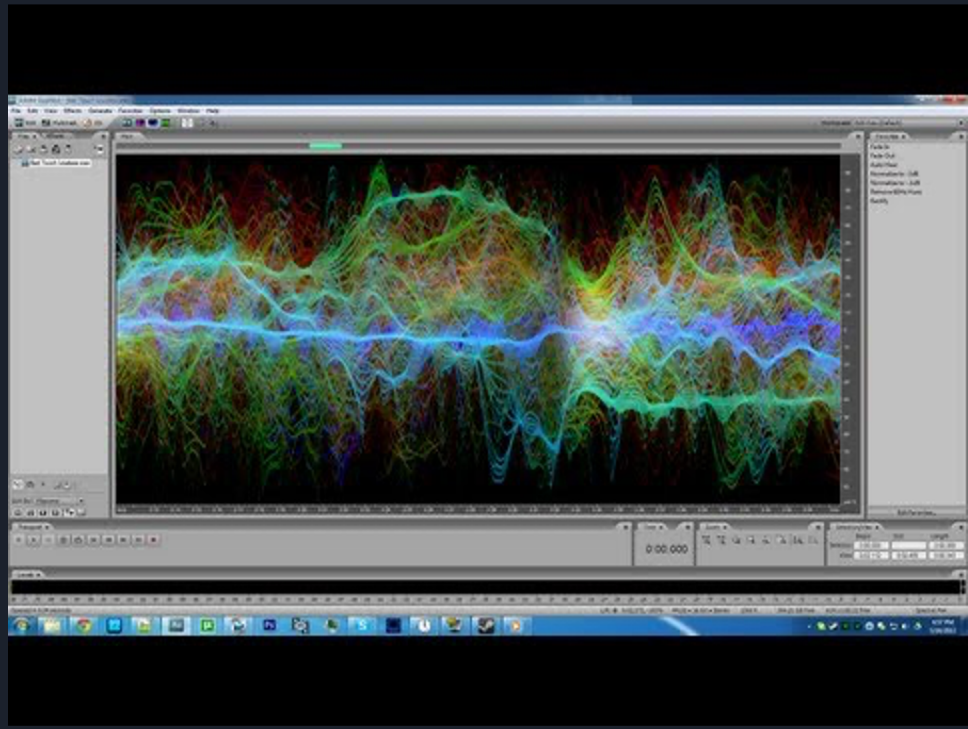
Time/Frequency-based Audio Coding cont.

- Quantization and Coding
  - Main data reduction step in a perceptual audio coder
  - [Scalar quantization] For low computational complexity
  - Performed under fixed-rate or average-rate constraints
- Two methods
  - Block companding/block floating point
  - Non-uniform quantization combined with Huffman coding

Examples & Lossy vs Lossless

- MPEG Layers I and II
- MPEG Audio Layer-3 (mp3)
- AC -3 (Dolby Digital (DVD & digital TV))
- AAC : MPEG-2 AAC

- Lossy vs Lossless

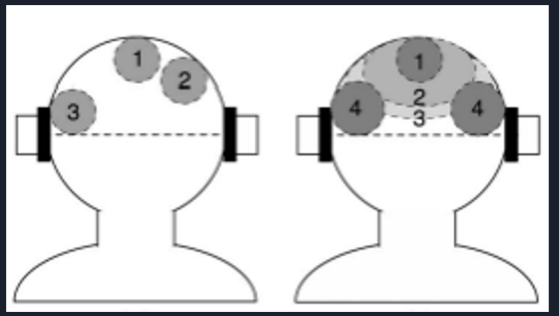


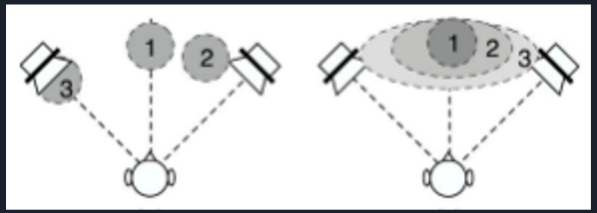
Some Newly Standardized Audio Codecs Since about 2000

- Toward Lower Bitrates: The AAC Codec Family
  - MPEG-2 AAC:
    - Bandwidth extension, avoids artifacts at low bitrates
    - Parametric coding at low bitrates
    - Speech and audio coding combined
- Audio Coding for High-Quality Telecommunication
  - Same concepts but for communication coding
- Toward Highest Quality: (Near) Lossless Audio Coding
  - Aims to reduce redundancy in encoded audio signals

Spatial Audio Coding

- SAC Encoding and Decoding
  - Spacial Audio Coding
    - Enables higher compression ratios
- Spatial Hearing and Cues
  - Differences at left & right ear gives a spatial image
- Spatial Synthesis
  - Think HRTF





Thank you for listening!

Any questions?

(Swedish is fully welcome)