Ogg Vorbis

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Vorbis is...

- A lossy compression format
- A competitor to MP3
- A public domiain specification
- An open source implementation

Technical Highlights

- Variable bit rate (VBR)
  - Only uses as many bits as necessary
- Uses the Modified Discrete Cosine Transform (MDCT)
- Uses vector quantization

Basics

- CODEC → COder/DECoder
- Lossy → Some information lost
  - Makes file smaller
  - Throw away perceptually irrelevant info
  - Throw away redundant info
- Bitrate → Bits/second used to encode audio

Ogg + Vorbis

- Ogg → transport
- Vorbis → audio encoding

Specification

- Designed for maximum encoder flexibility
- Low-complexity decoder
- Public domain

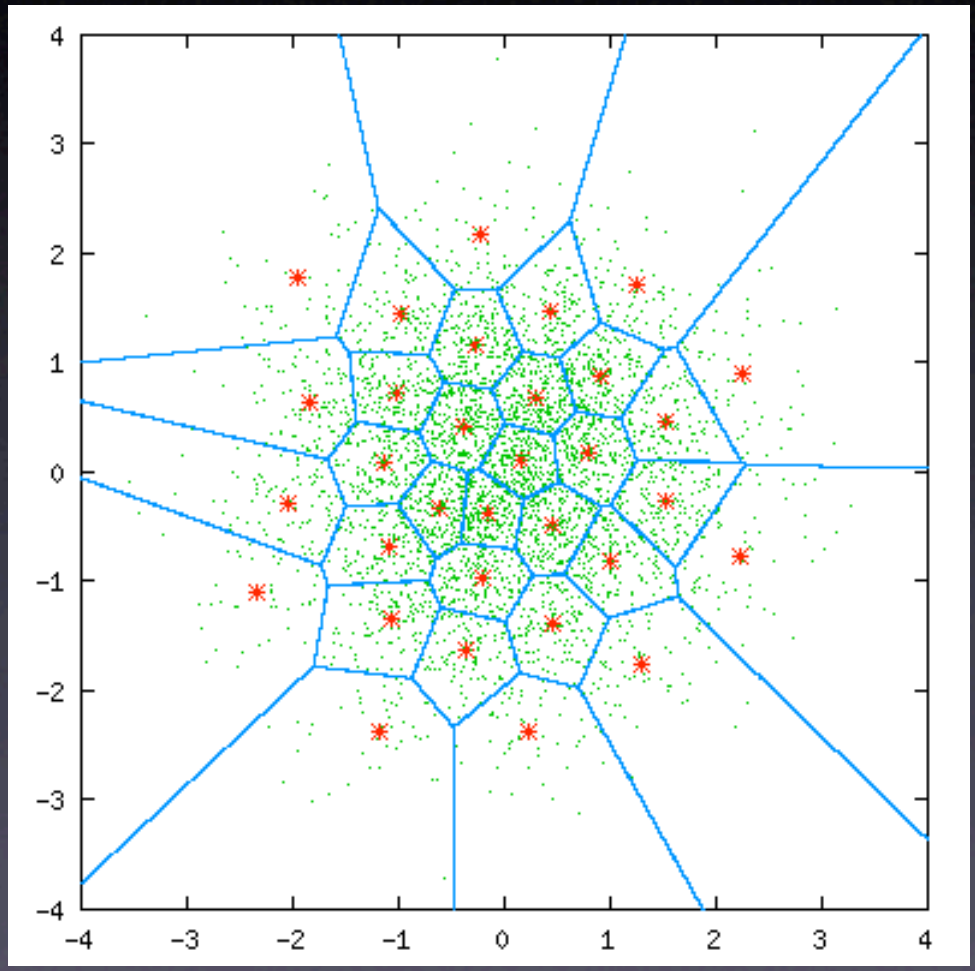
Algorithm

- Filter according to psychoacoustic model
- Window input
- Transform to frequency domain (MDCT)
- Subtract out spectral "floor" channels
- Quantize residual spectra, one per channel
- Couple channels
- Code floor, residuals

Psychoacoustic Model

- Exploits how we hear sound
  - Absolute threshold of hearing (ATH)
  - Tone masking
- Must keep quantization noise below masking threshold

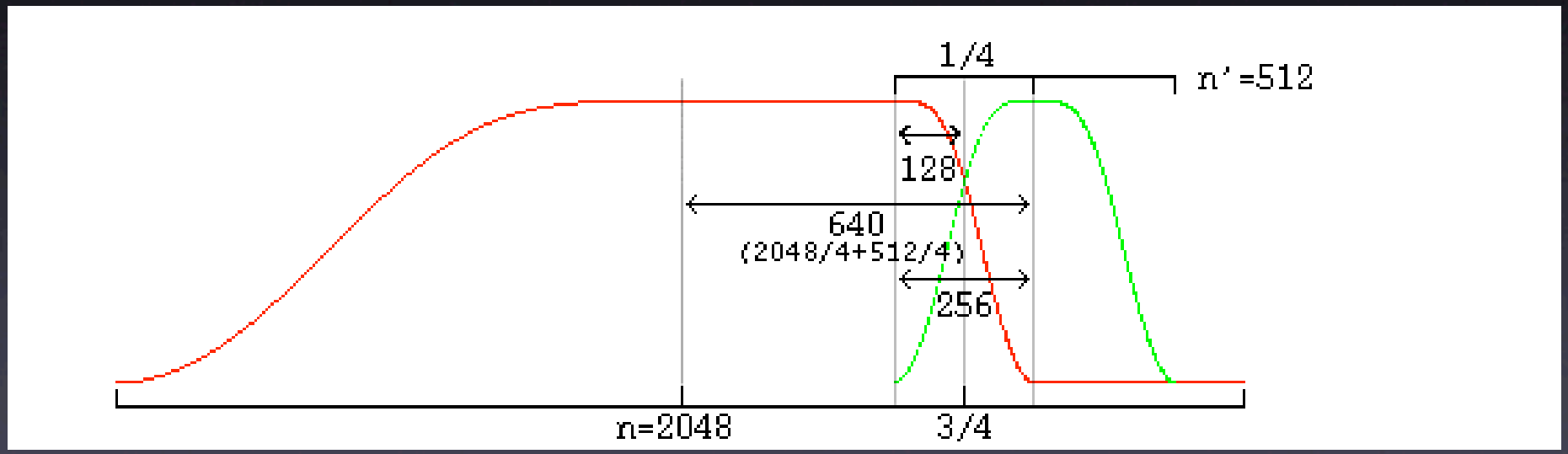
Vector Quantization



Variable Bit Rate

- Different sized windows used depending on audio content
- Can change window sizes on the fly (supported by MDCT)
- Better overall compression ratio

Variable windows



Performance

- Works well at high bitrates
- Apparently less well at low bitrates
- About the same amount of work to decode as MP3
- Smaller file sizes for the same bitrate

Licensing

- Spec is public domain
- Library reference implementation under BSD
- All other code under LGPL

Licensing (cont'd)

- Anyone can implement spec for free
  - No patents = no royalties
- Must make acknowledgement if using their reference implementation
- Commercial apps allowed

Adoption

- Clients
  - Winamp
  - Real Helix Player
  - XMMS
  - Whamb
  - Quicktime plugin
- Used in video games

Xiph.org

- A suite of open multimedia standards
- A non-profit organization
- Recently received a Real Helix grant

Related Xiph Projects

- Icecast
- Speex
- Theora
- FLAC
- Iceshare

Conclusion

- Pros
  - Patent free
  - Open Source
  - Good performance
- Cons
  - Not nearly as well supported as MP3
- www.xiph.org