Constrained-Energy Lapped Transform (CELT) codec

draft-valin-celt-codec-01.txt
Very Low-Delay Coding

• Benefits
  • Reduces acoustic echo problems (even w/o AEC)
  • Enables new applications
    – Collaborative network music performances
    – Transparent network sound servers
  • Better loss robustness

• Challenges
  • Limited frequency resolution
  • Must minimize overhead in bit-stream
Technology

• Transform codec (MDCT-based)

• Central ideas
  • Coding (and constraining) the energy in each band explicitly so that the spectral envelope is preserved
  • Use of PVQ as spherical quantizer

• Uses range coding (1979)

• Pyramid Vector Quantization (1986)
Codec Landscape

Bitrate (kbps/channel)

Delay (ms)

Real-time (live)

Archival

Phone quality

High fidelity

Vorbis, AAC, MP3

G.729

SILK

Speex

G.722.1C

G.729.1

AMR-WB+

AAC-LD

CELT

> wideband

narrowband  wideband  > wideband
Quality

- Internal MUSHRA (ITU-R BS.1534) tests of development versions
Conclusion

- CELT is designed for very low delay, high quality speech and music
- Complementary to SILK
- Resources
  - http://www.celt-codec.org/
  - List: celt-dev@xiph.org
  - IRC: irc.freenode.net #celt