

ISO/IEC MPEG-4 Audio V2

Error Robustness tools

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What is Error Robustness in Audio all about?

- Useful especially for wireless applications:
 - Broadcasting
 - Music distribution
 - High quality conference systems
- Goal:
 - Best audio quality over error-prone channels with minimum redundancy



Error Robustness in MPEG-4

- One of the main requirements for Version 2 of the MPEG-4 audio standard
- Two approaches:
 - Channel coding: Error Protection (EP)
 - Source coding: Error Resilience (ER)

Error Protection (EP)

- Standard provides an EP tool which supports all version 2 audio codecs
- The EP tool makes available:
 - FEC using convolutional and block codes
 - A wide range of CRCs
 - Equal EP and unequal EP (UEP)
 - Fixed-length and variable-length frames
 - Minimal overhead for each configuration

Error Resilient Bitstream Payload

- UEP requests a subdivision of the bitstream into parts with different error sensitivities
- All MPEG-4 audio version 2 codecs support this subdivision:
 - ER AAC LC
 - ER AAC LTP
 - ER AAC scalable
 - ER TwinVQ
 - ER BSAC
 - ER AAC LD
 - ER HVXC
 - ER HILN
 - ER Parametric
 - ER CELP

Error Resilience (ER) Tools

- Error resilience tools are source coding related and thus codec specific
- Within MPEG-4 audio version 2, error resilience tools are provided for
 - Advanced Audio Coding (AAC)
 - BSAC (Bit-sliced Arithmetic Coding)

ER AAC Tools

- Huffman Codeword Reordering (HCR)
 - to avoid error propagation within spectral data
- Reversible Variable Length Code (RVLC)
 - to avoid error propagation within scale factor data
- Virtual Codebooks (VCB11)
 - to detect serious errors within spectral data

ER BSAC Mode

- Segmented Binary Arithmetic (SBA) Coding
 - to avoid error propagation within spectral data

Demonstration - ER AAC LC


- ER AAC LC 96kbit/s@32kHz stereo

 – clear channel

- Channel: BER=1e-2, burst length = 1ms

– Synchronization & concealment

 – no concealment
(limitation to -17dBfs)

 – muting

 – sophisticated

+ Error Protection & Error Resilience

 – EEP (overhead 11.1 %)

 – UEP & HCR & VCB11
(overhead 10.9 %)

Summary

- Error Robustness is important - vital for mobile applications!
- MPEG-4 audio provides a full range of error robustness tools within its version 2
- Error robustness performance has been proven by a formal MPEG verification test
- MPEG-4 audio offers attractive solutions, also for wireless applications

