Fraunhofer HHI

Appendix: Summary of Fraunhofer HHI's VCEG Contributions on preLPC

C. Helmrich, S. Pientka, J. Pfaff, H. Schwarz, D. Marpe, and T. Wiegand

Overview of HHI's preLPC related input docs to 79th VCEG meeting

- **CA11**: **Crosscheck report on Core Experiment 1 for preLPC in lossless waveform coding**
  - CE 1 effectively proposes combined use of H.BWC's existing **LPF and DCT** coding tools
  - Block prediction → **residual-sample linear prediction** → **DCT** (**LMS**) → entropy coding
  - Extended signalling, greater **flexibility**: *cgps_allow_prelpc_flag*, *prelpc_direction_flag*
  - Suggestions by crosscheckers (us) for more "minimally invasive" standard integration
    → most changes proposed in CE already **supported by H.BWC 5.0** draft decoder spec.

- **CA12**: Proposal for addressing suboptimality in entropy coding stage when using preLPC
  - Combination LPF+DCT, as in CE or H.BWC 5.0, uses **DCT-domain** entropy coding stage
  - Suggestion: lean modification to that stage to **better adapt to** LPF-residual **statistics**
    → HHI proposal for greater efficiency, **requires change to H.BWC** draft decoder spec.

VCEG-CA11: Crosscheck report on Core Experiment 1 on preLPC

- Crosscheckers' suggestions:
  - **Don't restrict LPF tool** when used with DCT coding (*prev_ch_flag*, *delta_coding_flag*)
  - No block flag, use existing code for linear predictor, incl. delta-time coding capability
  - **Context-code** new …*_direction_flag*, improve residual **flipping** approach (see below)
  - Separate encoder speedups from newly added technology, could be integrated later
  - Update ACoM cfg files to use **LMS_ORDER:8** instead of 32, like EMG specific cfg files

    → avoids **95% of code changes**, improves coding **efficiency**; slightly slower encoding

- Context-coding of all block-level flags so far → do the same for preLPC's *direction_flag*
  - Decoder: *binDec.decodeBin(getlpfDirectionFlagCtx())* instead of *binDec.decodeBinEP()*

    → allow using **less than 1 bit** for flag on average, especially when flag toggles rarely

VCEG-CA11: Crosscheck report on Core Experiment 1 on preLPC

- Overview, results:

Lossless, Joint Channel Coding (JCC) over H.BWC 5

Dataset, Condition	Compression Ratio	Enc.Time Ratio	Dec.Time Ratio	Worst Case
CTC, CE proponent	0.13%	109%	99%	0.73%
ACoM, CE proponent	–1.00%	86%	109%	0.13%
CTC, crosscheckers	0.13%	110%	99%	0.73%
ACoM, crosscheckers	–0.97%	100%	109%	0.13%
CTC, **improvement**	**–0.12%**	124%	99%	0.00%
ACoM, **improvement**	–2.67%	117%	117%	0.01%
CTC, **impr. + CA12**	**–0.13%**	**122%**	98%	**0.00%**
ACoM, **impr. + CA12**	–2.95%	**112%**	97%	–0.01%

Lossless, Indep. Channel Coding (ICC) over H.BWC 5

Dataset, Condition	Compression Ratio	Enc.Time Ratio	Dec.Time Ratio	Worst Case
CTC, CE proponent	0.01%	129%	96%	0.15%
ACoM, CE proponent	–0.86%	62%	109%	0.13%
CTC, crosscheckers	0.01%	134%	99%	0.15%
ACoM, crosscheckers	–0.83%	72%	109%	0.14%
CTC, **improvement**	**–0.22%**	119%	100%	0.01%
ACoM, **improvement**	–2.83%	114%	118%	0.01%
CTC, **impr. + CA12**	**–0.32%**	**117%**	98%	**0.00%**
ACoM, **impr. + CA12**	–3.12%	**110%**	98%	–0.01%