Harmonization of H.BWC for LMS Prediction in the transform domain

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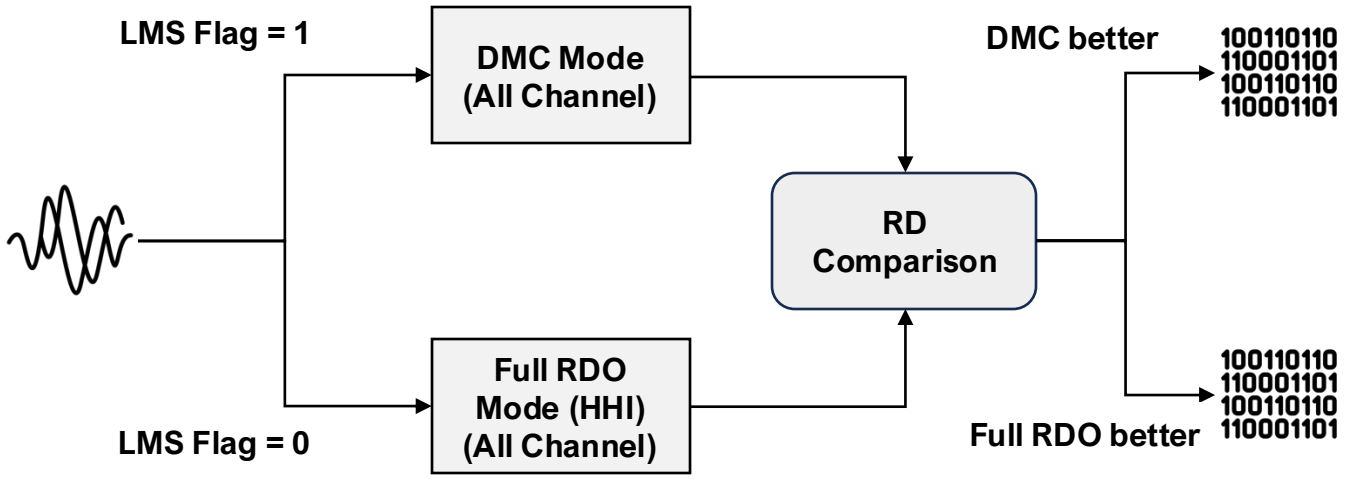
ETRI
Electronics and Telecommunications Research Institute

Sooyoung Park, Byeongho Jo, Jongmo Sung, Seungkwon Beack

TM2.1

- Encoding Process



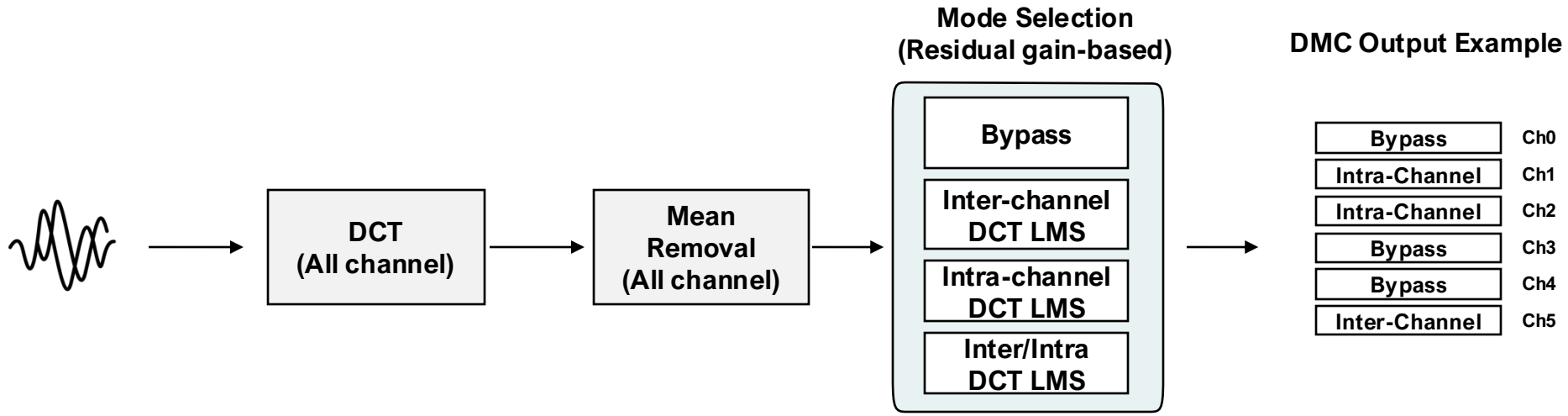
All channels are coded by DMC Mode

Each channel is coded using RDO with combined prediction and transform modes.

ECG: Block size < 512, Others: <1024

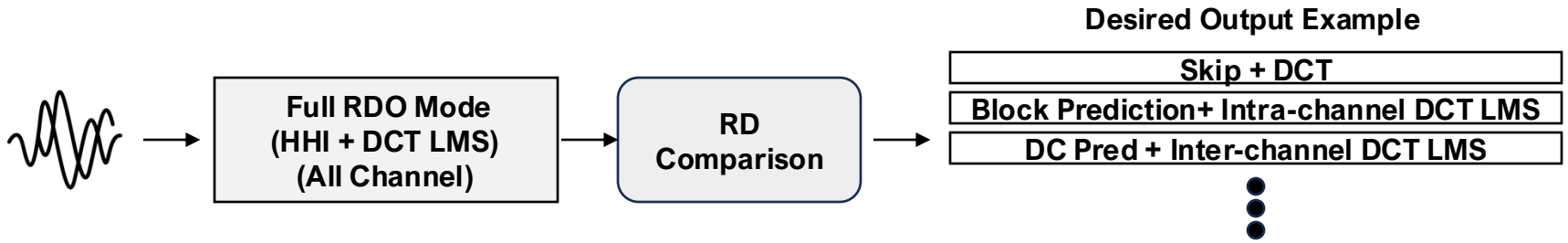
DMC Mode

- Encoding Process in DMC Mode



Harmonization Suggestion

- Integrating DMC into Full RDO Loop
  - Mode separation results in sub-optimal optimization
    - Ideally, optimal coding efficiency can be achieved by integrating DMC candidates directly into the Full RDO search loop for joint RD optimization.

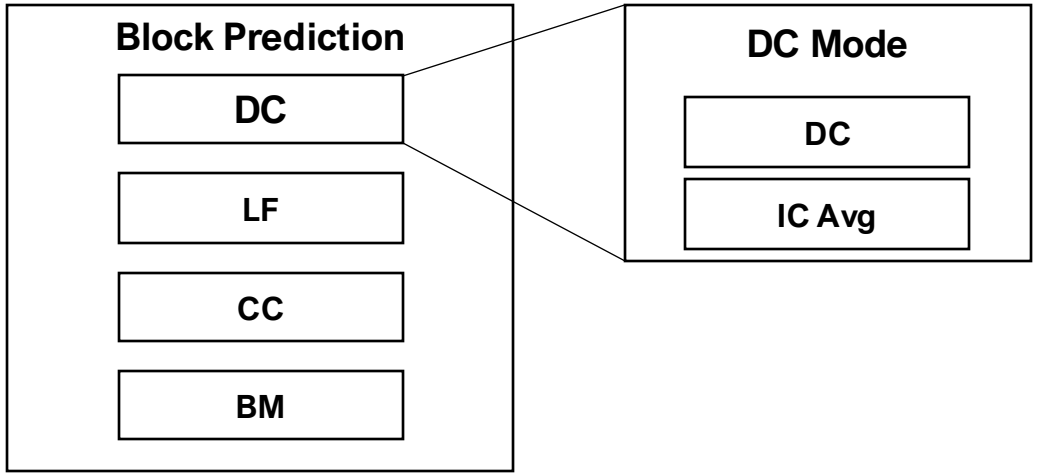


Harmonization Suggestion

- Expected Problems
  - Redundancy in Bypass Mode
    - Equivalent to Skip “Mode + DCT Transform” in full RDO loop
  - CABAC for DMS coding scheme is needed
    - VCEG-BX14 can solve this problem
  - Computation Inefficiency Issue
    - Encoding: DMC Mode needs DCT buffer for Inter-Channel DCT LMS (IC_LMS_DCT)
      - + DCT buffer control computation in RDO loop
    - Decoding: DMC Mode needs DCT buffer for IC_LMS_DCT
      - + DCT buffer control computation even when IC_LMS_DCT is not selected for certain channel
    - LMS computation in RDO Loop
      - + LMS prediction for all prediction combination

Suggested Method

- IC-Average Mode under DC Prediction
  - Additional 1 bit for suggested method
  - Simplified version of IC_LMS_DCT

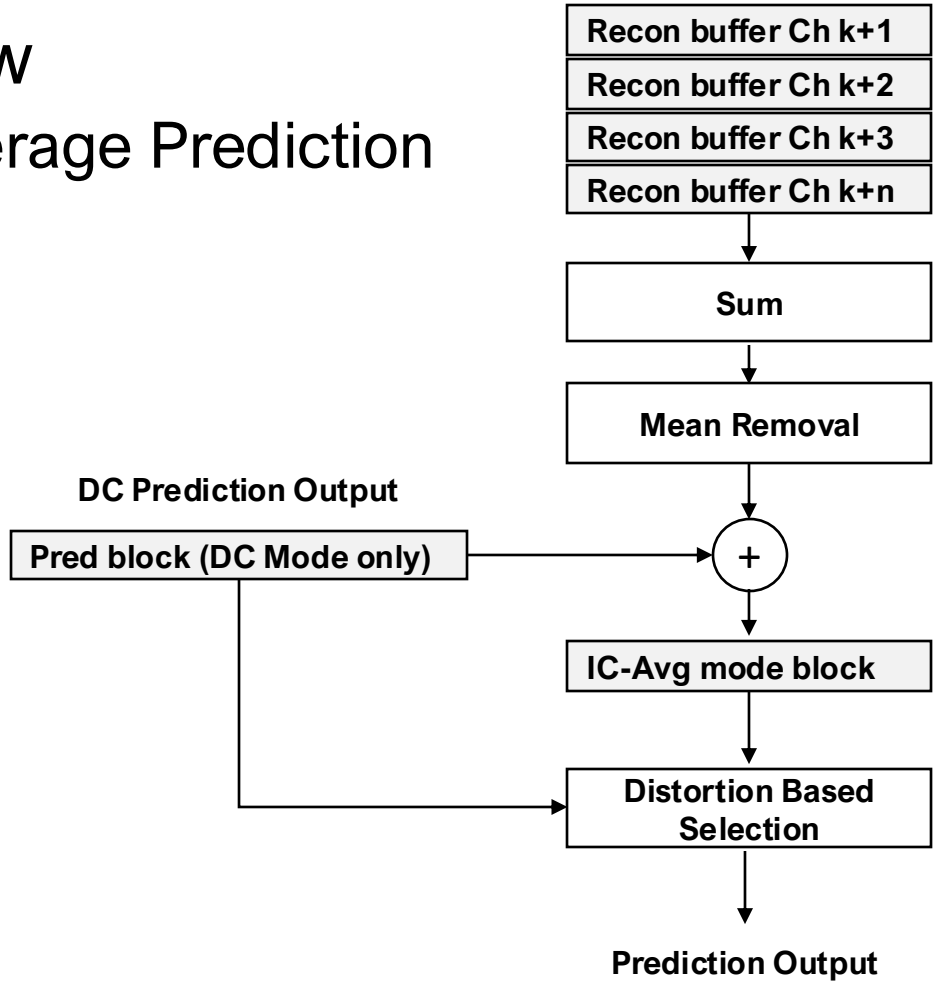


Suggested Method

- IC Average Prediction in DC Mode
  - Special case of IC_DCT_LMS
    - LMS Coefficient = 1/Num_Channels
    - Skip LMS coefficient update computation for Inter-channel DCT LMS prediction
  - Average of DCT signals is equivalent to average of temporal signal
    - - DCT buffer control computation for Encoding / Decoding
  - Mean removal can be easily adopt using DC Mode results
  - AR_DCT_LMS can be used in the RDO loop without DCT buffer control

Suggested Method

- Overview
  - IC Average Prediction



Experiment Setup

- HHI Works Only Short Block Size
  - Currently for long block size use only DMC mode
    - Proposed method is working on only in Full RDO loop
    - Long block (EEG/EMG: > 512, ECG: > 256)
- Two Evaluation on Full Development Dataset
  - Evaluation on TM with CTC
    - Long block as it is (original DMC mode only works)
  - Evaluation on short block only
    - LOG2_MAX_BLOCK_SIZE: 9 (originally 11)
    - MAX_SPLIT_DEPTH: 1 (originally 3)
    - MIN_SPLIT_DEPTH_FULL_TEST: 0 (originally 2)

Evaluation on TM with CTC

	BD-rate1 (%)	BD-rate2 (%)	ΔEncT(%)	ΔDecT(%)
MIT_ECG_Dataset	0.624	0.621	**84.8**	**99.5**
Ozdemir EMG	**-0.100**	**-0.099**	**85.0**	**94.6**
CHBMIT_EEG	**-0.097**	**-0.108**	**91.4**	104.6

* Propose method use Long block (EMG,EEG: > 512, ECG: > 256) as it is (Original DMC works)

Evaluation on Short Block Only

	BD-rate1 (%)	BD-rate2 (%)	ΔEncT(%)	ΔDecT(%)
Ozdemir EMG	**-0.012**	**-0.013**	**84.3**	100.5
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LOG2_MAX_BLOCK_SIZE: 9 (originally 11)
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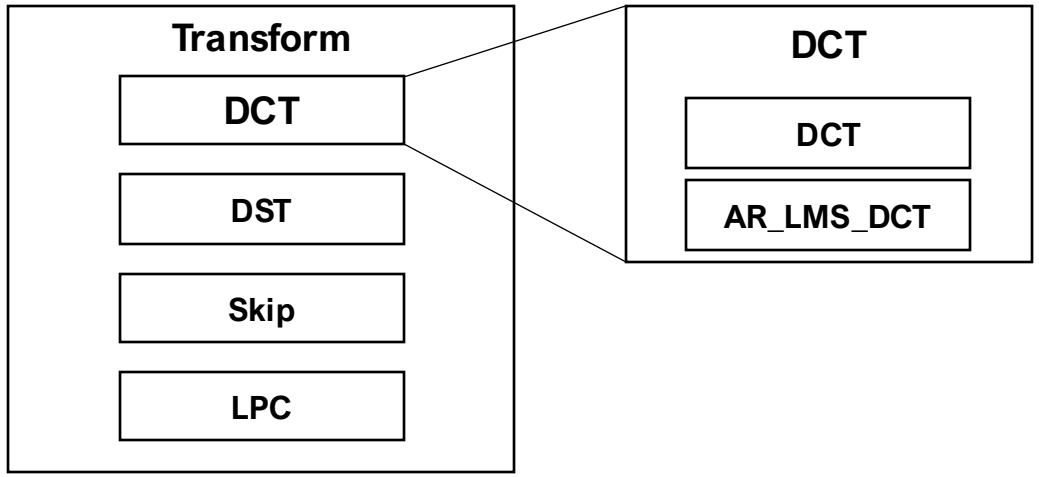
* ECG for short block excluded due to encoding error (Error: Step size 1.0 should be lossess)

Suggestion for Full Harmonization

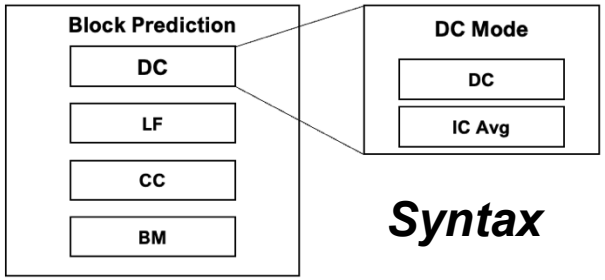
- AR_LMS_DCT under DCT Transform
  - Additional 1 bit for suggested method



Thanks for your attention!

IC_DCT_LMS into Full RDO Loop

- Inter-Channel Average Mode
  - Simplified version of IC_DCT_LMS (fixed coefficient)
  - Additional 1 bit under DC_Pred mode



Syntax

Evaluation on TM with CTC

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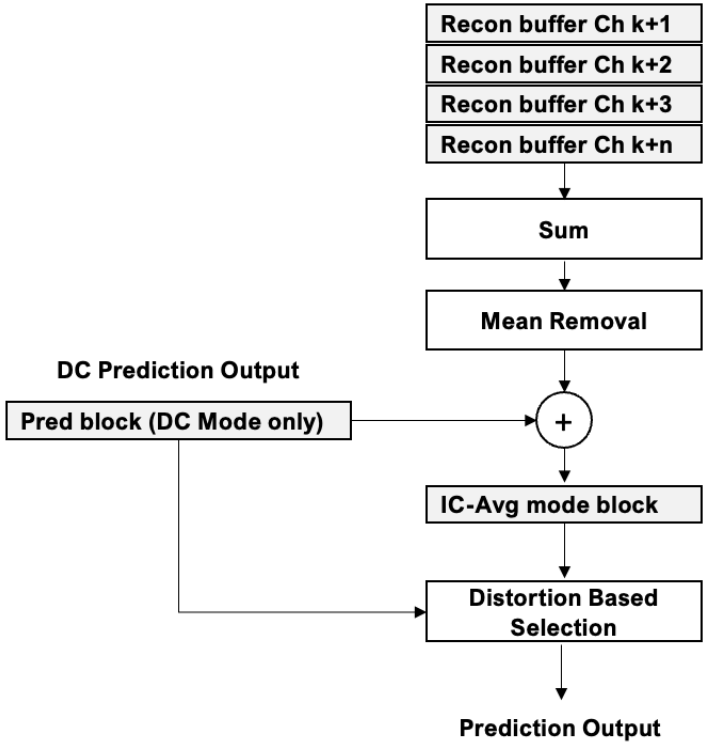

Overview