JCTVC-B025: Intra-prediction with Adaptive Sub-sampling
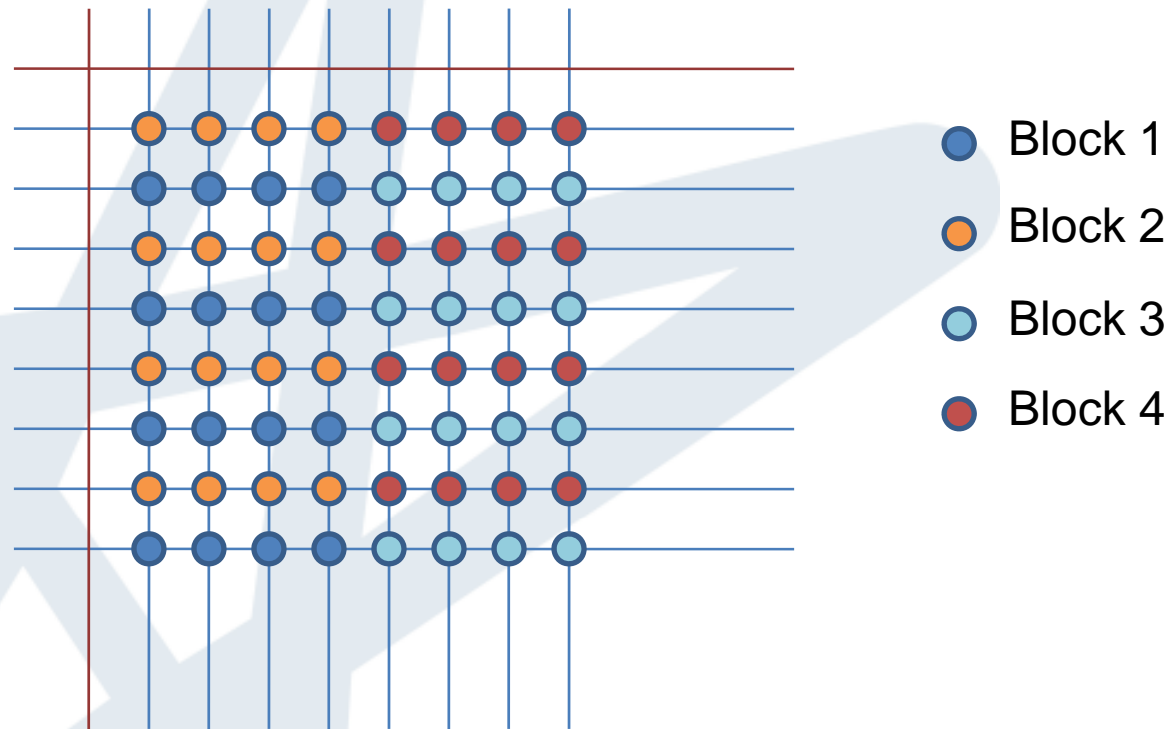
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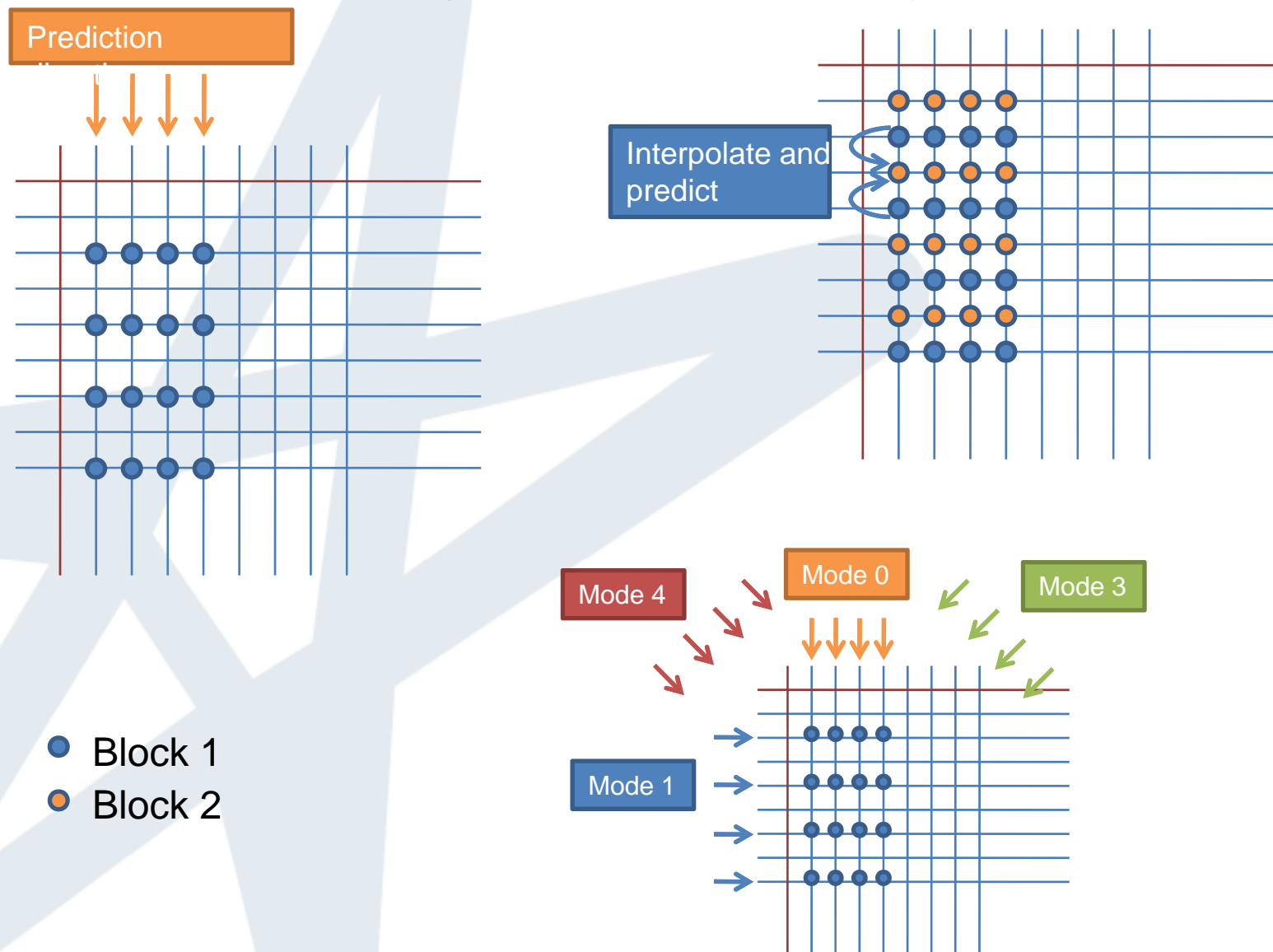Institute for Infocomm Research

Motivation

- Not all pixels can be predicted from reconstructed pixels that are located close to themselves due to the use of block transforms

- Proposed intra-prediction modes designed with the goal of improving prediction performance by:
  - Adaptively partitioning the prediction unit
  - Parts of the prediction unit are coded and reconstructed and then used for prediction by remaining parts
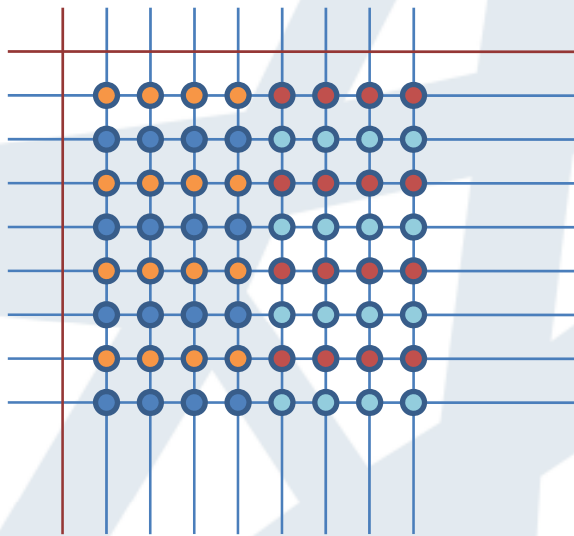
Adaptive Sub-sampling (MODE 1: VER)

- Block 1
- Block 2
- Block 3
- Block 4

Block 1-4 share one prediction mode

Illustration: Adaptive Sub-sampling (MODE 1: VER)

Prediction

Interpolate and predict

Mode 4 Mode 0 Mode 3
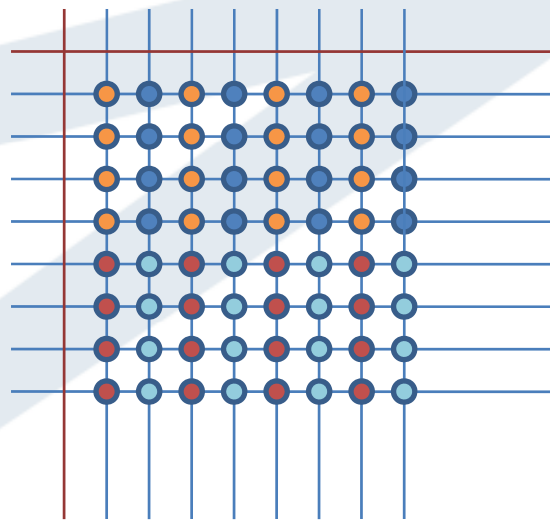
Mode 1

● Block 1
● Block 2

Prediction modes

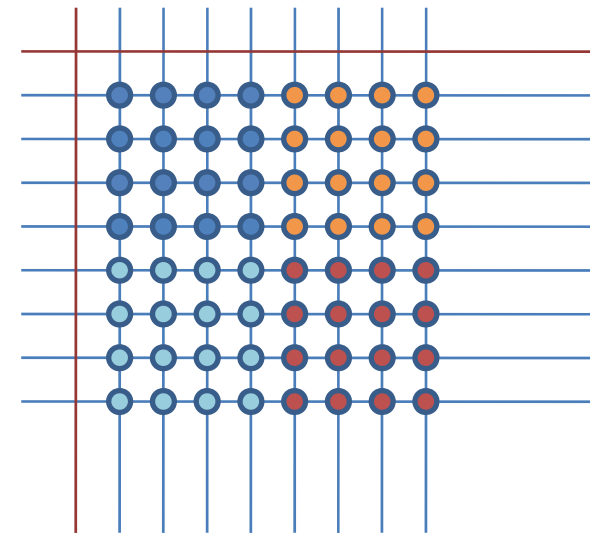- Block 1
- Block 2
- Block 3
- Block 4

sub-sample mode 1
(vertical sub-sampling)

sub-sample mode 2
(horizontal sub-sampling)

sub-sample mode 3

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Implementation

- JM-KTA (JM11.0KTA2.6r1)
- New prediction modes introduced as new 8x8 modes
- a **sub_sample_mode** flag signals to the decoder which of the 4 possible modes (sub-sample mode 1-3 and the existing 8x8 prediction mode)
- **Intra8x8PredMode** flag signals which of the 9 intra-prediction modes is used
- MB-level **sub_sample_flag** signals whether any of the 4 8x8 blocks in the MB is coded with one of the proposed sub-sample modes
- All previously available intra modes (4x4, 8x8, 16x16) considered during RDO

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Experiment

- RDOQ and ALF turned on
- frames are sampled at approximately 1s interval and coded as intra

Results

	BD-Rate (%)	BD-PSNR (dB)
PeopleOnStreet	-2.92	0.17
Traffic	-2.27	0.12
Average for Class A	**-2.60**	**0.14**
BasketballDrive	-2.09	0.07
BQTerrace	-1.59	0.10
Cactus	-2.03	0.09
Kimono1	-0.66	0.03
ParkScene	-2.13	0.10
Average for Class B	**-1.70**	**0.08**
BasketballDrill	-2.93	0.15
BQMall	-2.45	0.14
PartyScene	-1.36	0.11
RaceHorses	-1.61	0.10
Average for Class C	**-2.09**	**0.13**
BasketballPass	-2.15	0.13
BlowingBubbles	-1.55	0.12
BQSquare	-1.31	0.11
RaceHorses	-1.61	0.10
Average for Class D	**-1.66**	**0.12**
vidyo1	-2.39	0.13
vidyo3	-1.86	0.11
vidyo4	-2.03	0.10
Average for Class E	**-2.09**	**0.11**

Average gain of about 2%

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Conclusion

- Recommend that the proposal be studied within a core experiment
  - To study the performance of the prediction scheme when applied on other prediction unit sizes
  - To study the benefits of the scheme when prediction unit is larger than the maximum transform size

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