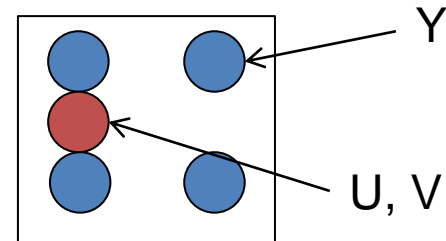# JCTVC-C040
Chroma intra prediction using reconstructed luma

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Background

- Video typically coded in YUV
  - Attempt to de-correlate luma and chroma components

- Chroma sub-sampling is often used
  - Human visual system less sensitive to chroma
  - High frequency components concentrated in luma component
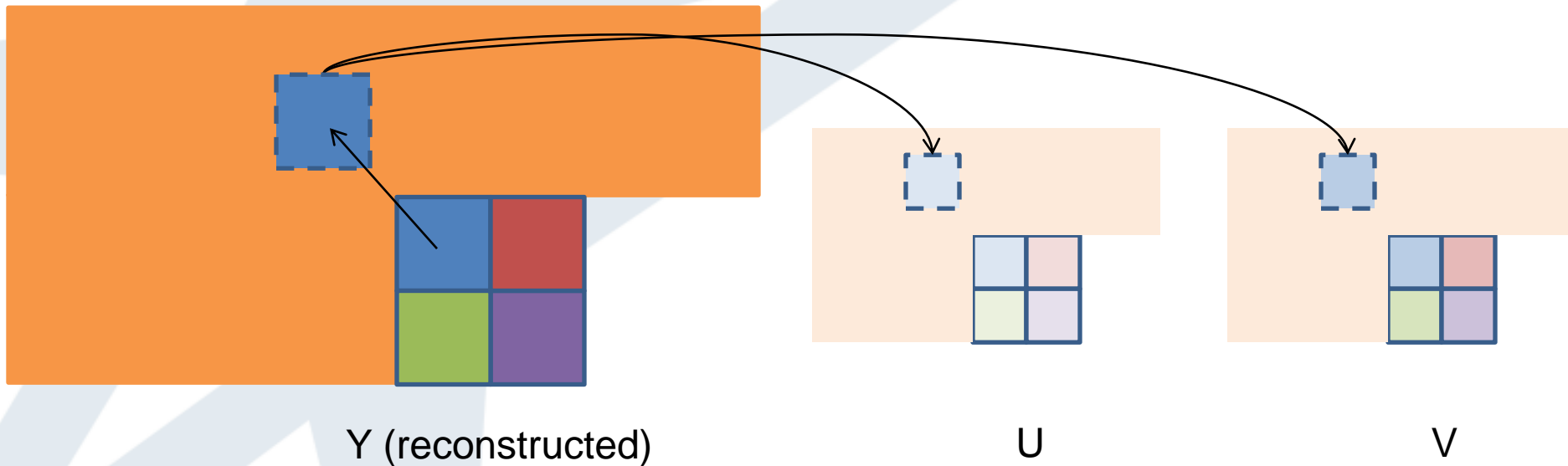 - 4:2:0 is commonly used

Current chroma coding in TMuC

- Prediction
  - DC, Vertical, Horizontal, Plane, Signaled luma prediction mode
- Transform Coding
- Entropy Coding

Proposed Approach

- Use corresponding reconstructed *NxN* luma block as a template to search for *N/2xN/2* chroma block to use as prediction

Y (reconstructed)   U   V

- Follow signaled transform quad-tree

Further refinements

- Average *N* predictors from top matches
  - N=4
- Half-pel accurate template matching in chroma-domain
  - Corresponds to full-pel search in luma
  - Bi-linear interpolation used to generate half-pel accurate chroma predictors

Advantages

- Only one search to predict both U and V
- Half-pel resolution search at little extra cost since luma is already double the resolution

Simulations

- Implemented in TMuC 0.7
  - Proposed mode is available as another chroma intra prediction mode
- Use JCTVC-B300 test conditions
  - Intra high efficiency
  - Random access high efficiency

I²R
A★STAR

Summary of results – Intra

Sequences Class	Y BD-Rate (%)	U BD-Rate(%)	V BD-Rate(%)
Class A	-0.4	-2.8	-2.8
Class B	-0.5	-2.5	-2.7
Class C	-0.8	-2.3	-2.7
Class D	-0.3	-1.4	-1.6
Class E	-0.1	-1.9	-2.2
All	-0.5	-2.1	-2.4

I²R
A*STAR

Summary of results – Random access

Sequences Class	Y BD-Rate (%)	U BD-Rate(%)	V BD-Rate(%)
Class A	-0.2	-2.7	-3.1
Class B	-0.2	-2.8	-2.8
Class C	-0.3	-1.8	-2.0
Class D	-0.1	-1.2	-1.2
All	-0.2	-2.1	-2.2

Complexity

Coding Configuration	Encoding Time (%)	Decoding Time (%)
Intra high efficiency	186	295
Random access high efficiency	108	124

Conclusions

- Proposed new intra prediction method for chroma components
    - Exploits availability of reconstructed luma pixels
    - Achieve 2.3% average bit-rate reduction in chroma coding
    - More impact expected for 4:2:2 or 4:4:4 chroma sub-sampling
- Recommend for study in CE/TE