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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  5th Meeting: Geneva, CH, 16-23 March, 2011 | Document: JCTVC-Exxx |

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| *Title:* | **CE6: Summary Report of Core Experiments for Intra Prediction** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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# Abstract

This contribution provides a summary of Core Experiment 6, Intra Prediction Improvements. From a total of 9 proposed CEs 8 had been cross-checked with full match by at least on organization. For cross checking, the recommended test conditions of intra-only were used for both high compression efficiency and low complexity as defined in the document JCTVC-D606.

# Introduction

Intra prediction improvement core experiments was divided into 7 categories

1. CE6.a: Block Based Intra Prediction
2. CE6.b: Short Distance Intra Prediction
3. CE6.c: Edge Based Intra Prediction
4. CE6.d: Parallel Intra Coding
5. CE6.e: Planar Intra Prediction
6. CE6.f: Intra Smoothing
7. CE6.g: Number of Intra Prediction Directions

Table 1 summarizes the technologies tested together with the list of the proponents and cross-checkers:

|  |  |  |  |
| --- | --- | --- | --- |
| Core Experiments | Technology | Proponent | Cross-checker(s) |
| CE6.a |  |  |  |
| CE6.b |  |  |  |
| CE6.c | Differential coding of intra modes (DCIM) | Sharp & Sony& Panasonic& Toshiba  JCTVC-C169, JCTVC-C176  JCTVC-D279, JCTVC-Exxx | Qualcomm JCTVC-Exxx  Sejong University JCTVC-Exxx  NHK JCTVC-E077 |
| CE6.d | Parallel Intra Coding | Sharp Labs. of America  JCTVC-B112, JCTVC-D074  JCTVC-Exxx | Toshiba JCTVC-Exxx |
| CE6.e |  |  |  |
| CE6.f |  |  |  |

# Summary of Experimental Results

## Coding Efficiency

### CE6.a

### CE6.b

### CE6.c

Table 2: DCIM with BiPred

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -0.7 | -0.5 | -0.3 | -1.0 | -0.2 | -0.3 |
| Class B | -1.3 | -0.9 | -1.0 | -1.2 | -1.3 | -1.5 |
| Class C | -1.8 | -1.5 | -1.8 | -2.2 | -1.9 | -2.1 |
| Class D | -1.3 | -0.9 | -1.0 | -1.7 | -1.3 | -1.4 |
| Class E | -1.8 | -1.7 | -1.6 | -2.3 | -0.5 | -0.9 |
| All | -1.4 | -1.1 | -1.1 | -1.6 | -1.1 | -1.3 |
| Enc Time[%] | 107% | | | 112% | | |
| Dec Time[%] | 103% | | | 108% | | |

Table 3: DCIM without BiPred

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -0.5 | -0.2 | -0.1 | -0.3 | 0.1 | 0.1 |
| Class B | -1.0 | -0.8 | -0.9 | -0.3 | -0.7 | -1.0 |
| Class C | -1.5 | -1.3 | -1.6 | -1.2 | -1.2 | -1.5 |
| Class D | -1.0 | -0.7 | -0.7 | -0.7 | -0.6 | -0.8 |
| Class E | -1.5 | -1.4 | -1.4 | -1.0 | 0.2 | -0.2 |
| All | -1.1 | -0.8 | -0.9 | -0.7 | -0.5 | -0.7 |
| Enc Time[%] | 110% | | | 111% | | |
| Dec Time[%] | 103% | | | 107% | | |

Table 4: DCIM with BiPred + Planar

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -1.1 | 1.1 | 1.4 | -1.4 | 0.4 | 0.8 |
| Class B | -2.1 | -0.3 | -0.2 | -1.7 | -1.2 | -1.0 |
| Class C | -2.2 | -0.6 | -0.6 | -2.6 | -1.8 | -1.9 |
| Class D | -1.9 | -0.1 | 0.1 | -2.1 | -1.3 | -1.3 |
| Class E | -2.8 | -0.9 | -0.3 | -2.9 | -0.4 | -0.9 |
| All | -2.0 | -0.1 | 0.1 | -2.1 | -0.9 | -0.9 |
| Enc Time[%] | 109% | | | 113% | | |
| Dec Time[%] | 105% | | | 111% | | |

Table 5: DCIM without BiPred + Planar

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -1.0 | 1.2 | 1.4 | -0.9 | 0.7 | 1.1 |
| Class B | -2.0 | -0.3 | -0.2 | -1.0 | -0.9 | -0.7 |
| Class C | -2.1 | -0.6 | -0.5 | -1.7 | -1.3 | -1.4 |
| Class D | -1.8 | 0.0 | 0.1 | -1.4 | -0.8 | -0.9 |
| Class E | -2.7 | -0.8 | -0.1 | -2.0 | 0.0 | -0.4 |
| All | -1.9 | -0.1 | 0.1 | -1.4 | -0.5 | -0.5 |
| Enc Time[%] | 109% | | | 112% | | |
| Dec Time[%] | 104% | | | 109% | | |

### CE6.d

Table 6: Parallel Intra prediction for 2X parallelism

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | 0.4 | 0.3 | 0.3 | 0.5 | 0.4 | 0.3 |
| Class B | 0.4 | 0.2 | 0.3 | 0.6 | 0.3 | 0.3 |
| Class C | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Class D | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Class E | 0.7 | 0.4 | 0.4 | 1.0 | 0.5 | 0.5 |
| All | 0.3 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 |
| Enc Time[%] | 103% | | | 106% | | |
| Dec Time[%] | 101% | | | 104% | | |

Table 7: Parallel Intra prediction for 8X parallelism

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | 0.4 | 0.3 | 0.3 | 0.5 | 0.4 | 0.3 |
| Class B | 0.5 | 0.3 | 0.3 | 0.7 | 0.4 | 0.4 |
| Class C | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Class D | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Class E | 0.8 | 0.5 | 0.4 | 1.0 | 0.5 | 0.5 |
| All | 0.3 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 |
| Enc Time[%] | 103% | | | 106% | | |
| Dec Time[%] | 101% | | | 104% | | |

### CE6.e

### CE6.f

# Conclusion

# References

1. Gisle Bjøntegaard, “Calculation of Average PSNR Differences between RD curves”, ITU-T SG16/Q6, 13th VCEG Meeting, Austin, Texas, USA, April 2001, Doc. VCEG-M33.
2. F. Bossen, “Common conditions and software reference configurations”, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, JCTVC-D600, 4th Meeting: Daegu, KR, Jan., 2011.