|  |  |
| --- | --- |
| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  3rd Meeting: Guangzhou, CN, 7-15 October, 2010 | Document: JCTVC-C172  WG11 Number: m18201 |

|  |  |  |  |
| --- | --- | --- | --- |
| *Title:* |  | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
| *Author(s) or Contact(s):* | Ali Tabatabai | Tel: +1-408-352-4715 Email:ali.tabatabai@am.sony.com |  |
| *Source:* | TE06 Coordinator | | |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Abstract

This contribution is a summary of Tool Experiment 6, Intra Prediction Improvements. Nine Organizations participated in cross checking of 5 out of 6 toolsets. For cross checking we used the recommended test conditions of intra-only prediction mode for both high compression efficiency and low complexity as defined in the document B306\_r3 [1].

Introduction

T06 is organized in 3 tool subsets:

## TE06.a: Bidirectional Intra Prediction

Proposed tools in this tool subset are:

1. JCTVC-B042 (Toshiba): Weighted Bidirectional Prediction (WBP) and Adaptive Sub-block Coding Order (ASCO)
2. JCTVC-B040 (Huawei and Hisilicon): Short Distance Intra Prediction Using Correlation between Lines & Pixels
3. JCTVC-A109 (MediaTek): Overlapped Block Intra Prediction (OBIP), Multiple Model Karhunen Loeve Transform (MMKLT), Context Dependent Mode Representation (CDMR)
4. JCTVC-A118 (Microsoft): Line/Pixel Based Prediction Modes

## TE06.b: Edge Based Intra Prediction

1. JCTVC-B109 (Sony): Differential Coding of Intra Prediction Mode

## TE06.c: Parallel Intra Coding

1. JCTVC-B112 (Sharp Labs. of America)

# Cross Verification

A summary Table of proponents, cross-checking organizations and related documents is here:

|  |  |  |
| --- | --- | --- |
| Tool | Proponent | Cross-checker(s) |
| TE6.a.1 | Toshiba  JCTVC-C07, m18102 | Renesas (JCTVC-C187)  Sharp (JCTVC-C179) |
| TE6.a.2 | Huawei, Hisilicon  JCTVC-C101, m18124 | DOCOMO (JCTVC-C045, m18066)  LGE (JCTVC-C028, m18039)  Microsoft (JCTVC-C27, m18314)  Ericsson (JCTVC-C157, m18183) |
| TE6.a.3 | MediaTek (OBIP)  JCTVC-C193 | Microsoft (JCTVC-C272, m18315) |
| TE6.a.4 | Microsoft  JCTVC-C270 | Huawei (JCTVC-C139, m18163)  DOCOMO (JCTVC-C045, m18066) |
| TE6.b.1 | Sony  JCTVC-C169, m18198 | Sharp (JCTVC-C175, m18204)  Panasonic (JCTVC-C217, m18257) |

# Experimental Results

Table : TE6.a.1 BD Rate Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -2.7 | -2.1 | -2.1 | -2.5 | -1.8 | -1.6 |
| Class B | -2.1 | -1.4 | -1.4 | -2.1 | -1.3 | -1.2 |
| Class C | -1.9 | -1.5 | -1.4 | -2.4 | -1.5 | -1.4 |
| Class D | -2.0 | -1.4 | -1.4 | -2.4 | -1.4 | -1.4 |
| Class E | -2.2 | -2.0 | -1.9 | -2.5 | -2.2 | -2.2 |
| All | -2.1 | -1.6 | -1.6 | -2.3 | -1.6 | -1.5 |
| Enc Time[%] | 94% | | | 100% | | |
| Dec Time[%] | 101% | | | 104% | | |

Table : TE6.a.2 BD Rate Summary

|  |  |  |  |
| --- | --- | --- | --- |
|  | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate |
| Class A | -0.4 | -0.1 | -0.5 |
| Class B | -0.6 | 0.2 | -0.2 |
| Class C | -1.3 | 0.1 | -0.3 |
| Class D | -1.3 | -0.3 | -0.5 |
| Class E | -0.9 | -1.0 | -0.9 |
| All | -0.9 | -0.2 | -0.4 |
| Enc Time[%] |  | | |
| Dec Time[%] | 103% | | |

Table : TE6.a.3 BD Rate Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 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 | -1.6 | -1.8 | -1.2 | -1.1 |
| Class B | -0.8 | -0.6 | -0.7 | -1.4 | -0.8 | -0.8 |
| Class C | -1.1 | -0.7 | -0.7 | -1.8 | -1.0 | -0.8 |
| Class D | -1.2 | -0.5 | -0.6 | -1.7 | -0.9 | -0.8 |
| Class E | -0.7 | -1.2 | -0.6 | -1.7 | -0.3 | -0.8 |
| All | -1.0 | -0.8 | -0.7 | -1.7 | -0.8 | -0.8 |
| Enc Time[%] |  | | |  | | |
| Dec Time[%] |  | | |  | | |

Table : TE06.a.4 BD Rate Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -1.3 | -0.6 | -0.7 | -1.2 | -0.4 | -0.6 |
| Class B | -2.3 | -1.0 | -0.9 | -2.4 | -0.6 | -0.8 |
| Class C | -2.7 | -1.1 | -1.3 | -3.3 | -1.1 | -1.2 |
| Class D | -2.1 | -0.9 | -0.9 | -2.7 | -0.8 | -0.8 |
| Class E | -1.9 | -0.7 | -0.6 | -1.9 | -1.2 | -1.1 |
| All | -2.1 | -0.9 | -0.9 | -2.4 | -0.8 | -0.9 |
| Enc Time[%] | 172% | | | 229% | | |
| Dec Time[%] | 208% | | | 301% | | |

Table : TE6.b.1 BD Rate Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -0.8 | 1.2 | 1.7 | ~~2.3~~ | ~~0.9~~ | ~~2.8~~ |
| Class B | -1.9 | 0.2 | 0.5 | ~~3.9~~ | ~~2.9~~ | ~~3.9~~ |
| Class C | -2.5 | -0.5 | -0.6 | ~~-0.1~~ | ~~-2.5~~ | ~~-2.2~~ |
| Class D | -1.4 | 0.4 | 0.0 | ~~0.2~~ | ~~-2.4~~ | ~~-2.7~~ |
| Class E | -2.3 | 1.9 | 1.2 | ~~1.8~~ | ~~8.6~~ | ~~6.2~~ |
| All | -1.9 | 0.5 | 0.4 | ~~1.7~~ | ~~1.2~~ | ~~1.4~~ |
| Enc Time[%] | 214% | | | ~~191%~~ | | |
| Dec Time[%] | 62% | | | ~~48%~~ | | |

Note that proponent of TE6.b.1 have informed that the results on intra low complexity configuration is affected by a VLC bug when MDDT is turned off (Ticket #79). The bug fix has recently been incorporated into the implementation and tests are being redone. The results for intra low complexity configuration will thus be updated in Document JCTVC-C169 in this meeting.

# Visual Evaluation

No independent visual information was reported

# Conclusion

Performance of 5 toolsets have been independently cross verified. These new intra prediction tools are showing potential for further investigation and incorporation into Test Model.

# References

1. Ali Tabatabai, “Tool Experiment 6: Intra Prediction Improvement”, Doc. JCTVC-B306\_r3, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, Geneva, Switzerland, July 2010.