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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  9th Meeting: Geneva, 27/04~07/05, 2012 | Document: JCTVC-I0429 |

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| *Title:* | **Cross-check of JCTVC-I0268: Quantization matrices for 4x4 DSTs in HEVC** | | | |
| *Status:* | Input Document to JCT-VC | | | |
| *Purpose:* | Informational | | | |
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| *Source:* | MediaTek USA Inc. | | | |

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# Abstract

This document reports the test results of JCTVC -I0268: Quantization matrices for 4x4 DSTs in HEVC from Motorola Mobility. The proposed techniques have been studied. The provided software has been checked, compiled and the results reported by the proponents can be confirmed.

1. Introduction of the proposed methods

Quantization matrices are designed to achieve higher compression ratio by utilizing the characteristics of human visual system. Many video coding standards offer the default quantization matrix, or matrices, designed based upon the specific transform(s) defined in those standards.

In the current HEVC, 4x4 discrete sine transform (DST) is adopted for some Intra prediction modes. The human visual system based quantization matrix for the 4x4 DCT is used for the 4x4 DSTs also. JCTVC-I0268 proposes new default quantization matrices for the 4x4 DSTs in HEVC.

Table 1 Proposed quantization matrix for 4x4 Intra TUs with 1D vertical DST and 1Dhorizontal DCT in HEVC

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 8 | 7 | 8 |
| 13 | 13 | 12 | 14 |
| 19 | 21 | 29 | 36 |
| 25 | 30 | 47 | 78 |

Table 2 Proposed quantization matrix for 4x4 Intra TUs with 1D vertical DCT and 1D horizontal DST in HEVC

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 13 | 19 | 25 |
| 8 | 13 | 21 | 30 |
| 7 | 12 | 29 | 47 |
| 8 | 14 | 36 | 78 |

Table 3 Proposed quantization matrix for 4x4 Intra TUs with 1D vertical DST and 1D horizontal DST in HEVC

|  |  |  |  |
| --- | --- | --- | --- |
| 5 | 7 | 8 | 10 |
| 7 | 12 | 15 | 17 |
| 8 | 15 | 29 | 43 |
| 10 | 17 | 43 | 87 |

# Experimental Results

Simulations were conducted following common test conditions defined in JCTVC-H1100 [1] with the following modifications.

QuadtreeTULog2MaxSize : 2

QuadtreeTUMaxDepthInter : 1

QuadtreeTUMaxDepthIntra : 1

RDOQ : 0

ScalingList : 1

Anchor data was generated using HM6.0 software [2]. Results produced by current software implementation are reported in the following table. In the JCTVC-I0268 software, one macro has been introduced to integrate the proposed methods:

* DST\_QUANT\_MAT

Table 4 reports the results.

Table 4. Results with the proposed methods

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **All Intra Main** | | | **All Intra HE10** | | |
|  | Y | U | V | Y | U | V |
| Class A | 10.9% | 29.7% | 30.6% | 11.0% | 30.2% | 31.0% |
| Class B | 9.6% | 38.4% | 38.8% | 9.3% | 38.5% | 38.4% |
| Class C | 8.0% | 31.8% | 31.7% | 8.2% | 31.0% | 31.1% |
| Class D | 7.8% | 27.8% | 27.9% | 8.0% | 27.3% | 27.2% |
| Class E | 7.8% | 45.8% | 45.5% | 8.3% | 45.8% | 44.4% |
| **Overall** | 8.9% | 34.3% | 34.6% | 9.0% | 34.2% | 34.1% |
|  | 8.9% | 34.3% | 34.6% | 9.0% | 34.2% | 34.0% |
| Class F | 7.3% | 24.3% | 24.4% | 7.6% | 23.9% | 24.3% |
| Enc Time[%] | 107% | | | 106% | | |
| Dec Time[%] | 103% | | | 102% | | |

# References

1. Frank Bossen, “Common test conditions and software reference configurations”, JCTVC-H1100, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T VCEG and ISO/IEC MPEG, San Jose, USA, Feb 2012.
2. HM 6.0 Software, <http://hevc.kw.bbc.co.uk/trac/browser/tags/HM-6.0>.