Report of Unified Single Depth Intra Mode Simplification

# Abstract

#### List of contribution

|  |  |  |  |
| --- | --- | --- | --- |
| **Participants** | **Doc No.** | **Title** | **Type** |
| LGE | [JCT3V-J0040](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2321) | Simplification for single depth mode pruning process | Proposal |
| Hisilicon | [JCT3V-J0096](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2320) | Cross-check on Simplification for single depth mode pruning process(JCT3V-J0040) | Crosscheck |
| ETRI | [JCT3V-J0054](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2363) | Simplification of single depth intra mode | Proposal |
| Sharp | [JCT3V-J0082](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2389) | Cross-check on Simplification of single depth intra mode (JCT3V-J0054) | Crosscheck |
| HiSilicon | [JCT3V-J0058](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2393) | Simplification on candidate list construction for single depth mode | Proposal |
| MediaTek | [JCT3V-J0087](http://phenix.it-sudparis.eu/jct2/doc_end_user/current_document.php?id=2393) | Crosscheck on simplification on candidate list construction for single depth mode (JCT3V-J0058) | Crosscheck |

#### Suggestion of unified solution of SDM simplification

Proponents JCT3V-J0040, 0054, 0058p1&2 suggest a unified solution of SDM simplification as follow:

* Reduce 5 neighbouring candidate samples to 2 (first 2 candidate samples: left and above one) – J0040 & J0058 p1
* Remove pruning process – J0054 & J0058 p2

Notes: The unified solution is identical to JCT3V-J0058p1&2

**1 Text Modification:**

The newly added parts compared to working draft are highlighted in yellow and the removed parts are marked with ~~strikethrough~~. The text bug-fix parts are highlighted in green.

I.8.4.4.2.9 Specification of intra prediction mode INTRA\_SINGLE\_SAMPLE

Inputs to this process are:

* a sample location ( xTb, yTb ) specifying the top-left sample of the current block relative to the top‑left sample of the current picture,
* the neighbouring samples p[ x ][ y ], with x = −1, y = −1..nTbS \* 2 − 1 and x = 0..nTbS \* 2 − 1, y = −1,
* a variable nTbS specifying the transform block size.

Output of this process is:

* the predicted samples predSamples[ x ][ y ], with x, y = 0..nTbS − 1.

The lists predSample[ i ] and availableFlag[ i ] are derived as specified in the following:

* For i in the range of 0 to 41, inclusive, the following applies:
  + Depending on i, the luma location ( xN, yN ) is specified in Table I-6.
  + The variable availableFlag[ i ] is derived as specified in the following:
    - If p[ xN, yN ] is marked as "available for intra prediction", availableFlag[ i ] is set equal to 1.
    - Otherwise (p[ xN, yN ] is marked as "not available for intra prediction"), availableFlag[ i ] is set equal to 0.
  + The variable predSample[ i ] is set equal to p[ xN, yN ].

Table ‑1 – Specification of xN and yN depending on i

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **i** | 0 | 1 | 2 | 3 | 4 |
| **xN** | ~~nTbS >> 1~~-1 | ~~0~~nTbS >> 1 | 0 | −1 | −1 |
| **yN** | ~~0~~nTbS >> 1 | ~~nTbS >> 1~~-1 | −1 | 0 | −1 |

The list availableFlag[ i ] is modified as specified in the following:

* For i in the range of 1 to 4, inclusive, the following applies:
  + For j in the range of 0 to ( i − 1 ), inclusive, the following applies:
    - 1. availableFlag[ i ] = availableFlag[ i ] &&  
          !( availableFlag[ j ] && ( predSample[ j ] = = predSample[ i ] ) ) (‑59)

The list sampleCandList is derived as specified in the following:

numCand = 0   
 for( i = 0; i < 52; i++ )  
 if ( availableFlag[ i ] && numCand < 2 )   
 sampleCandList[ numCand++ ] = predSample[ i ]  
 if( numCand = = 0 )  
 sampleCandList[ numCand++ ] = ( 1  <<  ( BitDepthY − 1 ) )  
 if( numCand = = 1 )  
 sampleCandList[ numCand++ ] = sampleCandList[ 0 ] + 1

The values of the prediction samples predSamples[ x ][ y ], with x, y = 0..nTbS − 1 are derived as follows:

predSamples[ x ][ y ] = sampleCandList[ single\_sample\_idx ] (I‑60)

**2. Performance:**

#### Introduction of proposals

Table 1 Configuration for tests

|  |  |  |  |
| --- | --- | --- | --- |
|  | # of cand samples | Pruning | Remove default case |
| 0040(0058p1) | 2 | Yes | No |
| 0054 | 5 | No | Yes |
| 0058p2 | 5 | No | No |
| 0058p1&p2 | 2 | No | No |

Notes: Remove default case is the process as follow:

1. Single sample flag is signalled as 0 when no usable candidate sample exists.
2. Set index flag as 0 when only one candidate sample exists.(which may occur parsing dependency problem for conformance whether the index is appropriate to the current CU in offline discussion)

#### Coding results

CTC case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *Video 1* | *Video 2* | *Video/video BR* | *Video/total BR* | *Synthesized/total BR* | *Enc time* | *Dec time* |
| 0040(0058p1) | **0.02%** | **0.02%** | **0.01%** | **0.00%** | **0.01%** | **99.6%** | **95.9%** |
| 0054 | **0.04%** | **0.05%** | **0.01%** | **0.00%** | **0.00%** | **99.9%** | **99.9%** |
| 0058p2 | **0.05%** | **0.05%** | **0.02%** | **0.00%** | **0.01%** | **99.9%** | **97.4%** |
| 0058p1&p2 | **0.00%** | **0.04%** | **0.01%** | **0.00%** | **0.02%** | **99.7%** | **92.9%** |

AI case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *Video 1* | *Video 2* | *Video/video BR* | *Video/total BR* | *Synthesized/total BR* | *Enc time* | *Dec time* |
| 0040(0058p1) | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **100.1%** | **100.4%** |
| 0054 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.01%** | **100.1%** | **99.7%** |
| 0058p2 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.01%** | **98.6%** | **95.8%** |
| 0058p1&p2 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.01%** | **98.7%** | **99.1%** |

Note: Slightly Enc time and Dec time different between 0040 and 0058p1;