HEVC FEI ABR Encoding Sample

Overview

HEVC FEI ABR Encoding Sample works with **Intel® Media Server Studio 2018 R2 – SDK for Linux* Server**.

It demonstrates usage of **Media Server Studio – SDK** (hereinafter referred to as "**SDK**") API for creation of a simple console application that performs encoding of an uncompressed or compressed video streams according to a H.265 video compression standard. The sample uses SDK FEI API (Flexible Encoder Interface) and provides capability to stream internal encoder information during encoding process to specified output.

- ENCODE FEI H.265. This is extension of conventional encoding functionality described in *SDK API Reference Manual*. It covers all stages of encoding and produces encoded bitstream from original raw frames. It is performed by ENCODE class of functions.

Features

HEVC FEI ABR Encoding Sample supports the following video formats:

input compressed	H.264 (AVC), H.265 (HEVC)
output (compressed)	H.265 (HEVC)

Note: For format YUV420, the **HEVC FEI ABR Encoding Sample** assumes the order Y, U, V in the input file.

Software Requirements

See `<install-folder>/Media_Samples_Guide.pdf`.

How to Build the Application

See `<install-folder>/Media_Samples_Guide.pdf`.

Running the Software

The executable file `sample_hevc_fei_abr` requires the following command-line switches to function properly:

`-i::h265 <InputFile>`	Set input encoded video file name, path and decoder type.
`-o <OutputFile>`	Output (compressed) video file, name and path
`-dso <DsoFile>`	Input HEVC stream for syntax elements extraction.

Alternatively 1:N transcoding pipelines could be described in parfile:

`-par <parfile>`	Use parfile for 1:N transcoding pipelines description. Each line describes one pipeline, where one is producer (decoder) and the others are consumers (encoders).
`-i::source`	Producer pipeline (decoder).
`-o::sink`	Consumer pipeline (encoder).

The following command-line switches are optional:

`-bref`	Arrange B frames in B pyramid reference structure (by default the decision is made by library).
`-nobref`	Do not use B-pyramid (by default the decision is made by library).
`-ppyr:<on,off>`	Enables P-pyramid (default is off).
`-gpb:<on,off>`	Make HEVC encoder use regular P frames (off), or general-purpose B (on). The default is on.
`-idr_interval <size>`	IDR interval size in number of GOPs term, default 0 means every I is an IDR, 1 means every other I frame is an IDR and etc.
`-n <number>`	Number of frames to process.
`-timeout <seconds>`	Set timeout to run processing in seconds.
`-r (-GopRefDist) <distance>`	Distance between I- or P- key frames (1 means no B-frames) (default is 0 (I frames only)).

`-g <size>`	Set GOP size (1(default) means I-frames only).
`-l <numSlices>`	Set number of slices.
`-num_ref (-NumRefFrame) <numRefs>`	Number of reference frames (number of DPB frame slots).
`-qp <value>`	Set QP value for frames.
`-DisableQPOffset`	Disable QP offset per-pyramid
`-NumRefActiveP <numRefs>`	Set number of maximum allowed references for P frames (up to 4(default)).
`-NumRefActiveBL0 <numRefs>`	Set number of maximum allowed backward references for B frames (up to 4(default)).
`-NumRefActiveBL1 <numRefs>`	Set number of maximum allowed forward references for B frames (up to 2(default) for interlaced, 1(default) for progressive).
`-gop_opt <closed|strict>`	Set GOP optimization flags (can be used together): closed – references to other GOPs are forbidden; strict – no GOP optimization from MSDK.
`-SearchWindow <value>`	Specifies one of the predefined search path and window size. In range [1, 5] (5 is default). If non-zero value specified: -RefWidth / RefHeight, -LenSp, -SearchPath are ignored.
`-RefWidth <width>`	Set width of search region (should be multiple of 4), maximum allowed is 64 for one direction search and 32 for bidirectional. At the same time search window w*h is 2048 for one direction and 1024 for bidirectional search.
`-RefHeight <height>`	Set width of search region (should be multiple of 4), maximum allowed is 64 for one direction search and 32 for bidirectional. At the same time search window w*h is 2048 for one direction and 1024 for bidirectional search
`-LenSP <length>`	Defines number of search units in search path. In range [1, 63].
`-SearchPath <value>`	Defines shape of search path. 0,2 - full, 1-diamond.
`-AdaptiveSearch`	Enables adaptive search.

-MultiPredL0 <type>	Use internal MV L0 predictors for FEI ENCODE, 0 – off, 1 – spatial.
-MultiPredL1 <type>	Use internal MV L1 predictors for FEI ENCODE, 0 – off, 1 – spatial.
-NumPredictorsL0	Number of maximum L0 predictors for FEI ENCODE (default – derive from frame type).
-NumPredictorsL1	Number of maximum L1 predictors for FEI ENCODE (default – derive from frame type).
-MVPBlockSize <size>	External MV predictors block size, 0 – no MVP, 1 – MVP per 16x16 block, 2 – MVP per 32x32 block, 7 – derive on per MVPs basis, use when reading MVPs from file.
-DSOMVPBlockSize <size>	Force DSO to generate MVP buffer with MVPs per block size: MV predictors block size, 0 – no DSO MVP output, 1 – MVP per 16x16 block, 2 – MVP per 32x32 block, 7 – determined by CTU partitioning (default).
-DrawMVP	Creates output YUV file with MVP overlay.
-DumpMVP	Dumps final per-frame MVP structures with DSO data as binary files with filenames with following pattern "MVPdump_encorder_frame_%%(frame number in encoded order).bin".
-ForceCtuSplit	Force splitting CTUs into CUs at least once.
-NumFramePartitions <num>	Number of partitions in frame that encoder processes concurrently (1,2,4,8 or 16).
-vbr::sw	Use MSDK SW VBR rate control.
-vbr::la	Use LookAhead VBR rate control.
-TargetKbps <target_rate>	Set target bitrate for BRC algorithm (in kb/s).
-LookAheadDepth <value>	Number of frames to look ahead (default is 100).
-LookBackDepth <value>	Number of frames to look back for statistics calculation (default is 100).
-AdaptationLength <value>	Number of frames to calculate adjustment ratio to minimize bitrate estimation error (default is 100).

`-Algorithm::MSE <filename>`	Use YUV file for MSE calculation (implementation is not optimized).
`-Algorithm::NNZ`	Use number of non-zero transform coefficients for visual distortion approximation.
`-Algorithm::SSC`	Use Sum of Squared transform Coefficients for visual distortion approximation.
`-FastIntra::I|P|B`	Force to skip HEVC-specific intra modes (use AVC modes only).
`-ForceToIntra`	Force CTU to be coded as intra if all CUs in input DSO stream are intra.
`-ForceToInter`	Force CTU to be coded as inter if all CUs in input DSO stream are inter.
`?`	Print help.

Below are examples of command-lines that can be used to execute **HEVC FEI Encoding Sample**:

DECODE + DSO + LA BRC (2 Mb/s) + ENCODE

```
sample_hevc_fei_abr -vbr::la -TargetKbps 2000 -LookAheadDepth 100 -
LookBackDepth 100 -i::h264 Input_1920x1080p_40Mb.h264 -o Output.265 -
dso Input_1920x1080p_5Mb.h265 -n 1828 -g 32 -gpb:on -idr_interval 0 -
GopRefDist 4 -NumRefFrame 4 -NumRefActiveP 3 -NumRefActiveBL0 3 -
NumRefActiveBL1 1 -bref -l 1 -Algorythm::NNZ -AdaptationLength 100
```

1:N

```
sample_hevc_fei_abr -par parfile
```

parfile content:

```
-dso dso_stream.h265 -i::h264 input_stream.h264 -n 1057 -l 1  -o::sink
-i::source -gpb:on -idr_interval 1 -DisableQPOffset -g 32 -GopRefDist 4
-NumRefFrame 4 -NumRefActiveP 3 -NumRefActiveBL0 3 -NumRefActiveBL1 1 -
bref  -NumFramePartitions 4 -MVPBlockSize 7 -vbr::sw -TargetKbps 3000 -
o output_3mbs.265
-i::source -gpb:on -idr_interval 1 -DisableQPOffset -g 32 -GopRefDist 4
-NumRefFrame 4 -NumRefActiveP 3 -NumRefActiveBL0 3 -NumRefActiveBL1 1 -
bref  -NumFramePartitions 4 -MVPBlockSize 7 -vbr::sw -TargetKbps 5000 -
o output_5mbs.265
-i::source -gpb:on -idr_interval 1 -DisableQPOffset -g 32 -GopRefDist 4
-NumRefFrame 4 -NumRefActiveP 3 -NumRefActiveBL0 3 -NumRefActiveBL1 1 -
bref  -NumFramePartitions 4 -MVPBlockSize 7 -vbr::sw -TargetKbps 8000 -
o output_8mbs.265
```

Tip:

To achieve better performance, use input streams in NV12 color format. If the input stream is in YUV420 format, each frame is converted to NV12 which reduces overall performance.

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