HEVC/H.265 Main Profile Decoder (v01.00.00) on ARM (66AK2X Platform)

FEATURES

- **Supports decoding of HEVC Main, Main Still profile bitstreams up to level 5.0**
- **Supports arbitrary resolutions from 64x64 up to 4kx2k**
- **Supports width and height as non multiple of 16**
- **Supports YUV 4:2:0 Planar Chroma format**
- **Supports decoding progressive content**
- **Supports SEI and VUI parameters decoding.**
- **Supports B frame decoding**
- **Supports CTU sizes 64x64,32x32,16x16**
- **Supports multiple slice, multiple tile decoding**
- **Supports decoding of streams with Wave front parallel processing**
- **Supports bitstreams encoded with Low delay and Random access configurations**
- **Supports Multiple reference frames**
- **Supports decoding of streams with scaling matrices**
- **Supports decoding of streams with Weighted Prediction**
- **Supports decoding PCM encoded CTUs**
- **Supports Deblocking and SAO features decoding**
- **Supports dependent slice decoding**
- **Supports IDR & CRA frame decoding**
- **Supports IRAP frame decoding**
- **Supports TSA,STSA feature decoding**
- **Supports decoding frames with LTRP feature**
- **Supports AMP feature decoding**
- **Supports TMVP feature decoding**
- **Supports constrained intra prediction**
- **Supports transform skip and trans quant bypass mode**
- **Supports unrestricted motion vectors which allows motion vectors to be outside frame boundary**
- **Supports input and output call back API functions for Low Delay Interface**
- **Shall accept video elementary stream in big endian format**
- **Supports decode only header mode**
- **Error resilient codec, supports error codes**
- **Supports error concealment at slice level**
- **Decoder library validated on XTCIEVMK2X platform**

DESCRIPTION

HEVC/H265 is video compression standard from ITU-T Video Coding Experts Group and the ISO/IEC Moving Pictures Experts Group successor to H264/MPEG4 AVC. Higher Data compression ratio is achieved compared to H.264/MPEG-4 AVC at the same level of video quality. It can alternatively be used to provide substantially improved video quality at the same bit rate. It can support 8K UHD and resolutions up to 8192×4320

This project is developed and validated on XTCIEVMK2X platform using Linaro ARM GCC Toolchain Version 4.7-2013.03.

PRODUCT PREVIEW

Performance and Memory Summary

This section describes the performance and memory usage of the HEVC Main profile Decoder tested on XTCIEVMK2X platform.

Table 1 Configuration Table

CONFIGURATION	ID
HEVC Main Profile, 1080p, IBBP, Multi core(4 Cores)	H265MP_DEC_001
HEVC Main Profile, 1080p, IBBB, Random Access, Multi core(4 Cores)	H265MP_DEC_002
HEVC Main Profile, 1080p, IPPP, Low Delay, Multi core(4 Cores)	H265MP_DEC_003
HEVC Main Profile, 1080p, IBBP, Multi core(2 Cores)	H265MP_DEC_004
HEVC Main Profile, 1080p, IBBB, Random Access, Multi core(2 Cores)	H265MP_DEC_005
HEVC Main Profile, 1080p, IPPP, Low Delay, Multi core(2 Cores)	H265MP_DEC_006
HEVC Main Profile, 720p, IBBP, Multi core(2 Cores)	H265MP_DEC_007
HEVC Main Profile, 720p, IBBB, Random Access, Multi core(2 Cores)	H265MP_DEC_008
HEVC Main Profile, 720p, IPPP, Low Delay, Multi core(2 Cores)	H265MP_DEC_009
HEVC Main Profile, 720p, IBBP, Single core	H265MP_DEC_0010
HEVC Main Profile, 720p, IBBB, Random Access, Single core	H265MP_DEC_0011
HEVC Main Profile, 720p, IPPP, Low Delay, Single core	H265MP_DEC_0012

Table 2 Cycles Information - Profiled on XTCIEVMK2X with Linaro ARM GCC Toolchain Version 4.7-2013.03

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) (1)		
	TEST DESCRIPTION	AVERAGE(2)	PEAK(3)
H265MP_DEC_001	Airshow_p1920x1080_420p_4Mbps.265, YUV420, IBBP @ 4Mbps @ 30 frames per second	839	902
H265MP_DEC_002	Airshow_p1920x1080_420p_4Mbps_RA.265, YUV420, Random Access, IBBB @ 4Mbps @ 30 frames per second	888	956
H265MP_DEC_003	Rich_p1920x1080_420p_2Mbps_VC.265, YUV420, Low Delay, IPPP @ 2Mbps @ 30 frames per second	550	593
H265MP_DEC_004	Airshow_p1920x1080_420p_4Mbps.265, YUV420, IBBP @ 4Mbps @ 25 frames per second	1264	1315
H265MP_DEC_005	Airshow_p1920x1080_420p_4Mbps_RA.265, YUV420, Random Access, IBBB @ 4Mbps @ 25 frames per second	1219	1297
H265MP_DEC_006	Rich_p1920x1080_420p_2Mbps_VC.265, YUV420, Low Delay, IPPP @ 2Mbps @ 25 frames per second	727	833
H265MP_DEC_007	Airshow_p1280x720_420p_2Mbps.265, YUV420, IBBP @ 2Mbps @ 30 frames per second	644	667
H265MP_DEC_008	Airshow_p1280x720_420p_2Mbps_RA.265, YUV420, Random Access, IBBB @ 2Mbps @ 30 frames per second	636	690
H265MP_DEC_009	FourPeople_p1280x720_420p_1Mbps_VC.265, YUV420, Low Delay, IPPP @ 1Mbps @ 30 frames per second	380	407
H265MP_DEC_0010	Airshow_p1280x720_420p_2Mbps.265, YUV420, IBBP @ 2Mbps @ 30 frames per second	1169	1253
H265MP_DEC_0011	Airshow_p1280x720_420p_2Mbps_RA.265, YUV420, Random Access, IBBB @ 2Mbps @ 30 frames per second	1203	1310
H265MP_DEC_0012	FourPeople_p1280x720_420p_1Mbps_VC.265, YUV420, Low Delay, IPPP @ 1Mbps @ 30 frames per second	675	726

(1) Measured with ARM Cortex-A15, 1375 MHz clock, DDR3 1333MHZ clock, Program memory, I/0 buffers and Stack in external memory.
(2) Average cycles are calculated as (Total cycles*30/number of frames).
(3) Peak cycles are calculated as maximum of moving average of 30 frames, multiplied with 30 to get per second MHz.

Table 3 Memory Statistics of HEVC Decoder with Linaro ARM GCC Toolchain Version 4.7-2013.03

CONFIGURATION ID	MEMORY STATISTICS[1][2]				
	PROGRAM MEMORY[4]	DATA MEMORY [3] [5]			TOTAL
		PERSISTENT	CONSTANT	SCRATCH	
H265MP_DEC_001 H265MP_DEC_002 H265MP_DEC_003	271	76265	7	8960	85503
H265MP_DEC_004 H265MP_DEC_005 H265MP_DEC_006	271	76215	7	8880	85373
H265MP_DEC_007 H265MP_DEC_008 H265MP_DEC_009	271	37622	7	7468	45368
H265MP_DEC_0010 H265MP_DEC_0011 H265MP_DEC_0012	271	37551	7	1321	39150

(1) All these memory requirements are for HEVC Main Profile Decoder library only. They do not include any memory requirements from application side. Stack, heap and code requirements for application are extra.
(2) All memory requirements are expressed in kilobytes (1K bytes = 1024 bytes).
(3) The memory requirements given in Table 3 are calculated for YUV 420 Chroma sub sampling.
(4) Typical input and output buffers for 1920x1080 resolutions with YUV planar 4:2:0 formats are as follows.
Input Buffer: 3072 KB
Output Buffer: 3060 KB

Notes

- I/O buffers:
  - Input buffer size = 3072 K-bytes (for 1920x1088 resolution, YUV420)
  - Output buffer size = 3060 K-bytes (for decode 1920x1088 resolution)

References

- ISO/IEC 23008-2:2013 Infrastructure of audiovisual services - Coding of moving video: High efficiency video coding.
- HEVC/H.265 Main Profile Decoder on ARM (66AK2X Platform) User's Guide (SPRUGH8).

Glossary

Term	Description
Constants	Elements that go into .const memory section
Scratch	Memory space that can be reused across different instances of the algorithm
Instance	Persistent-memory that contains persistent information - allocated for each instance of the algorithm

Acronyms

Acronym	Description
HEVC	High Efficiency Video Coding
ISO	International Organization for Standardization
EVM	Evaluation Module

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