HEVC 4K Real-time Software Encoder

Real-time software encoding up to 2160p60

Fraunhofer HHI has developed an encoding solution for the newly established H.265/MPEG-HEVC video coding standard that demonstrates the benefits of high-efficiency video coding (HEVC). The latest real-time software encoder can encode 4K 60Hz ultra high definition video in real-time.

Specifications

- HEVC Main and Main 10 Profile conformance
- 2160p60 10-bit real-time encoding
- Interlaced support
- I, P and hierarchical B pictures
- Advanced multi-threaded architecture
- CPU optimizations (SSE4.1 to AVX2)
- Look ahead processing
- HRD conformance, VBR and CBR
- Available as SDK for Microsoft Windows, Linux, Apple OS X platforms

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Real-time software decoding up to 2160p60

Fraunhofer HHI has developed an H.265/MPEG-HEVC software decoder. Its resource efficient, multi-threaded architecture makes real-time decoding of 4K 60Hz ultra high definition video possible and perfectly suits the ever-growing need for high resolution video in applications such as mobile web streaming, and high-quality TV broadcasting.

Specifications

- HEVC Main, Main 10 Profile conformance
- Optional HEVC Range Extensions conformance
- 2160p60 10-bit real-time decoding*
- Interlaced support
- Picture-level parallel processing
- CPU optimizations (SSE2 to AVX2 and NEON for ARM)
- Available as SDK for Microsoft Windows, Linux, Apple OS X / iOS
- Playback solutions with VLC player decoder plugin and own HHI Linux player with dedicated HDMI/SDI output

*8-core Intel Sandy Bridge-based or equivalent CPU required

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HEVC 4K Real-time Hardware Decoder

Real-time hardware decoding on FPGAs

Fraunhofer HHI has developed a completely hardware based H.265/MPEG-HEVC decoder IP core. Without an additional processor core, the decoder achieves real-time performance for 4K ultra high definition (UHD) video requiring only moderate clock frequencies. For evaluation purposes the design is available as an implementation for the Altera Stratix V GX Advanced Systems Development Kit (4K/UHD) and the Altera Stratix V DSP Kit (up to 1080p60).

Specifications

- HEVC Main and Main 10 Profile conformance
- Optional HEVC Range Extensions conformance for Main 4:2:2 (10) Profile
- 1080p60 10-bit real-time decoding even on mid-range FPGAs
- 4K/UHD 10-bit real-time decoding on powerful FPGAs (at least Stratix V)
- Fully hardwired implementation, no need for an additional processor core
- Standard interfaces for easy SoC integration
- Low logic utilization approx. 70k ALM*
- IP core available as FPGA netlist or VHDL code for ASIC implementation
- Comprehensive synthesis and test bench environment

*Altera Stratix V ALMs

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HEVC 4K Bitstream Test Suite

To achieve high coding efficiency, the HEVC standard allows much more flexibility in encoding decisions and bitstream variations compared to previous video coding standards. For HEVC decoder products, it is important to ensure as early as possible that they are compatible with all possible conforming bitstreams that current and future encoders might produce. The aim is to avoid update or replacement costs if incompatibilities are found later.

The HHI HEVC bitstream test suite is a set of specially crafted coded video sequences that can be used to test conformance of HEVC decoders. Each of these bitstreams has specific characteristics that test the functionality of all individual components of an HEVC decoder and their interactions. A reference decoder is shipped with the test suite that can be used to verify the decoding results.

The HEVC bitstream test suite is targeted at 2160p60 Main and Main 10 Profiles (both at Level 5.1 Main Tier).

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About the Fraunhofer HHI Team

The three groups for Multimedia Communications, Embedded Systems and Image & Video Coding at the Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute make up the largest team of dedicated video coding experts in Europe with a long and distinguished track record in the development and implementation of video coding standards. Milestones of the team's work include

- Key contributions to the standardization of H.264 / MPEG-4 AVC, including its high profile extension, scalable video coding, and multiview video coding
- Editing of standard texts and coordination of reference software
- Participation in the development of system layers like MPEG-2 transport stream, ISO base media file format with AVC file format and MPEG-DASH
- Development of hardware IP cores, real-time software encoders for H.264 / MPEG-4 AVC and its extensions, which are successfully deployed in several products
- Development of bitstream test suites for H.264 / MPEG-4 AVC and its extensions, which can be considered as the gold standard for H.264 / MPEG-4 AVC decoder conformance
- Key contributions to the standardization of H.265 / MPEG-HEVC
- Development and demonstration of H.265 / MPEG-HEVC solutions for encoding, transport, decoding and conformance

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H.265 / MPEG-HEVC 4K Software and Hardware Solutions