The new disruptive visually lossless light video compression, Extremely Tiny in FPGA

A technology serving the global AV industry

TICO compression is new patent-pending visually lossless light compression specifically designed for the industry. This revolutionary technology is extremely tiny in FPGA fitting the smallest Xilinx Artix-7 and Spartan-6 devices, robust for real-time operation with no latency.

Up to now, image and video are sent or stored uncompressed into many displays and systems such as cameras, video servers or recorders. TICO is a smart upgrade path to manage higher resolutions (4K, 8K ...) and frame rates while assuring visual quality, keeping power and bandwidth at a reasonable budget and reducing significantly the complexity and cost of the system.

Technology benefits

- Visually Lossless quality from 2:1 to 4:1
- Robust over multiple generations
- Fixed latency: down to microseconds
  Selectable from 1 to x pixel lines
- Small complexity and ultra-compact codec: easy to implement in low-cost FPGA. Limited internal memory - no external memory required
- Powerful, Real-time or faster than real-time in CPU
- Compatible with different resolutions, from mobile, HD to 4K/8K UHDTV, via multiple usual transport schemes
- Designed to be a standard for industry-wide support: TICO compression technology is available on multiple software and hardware technologies. Code, hardware IP-cores and software libraries are licensable from intoPIX
Typical applications from HD to Ultra HD

- Digital Video Recorders
- Video Servers, mixers, routers and switchers
- Cameras (high-res, real-time or high speed)
- Video monitor and displays
- Frame grabbers and video capture devices
- Video over IP systems (ST2022, AVB,...)
- Industrial and surveillance
- Cable extenders

(...)

TICO is a smart solution to

- Support higher Data stream (4K, 8K ...) in existing systems or networks using the available pipeline bandwidth
- Increase the number of streams or the stream resolution that could be supported in a multi-stream configuration
- Reduce significantly the internal video bandwidth (and power consumption) in systems such as mobile devices, cameras, video servers and displays
- Increase with cost-effectiveness the storage or video buffer capacity
- Solve display link limitation on TV, monitor and mobile panel to carry larger resolutions than could be support by a display link with unCompressed images and video in real time
- Reduce the number of lanes needed to transport a stream in a display interface in order to save power, cost, or both. Or even enable the use of a lower link rate for applications where high link rates may not be possible

XILINX FPGA implementation

- Color modes : 422 and 444, RGB, YCbCr, XYZ
- Bit Depth : 8, 10 or 12
- Resolutions : Any up to 8K (8192 x 8192)
- Frame Rates : Any (depending on intoPIX IP-core configuration)

Compression

- (Sub) Intra-frame
- Real-time operation guaranteed (no overflow or underflow)
- Latency - Selectable from 1 to X lines

Quality and Bit Rate Control

- Adjustable compression rate for Lossy/Visually lossless/lossless
- CBR (constant bit rate) operation (optional VBR mode)

FPGA

- Low cost implementation in any Xilinx FPGAs: very low FPGA logic and internal RAM usage
- Fit in the smallest Xilinx Artix-7 and Spartan-6 FPGAs
- Encoder and decoder have approximately the same complexity

IP-Cores releases

<table>
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<tr>
<th>IP-core Reference #</th>
<th>Visually Lossless with 444 8bit (in bpp**</th>
<th>Visually Lossless with 422 10bit (in bpp)</th>
<th>Max FPS</th>
<th>Max Resolution</th>
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<tr>
<td>IPX-TC1-UHD4K-Enc</td>
<td>max 6bpp (4:1)</td>
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<td>60</td>
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<td>4 lines</td>
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<tr>
<td>IPX-TC1-UHD4K-Dec</td>
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<td>4K UHD1</td>
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<td>IPX-TC1-MLS-Enc</td>
<td>Lossless (1.2:1 to 1.8:1)</td>
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<td>60</td>
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<td>Math. Lossless</td>
<td>2014</td>
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<tr>
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* Ask for your flavor.
** bpp = bit per pixel. Example: a 444 8 bit picture equals to 24 bit per pixel (bpp). Compressed at 12bpp, it is equivalent to 2:1 compression.
*** At 4:1, TC2 provides better quality than TC1 at short viewing distance (< 60 pixels per degree).

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