Fast VCR software for XIMEA cameras

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https://www.ximea.com/support/projects/vision-libraries/wiki/fast_vcr_software_for_ximea_cameras

Fast VCR software from Fastvideo¶



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XIMEA offers the most compact and high speed cameras with various resolutions, frame rates, bandwidths, USB3 and PCIe interfaces, spectral sensitivities and image sensors. These cameras, together with high quality, do provide high performance (especially with PCI-Express interface) which significantly increases the overall bandwidth and demands on the computer.

In combination with the XIMEA API/SDK software package that can be downloaded from XIMEA webpage for free, comes also an application called - CamTool.
This viewer like software allows to see the picture coming from the camera (or multiple

cameras), control the supported features, develop plug in functionality and save data in different formats as images or videos.

To extend the portfolio of processing tasks that can be applied to the data coming from the camera, Fastvideo company has developed a GPU-based software to work with XIMEA cameras.
This software enables maximum performance at the highest image speed and quality, all at 8 / 10 / 12 bit (monochrome or bayer) and in real time.

Benefits of Fast VCR¶
Recently released CMOS sensors from Sony Pregius S 4th generation family offer slower and high speed models.
The high speed models like IMX542, IMX541 or IMX540 come with resolutions up to 24 Mpix and speeds above 100 Fps.

This kind of speed requires high bandwidth of PCIe interface to take full advantage of the sensor's potential.
The PCIe Gen3 with 4 or 8 lanes can sustain such data throughput from the hardware point of view.

Maintaining high resolution at high Fps can be complicated also from the software side, especially in real-time and without dropped frames.
That is where the Fast VCR software, running on NVIDIA GPU, comes handy.

Below is a description of the pipeline including high quality demosaicing with other image processing modules.
This color aspect would be helpful for streaming and broadcasting applications, digital cinema, 3D, AR and VR.

Camera control part¶

- Camera initialization (camera model, resolution, fps, etc.)
- Input bit depth and pixel format
- Image resolution and ROI (region of interest)
- FPS and exposure time
- Gain
- Camera bandwidth control
- Automatic exposure/gain control
- Optional modes: binning, decimation, dual gain, dual ADC, etc.

Image processing pipeline for cameras on GPU¶

- Image acquisition
- Data unpacking
- Image linearization
- Dark frame subtraction (FPN)

- Flat-Field Correction (Shading Correction)
- Bad pixel removal
- White Balance / AWB
- Adaptive Exposure and Gain control
- High quality demosaicing with MG algorithm
- Color correction with matrix profile or DCP profile
- Highlight recovery
- Exposure correction (brightness control)
- Curves and Levels
- Wavelet-based denoising
- Crop
- Rotation (90/180/270 degrees) and flip/flop
- Resize (downscale and upscale)
- Sharpening (local contrast)
- Gamma transform
- JPEG compression and storage to SSD
- Optional conversion to NV12 for further h264/h265 encoding and streaming
- Realtime output to monitor

Outputs description¶

- Output to monitor via OpenGL in real time
- Camera statistics
- Encoding to JPEG and storing images to SSD
- Video encoding to MJPEG (AVI), H.264/H.265 (MP4) and storage to a container on SSD
- Low-latency video streaming via RTSP
- Real time RAW/PGM/DNG data storage to SSD (compressed or uncompressed)
- Interoperability with third-party GPU-based SDKs
- Interoperability with GPU-based neural network applications

Image processing modules on GPU (optional)¶

- RAW frames capture, preview and storage to SSD
- Histograms for raw and processed data
- Curves and levels for RAW, RGB, HSV
- DCP support
- 3D LUT support
- Geometric and affine transforms
- Undistortion via fast remap
- Chromatic aberration suppression at RAW domain
- LCP support
- HDR support
- Local and global tonemapping

- SDI output support
- Multiple camera support
- Fast replay (synchronized viewer) solution for multicamera systems
- High performance JPEG2000 and Raw-JPEG codecs
- Automatic realtime partitioning of AVI video file to the specified file size
- Interoperability with FFmpeg
- Scripting via python
- Camera and lens calibration (CPU/GPU)
- GenICam (GenTL) support to work with Basler, Daheng and other cameras
- Much more...

Supported XIMEA camera families¶
At the moment, the growing list includes:

xiB-64 series - high speed PCIe cameras
xiC series - USB3 cameras with Sony Pregius sensors
xiQ series - USB3 cameras with Global shutter CMOS sensors
xiX series - Embedded vision and multi-camera family

Download software¶
You can download Fast VCR software using this link to test it with available XIMEA cameras - in 8/10/12-bit monochrome or Bayer.

FastVCR software for XIMEA on Windows