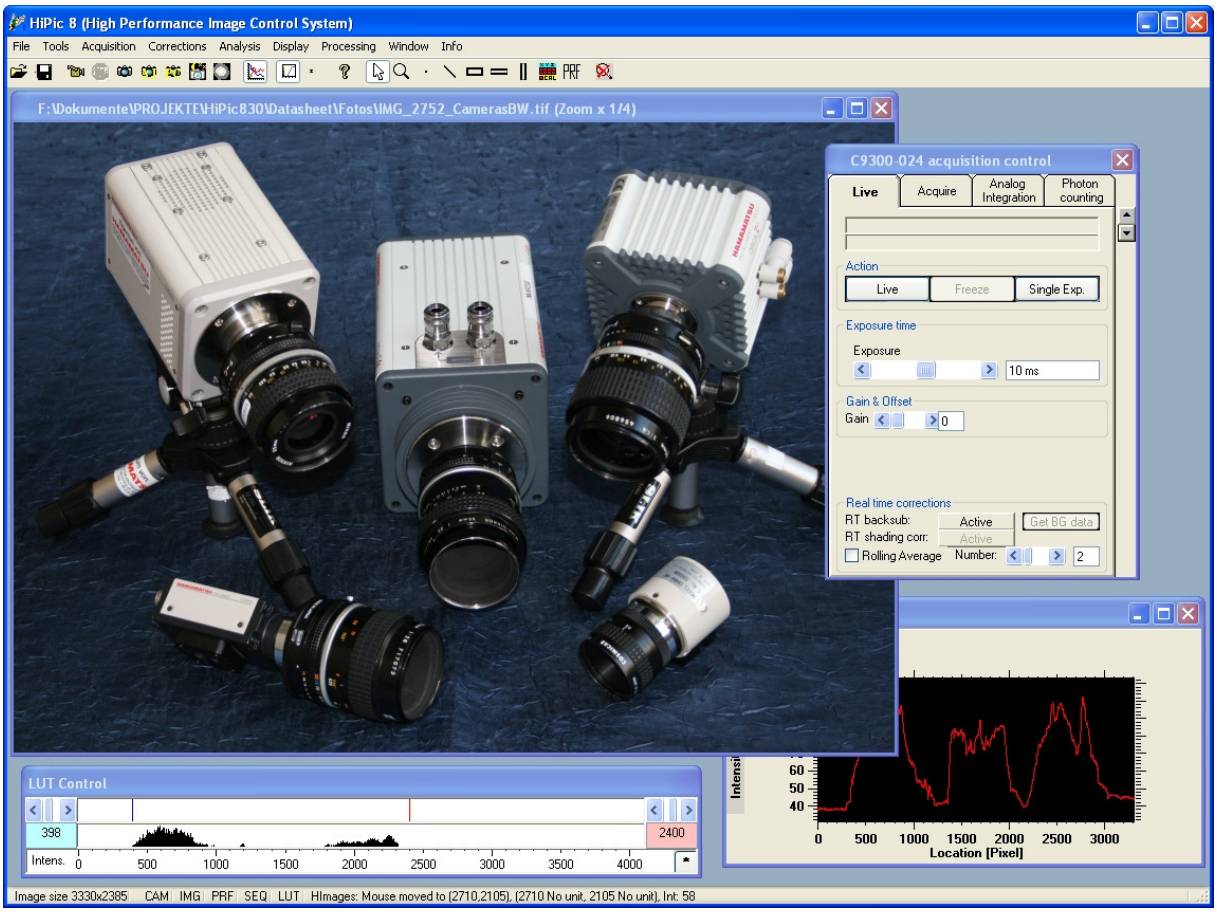
HAMAMATSU

HiPic

High Performance Image Control and Processing Software



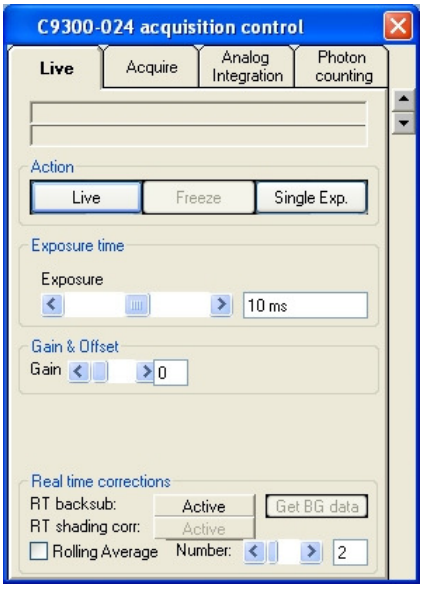
Introduction

HiPic is a software designed for image acquisition and image analysis supporting a wide variety of Hamamatsu cameras such as CCD, EM-CCD, EB-CCD, back thinned CCD, line sensor, TDI sensor and X-Ray cameras. It requires a Windows PC with a camera interface board or an on-board interface such as fire wire or USB depending on the camera type.
Camera setup and access to all sophisticated features of Hamamatsu cameras is made easy and understandable and the risk of wrong operation or data loss is reduced to a minimum.
Images can be acquired in full resolution and full speed with up to 16 bit grey levels. All special features of Hamamatsu digital cameras like exposure time, binning, chip temperature or gain settings can be controlled by HiPic and all necessary functions for the efficient use of high performance cameras like sophisticated correction algorithms or triggering features are provided.

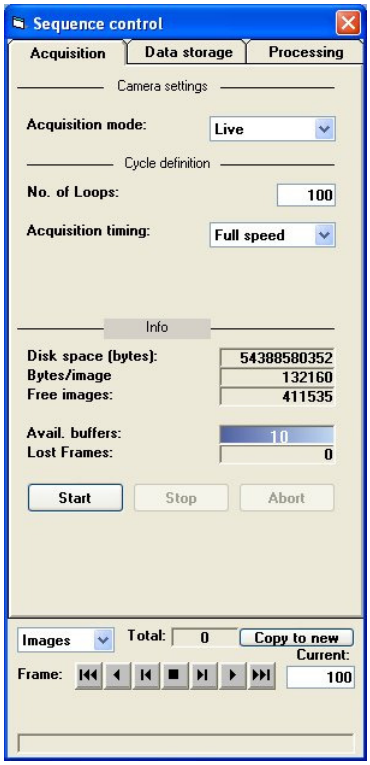
Features and applications

- Image processing software for all Hamamatsu grey scale camera like the ORCA or ImagEM series, analog video cameras, the X-ray Flat panels or X-ray Line sensors or very special and sophisticated sensors such as TDI or X-Ray TDI sensors.
- Suitable for applications in physics, industry or biology, for high performance digital image acquisition, processing and analysis.
- All camera features controllable.
- Sequence acquisition at high frame rate.
- Supports many different image interfaces like analog video, RS422, LVDS, Camera Link, FireWire A and B, or USB 2.0.
- Full support of all cameras supported by DCAM API (Hamamatsu standard)

Image Acquisition and Camera Control



The HiPic software allows controlling and utilizing all camera features such as binning and sub array mode to adapt the camera to the individual measurement conditions.
Image data can be acquired from cameras with 8, 10, 12 14 or 16 bit depth and displayed as a continuous series of images (**LIVE mode**) which is useful to do adjustments and optical alignment or acquired individually (**ACQUIRE mode**) to keep the image data for subsequent analysis. Memory integration with a resulting image of 16 bit or 32 bit (**ANALOG INTEGRATION mode**) allowing almost infinite integration is available to reduce noise for high precision measurement. On the other hand **sequences** of images can be acquired in full speed to **observe dynamic processes**. Real time background subtraction and real time shading correction is available to display images in full speed with best quality. Alternatively to ANALOG INTEGRATION a **recursive filter** can be applied to live images to reduce noise while still keeping the dynamic aspect of LIVE mode.



When acquiring sequences one can choose between different **memory options** (write to RAM or hard disk) adapting the experiment to the needs of timing (e.g. high speed) and memory requirement. A streaming mode which saves data continuously to hard disk allows acquiring images over a long time just limiting the number of acquired frames to the available hard disk space. Images of a sequence can be accessed and analyzed individually or in one step.
Various external **trigger** modes are supplied to synchronize the image acquisition to external events (Edge trigger, Level trigger, frame trigger).

Image display and analysis

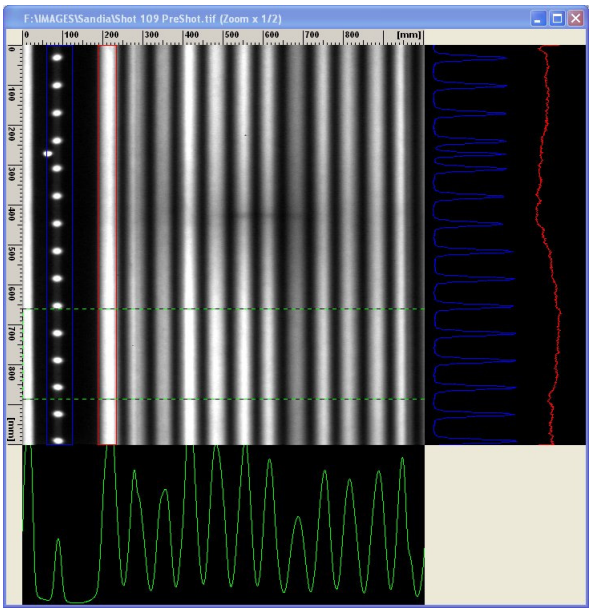
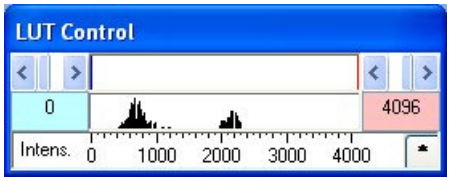


Image display includes display of rulers, multiple regions of interest (ROIs) with optional display of profiles inside or outside the image area. The look up table (LUT) is used to adapt the dynamic range of the image data for display and allows visualizing even very faint images clearly. Black and white or pseudo colors can be used for display. In very critical cases a nonlinear LUT can be applied to visualize the image. For special cases like



fluorescence microscopy a superimpose function is available.
If the quick profile display in an image window is not sufficient, a sophisticated profile tool is available. It allows sampling data along a user defined sampling line. Up to 10 profiles can be handled simultaneously and simple analytical parameters like peak position, FWHM, fall or rise time can be easily obtained on the fly. Data can be printed, saved in ASCII format or exported to other applications using copy and paste or DDE. A histogram tool is also available.

Data Correction and Calibration

HiPic supports all important image data correction functions required for CCD cameras and video imaging. This includes background correction (also called dark correction) shading correction (sometimes called flat field correction) and defect pixel correction. Physical units can be assigned to the pixel coordinates which is called calibration (sometimes also called scaling).
Background correction is used to subtract an offset signal caused by CCD dark current, non uniform video noise or background light such as stray light or auto fluorescence signal.
Shading correction is a multiplicative correction compensating overall system non-uniformity such as those caused by imperfect illumination or imperfect optical systems e.g. vignetting.
Defect pixel correction is implemented to correct defective pixels, lines or columns (hot pixel or dead pixel).
These corrections can be performed as a separate step, automatically after the measurement or in real time during live mode. If the camera supports a similar functionality in its firmware or in a DSP this can be used as well.
The HiPic supports a flexible scheme for attaching calibration information to all measurement data like images or profiles. Both spatial axes can be independently calibrated using a linear or nonlinear functions and arbitrary units.

Data export

Image data can be saved in a proprietary format or in 8 or 16 bit TIFF format. TIFF format is a common image format for exporting images to third party image processing software. Especially 8 bit TIFF images are useful to export images to DTP programs. Image data and profile data can be saved to ASCII files and imported into other programs like Excel, Origin or Mathlab for further analysis. DDE can be used to link profile or image data to other programs like Excel dynamically.

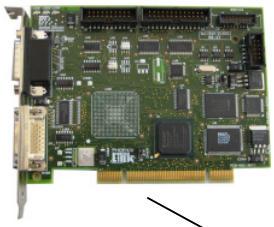
Remote control and scripts

Almost all functions of the software like image acquisition or image data save can be controlled from other applications by a tool called RemoteEx. This tool is based on simple text commands sent via TCP-IP across a network (LAN) or from an application executed on the same computer. Image data can be sent by TCP-IP as well or exchanged by saving the data to a file and loading it from the other application. The RemoteEx allows an easy integration of the functionality from almost every other application, across a network and also from other platforms like UNIX. The RemoteEx is included in the standard distribution and can be used freely by everybody. It includes also a Script functionality which allows building up automated measuring sequences. Sample scripts are also part of the distribution.

DCAM API support

Additionally to the internal drivers which allows controlling already many Hamamatsu cameras in combination with many frame grabbers and interfaces the HiPic supports many cameras through the well introduced Hamamatsu standard DCAM API (digital camera application programming) interface. All aspects of the DCAM interface are fully used including the powerful and recently introduced properties. The support of DCAM includes Area, Line and TDI cameras and allows connecting cameras where no internal drivers are available like the FireWire or USB cameras. Ask your Hamamatsu representative which combination of grabber/camera is supported by which driver.

System configuration



Frame grabber
or another
interface board
like Fire Wire

Computer

Interface cable

Hipic Software

Hamamatus digital camera
(Also includes controller or power
supply depending on camera type)

Hardware requirement and supported hardware

Supported cameras

Digital CCD Cameras	C4880, C4880-8X, C4742-95, C4742-98, C6790-8X, C7300, C8000-10, C8000-20, C8484, C8800, C9300, C10600, all ORCA series
EM-CCD Cameras	C9100 series e.g. ImagEM
EB-CCD Cameras	C7190 series
Analog cameras	C3077, C5405
Image Intensifier cameras	C4880-91/92/93, C5987
TDI sensors	C10000 series
X-Ray Flat Panels	C7921, C7942, C7943, C9250, C9252DK, C9311, C9312, C9321, C9720, C9728, C9730, C9732, C10013, C10322D, C10500D, C10502D
X-Ray Line sensors	C7390, C8133, C8750, C9133, C9750
X-Ray TDI Sensors	C10650
other X-Ray Sensors	C9266

Supported grabber

Analog Grabber	Dalsa IC-PCI+AM-VS, PCVision, PC2Vision
Digital Grabber	Dalsa IC-PCI+AM-DIG, PCDig, Active Silicon Phoenix Dig36, National Instruments PCI1422, PCI1424
Camera Link Grabber	Dalsa PcCamLink, X64, Active Silicon Phoenix CL, National Instruments PCI1426, PCI1428
Other supported Interfaces	FireWire A, FireWire B, USB 2.0

Operating systems:	Windows 98, Windows NT, Windows 2000, Windows XP
Minimum requirement:	Pentium 1GHz, 512 MB RAM, Graphics board 1024 x 768, one free PCI, PC-E, PCI-X slot depending on the used interface board, one serial port depending on camera, free USB connector or parallel port for hardware lock

Functions

Acquisition	Live image mode
	Real time background subtraction, shading correction and defect pixel correction
	Reduction of noise by in memory integration or recursive filter
	Single image acquisition
	Image sequence acquisition
	Live image data streaming to hard disk
	Supports area mode and line scan cameras
	Supports photon counting mode, dynamic photon counting (in combination with image intensifier) and offline photon counting analysis
	Special acquisition modes like PIV depending on the camera model
Camera control	Exposure time
	Binning mode
	Subarray mode
	Superpixel mode
	Control of CCD-chip temperature
	Various internal/ external trigger modes
	Overexposure security function (ImagEM only)
	Full computer control of all camera parameters
Hardware support	Many frame grabbers are supported
	DCAM API support
Corrections	Background subtraction
	Shading correction
	Defect pixel correction
	Manual, Automatic, real time or offline execution of corrections
Image display	Zoom and scroll
	Superimpose
	Rulers and multiple profile and FWHM display (selectable)
	B/W and pseudo color display using linear or nonlinear LUT, Optional display of negative values
	Scrolling LIVE display for line sensor and TDI cameras
Image Save/Load and data export	Save and load in TIFF or proprietary format
	Export image or profile data in ASCII format
	Support Copy/Paste of ASCII data and DDE
Image Analysis	Intensity profile analysis. Display up to 10 profiles simultaneously in different colors
	Display multiple profiles in combination with the image or separately
	Zoom/Unzoom, display of sub regions of the profile, scaled or unscaled display and linear or logarithmic display
	Various easy to use functions like show, save, load and info
	Histogram analysis
	Arithmetic operations on one image or between images
Extending the functionality	Remote control and User functions, Scripting

Specifications and appearance are subject to change without notice

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