

P3I SOFTWARE

Frame Grabber Software

ELTEC Frame Grabber Tools

- Drivers
- Configuration Tools
- Imaging Tool Kits
- Samples

III Main Features

- Generic software interface for ELTEC frame grabber and imaging product line
- Available for p3i2, p3i4, p3i_DIG, ^{mini}HiPerCam, and ENetCam families
- Real-time image acquisition
- Powerful virtual to physical memory management during run-time
- Makes handling of image sequences as easy as single images
- DLL with complete frame grabber control
- Windows based configuration and setup utility included
- Easy set-up file handling to store different p3i configurations
- Direct Draw support
- Runs under Linux, Windows CE, Windows 98/ME/NT/ 2000/XP
- Ports for VxWorks, OS-9 on request

III The Software Foundation for

- P3i2 family
- P3i4 family
- P3i_DIG / CL
- MiniHiPerCam
- HiPerCam 2
- EnetCam

III Available for

- Linux
- Windows CE
- Windows 98 / ME
- Windows NT / 2000
- Windows XP
- VxWorks, OS-9

III Drivers

The Frame Grabber Driver suite is the software foundation for ELTEC's complete p3i frame grabber and imaging computer family. It is the unified interface used across all p3i products.

The drivers combine three essential advantages:

- Fast and optimized access to the frame grabber hardware
- Relieves the program developer from all hardware dependent stuff
- Unifies the frame grabber interface for easy switching between the p3i members

Special care has been taken to simplify the use of complex camera features like restart-reset modes or acquisition of image sequences. Applications ranging from simple single image grabbing, up to programming your p3i frame grabber to become a real image sequence machine, are all easily supported by ELTEC's frame grabber drivers.

Intelligent PCI DMA makes the Difference

The heart of each p3i frame grabber is its PCI DMA controller. All boards work without the need of a frame buffer on-board. Image data is stored directly in the CPU's main memory. ELTEC is using the most sophisticated PCI DMA

controllers available. ELTEC frame grabber DMA means FAST & FLEXIBLE. Flexible DMA schemes (scatter-gather DMA) allow the acquisition of complete sequences without CPU intervention and without missing a single frame. So, the main advantage of the PCI bus, fast data transfer is extended by ELTEC with an intelligent PCI DMA.

ELTEC's scatter-gather DMA is used to handle paged addresses, resulting in linear, contiguous images appearing in main memory for easy access:

- The p3i frame grabber is able to acquire directly into linear memory
- Frame buffer memory is allocated during run-time, NOT during Windows start-up
- Reallocation of frame buffer memory is easy
- Windows -based test/set-up program
- On-line documentation supplied as Windows Help or PDF file

With this flexible memory management of ELTEC's frame grabber drivers it is easy to use up to 128 MB in main memory of your PC to store large numbers of different and long image sequences, filling many megabytes of memory. It is as easy as storing a single frame.

Only this flexibility gives the security that your application is able to adapt to different memory needs during run-time.

Software Concept

ELTEC's frame grabber driver suite consists of a device driver and a Dynamic Link Library (DLL). It is only natural that the DLL supports the whole p3i hardware. Set-up of ADC, offset/gain, camera multiplexer, region of interest (acquisition window dimensions), camera selection and setup file support are part of the DLL. Permanent (live), single shot and sequence acquisition of images can be requested and the various states of the acquisition (active/finished) can be inquired.

Industrial Requirements

ELTEC's drivers have an extensive built-in camera support making it extremely easy to use non-standard camera features (e.g. restart/reset). Further, all signals essential to industrial applications are integrated into the drivers.

Signals for pixel synchronous acquisition (external clock) and process control (external trigger) are supported.

III Configuration Tool

A test and setup utility, running under Windows or Linux, allows to adjust all relevant camera parameters and have them stored by the DLL in a file for further use in user applications.

It supplies Video-in-a-Window display by using Windows functions, thus enabling overlapped acquisition windows. The same utility supports test and configuration of the p3i board under Windows and Linux.

III Source Code Samples

Sample source code is supplied for Windows and for Linux:

For Windows they show how to set up the grabber hardware, acquire an image, grab image sequences, and use special hardware features (such as quadro mode for p3i_QUADRO, trigger and script parameters for p3i_DIG).

Additionally, they show how to display the image with a stand-alone program which has the purpose to display images using either standard DIBs (device independent bitmaps) or using DirectDraw.

All Windows samples have been tested with Visual C++.

The Linux samples show how to set up the grabber hardware, to acquire an image, and to display the image using X11

On-line Documentation

An on-line Windows help file covers all aspects of hardware and software installation, as well as the programmer's manual for DLL users.

DirectX

For many applications there is a need to develop applications using Microsoft's DirectX SDK, and/or to use standard software that accesses the DirectShow interfaces. For all these cases a DirectShow Video Capture Filter was implemented for the ELTEC frame grabbers p3i_MONO, p3i_RGB and p3i_ALL. This filter is currently not compatible with the old Video for Windows standard. It supports Live, Snapshot, and triggered snapshots as well as offset/gain settings.

III Imaging Libraries

Anyone writing imaging applications knows the problem of where to get standard algorithms from: either writing his own library of textbook algorithms or to use a third-party product for the frame grabber and camera combination, that suit the application best. ELTEC responded to this need and adapted a full selection of third-party tools to their frame grabbers, covering the spectrum from a full-blown graphical development system with scripting support to simple libraries supplied in source form.

Product	Library	GUI-based development	Scripting	OS	PowerPC	Freeware	Runtime royalty-free	Manufacturer and ©
Halcon	X	X	X	Windows	-	-	-	MVTec
IPP	X	-	-	Windows, Linux	-	-	X	Intel
IPL98	X	-	-	Windows, Linux, CE	X	X	X	Univ. of South. Denmark
Heurisko	X	X	X	Windows, Linux	-	-	-	Aeon
AdOculus	X	X	-	Windows	-	-	X	The Imaging Source
Coake	X	X	X	Windows, CE	X	-	-	SAC

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III A Selection of Frame Grabber DLL Functions

Initialization

- eL_OpenHW (BoardSelect, Mode)
- eL_InitContext (BoardId, Filename)
- eL_InitHW (BoardId, MemStart, SizeX, SizeY, FrameCount, Pitch, BufferNo)
- eL_CloseHW (BoardId, Mode)

Configuration and Video Input

- eL_SetInputRefLevel (BoardId, CamSel, LevelLow, LevelHigh)
- eL_SetVideoInPort (BoardId, CamSel)

Acquisition Control / Memory Management

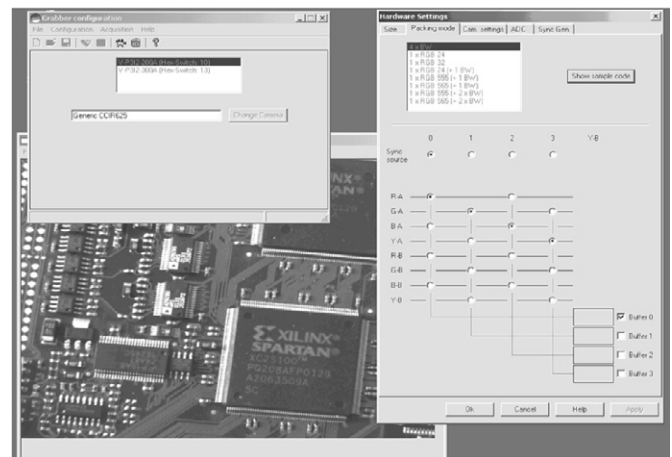
- eL_Acquire (BoardId, Mode)
- eL_SetAcqWindow (BoardId, StartX, StartY, SizeX, SizeY)
- eL_NewMemBuffer (BoardId, MemStart, SizeX, SizeY, FrameCount, Pitch, BufferNo)
- eL_FreeMemBuffer (MemStart, BufferNo)
- eL_SetAcqMemFormat (BoardId, Format)

Timing / Synchronisation

- eL_WaitFrameEnd (BoardId)
- eL_WaitFrameStart (BoardId)
- eL_WaitAcqEnd (BoardId)
- eL_WaitFieldEnd (BoardId)
- eL_TestFrame (BoardId)
- eL_TestAcq (BoardId)
- eL_TestFrameCount (BoardId)

Miscellaneous

- eL_GetSetting (BoardId, Item, Select)
- eL_GetNumOfBoards
- eL_WriteSetupFile (BoardId, Filename, Overwrite)
- eL_GetHWRevision (BoardId, High, Low)
- eL_GetSWRevision (Release, Revision)
- eL_GetDriverRevision (Release, Revision)
- eL_GetErrorCode (void)
- eL_GetCamFeatures (Cam, Feature)



Color Cameras

- eL_SetPackingMode (BoardId Mode)

Line Cameras (p3i3_DIG)

- eL_SelExtTriggerInput (BoardId, CamSel, TriggerInput)
- eL_SelLineTriggerMode (BoardId, CamSel, LineTrigger, Frequency)
- eL_SelFrameTriggerMode (BoardId, CamSel, FrameTrigger, FrameSize)
- long eL_SetExposureTime (long BoardId, long ExpTime, long Reserved1, long Reserved2)

Documentation

- Free Internet

Please contact your local sales office for detailed information.