mvIMPACT Base

The mvIMPACT Base Module is the foundation framework of the MATRIX VISION Software Development Kit. This module addresses three issues: 1) ways to drive acquisition of digital images from imaging devices, 2) means to store digital images in the memory of a computer, 3) image processing functions tailored to such stored images.

This module is for free. It is intended to allow anyone make a quick, yet substantial step toward the implementation of his machine vision project.

Image acquisition

Digital images can originate from various sources such as frame grabbers, digital cameras, flatbed scanners or disk files. mvIMPACT puts major emphasis on video sensors used in vision systems and allows tight control of industrial cameras: synchronous or asynchronous triggering, progressive or interlaced frames, area, line or variable scan, arbitrary resolution…

Image storage

mvIMPACT can process multidimensional images and video sequences, including the color, multi-channel, volume and animated cases, with a bit depth of 8 to 16 bits. Image planes can be processed in isolation or as a whole. Special importance has been put on the most common cases of single-plane gray-level and 24 bits true color.

Image processing

The main goal of the image processing toolset is to prepare pictures to later ease their analysis. A complete description of the capabilities of mvIMPACT is out of the scope of this data sheet. The following sections give a brief overview.

1. Point to point transforms

The simplest operations one can think of handle every pixel in isolation. For instance, linear contrast stretching applies the same gain and an offset everywhere, while thresholding turns background and foreground pixels to black and white.
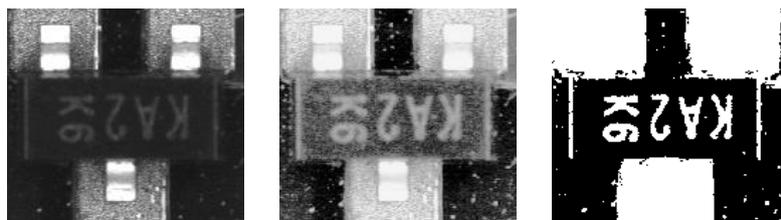

Contrast enhancement by equalization and thresholding

When several source images are combined, the full range of arithmetic operators can be used to achieve effects such as shading correction, adaptive thresholding, temporal noise reduction, masking...

2. Spatial filtering

Filters are used to enhance specific image characteristics such as sharpness, smoothness or local contrast by combining gray-level values in a small sliding window around every pixel.
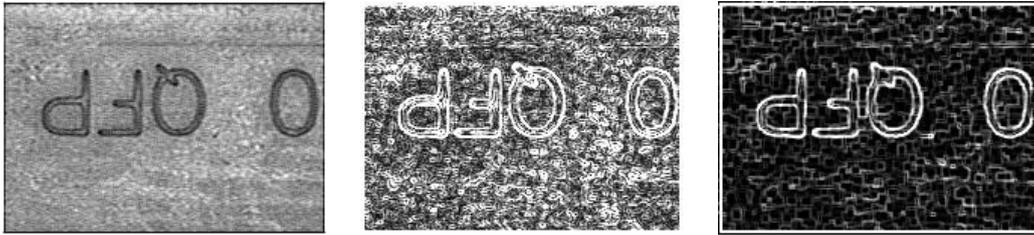

Edge detection in noisy conditions

mvIMPACT Base supports a complete range of linear and non-linear neighborhood operators, including general convolutions and rank filters.

3. Mathematical morphology

Further image transforms act on the shape of image features and help improve specific properties such as connectivity: erosion, dilation, opening, closing, thinning, thickening.
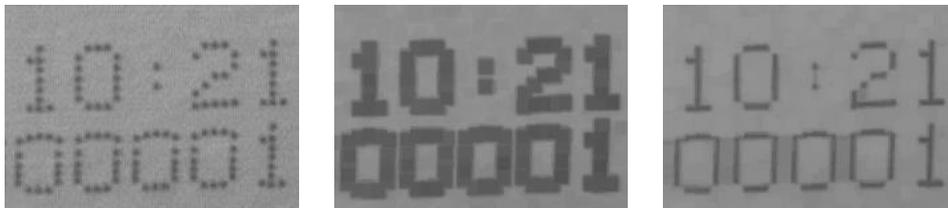

Connectivity improvement on dot printed characters

Other modifications are related to the segmentation of images to form regions: labeling, watershed, hole filling...

4. Global operations

At the other end of the spectrum, you will find yet many other possibilities such as

- **Grey-level statistics**: to achieve classification from histogram analysis,

- **Geometric transforms**: for realignment or unwrapping purposes,

- **Frequency domain processing**: for sophisticated linear filtering.
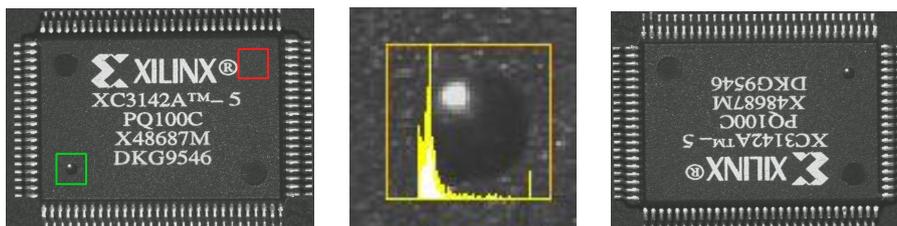
Pin one detection and realignment

Usually, processing applies to whole images. The Base module supports processing on smaller areas called Objects Of Interest, such as rectangles, line segments, freehand curves, isolated points…

Technical issues

Image Storage organization

All common file formats as well as user-defined ones are supported.

Other data structures such as sub-images, profiles, lookup tables or histograms are also managed by mvIMPACT Base and have corresponding display utilities. Multithread-safe operation with appropriate memory access arbitration is provided, as well as event-driven interaction with the GUI.

All acquisition modes supported by the hardware such as live sequence recording, frame integration, on-the-fly shading correction, background subtraction, and the like can be driven by the software.
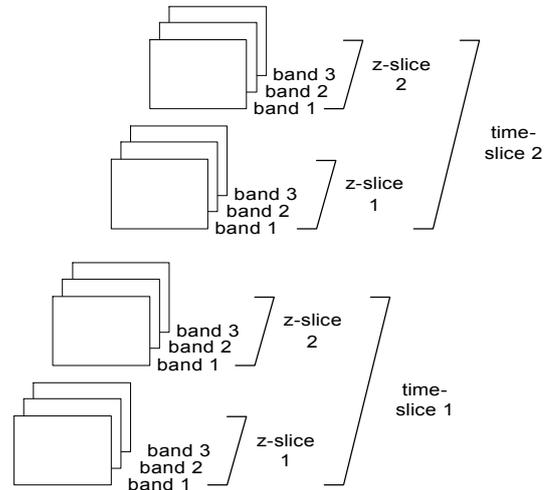
Licensing

When a MATRIX VISION frame grabber is detected, all mvIMPACT Base functions are enabled. Otherwise, a dongle is required.

A 30 days demo mode is also provided.

Hardware protection of application

The licensing mechanism can be used to protect the end-user applications, whatever the licensing mode. Licenses are granted based on a hardware key and a registry entry file. This way, licensing over email can be implemented.

Integration of proprietary functions

Proprietary image processing functions integrate seamlessly with mvIMPACT. Full access to the image buffers are provided through appropriate pointers.

In addition, proprietary mvIMPACT extension modules can be produced. An example project for this is provided.

Debugging support

All mvIMPACT functions generate status messages, which can be traced, filtered or stored in a file. A specific tracing utility is provided.