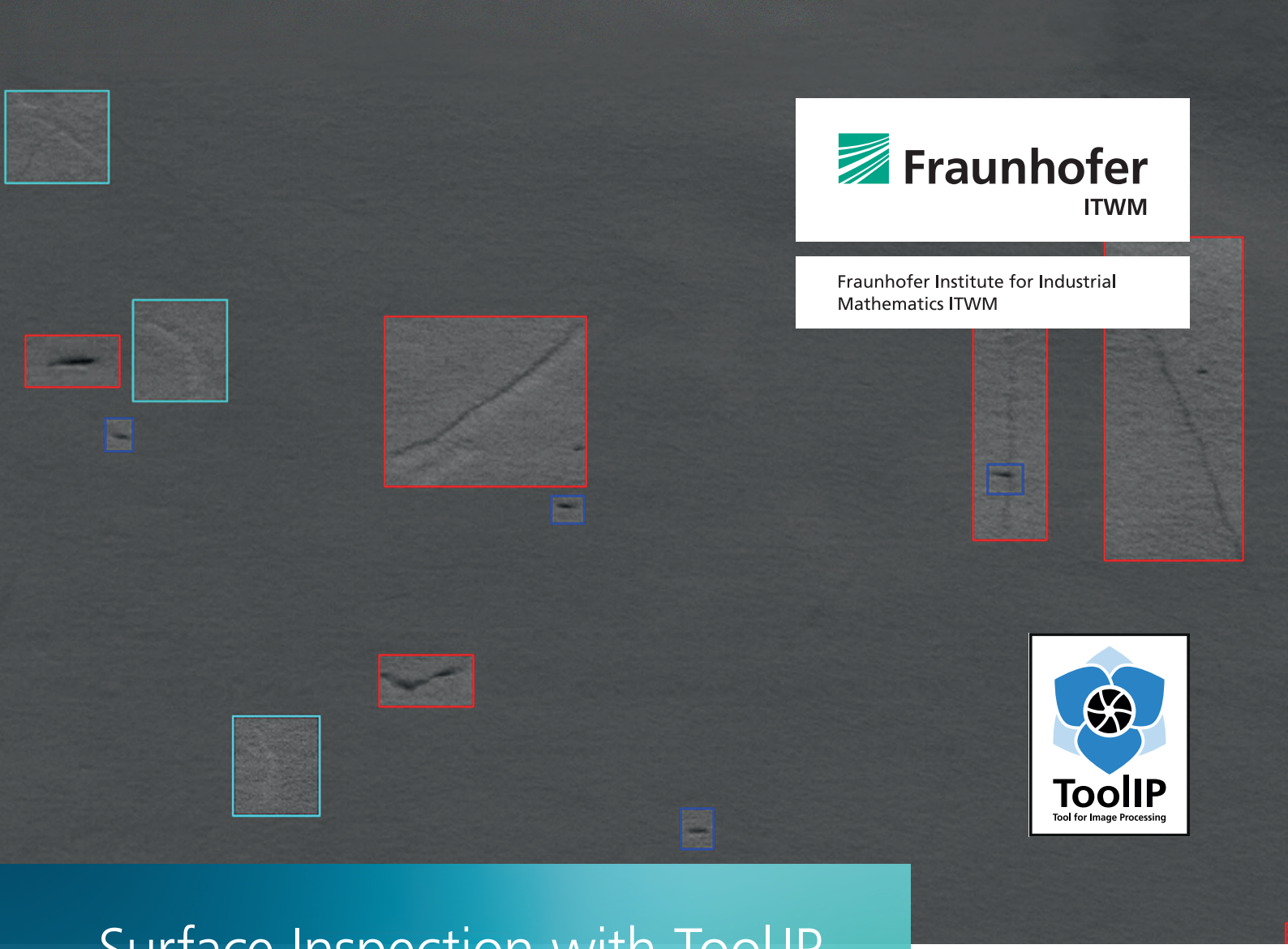

Fraunhofer ITWM

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ToolIP
Tool for Image Processing

Surface Inspection with Tool IP

Tool IP's image processing library offers a wide variety of mathematically founded operations. All available algorithms have been developed in C++ and can be combined in a flexible way to create image processing solutions fulfilling customer-based requirements.

Above: Final result of the defect detection process on an object surface using multiple defect classes

Functionality

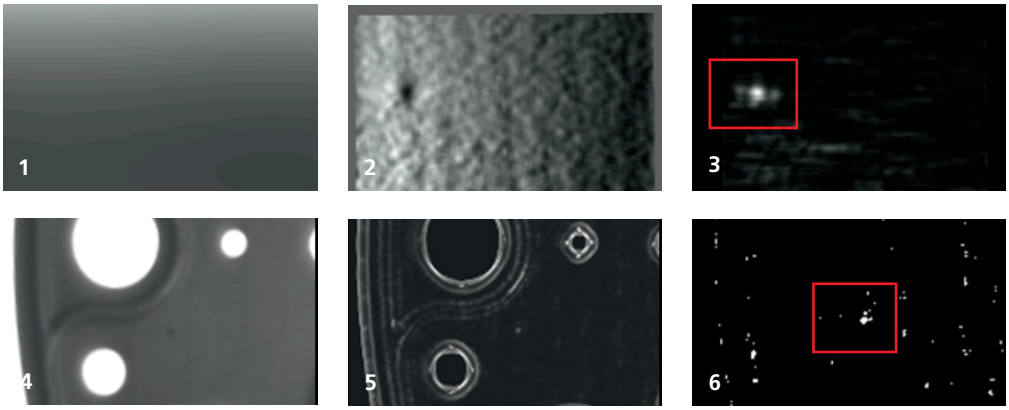
Tool IP allows for building complete solutions for complex image analysis tasks in a very intuitive way. It comes with an integrated image processing library. Especially for software developers Tool IP offers the possibility of building tailored solutions. Basic knowledge of image processing is advantageous.

In Tool IP solutions are displayed as graph-like structures. Each node represents an algorithmic component whereas the edges describe the data flow. By drag and drop new algorithms from the left side menu can be included. The resulting image processing solution can be embedded into customer applications.

Benefits

- Platform-independent running on Linux (Intel and ARM) and Windows 10
- Highly modular
- Intuitive user interface for rapid prototyping and system integration
- Easy integration into custom applications

Image processing with ToolIP – library modules



1–3 Detection of a dent on an unpainted car body (original image, after curve fitting, covariance)
4–6 Detection of a defect on a gasket (original image, application of a region feature, actual defect)

ToolIP contains the following modules, each including multiple image processing algorithms:

Image Denoising and Enhancement
A variety of filtering operations and adaptive anisotropic filters.

Edge Detection
Allows gradient calculation with masks, edge detection with Canny's detector and ridge detection using the Hessian matrix and others.

Object Detection
Not only template matching but also gradient based object models and similarity measures.

Image Registration
Grey-value-based matching methods derived from the joint grey level distribution.

Segmentation
Besides adaptive thresholding many other local features are available for segmentation.

Labeling
Allows mapping of features onto segmented objects.

Region Features
Objects can be characterized using many types of features (e. g. variance, Haralick …).

Classification
Classification algorithms such as linear discriminant, Mahalanobis distance, SVM and Gaussian are provided.

Clustering
Automatic grouping of objects via K-Means and others is supported.

Matrix Operations
Most linear algebra operations like SVD, QR-decomposition. PCA and others are available.

Camera interface
An interface for Prosilica cameras is allowing for inline image analysis. Other cameras can be supported on request.

Third party libraries
A number of useful algorithms, such as OCR and a QR-code reader, have been integrated from third party libraries.

For more information please go to www.itwm.fraunhofer.de/toolip

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