



- robust
- fast
- accurate
- flexible
- comprehensive

the Power of Machine Vision



The Machine Vision and Imaging Specialists

Perth: +61 (08) 9242 5411 Sydney: +61 (02) 9979 2599

Melbourne: +61 (03) 9384 1775

Email: sales@adeptturnkey.com.au

Website: <http://www.adeptturnkey.com.au>



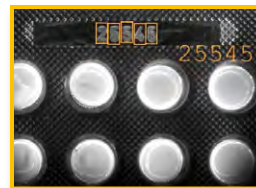
Professional Software for all Machine Vision Applications

Used in many industry sectors

Aerospace and space travel
 Agriculture, food
 Automobile parts and manufacturers
 Ceramics
 Chemicals
 Electric components and equipment
 Glass production and processing
 Government and military
 Health care and life science
 Iron, steel and metal
 Machinery
 Medical supplies
 Mining
 Packaging
 Paper products
 Pharmaceutical
 Photogrammetry and remote sensing
 Precision engineering and optics
 Printing
 Railroads and trains
 Retail
 Rubber, synthetic material, foil
 Semiconductors
 Shipbuilding
 Solar, renewable energy, recycling
 Surveillance and security
 Telecommunication
 Transport, logistics, trade
 Wood and timber

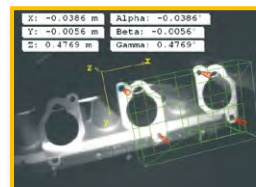
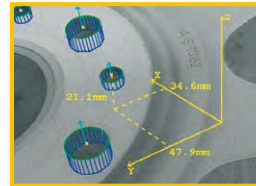
■ Food, Health Care & Life Sciences

Surface and print inspection, fill level measurement, packaging inspection, OCR, bar code, and data code reading: HALCON features robust and reliable solutions for all applications.



■ Automotive & Robotics

Determine the 3D pose of objects based on a CAD model, extract 3D data for bin picking and robot path planning: HALCON's unique 3D vision techniques open new possibilities for numerous automotive and robotics applications.



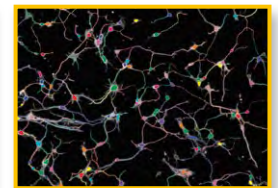
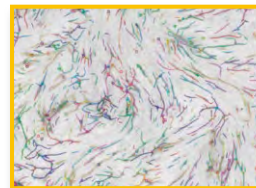
■ Packaging

Quality control, completeness inspection, identification – HALCON offers outstanding methods in all areas of packaging.



■ Medical Image Analysis

CT, MR, X-ray – no matter what source and resolution: HALCON processes 8/16/32 bit integer and float images.



Angiogenesis: Testing the growth of new blood vessels.

Axons: Finding cell nuclei with HALCON.

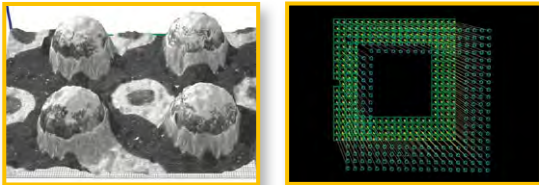


Machine Vision & Industrial Inspection

HALCON offers speed, accuracy, and robustness for a wide variety of applications such as quality inspection, robot vision, and material flow control.

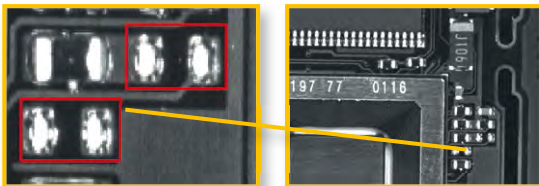
Board, Wafer & Die Inspection

PCB, BGA, AOI/AXI, ball-wedge and wire bonding machines: HALCON recognizes defects with an accuracy better than 1µm.



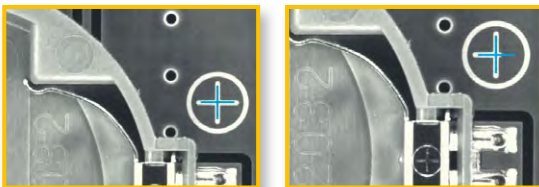
Completeness Inspection

Insufficient soldering paste, missing diodes, rotated components: HALCON detects all incomplete or incorrectly positioned parts within milliseconds.



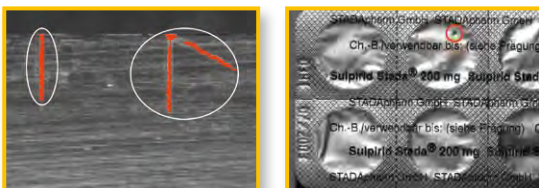
Positioning & Alignment

Board alignment, fiducial localization: HALCON reliably finds objects with an accuracy better than 1/20 pixel also if they are partially occluded.



Surface Inspection

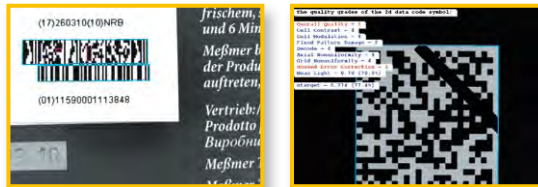
Different materials, different error classes like holes, wrinkles, edge cracks, inclusions, contaminants, coating voids, scratches, spots, and dents: HALCON's advanced filtering techniques are tailored to your needs.



Photometric stereo is used to detect a hole in a blister.

Quality Assurance

Quality assurance of bar codes and data codes: HALCON rates in compliance with the standards ISO/IEC 15415, ISO/IEC 15416, and AIM DPM-1-2006. HALCON secures the quality of your codes.



Print quality inspection of bar codes for ISO/IEC 15416.

Print quality inspection of data codes for AIM DPM-1-2006.

Print Inspection

Labels and forms printed on paper, plastic, or metal by any kind of printer: HALCON automatically compares trained patterns with your prints.



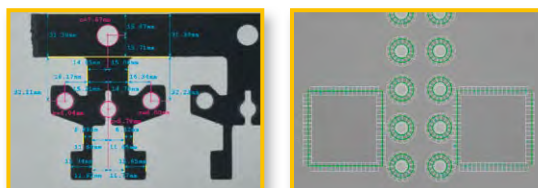
Identification

Identify and read bar codes, data codes and perform OCR: HALCON reads a single character in < 0.1 ms.



Measuring

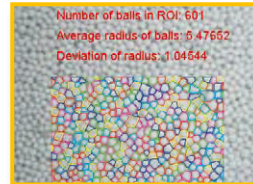
HALCON's superior edge detection and contour analysis techniques, in combination with powerful 3D camera calibration, extends measurement accuracy to the entire field of view.



Leading-Edge Techniques and Optimal Performance

■ Blob Analysis

Hysteresis, local, binary, and standard thresholding, plus more than 20 additional segmentation operators; area, orientation, and 50 more shape and gray value features: HALCON performs blob analysis within milliseconds.



Processing of partially overlapping blobs.



Extract blobs with subpixel accuracy.

■ Morphology

Erosion, dilation, opening, and closing with arbitrary structuring elements: HALCON excels with the fastest and most comprehensive implementation of morphological algorithms.



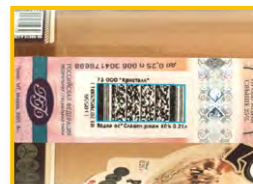
Distinguish touching objects.



Detect contour defects.

■ Bar Code & Data Code Reading

All common bar codes can be read in any orientation even with an element width of only 1.5 pixels. HALCON also reads ECC 200, QR, Micro QR, Aztec, and PDF417 codes of any size with modules even smaller than 2x2 pixels, as well as data codes with a distorted finder pattern.



PDF417 code



GS1 DataBar

■ OCR & OCV

Train, classify, or verify your font using HALCON's powerful classifiers. Many pre-trained classifiers from different application areas lead to highest recognition rates "out of the box", such as 0.65% error rate on the MNIST data set.



Read dot prints on complex background.

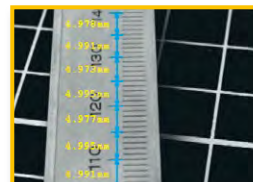


HALCON provides a syntactic and lexicon-based autocorrection.

■ 3D Vision

3D Calibration

A small set of internal and external camera parameters map the image coordinates to real world coordinates permitting, for example, subpixel-accurate measurements up to 1 μm in a field of view of 10 mm – also with line scan cameras. HALCON's hand-eye calibration is crucial for robotic applications.



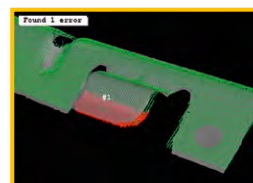
Distances on the calliper can be measured in the presence of perspective distortions.



Hand-eye calibration enables robotic grasping applications.

3D Object Processing

Using HALCON's 3D object model, 3D registration, 3D object processing as well as 3D object recognition and surface comparison can be performed.



Errors are detected using 3D surface inspection.



A 3D object model is segmented into connected components.

- Included methods**
- 1D measuring
 - 3D matching
 - 3D object processing
 - 3D primitives fitting
 - Alignment
 - Bar code
 - Blob analysis
 - Camera calibration
 - Classification
 - Color processing
 - Contour processing
 - Data code
 - Depth from focus
 - Edge extraction
 - Feature extraction
 - FFT
 - Filtering
 - Geometric measurements
 - GPU acceleration
 - Hand-eye calibration
 - Hough transformation
 - Image acquisition
 - Laser triangulation
 - Matching
 - Morphology
 - Mosaicking
 - Movement detection
 - OCR
 - OCV
 - Parallelization
 - Photometric stereo
 - Point extraction
 - Pose estimation
 - Radiometric calibration
 - Rectification
 - Region processing
 - Sample-based identification
 - Segmentation
 - Stereo
 - Texture analysis
 - Variation model
 - Visualization



■ Matching

Correlation-based Matching

HALCON's gray-value-based matching offers different methods, e.g., correlation-based matching. This method is particularly robust against defocus, shape deformation, and texture.

Shape-based Matching

HALCON's superior subpixel-accurate matching technology finds objects robustly and accurately in real-time, even if they are rotated, scaled, perspectively distorted, locally deformed, partially occluded or located outside of the image, or undergo non-linear illumination changes. It can process images with 8 or 16 bits and also handles color or multi-channel images. Objects can be trained from images or from CAD-like data. Moreover, HALCON's unique component-based matching is able to locate objects that are composed of multiple parts that can move with respect to each other.

Descriptor-based Matching

Planar objects with texture are localized with HALCON's descriptor-based matching. This method is extremely fast and localizes the objects in any rotation and tilt.

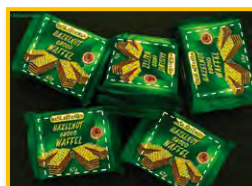
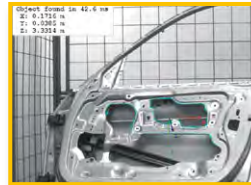
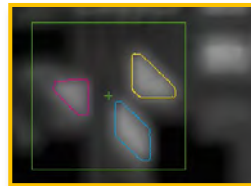
■ 3D Matching

Shape-based 3D Matching

Recognition and 3D pose determination of arbitrary 3D objects: HALCON's cutting-edge 3D matching determines the position and orientation of 3D objects represented by their CAD model.

Surface-based 3D Matching

As an alternative to the shape-based 3D matching, HALCON's surface-based 3D matching is optimized to also find objects with arbitrarily shaped surfaces in distance images.



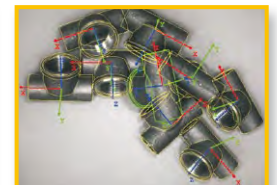
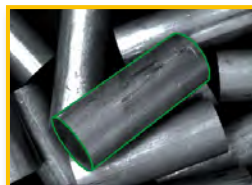
HALCON's perspective deformable matching robustly localizes objects with perspective distortions.

HALCON's descriptor-based matching locates planar objects extremely fast.

HALCON's local deformable matching finds objects with surface deformations.



HALCON's component-based matching finds compound objects fast and reliably in one step.



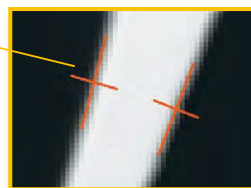
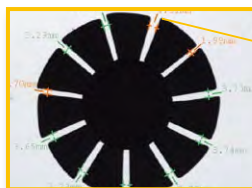
3D matching in combination with binocular stereo.

Surface-based 3D matching with multi-view stereo.

■ Measuring

1D Measuring

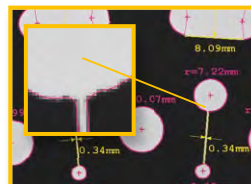
Measure edges along lines or arc segments: HALCON's powerful algorithms perform subpixel-accurate measurements in less than a millisecond. In combination with gray-value calibration even non-linear gray-value responses can be compensated to achieve highest accuracy.



Inspect the distances between the blades of a fan.

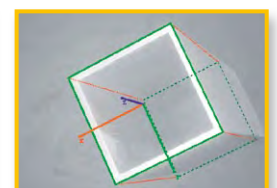
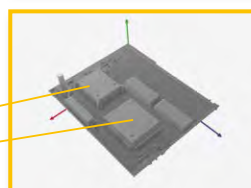
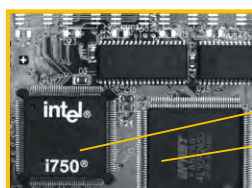
2D Measuring

Fitting an ellipse to a subpixel contour output of an edge filter allows you to achieve highest precision. HALCON's advanced algorithms extract contour data from images with more than one channel, e.g., from color images.



3D Measuring

HALCON's outstanding algorithms reconstruct the disparity or distance images or 3D coordinates of surfaces with many different methods: binocular, multi-view and photometric stereo, sheet of light, and depth from focus. You can also determine the 3D pose of circles and rectangles easily with only one camera. The segmentation and fitting of 3D primitives allows accurate measurement of, e.g., cylinders and spheres.



More than Software

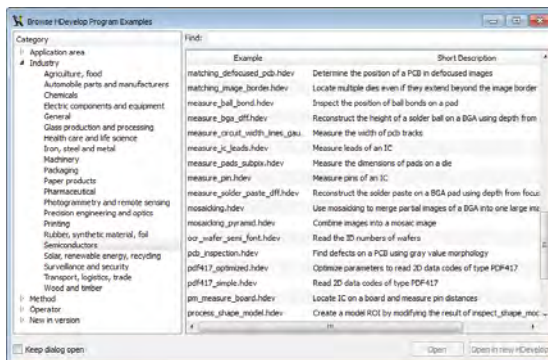
■ Extensive Support and Training

- Free application evaluation, also prior to purchase
- Free worldwide support for HALCON users by MVTec's distributors
- Free upgrade to new versions within the first year after purchase
- Worldwide trainings, also individually tailored to the customer's needs
- Easy maintenance by free web download of newest software releases

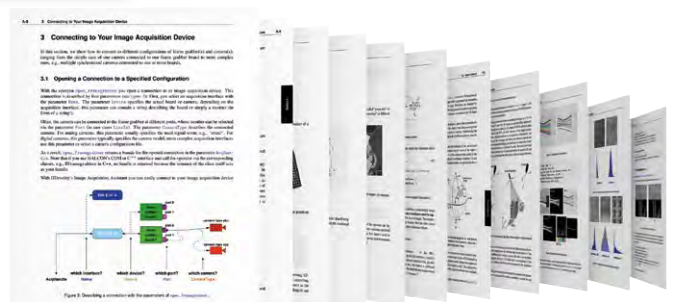


■ Comprehensive Documentation and Fast Development

- Documentation for every user and level – ranging from the "Quick Guide" to the "Solution Guide"
- Numerous example programs for every application area
- Easy-to-use browser for example programs
- Integrated Development Environment (IDE) for machine vision



Examples Browser





■ Reliability

HALCON is proven worldwide in tens of thousands of applications. The sophisticated algorithms are developed by MVTec's engineers, who have more than 25 years experience in machine vision. HALCON is concentrated core competence – developed by the only software manufacturer worldwide purely developing software for machine vision.

■ Speed

HALCON is implemented for highest performance, e. g., by actively exploiting multi-core computers, SSE2 and AVX, as well as GPU acceleration.



■ Protection of Investment

Compatibility is an important key for protection of investment. The machine vision software in which you invest today, must still be suitable tomorrow – wherever the advances in technology lead us and however the requirements of individual systems will change. In order to meet all needs, HALCON supports a great amount of image acquisition devices as well as a large variety of operating systems and programming languages.

HALCON naturally provides maintenance and availability of a version for years, also after purchase. Every new HALCON version is released with many technical innovations as well as improvements and enhancements in all areas – including, of course, also documentation and examples.

Shape-based matching (template size: 100 x 100, search area: complete image with 360° rotation)	0.875 ms
Affine transformation (nearest neighbor)	0.157 ms
Sobel edge filter (3 x 3)	0.089 ms
Median (3 x 3)	0.111 ms
Binomial filter (5 x 5)	0.078 ms
Gray opening (3 x 3)	0.075 ms
Binary dilation (50 x 50)	0.055 ms
Binary erosion (50 x 50)	0.014 ms
Threshold operation	0.061 ms
Subpixel-accurate threshold	0.257 ms
Feature calculation for 350 objects (blobs) (features: "center of gravity" & "number of pixels")	0.022 ms
Subpixel-accurate measuring of edge positions (search size 50 x 10)	0.004 ms
Fast Fourier transform	1.198 ms

The above runtime examples were measured using a byte image of size 640 x 480 on an Intel Core i7-2600K - 3.40 GHz computer using at most 4 threads. Note: runtime may vary with different input data.

