Machine vision systems

Applicable tasks

- **Recognition of color and alphanumeric markings**
  control of color marks, reading symbols and numbers at high speed, comparison with patterns
- **Determining the position of objects and their parts**
  relative position determination, part size and rotation check
- **Checking the assembly and components proper installation**
  reliable control of the correctness of the assembled product
- **Surface defect detection, print quality check**
  search for scratches, blemish and foreign matter
- **Counting the number of objects**
  automated control of the number of items in the package
- **Measurement of critical dimensions, tolerances**
  high accuracy of dimensional measurements
- **Reading 1D and 2D codes from product labels**
  product traceability (Track & Trace systems)

System architecture

The main system components

An PC with "Windows" operating system

© VDT-Vision software installed

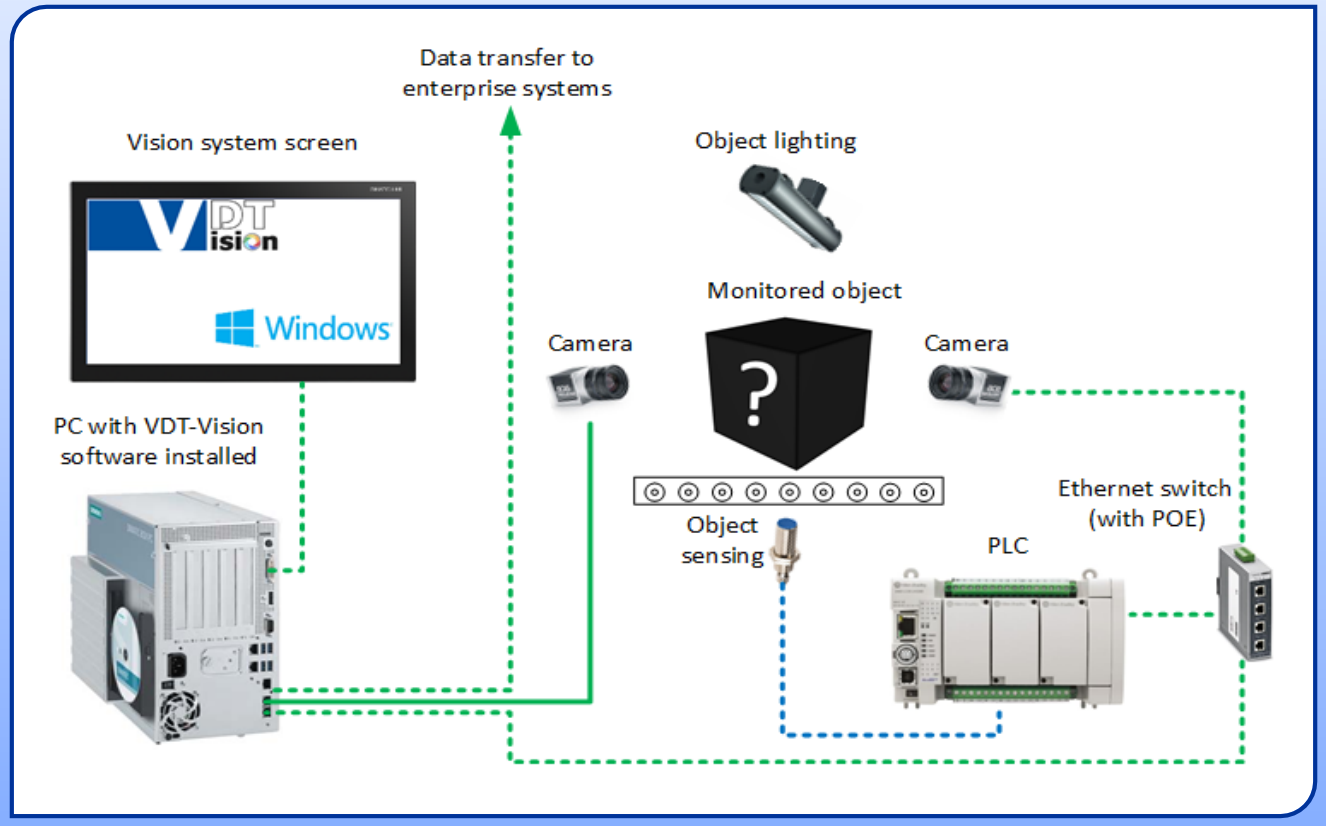
Camera

Optional components

Operator screen

Ethernet Network Switch (POE)

Programmable logic controller



LED lights

Object detection Sensors

An PC Card “Framegrabber”

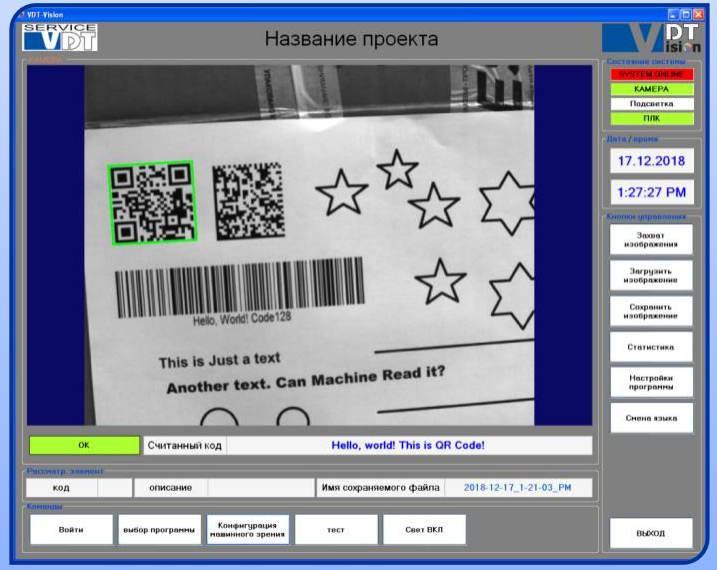
VDT-Vision Software

The main characteristics of VDT-Vision software

full control over the work of the system from a single software package
image capture from GigE or USB 3.0 cameras (up to 8 cameras simultaneously)
image inspection based on vision tools on PC
fully integrated machine vision control system

Complete and clear information about the system

images and inspection results storage
statistics store and accumulating
system status display



Data transfer to external systems

the ability to transfer processing results:
- on the operator screen
- to external data server
- to technology control PLC's
- Windows data exchange technologies support

Camera image capture

The VDT-Vision software allows you to capture images from GigE (Gigabit Ethernet) machine vision cameras

- USB3.0 cameras support

GigE cameras are standard cameras without image processing.
The inspection (analysis) of images is carried out using the VDT-Vision software.

VDT-Vision is able to work with all major manufacturers of GigE cameras.

- Basler
- Sick
- Cognex
- Datalogic

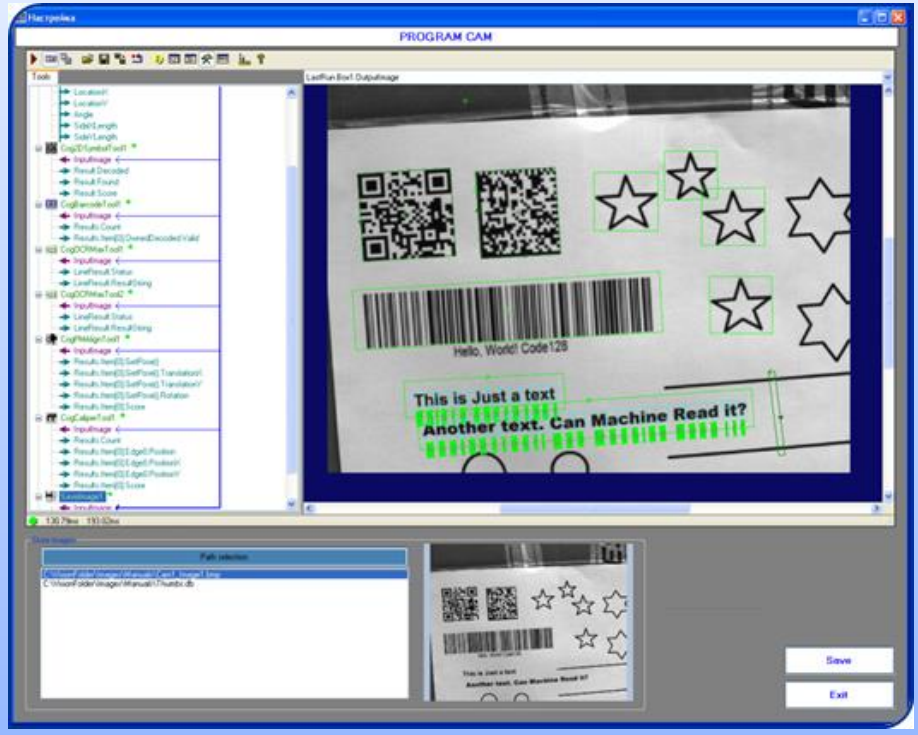
Optics from various manufacturers can be used with cameras
(Fujinon, KOWA, Basler, Evetar)

The Inspection (image processing)

- Image processing from cameras is performed using machine vision tools which are added and linked in the correct order in correspondent window.

- The software allows you to process color and monochrome images, recognize text and numbers, read 1D and 2D codes, find image elements by templates, make measurements of the distance between objects, and much more.

- The built-in library contains a huge set of various processing tools.



Integration into existing systems

Standard industry protocols support

S7
TCP/IP
RS232 (RS-485)
MODBUS
PROFINET (via gateway)
Digital and analog I/O (including PC I/O boards)

Windows operating system interfaces support

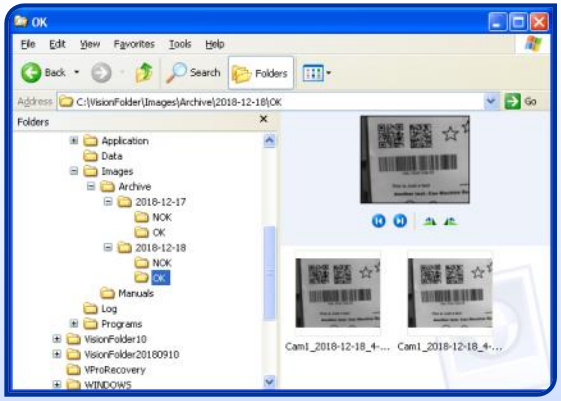
FTP
Samba

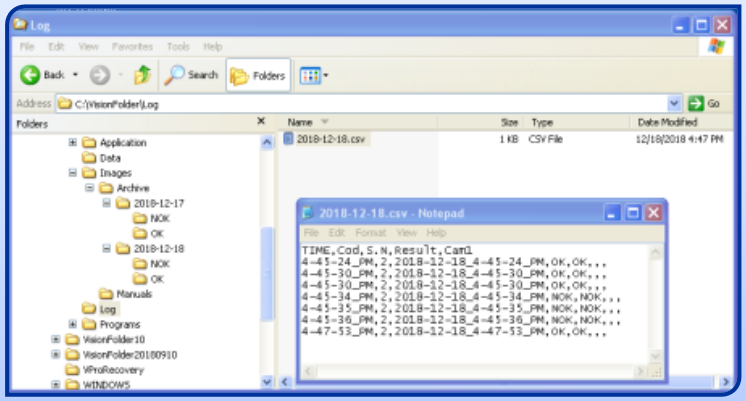
Additional features

data transfer to SQL Server or ORACLE databases
generating reports in MS Excel or MS Word format
integration of other communication protocols are possible

Inspection results storage

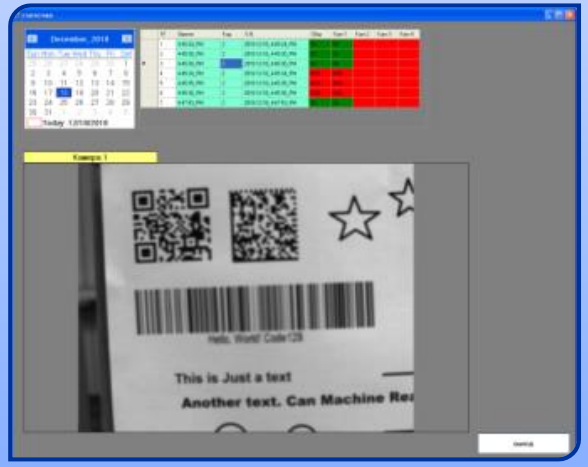
The software allows you to save all the images on a local computer disk, as well as to sort them.





The results of all inspections are stored in log files, the possibility of transferring data to the SQL server, ORACLE is provided.

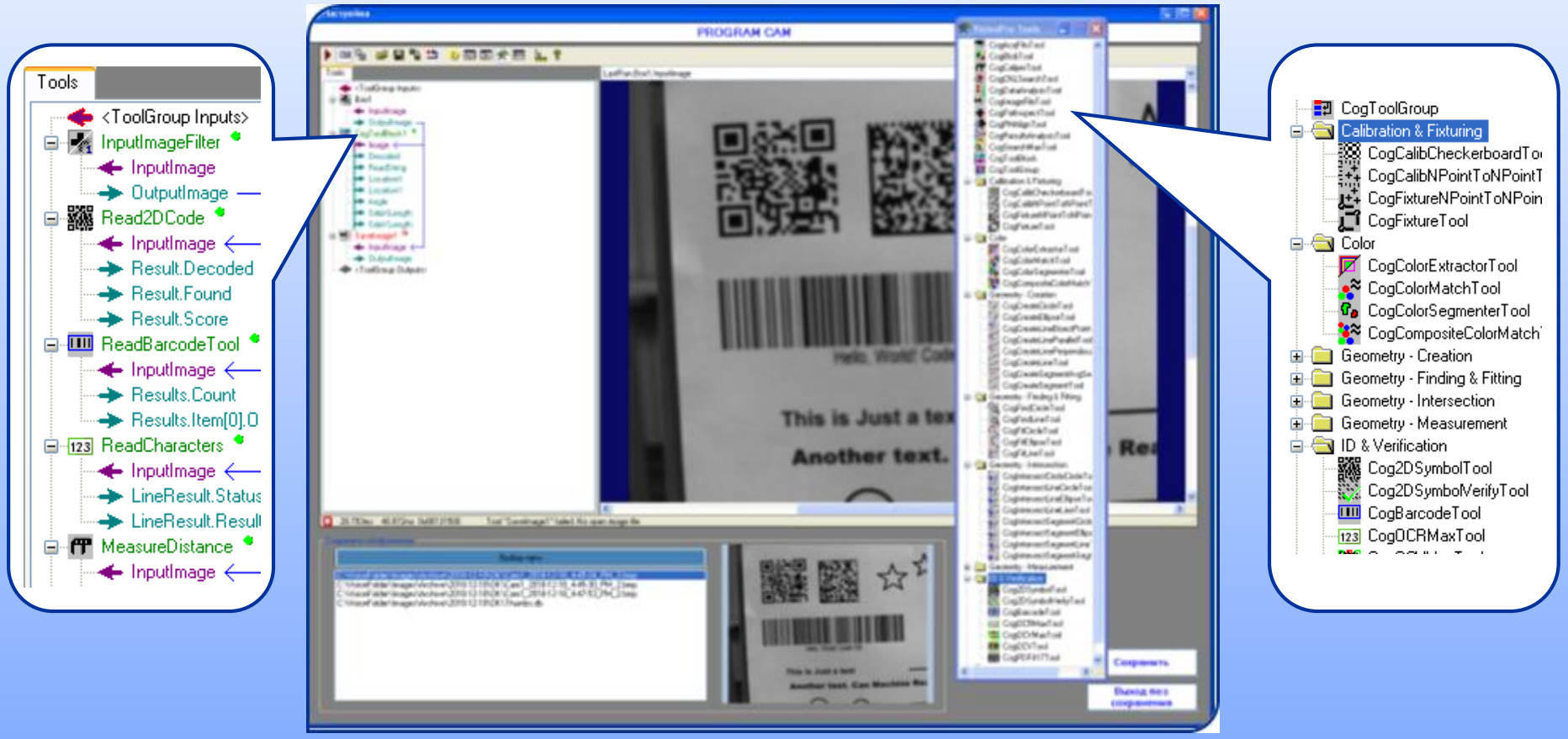
VDT-Vision has a built-in interface for viewing inspection results and photos.



Configuration

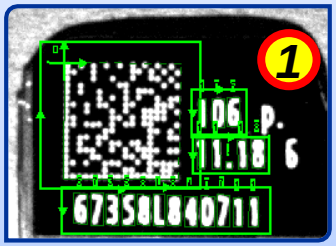
The configuration of the system is carried out through the built-in interface.
On the left side of the screen are the selected tools of machine vision, on the right - viewing the resulting image.

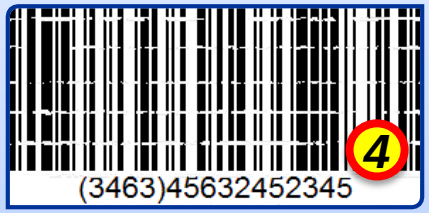
To add new tools called "floating" panel.

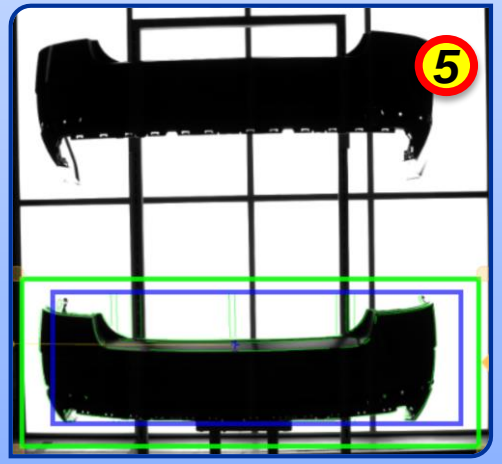


Application Examples

1. Control of marking (symbols, numbers, 2D code)
2. Monitoring of components installation on pre-selected parts
3. Handle label position control
4. Quality control of printing 2D and barcodes
5. Monitoring the components position on the automatic painting line







VDT-Vision software test stand

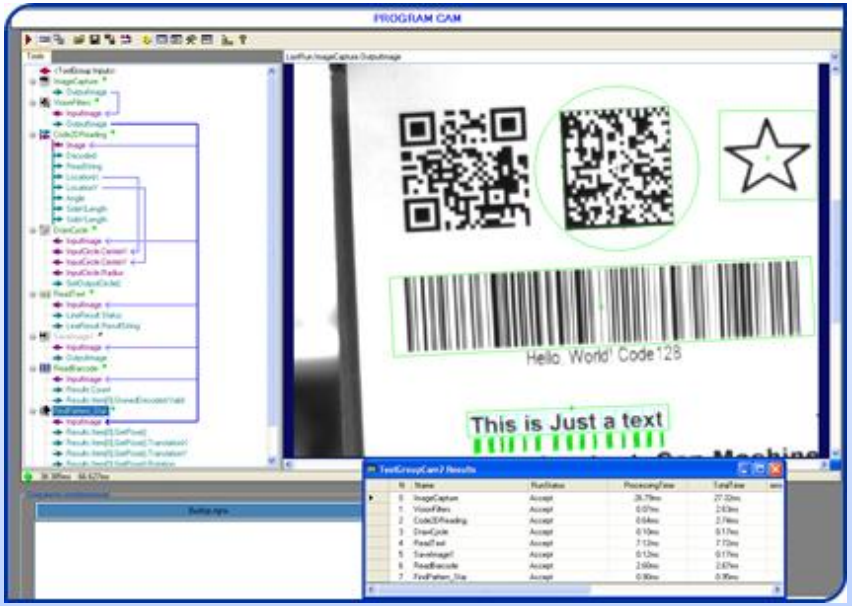
- To demonstrate the capabilities of the VDT-Vision software the stand was made
- VDT-Vision Software was deployed on a standard laptop
- For image capture the Camera COGNEX CAM-CIC-1300-60-G (1280x1024) is used
- Data transfer realized at the stand
  - SIMATIC S7-300 controller
  - operator panel KTP700
  - TCP/IP communication protocol

The Performance

- To measure the performance of the prepared test image with tasks for codes reading, text and graphic elements finding and verification.

- Camera was used for test measurements:
  - COGNEX CAM-CIC-1300-60-G

- The time measuring results for image capture, codes reading, text recognition for different resolutions:



test task for resolution 640x480

ToolGroupCam2 Results

	N	Name	RunStatus	ProcessingTime	TotalTime	erro
▶	0	ImageCapture	Accept	26.79ms	27.32ms	
	1	VisionFilters	Accept	0.07ms	2.63ms	
	2	Code2DReading	Accept	0.64ms	2.74ms	
	3	DrawCycle	Accept	0.10ms	0.17ms	
	4	ReadText	Accept	7.12ms	7.72ms	
	5	SaveImage1	Accept	0.12ms	0.17ms	
	6	ReadBarcode	Accept	2.60ms	2.67ms	
	7	FindPattern_Star	Accept	0.90ms	0.95ms	

test task for resolution 1280x1024

ToolGroupCam2 Results

	N	Name	RunStatus	ProcessingTime	TotalTime	errorTyp
▶	0	ImageCapture	Accept	41.93ms	42.48ms	
	1	VisionFilters	Accept	0.03ms	2.52ms	
	2	Code2DReading	Accept	10.96ms	13.10ms	
	3	DrawCycle	Accept	0.14ms	0.18ms	
	4	ReadText	Accept	6.71ms	7.27ms	
	5	SaveImage1	Accept	0.12ms	0.17ms	
	6	ReadBarcode	Accept	2.75ms	2.80ms	
	7	FindPattern_Star	Accept	2.30ms	2.35ms	

Comparison with smart cameras

VDT-service

Opportunities	VDT-Vision	Smart cameras	Comments
Using a wide range of machine vision tools without the need to buy a new hardware;			Smart cameras are having a set of tools depending on the model, manufacturer and a price of the camera.
The ability to store large amounts of photos, sorting, transfer to the "cloud" services			For smart cameras, the option is possible on external devices with a connection to each camera and additional software
Ability to learn and customize when it is convenient			For smart cameras, learning is done with "here and now" principle
Statistics control ability			On smart cameras implemented separately. Only general, short time statistics available
Comfortable user and operator interface			On smart cameras sold separately
Remotely control and configure ability			You must have a permanent connection to each camera.
Reading any barcode, 2-D codes			Depends on model and camera manufacturer
High performance			Depends on the used smart cameras and the hardware of the VDT-Vision PC
Possibility of the subsequent connection of cameras to the system			VDT-Vision: ability to connect in future up to 8 cameras for smart cameras the PLC and HMI project changes necessary

Thank you for your attention!

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