Everything under control - right where the action is with Smart Vision

CORSIGHT, the smart vision system developed by the technology company NET GmbH, is an all-round control system: the decentralised, digital image processing system is able to optimise production and logistics processes, monitor traffic flow, increase the safety of both machines and tunnels, and even control access to multi-storey car parks and toll roads. It combines the features of a camera, a computer and an image processing system in a compact housing and is, as such, predestined for flexible use in the smallest of spaces.

Trust is good, but control is better – above all when performing a key function in industrial image processing. No-one knows this better than the engineers at NET GmbH, the Bavarian technology company based in Finning. The products developed by the company, particularly the innovative smart vision system CORSIGHT, are the perfect choice in situations where effective monitoring or, better still, thorough inspection is required. CORSIGHT is a decentralised, digital image processing system, able to optimise production and logistics processes, monitor traffic flow, increase the safety of both machines and tunnels, and even control access to multi-storey car parks and toll roads.

Decentralised image processing wherever decisions are called for

CORSIGHT is at its most effective in situations where other control mechanisms cannot be used or are less economical. In such cases, smart vision symbolises the performance of all image processing tasks at a single location as the all-in-one system combines camera, computer, lighting and image processing in a single, small compact housing. This means that CORSIGHT is positively predestined for flexible use in the smallest of spaces. Unlike conventional, centralised image processing systems, image acquisition, image processing, image interpretation and process decision are all carried out within one single unit - precisely where inspection and control is called for.

CORSIGHT's ability to integrate with other systems is further enhanced by the software interface SynView. This means that the smart vision system is compliant with the current GenIcam, GenTL and GigE industry standards and has been developed by NET as a solution for cameras and tools that can operate these interfaces. Users can thus integrate CORSIGHT into their existing environment without further ado.

This results in tangible advantages, such as low space requirement, simple assembly and lower infrastructure costs for installation as opposed to a complete system comprising a standard computer, camera and cabling. Existing machinery can be expanded quickly, easily and at low cost. All you have to do is add a test bench - you don't need to alter a central system for this. Each test bench operates independently, but they can all be easily interlinked by means of a standard network or a central system that monitors, controls and optimises all of the machinery. All interlinked test benches, including all data and test programmes, can be easily accessed and are centrally updated. CORSIGHT runs under Windows or Linux and is compatible with all conventional image processing software.

Practical monitoring in industrial applications

Rejecting bad parts during the production or packaging process, making the flow of goods more flexible and more cost-efficient for logistics or recording traffic violations around the clock - all these are typical examples

of situations in which the use of the CORSIGHT smart vision system makes existing processes more flexible, more effective and more cost-efficient. The following shows three typical applications in detail:

Industry/mechanical engineering - quality and factory automation

The manufactured parts are inspected during the production process so that bad parts can be rejected at an early stage or so that the production process can be controlled and optimised. This may apply for monitoring fill levels, caps and labels in bottling plants or for checking the dimensional accuracy of bending loads, diameters, distances and widths in the production of crankshafts. As there is often not enough room on the machine itself to carry out inspection, the CORSIGHT smart vision system is the perfect solution: the compact housing can be integrated directly into the machine. All smart vision systems incorporated into a machine/machinery can be easily interlinked to the machine control system's main computer by means of a network connection. The production process can thus be controlled at low set-up cost, and both the product quality and the process itself can be optimised at machine speed.

Logistics

Networked systems with compact dimensions that can be applied directly to the flow of goods immediately reduce logistical expenses by identifying and decoding barcodes, QR codes, data matrix codes and reading text. These systems can be used not only for parcel distribution on the basis of the address stated on the address field and the barcode on the parcels, but also for part-feeding systems in the automotive assembly industry on the basis of data matrix and barcodes with which each vehicle can be assembled individually according to customer specification.

Traffic engineering

In traffic engineering there are numerous ways in which smart vision systems can be applied: for recording traffic violations, collecting tolls, identifying and monitoring traffic flow with an automatic warning system that is activated in the event of traffic congestion, and identifying a particular vehicle and its number plate upon entering a multi-storey car park. The key feature in all cases is the identification of vehicles, number plates, bicycles and pedestrians and their movements by means of a "flash unit" to detect traffic violations, for example. In order to secure evidence, a photo or video clip of each occurrence can be transmitted wirelessly via WLAN or GSM and the control system warned.

Unique system features: integrated additional benefits

CORSIGHT, the smart vision system, has many unique features:

All-in-one

A single, compact, IP67-compliant case houses a complete image processing. The system comprises an embedded computer, a digital camera, lighting and digital interfaces. The X86-compatible CPU enables the use of image processing software under Windows or Linux. Users can use the tools with which they are already familiar to configure or program the system. When used in everyday work environments, this means that the image can be acquired and processed, and control takes place wherever monitoring and reaction are called for. The costs of integration and development remain low as the development department already has the expertise necessary to create an application.

Efficient use of computer resources

The FPGA between image sensor and CPU enables precise control of the image acquisition and real-time image editing without CPU. The intelligent camera featuring FPGA performs image processing tasks that have extremely high computing requirements. The parallelism of the processing technique in the FPGA - all processing steps run permanently and concurrently - enables real-time execution speeds to be achieved with deterministic processing times. The image data is then stored in the system memory via Direct Memory Access (DMA). This means that CORSIGHT can also be used for tasks that require a high clock rate, such as bottling. The SSD connection enables data to be transferred from the RAM to the SSD at high bandwidth in a way that reduces the CPU load.

Digital interfaces and internal miniPCI-Express Slot

Digital interfaces such as WLAN, Bluetooth or a GSM connection can be easily created. The Gigabit Ethernet interface enables a direct link to the machine control system and its protocols. This reduces the costs of peripherals and/or infrastructure in certain applications as there is no need for a cable to transmit the occurrence to the control system. The digital, opto-decoupled inputs and outputs enable synchronisation with the machine cycle and allow machine components, such as the identification and rejection of faulty parts, to be directly operated without any additional effort.

SynView and image processing software packages

NET's SynView software enables an interface environment for all types of cameras as well as the use of NET cameras. Image acquisition can be internally controlled via the popular standard GenICam as conventional image processing software is supported. This means that GenICam / GenTL-compliant software packages, such as Adaptive Vision Studio, HALCON or LabView, and open-source packages, such as OpenCV, can both be used without any additional time and effort spent on integration.

Human Machine Interface (HMI)

A monitor for displaying images and results as well as a keyboard and mouse or, optionally, a touch screen for entering the data can be directly connected to the system.

Compact & powerful: performance characteristics of CORSIGHT

Featured properties as a camera for image processing

• Compact all-in-one image processing system: Combines all the components of an image processing system in one single housing

• Wide range of image sensors: The proper image sensor - CCD or CMOS - for every application, from VGA to 5 megapixels.

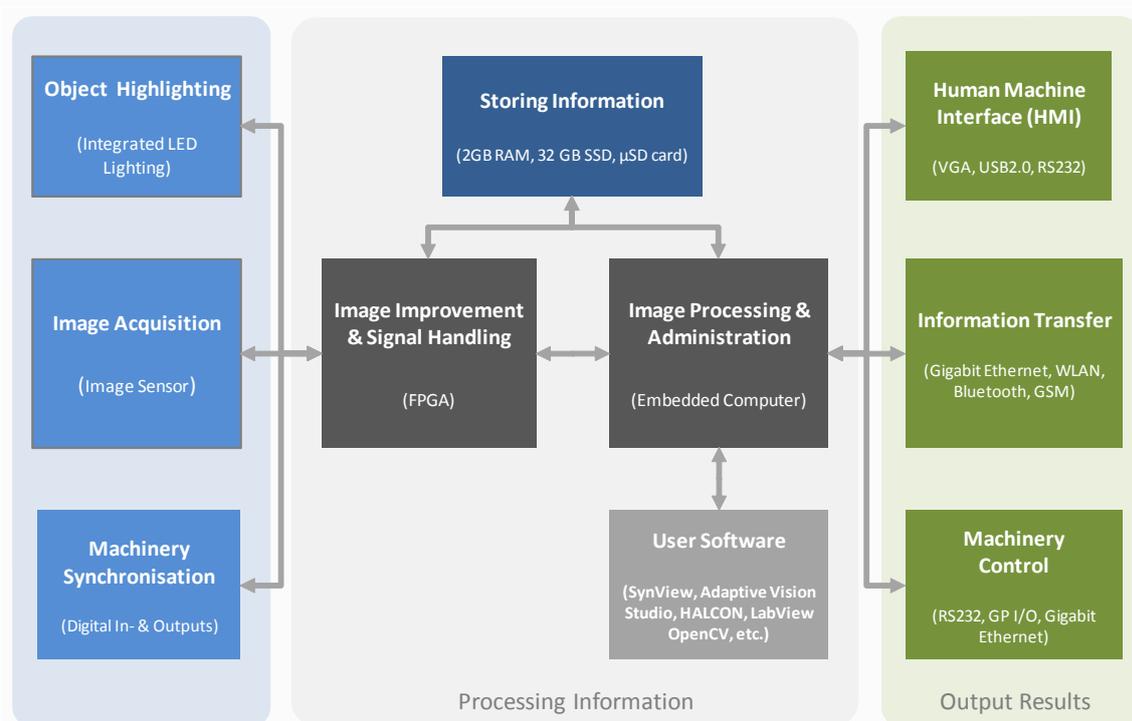• Dust- and splash-proof in accordance with IP67

Featured properties as a computer for image processing

• Embedded computer: Based on standard CPU architecture (X86) and SSD-based hard disk

• On-board FPGA: CPU load-free image editing featuring programmable logic, low-cost real-time image processing, and high-performance image processing for industrial applications with a high rate of transmission data.

• Standard interfaces: USB2, Gigabit Ethernet, RS232, VGA and digital in- and outputs

Featured properties of algorithms and software

• Windows or Linux: The system software already run by the company can be used

• Supports SynView, NET GmbH's cross-camera software interface: An application for all GenICam / GenTL-compliant cameras

• Directly supports commercially available software packages GenTL-compliant software packages such as Adaptive Vision Studio, HALCON, LabView and OpenCV

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Fig. 1 Functional diagram of CORSIGHT

Object Highlighting (Integrated LED Lighting)		Storing Information (2GB RAM, 32 GB SSD, μSD card)		Human Machine Interface (HMI) (VGA, USB2.0, RS232)
Image Acquisition (Image Sensor)	Image Improvement & Signal Handling (FPGA)	Image Processing & Administration (Embedded Computer)		Information Transfer (Gigabit Ethernet, WLAN, Bluetooth, GSM)
Machinery Synchronisation (Digital In- & Outputs)		User Software (SynView, Adaptive Vision Studio, HALCON, LabView OpenCV, etc.)		Machinery Control (RS232, GP I/O, Gigabit Ethernet)
	Processing Information			Output Results

Simple control, minimum effort: SynView at a glance

Intuitive operability, flexible adaptability to the software already in use within the company, and low maintenance: CORSIGHT is quick and easy to use thanks to the integrated SynView interface developed by NET.
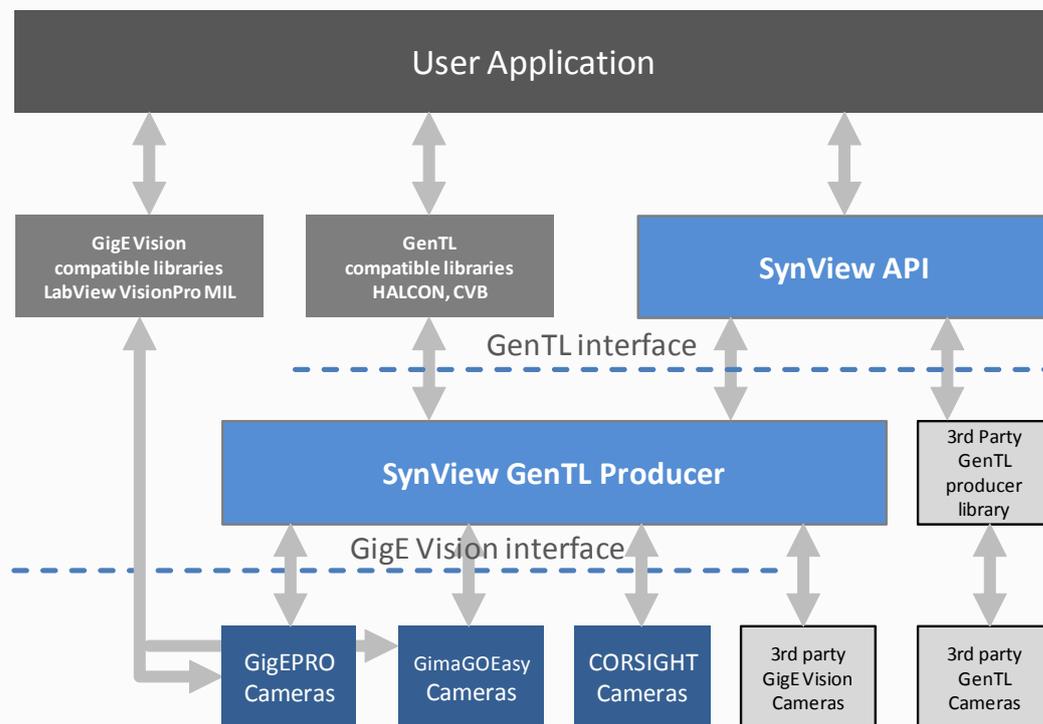
SynView is based on the current GenIcam, GenTL and GigE industrial standards and has been developed by NET as a solution for cameras and tools that can serve these interfaces. Users can thus integrate CORSIGHT into their existing environment without further ado. A new application developed by the customer on the basis of SynView generally works not only with any other camera that complies with these standards, but also with cameras for which a unique SynView software interface has been developed. This makes it a common, standardised interface for this category of cameras, which may include not only NET cameras, but licenced third-party products as well.

Service and maintenance requirements are also kept to a minimum: an application developed for a USB camera, for example, can easily be used on an adapted hardware solution on the basis applied for GigE cameras, in order to extend an existing system to a larger network, for example. A series of DLLs, which offer a large number of functions for customer applications, form the basis of the system.

SynView is even a great deal simpler to use than the direct implementation of the standard, enabling the user to concentrate fully on the application.

The complete system with connections to the outside world (see next page):

Fig. 2: SynView complete system

The core of the system is the so-called "SynView GenTL Producer". The interface of this core is compatible with the GenICam and GenTL standards.

The "SynView API" generalises the GenTL standard even further and creates an interface that is completely object-oriented and very simple to operate. A complete list of object-oriented languages such as "C++", "C++.Net", "C#" and "Visual Basic.NET" are supported. There is, of course, also a pure C interface.

Users don't have to familiarise themselves with new programming environments: the SynView API is the preferred interface for programmers of customer applications. This means that programmers can carry out their development work in their preferred language without any restrictions.

Windows and Linux systems in 32 and 64 bit architectures are both supported.

The Explorer makes it possible: quick development of own applications

The Explorer function that is integrated into CORSIGHT makes the development of customer applications mere child's play. Yet, in principle, the Explorer is an application just like any other customer or demo program. The extremely helpful tool is based on the SynView system's SynView API. The various possibilities that the system offers are, however, fully exhausted.

The Explorer enables the graphic display of all of a GenICam standard-compliant camera's features. To do so, it uses a "feature tree" that can be opened and closed. The Explorer offers the following simple-to-use tools not only for beginners, but also for experienced SynView developers: code generator, code templates generator, project generator and settings generator.

Even an absolute beginner can create a complete project for Microsoft Visual Studio 2010 with just a few mouse clicks (the relevant source codes and makefiles are created under Linux). The created program can be run immediately and provides an image of the connected camera - complete with generated GUI. There are versions that, for example, can activate OpenCV functions or use Qt-generated GUIs as well as .NET-based GUIs.

The Explorer makes developers' jobs easy: they can use the application to immediately try out new functions and transfer fragments of the program from the Explorer window to their own program with "cut&paste", with the result that they can implement these new functions without any coding effort. Experience shows that this feature works surprisingly well and surprisingly fast, making it a firm favourite among users. The time-consuming search through developer documentation is a thing of the past.

Conclusion

The advantages of a compact and universal system such as CORSIGHT are apparent wherever industrial image processing as part of monitoring and control processes plays a key role: decentralised image acquisition, image processing, image interpretation and process decision in the smallest of spaces - precisely where in-spection and control is called for. As it supports current interface standards, the SynView software interface is compatible with commercially available third-party software products. It can also be integrated quickly, easily and at low cost into existing machinery.

About NET

NET New Electronic Technology has more than 15 years of experience in the development, production and distribution of innovative camera technology. Its in-depth application knowledge enables NET to come up with creative concepts and solutions for the industrial and medical sectors. Camera technology, CCD and CMOS technology, FPGA programming, hardware and software design are NET´s core skills which can be tapped within the company. The innovative portfolio is supplemented by a wide range of standard and custom vision components as well as machine vision software.