Smart line scan solutions for continuous processes

net
younique solutions

Line scan sensors offer unique advantages over area scan sensors, when it comes to inspection of moving objects. We would like to give you an overview of applications suitable for smart line scan cameras, and give guidance how to make optimal use of smart image processing systems.

Especially when inspecting continuous material, or moving objects, a continuous image acquisition without any gaps is much more efficient. Requirements like minimal detection lag, high resolution, reduction of distortion, zero pixel defects, or more simple lighting configurations clearly favor line scan sensors.

## Web Inspection of Film and Glass Substrate

Inspection systems are commonly used in blown film and flat film extruders as well as in converting or coating lines.

Detection of various defects on continuous materials, like foil or film, require special lighting setups, which consist of multiple lights. Any combination of bright field, dark field, or even multispectral lighting may be required to detect all anomalies on the material. Since multiple light sources may eliminate each other, only one light source can be used per line.

In order to record every position on the surface with all different light sources, the line scan cameras used need to support fastest line rates with virtually no jitter.

CORSIGHT offers line scan sensors with line rates of up to 1 million per second and guarantees virtually jitter-free acquisition. Furthermore, CORSIGHT provides the right hardware to process the image data in real time, for example by calculating 2D filters on the fly in the camera's FPGA, even before it is available to the CPU for evaluation.

Plastic and Rubber Industry:
Film / Glass Substrate
Inspection
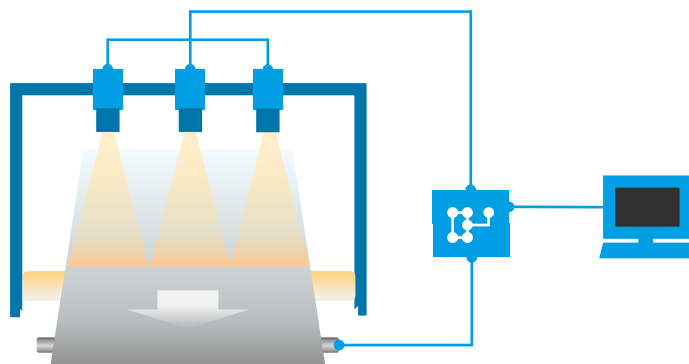
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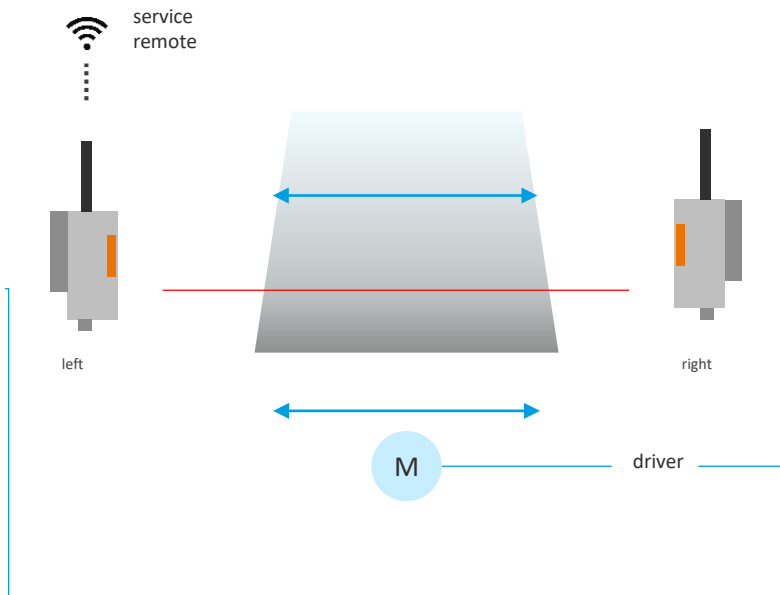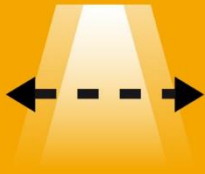
Position Measurement / Web Guiding

CORSIGHT line scan smart cameras detect the position of the web edges, and calculate the current position within a millisecond. The camera also registers the current position of the linear drive using the encoder signal connected to one of CORSIGHT's digital I/O ports. The software solution running directly on CORSIGHT is now able to compare the web's current position with the expected position, and controls the linear drive to compensate for the displacement. This implements a closed loop system to keep the web within tolerances.

A CORSIGHT all in one solution can be used for various applications, for example, if two or more layers need to be laminated. It is easy to detect the position of materials for the adjustment of cutting tools, or the position of the material itself in winding stations. CORSIGHT features an Intel Atom E3940 CPU with Windows 10 IoT, or Linux as operating system. A large choice of area scan, high speed, and line scan sensors is available. Connectivity options include Gigabit Ethernet, USB, RS232, DisplayPort, Bluetooth, and even WiFi. CORSIGHT's open platform allows to run various standard image processing libraries as well as customer specific algorithms. NET's Open Camera Concept even allows customers to use resources like the onboard FPGA.

service remote

left

right

M   driver

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Position Measurement / Web Guiding

Advantages of Line Scan

- Resolution and Cost: In the above example, compared to a typical 16MP Global Shutter area scan camera, a 4K line scan camera might come at half the cost or even less.

- 100% Inspection: Unlike an area scan camera, special shuttering and image stitching techniques are not needed to obtain a continuous image of an object's surface. There are no gaps, overlaps, or smears in the captured image.

- Lighting setup: As only the portion of the object covered by 1 line of pixels needs to be illuminated, it is much easier to achieve homogenous lighting than with an area scan camera.

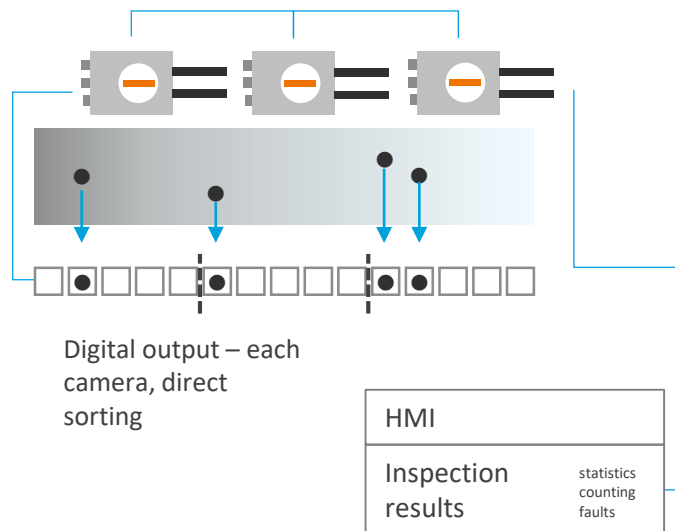# Smart line scan solutions for continuous processes
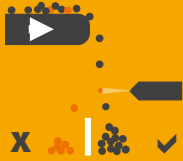
Sorting of fast moving and small Objects

NET offers CORSIGHT as a smart vision system with integrated line scan sensor (2 and 4 K) and line scan functionality in area scan sensors. NET`s 3iCube / iCube USB cameras and GigEPRO cameras offer line scan functionality with area scan sensors.

Sorting machines are used to automatically check dimensions and surface condition of bulk goods at highest speed. Every smart vision system is able to work autonomously in a certain range of the conveyor.
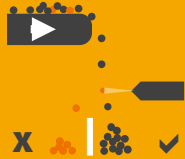
It then decides if an object is good or bad, directly controls the sorting mechanism in real time, and transmits statistical data to a central processing unit. Depending on the type of objects, a free fall setup instead of a conveyor may be realized even without knowledge of the current speed.
The compact all in one machine vision system CORSIGHT offers highest sorting efficiency right where it is needed, instead of the need to rely on complex interfaces like camera link, or 10 GigE. All smart processing resources, like CPU or FPGA, can be used in a custom application based on NET's Open Camera Concept.

Digital output – each camera, direct sorting

HMI	
Inspection results	statistics counting faults

4

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Sorting of fast moving and small Objects

5 pros for Smart Line Scan vs. Smart Area Scan

- resolution   higher resolutions achievable with 1k up to 4k
- speed   up to 1 million lines per second
- components   homogeneous illumination of an area vs. a small line illumination
- sensor size   allows standard CCTV and C-mount lenses
- architecture   built in FPGA: no external frame grabber / video output

                      built in incremental encoder: no additional gearbox or trigger generator required

Smart line scan solutions for continuous processes

The NET Open Camera Concept®

Open Camera Concept

The GigEPRO camera series enables the integration of real-time algorithms directly in the camera, which opens up new possibilities for optimizing applications. The GigE Vision, GenTL/GenICam-compatible camera comes with the Open Camera Concept that enables customers to create an "application specific camera" using the algorithms provided by NET, their own algorithms, or a combination of both, for real-time applications. Based on this functionality and flexibility, developers are provided with everything they need to start programming their GigEPRO immediately.
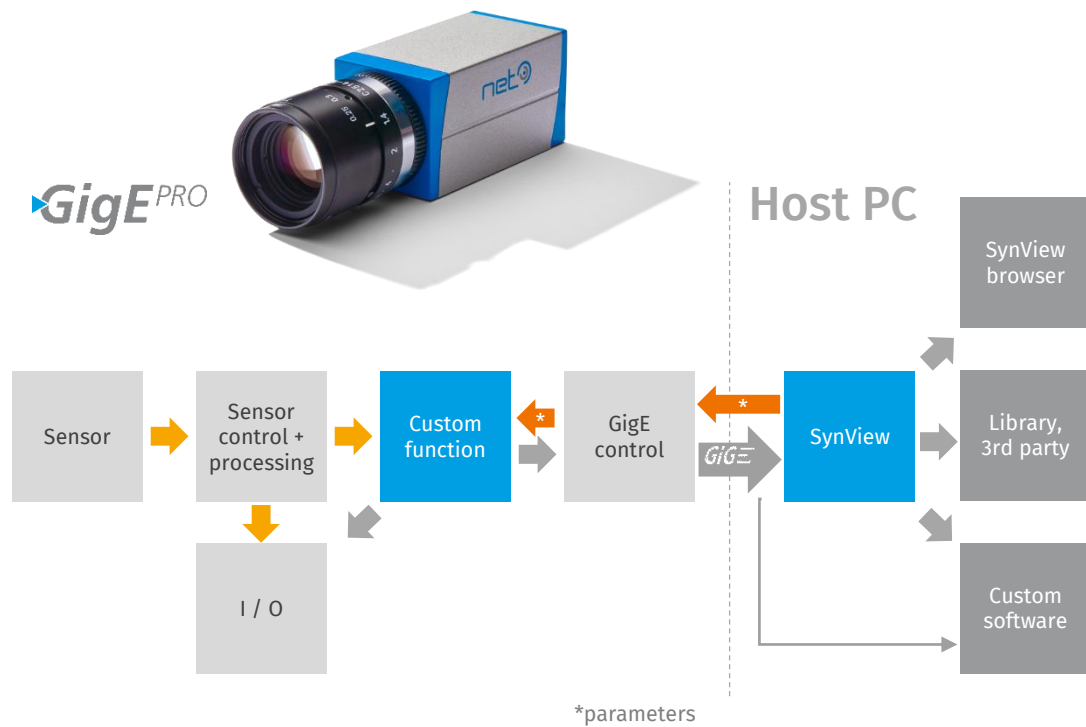
GigEPRO - GigE Vision camera with integrated algorithms for real-time applications

- GigEPRO offers system integrators a camera for the development of application-specific image processing solutions for real-time applications

- Companies are able to protect their competitive advantage as it is impossible to apply their know-how

- GigEPRO is able to encrypt sensitive image data using personalized algorithms that only the customer knows

- Compared to standard machine vision cameras, the GigEPRO Open Camera Concept offers more built-in options as it is not only possible to program specific functions, but in addition a wide variety of library-based functions can also be added and combined with each other

- As a complete all-rounder with image pre-processing functions, GigEPRO reduces the load on the host PC's computing capacity and significantly reduces the infrastructure costs

- GigEPRO is compliant with industry standards - the extended functions can be easily integrated into a GenICam-based environment

Smart line scan solutions for continuous processes

The NET Open Camera Concept®

Open Camera Concept

*GigE*PRO

Host PC

Sensor	Sensor control + processing	Custom function	GigE control	SynView

I / O

GigE

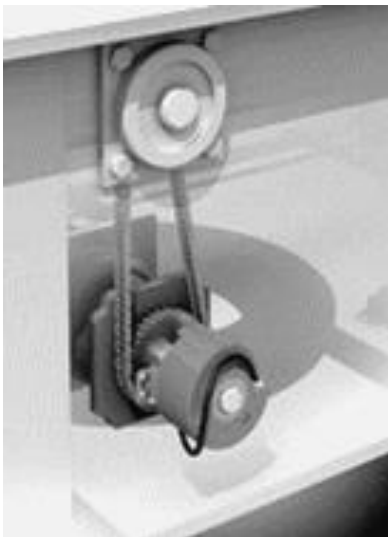SynView browser

Library, 3rd party

Custom software

*parameters

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Line Scan incl. Gearbox (Encoder Application)

To simplify image processing, it is paramount to acquire images without any distortion, especially in line scan applications. An incremental encoder provides information about the current speed of the conveyor to the CORSIGHT smart vision system.

Every application using line scan cameras requires to synchronize the machine speed with the line recording rate of the camera. CORSIGHT offers a hardware interface to directly process the signals of an incremental encoder, and generate the respective line trigger signals for the line scan sensor internally.

CORSIGHT offers all commonly used modes of signal encoding, such as:

- Quadrature decoder module
- Single phase mode
- Dual phase mode
- Quadrature mode
- Direction analyzer
- Sensor trigger generator

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Corsight All in one Vision System

CORSIGHT – Image Acquisition, Processing, and Machine Control at the place of inspection

CORSIGHT, the smart vision system developed by NET New Electronic Technology, offers camera, processing unit, and machine vision software in a compact housing. It paves the way towards the Industrial Internet of Things (IIoT) in manufacturing industries in shape of a decentralized, digital, image processing system. Imaqe acquisition, processing, and machine control all take place autonomously on a single system, directly where products are inspected, and their production needs to be controlled. This is edge computing for machine vision.

CORSIGHT offers a solution for almost every application area

CORSIGHT is applicable to most industries, and applications. The smart vision system checks the quality of discrete products, as well as the surface of continuous materials with 100% reliability and accuracy. Large production volumes, high line speed, or color processing are no challenge for CORSIGHT. When inspecting continuous material, it keeps up with highest speeds and recognizes tiniest defects thanks to its' fast, high-resolution line scan sensors. Powerful area scan, and line scan sensor options allow CORSIGHT to detect surface defects, check dimensions, determine absence and presence of objects, and much more.