ANIE FEDERAZIONE
Technologies for our future

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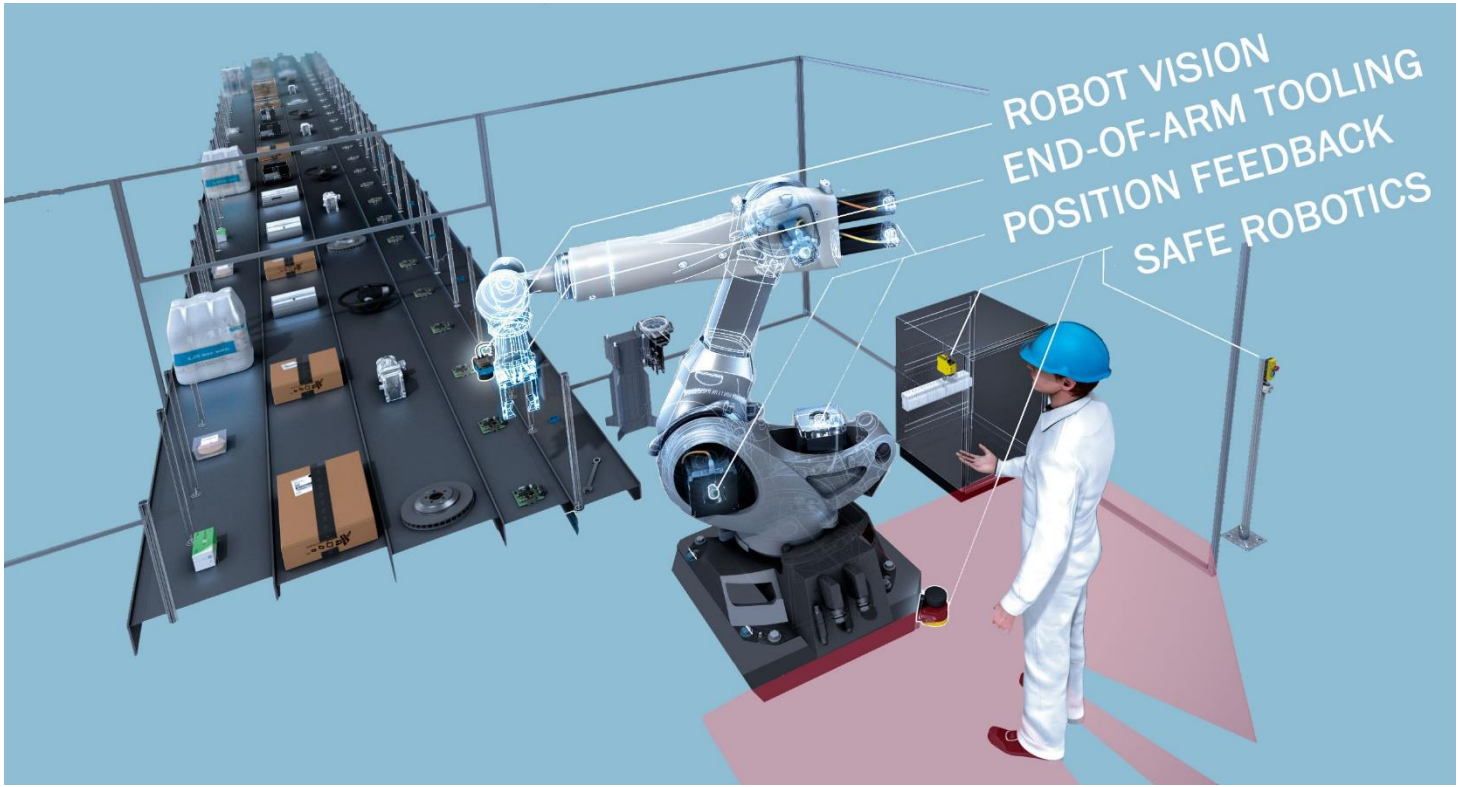
Robot Guidance with vision systems

Claudio Donadoni

SICK
Sensor Intelligence.

Sensor solutions for robotic



Sensor solutions for robotic

ROBOT VISION

Image-based solutions which enlarge the field of vision of the robots are increasingly becoming the focus. Thanks to vision technology, the robot localizes and identifies defined objects in advance and decides by itself how to grip the respective part. Thereby, there is no need for mechanical attachments such as object guides. Even measurements and quality inspections can be carried out.

SAFE ROBOTICS

The close and, at the same time, safe collaboration between humans and robots on an equal footing is the prerequisite for high productivity, increasing efficiency, and improved ergonomics. Safety technology thereby plays a key role and enables unimpaired and safe human intervention into the robot system and reduces downtime in production.

END-OF-ARM TOOLING

The sensitivity of gripper arms is becoming increasingly important. Intelligent object detection is the key to complex automated applications and detection functions can be customized and preset in line with special object properties relating to material, surface, or form, for instance.

POSITION FEEDBACK

Motor feedback systems in the field of robotics deliver the data on speed and position as well as on the condition of the drives to the control system. They thereby create the sensory foundation for all robot movements.

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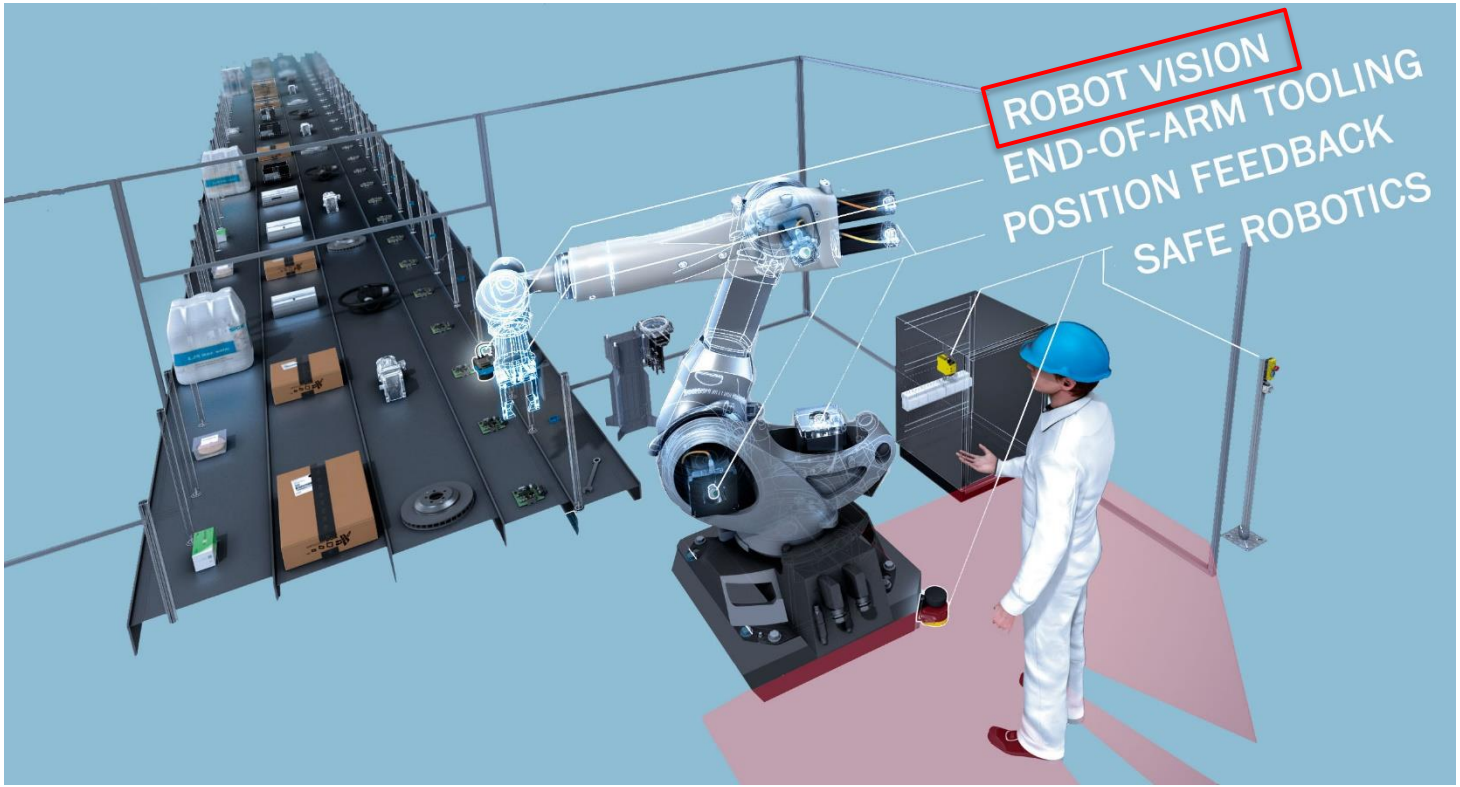

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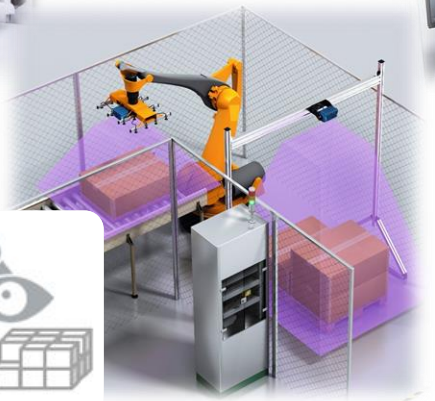
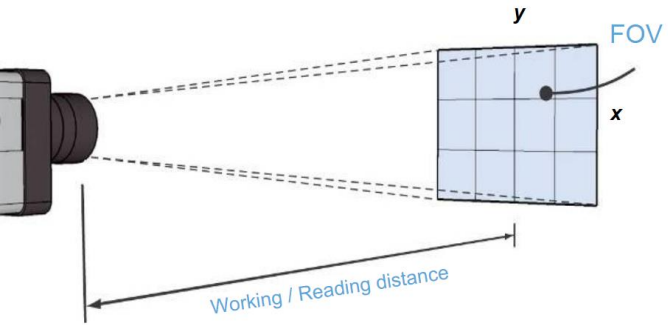
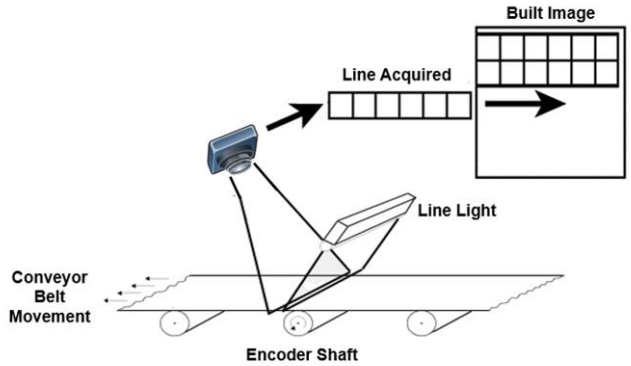


2D data



2D **area array** system takes a two-dimensional snapshot of an object,
1D **line scan** systems build images line-by-line.



3D data

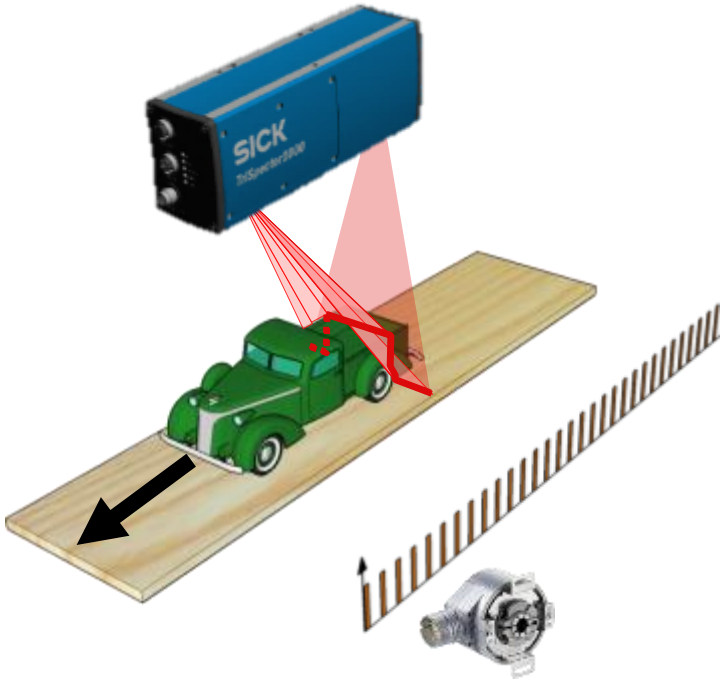
There are different technologies to acquire 3D data.

The most common are:

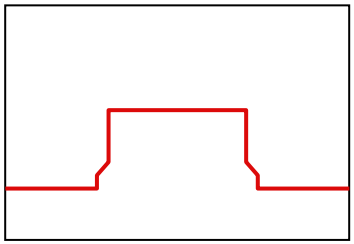
- Laser triangulation
- Time Of Flight (TOF)
- Stereoscopy

3D data – laser triangulation

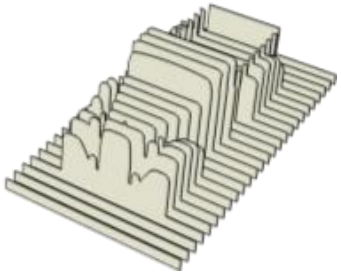
- A laser line is projected on the object
- A height profile is recorded by the camera (angled view)
- Movement → multiple height profiles are collected → 3D image
- Encoder pulses → ensures equal profile distances → no distortion



Encoder



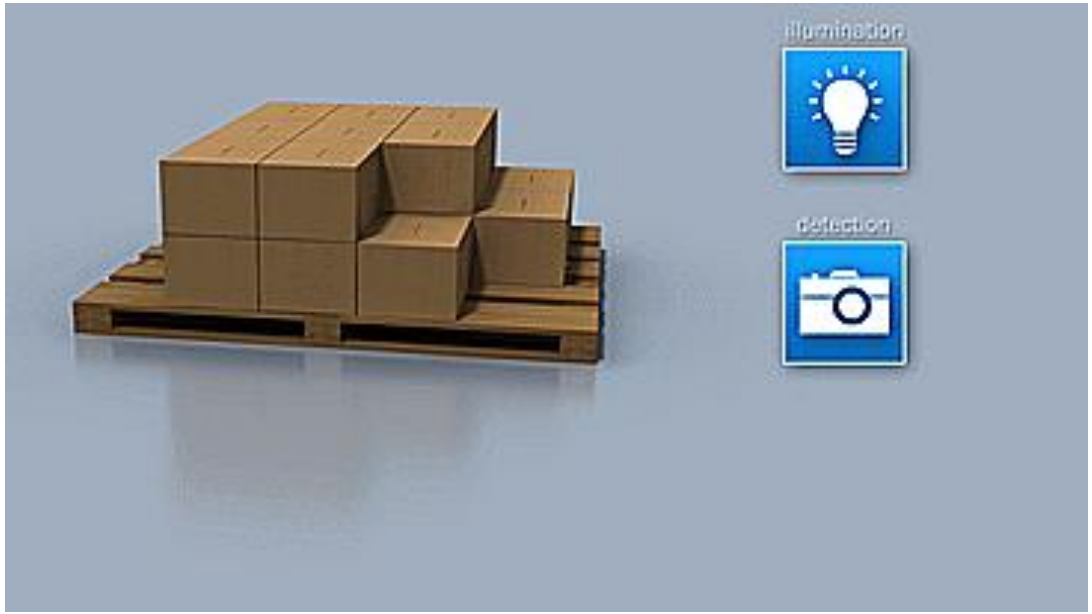
Height profile



3D image = Collection of height profiles

3D data – time of flight

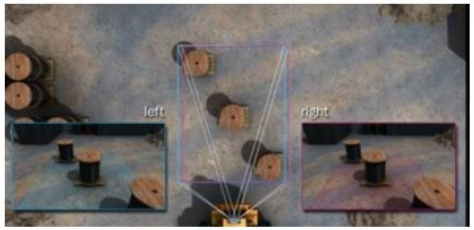
By knowing the time or phase shift of signal arrival relatively to the initial signal, the distance (depth information) between the device and target can be extracted

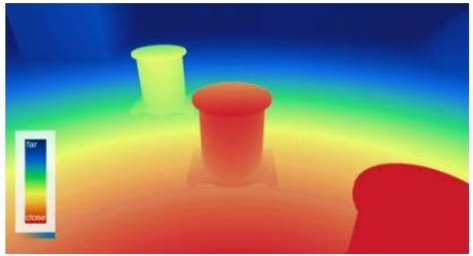


3D data - stereoscopy

In stereoscopy, 2D images of the same object are taken from different angles, just like in human eyesight.

Combining the position information of the objects photographed in each 2D image it is possible to reconstruct the 3D distance map.

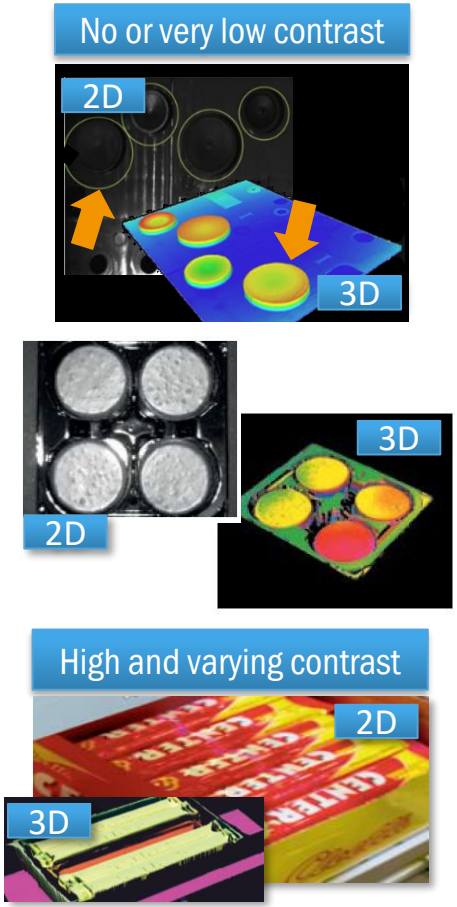




2S vs 3D

2D CAMERA

- Works with intensity or colors
- A good contrast beetwen object and background is necessary
- It’s possible to inspect the graphic of the object
- It’s sensible to environment conditions (variation in illumination, dirt on conveyor, etc)



3D CAMERA

- Works with height
- No contrast beetwen objects and background needed
- Robust illumination changes
- Color indipendent

Belt picking

2D

Robot belt picking

Robot picking of kitted parts

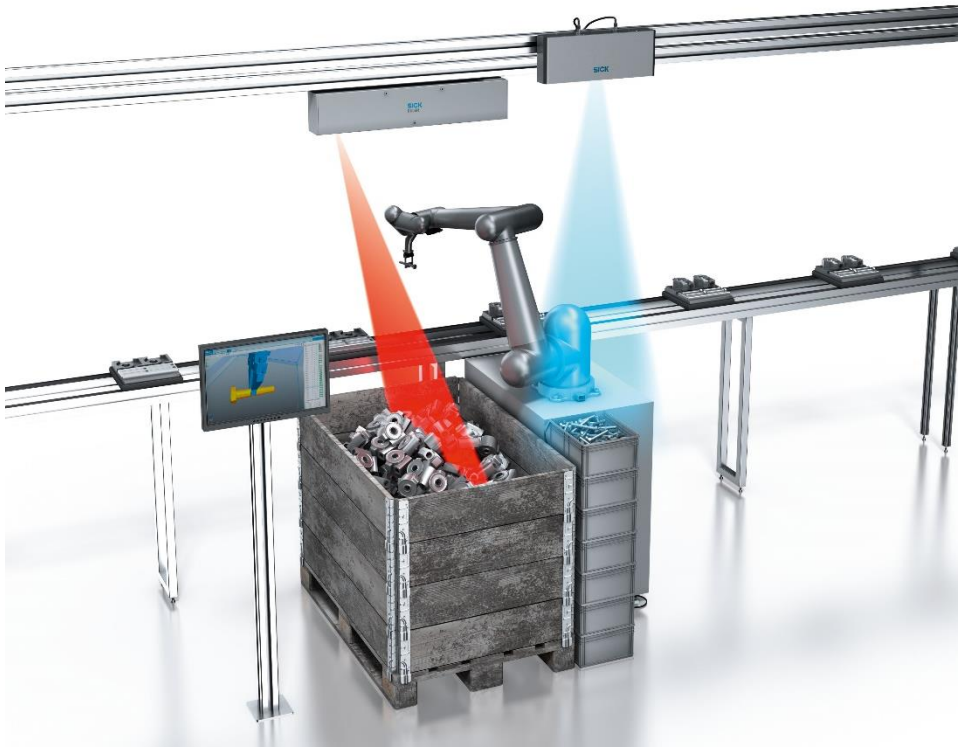
3D

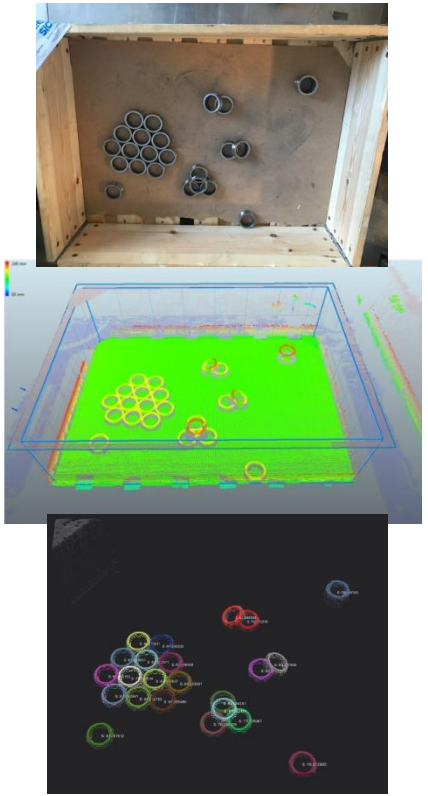
Robot picking for packaging

Robot picking for packaging

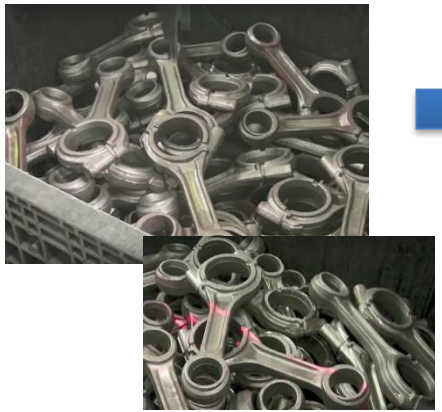
Robot picking for packaging

Bin Picking

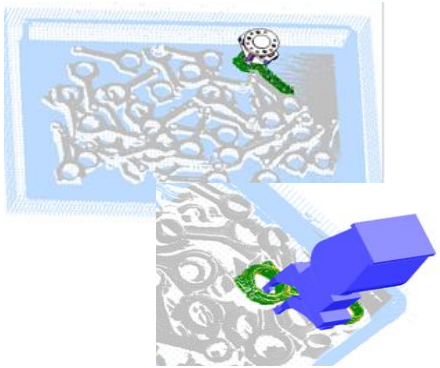




Bin picking process



1. Acquire new data



2. Locate part with different algorithm, e.g. using the CAD model

3. Pick up the part

repeat

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