Create value to your production with 3D ToF cameras.

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Agenda

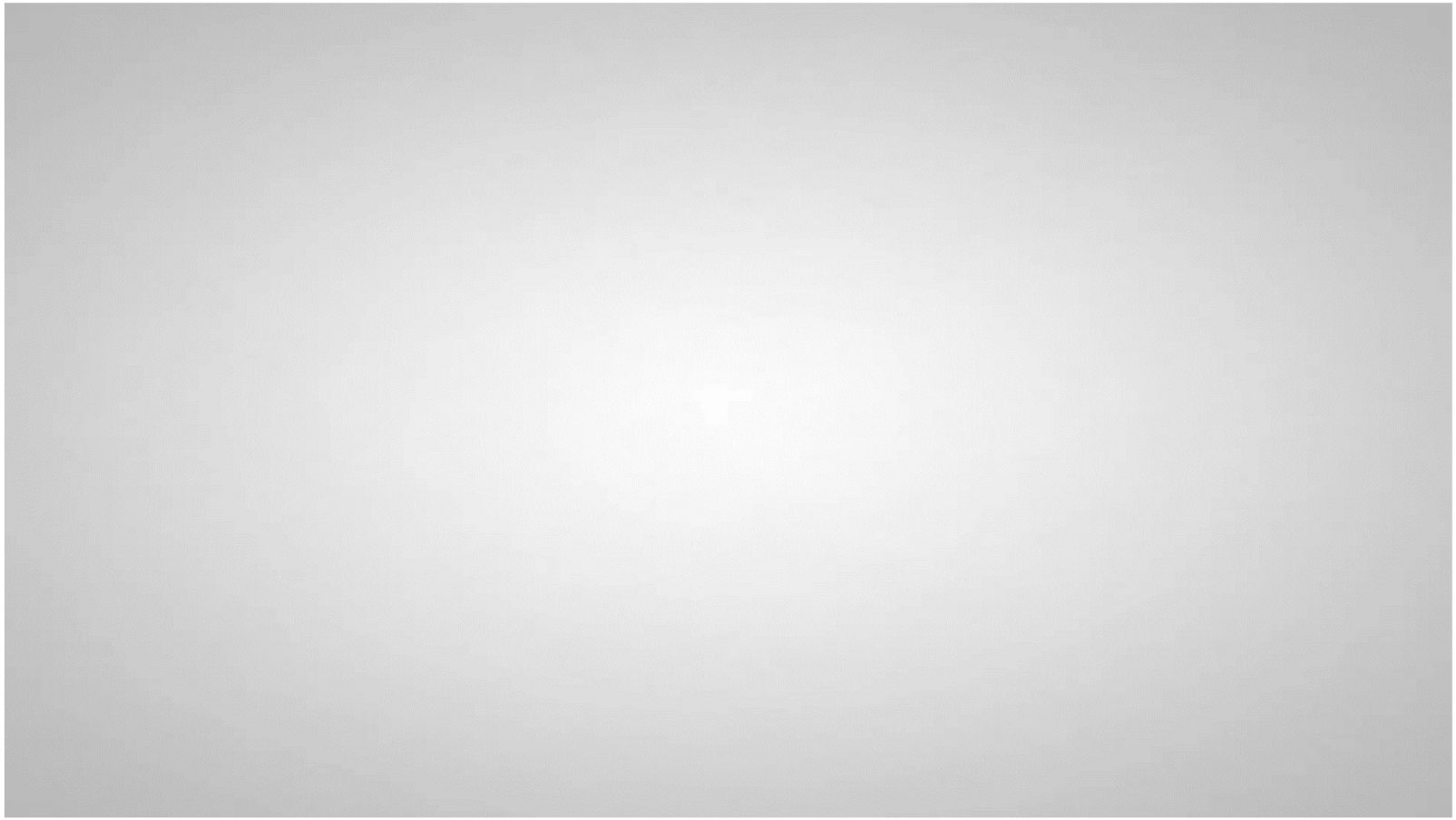
- Technical introduction on ToF-technology
- Markets for ToF-technology
- Ifm range of 3D-technology
- Basic values
- Applications

Technology: ToF camera

O3D 3D sensor with PMD Time-of Flight technology

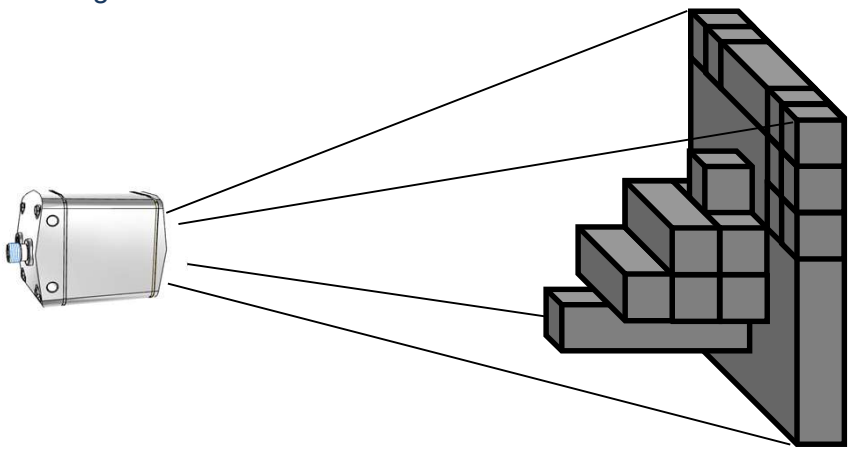
Time-of-Flight (ToF). By measuring the time of flight of light, it is possible to determine the distance values at pixel level between the individual pixels and the object. Thereby, the 3D information is generated without any detours in real time. The best-known ToF techology is known as PMD (Photonic Mixer Device).

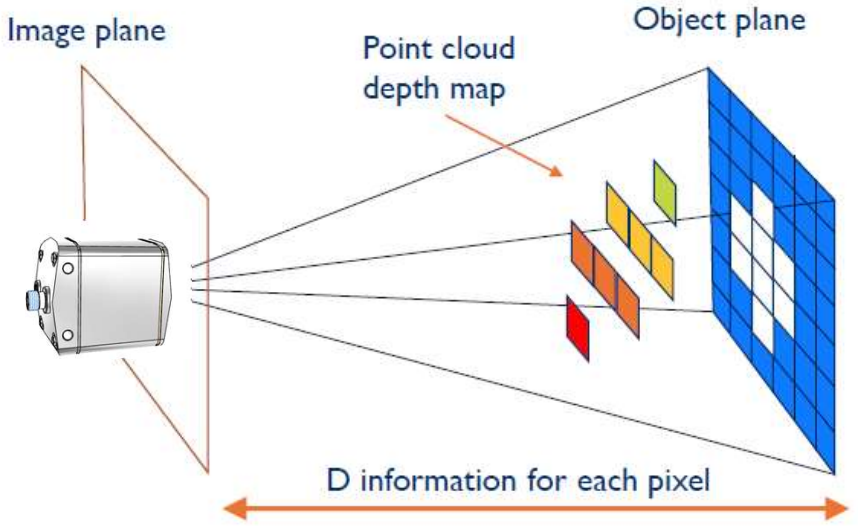
The PMD time-of-flight technology ensures detection of scenes and objects with just one image capture of 23,232 pixels in three dimensions and without motion blur. The scene is illuminated by modulated, invisible infrared light and the reflected light hits the PMD sensor.

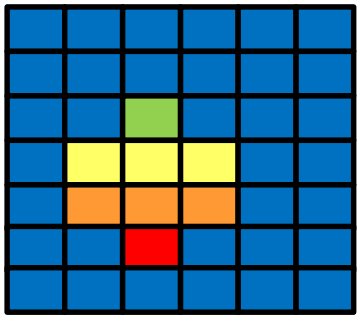


Technology: 3D image

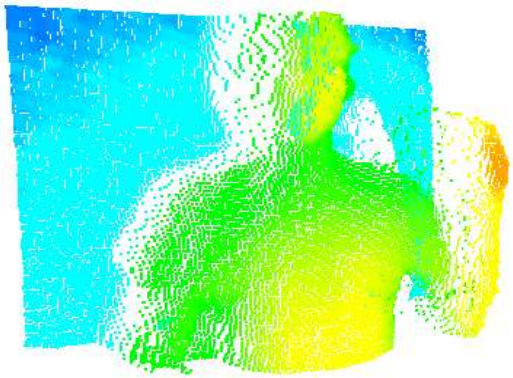
Image scene



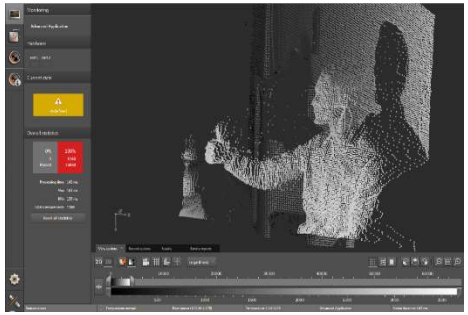




Resulting illustration



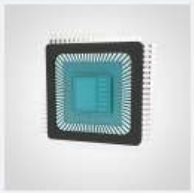
Distance image



Amplitude image

Technology: ToF camera

O3D 3D sensor with PMD Time-of Flight technology

1		**Infrared LEDs** Four high powered IR LEDs (830nm) illuminate the entire field of view of the O3D over a range of 0.3m to 5m and are protected by scratch-resistant glass.
2		**The lens** The lens determines the field of view for the O3D. 60° x 45° and 40° x 30° alternatives are available for best possible adjustment to the application.
3		**Time-of-Flight-Imager** The pmd time-of-flight image sensor resolves the scene with 176 x 132 pixels. It is also equipped with a patented extraneous light suppression that makes it immune to changing light conditions in the application environment.
4		**M12 Ethernet process data interface** The M12 Ethernet interface can be used both to set the parameters of the sensor and for communication of outgoing data via industrial Ethernet networks (TCP/IP & EIP). The parameters are set using the freely available ifm Vision Assistant.
5		**M12 power supply** The 8 pin M12 connector is both for power supply of the sensor and an interface for the digital and analogue outputs.

Markets for ToF-cameras

Consumer

Gesture control / face recognition

People and pet recognition / -counting

Navigation of robots and drones

Industry

Factory automation and robotics

Use for mobile machines (e.g. agricultural)

Automotive

Driver assistance / occupant monitoring

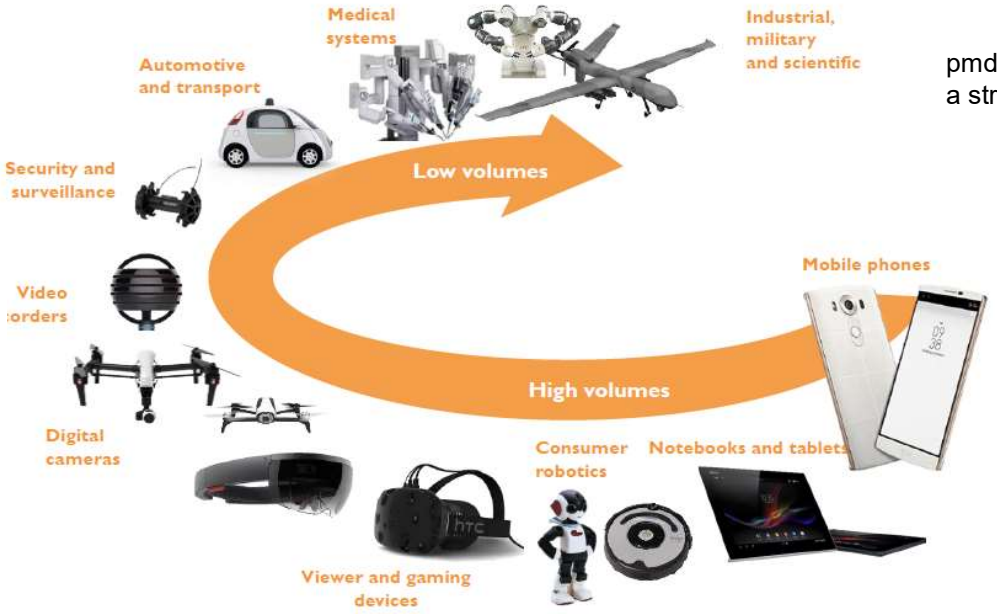
Pedestrian, driver and vehicle safety

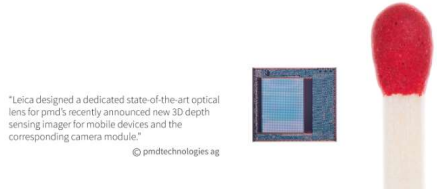
Comfort functions (e.g. gesture control)

Disruptive module from consumer application

pmd use case at consumer products

pmd inside the Zenfone AR
from Asus





pmd and Leica Camera announce
a strategic technology cooperation

pmd inside the Lighthouse AI
a Smart Security Home Camera

pmd inside the phones of
Lenovo, Azus and more

pmd
can you imagine

Different version on the 3D technology.

ToF (Time of Flight) cameras in the industrial market.

3D camera system
for mobile vehicles
basic sensor functions

Digital 3D ToF chip
camera & sensor
new UX design

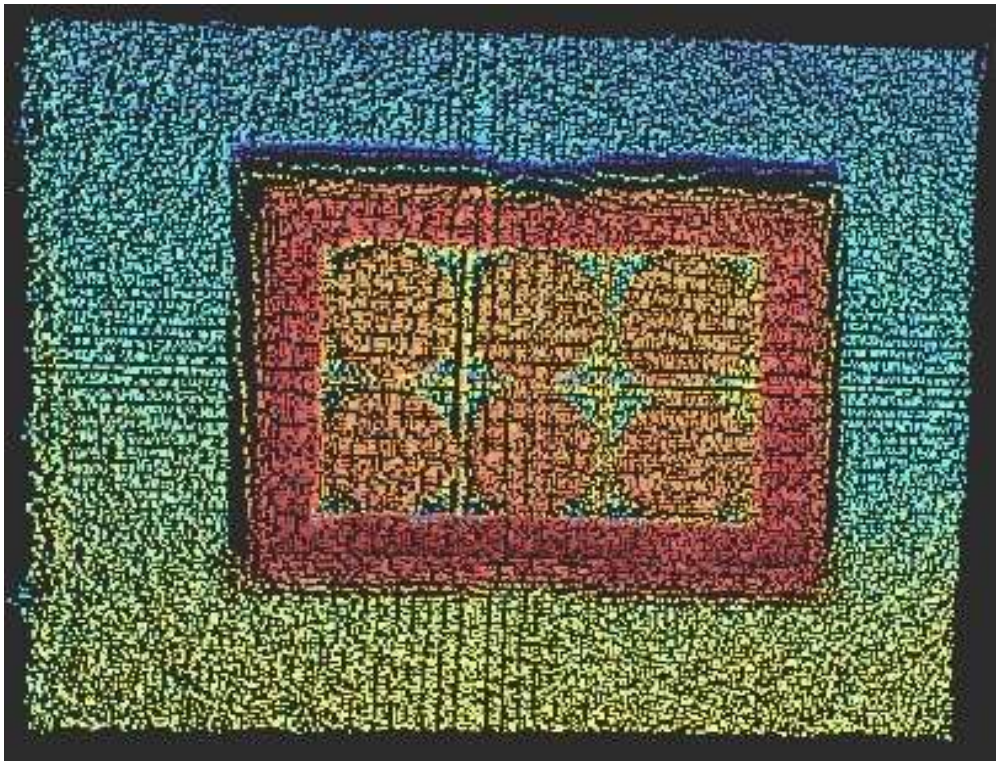
consumer module
Based, robotic
3D ToF camera

Industrial applications

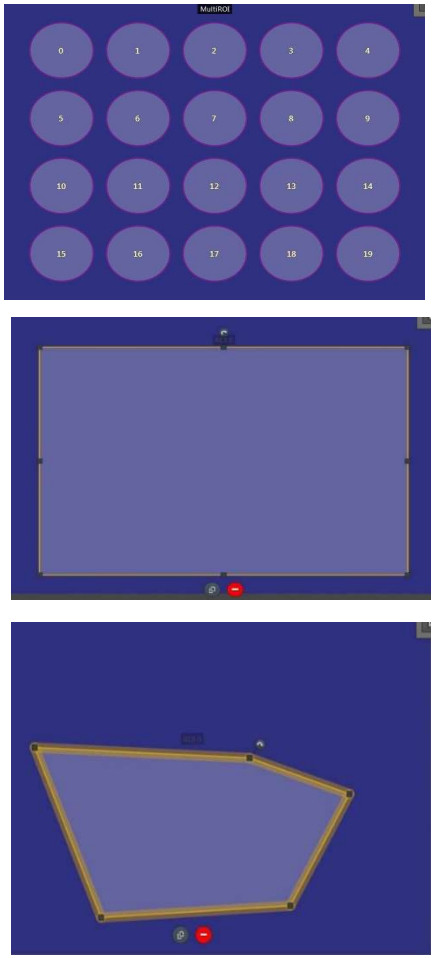
Sensor - onboard evaliation

Camera – external evaluation

Sensor - How does it work?

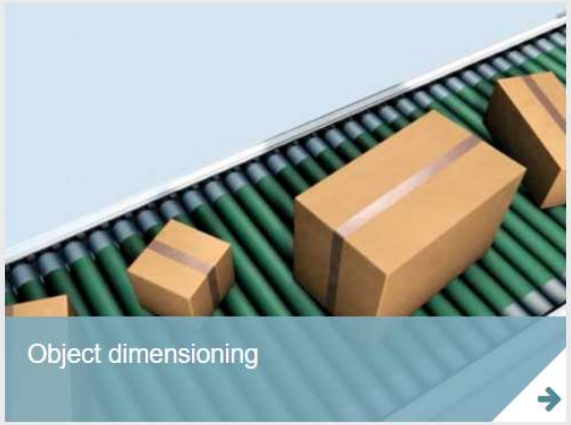


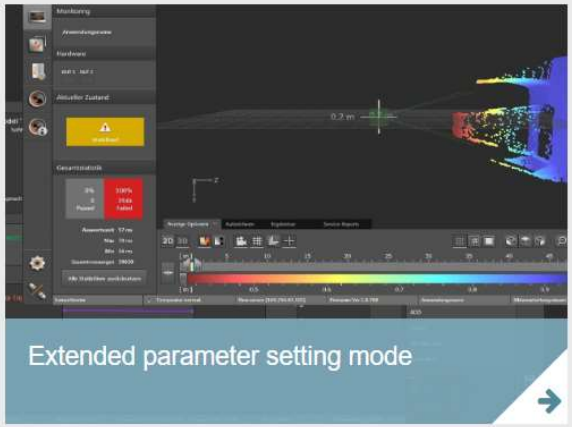
Region of interest



Possible applications with the O3D-sensor

Application examples





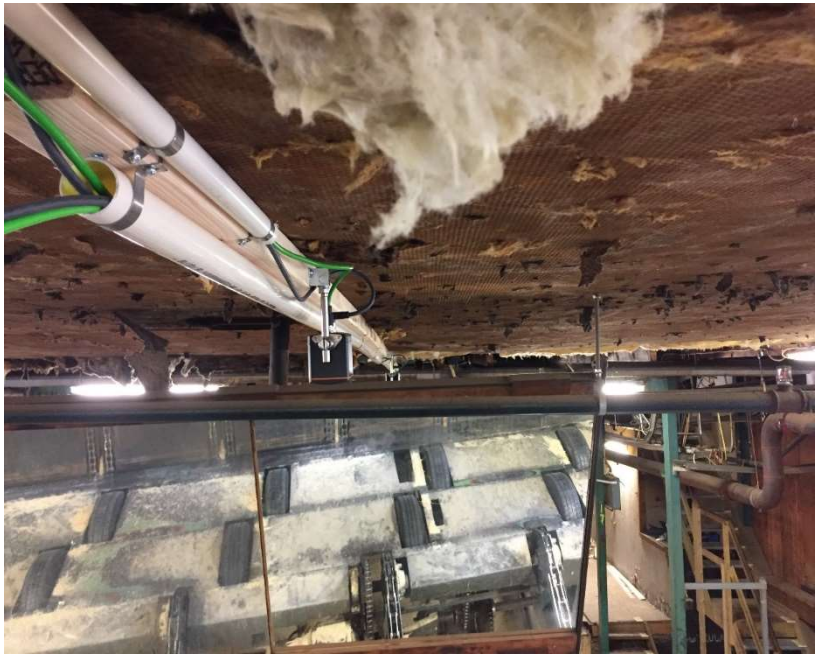
Basic values for 3D ToF technology

- Low investment for basic functions
- Flexible – easy to change
- Saves hardware costs – replaces other sensor
  - Less components for the same function
  - Less down time in harsch enviroment
- Replaces manual visual inspection functions
- Reduces cycle time in certain processes

- Eyes for AI-functions. Self learning.

Saw mill

Level detection



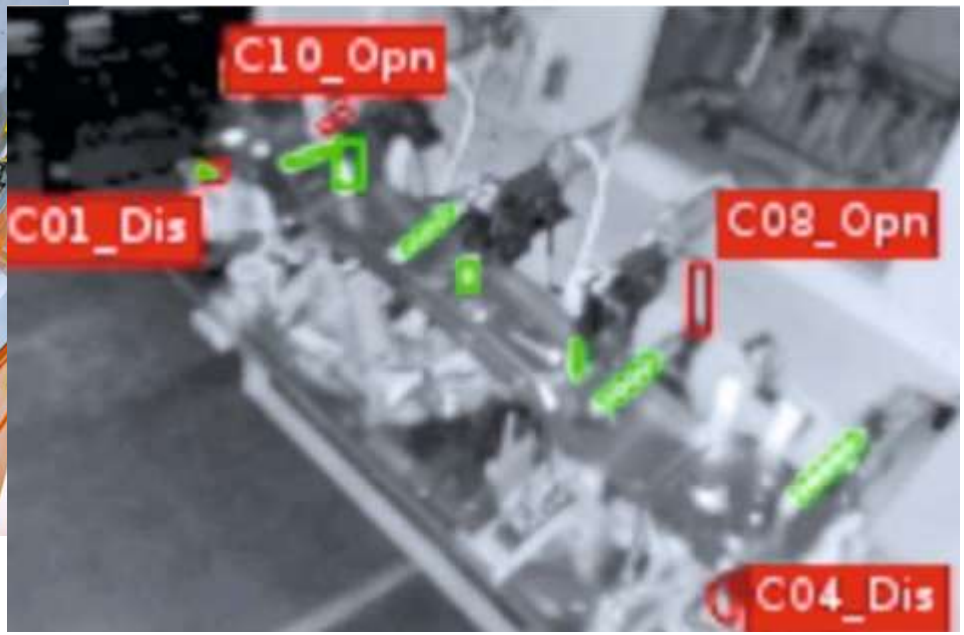
Saw mill

Edge detection

Opel, Rüsselsheim

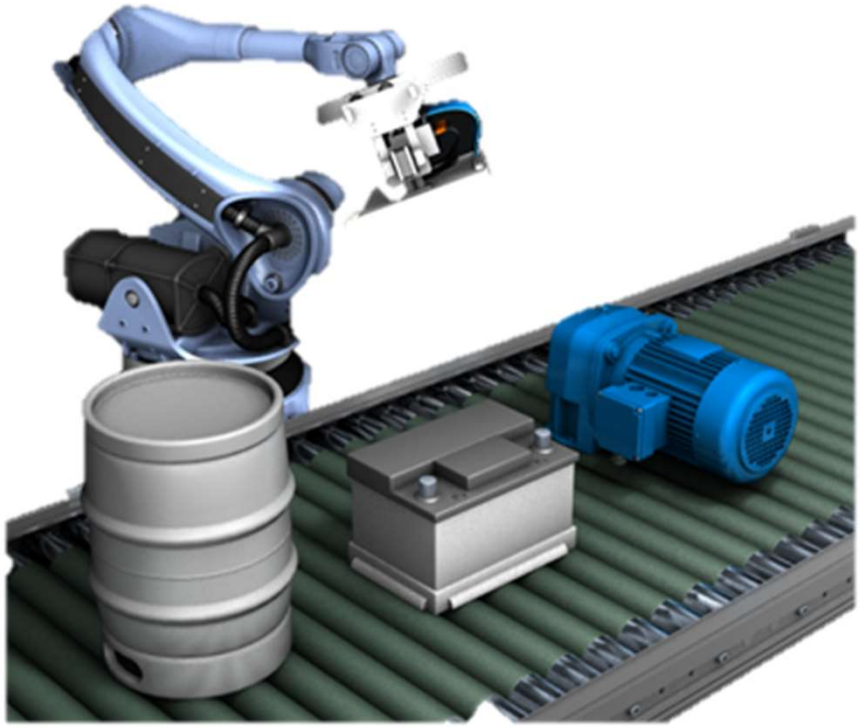
Replaces sensors and cables on the fixture.

Cost savings 20 -30%.



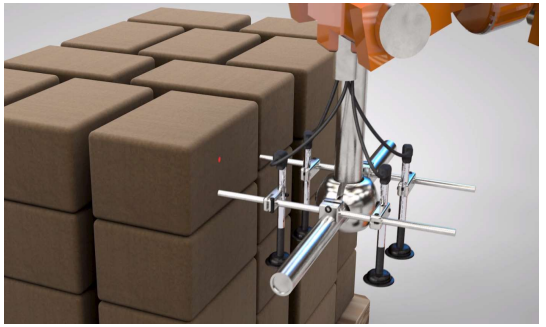
ifm function roadmap: automation of robot grippers

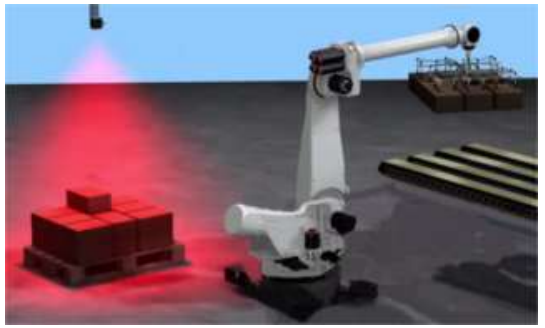
- The 3D sensor detects the object position, even when objects are moving, and transmits it to the robot control, which controls the gripper. The system can detect rectangular, round and irregular shapes and transmit not only the position of their centre of gravity, but also their number and dimensions to the controller.

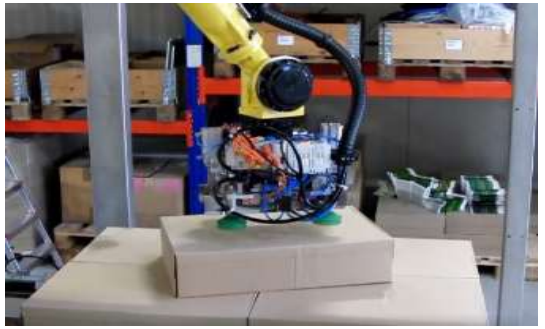


Depalletisation

- Control for robot to depalletise cardboard boxes or sacks from pallets. Sensor basically provides the position coordinates and additional events like orphan- , slip sheet or last layer detection.

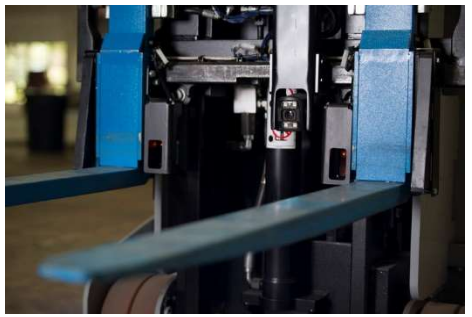


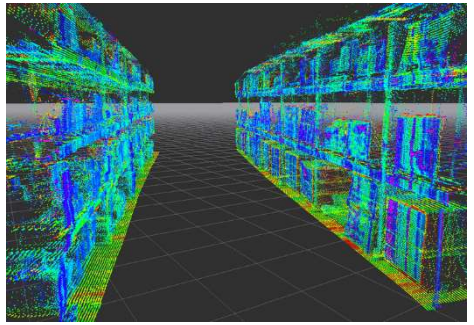




Applications on forklifts and truck navigation

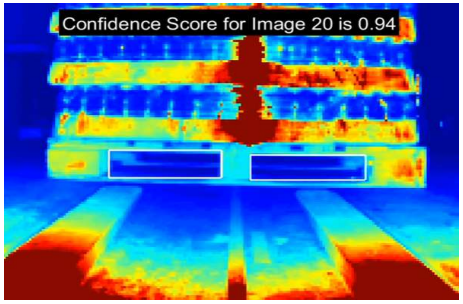
- Fork pocket detection
- Palette handling forklifts
- Shelf availability stacker cranes STC
- Collision avoidance
- Obstacle detection
- Real-time mapping: Simultaneous Localization and Mapping (SLAM)



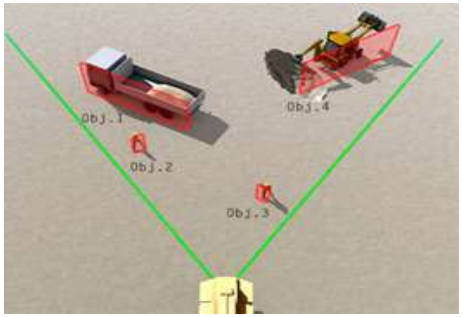


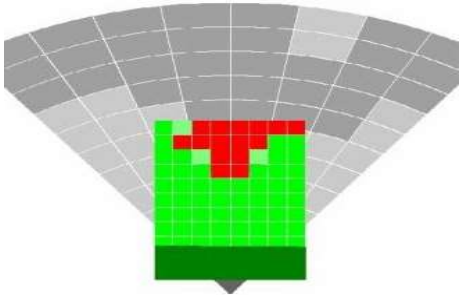
Prospect ifm function: AGV and forklift navigation

- Pick-and-Drop (Pallet pocket detection)

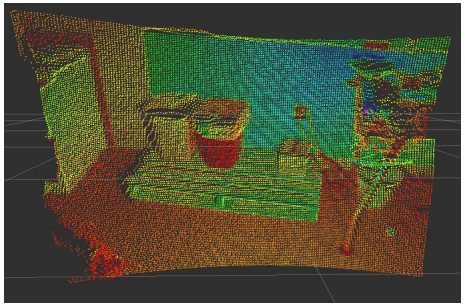


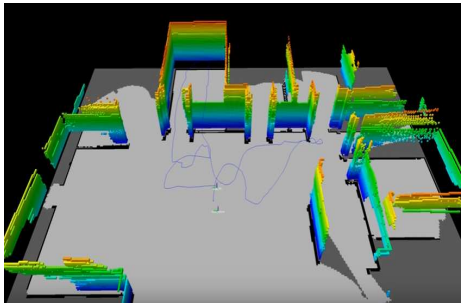
- Obstacle detection





- Featureless navigation (SLAM)



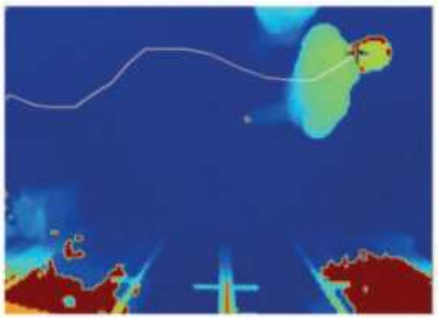


Camera solutions

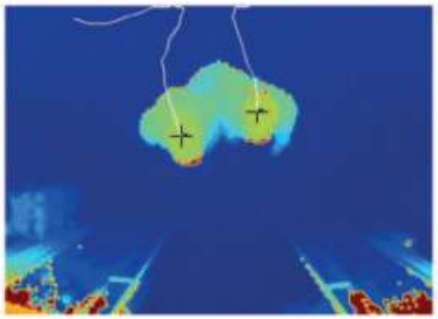
Consumer - People counting

AT A GLANCE

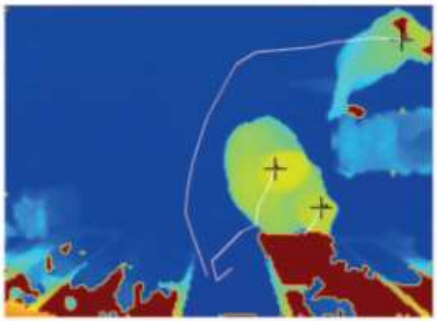
Examples for People Recognition



Closed Door, man walks by

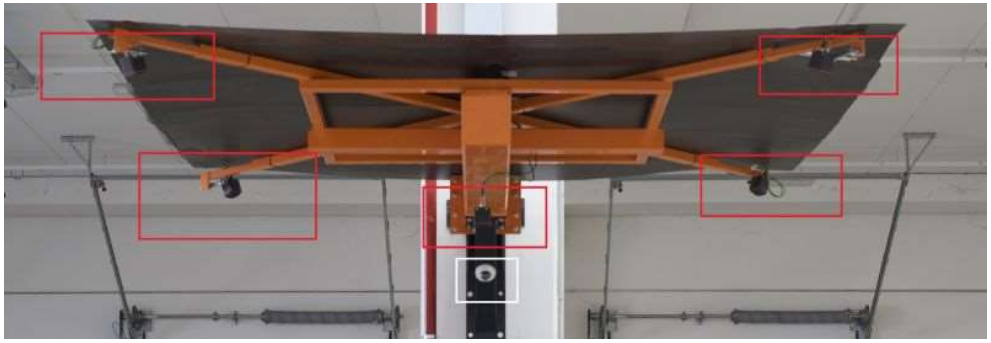


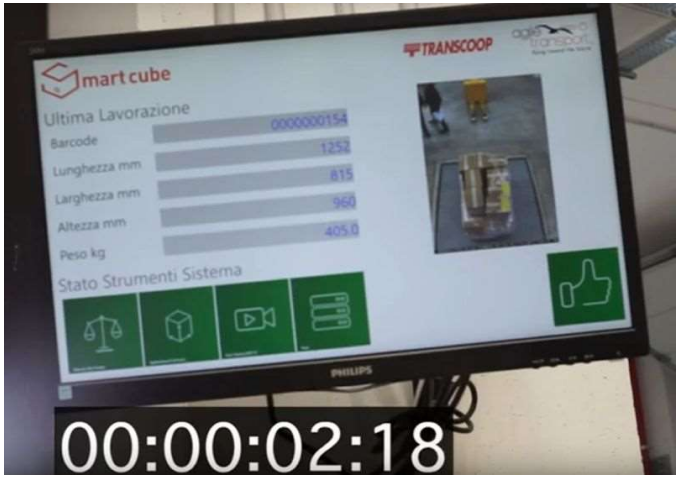
Two people walk through the door arm in ar



Foreign object in the scene (baby stroller)

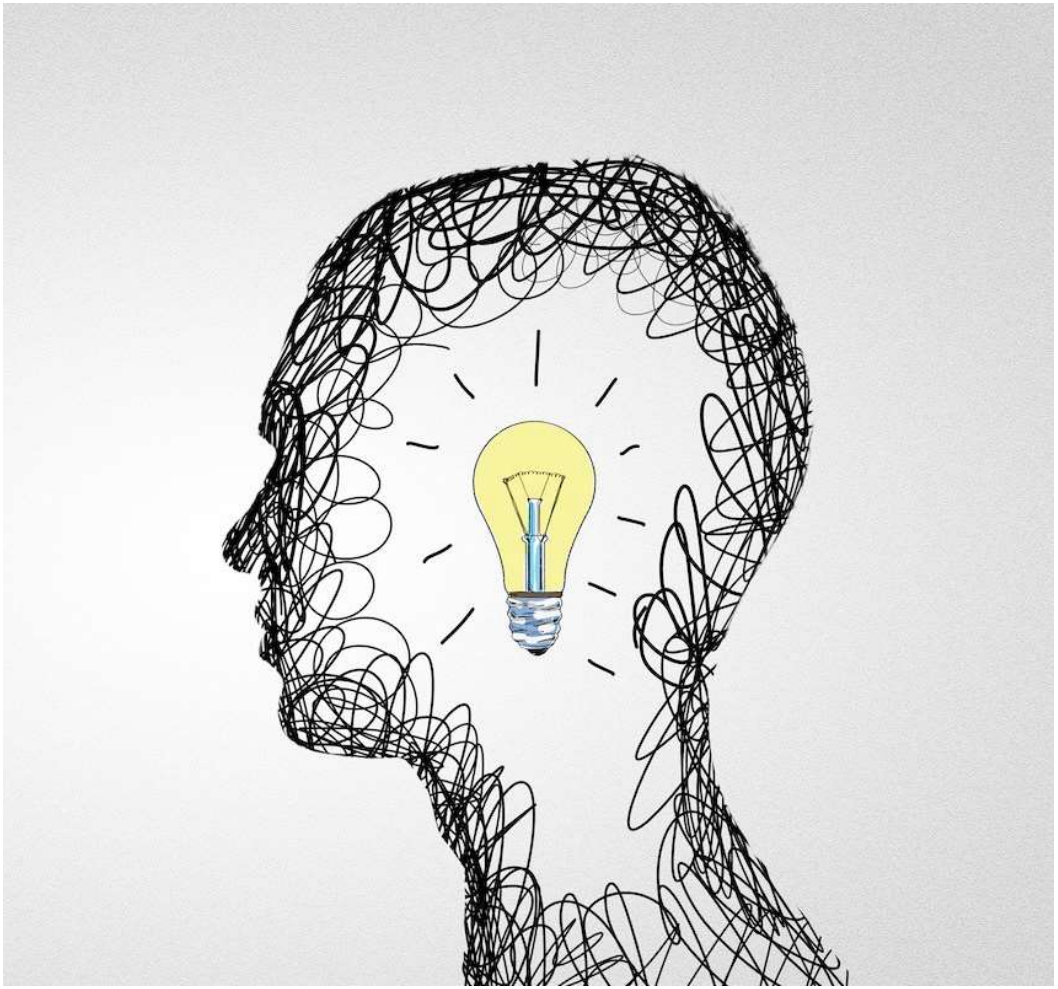
Logistic - Volume measurement





Agricultural – Milking robot

Your mind is the limit!



Tack för visat intresse!

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