ESPROS Photonics Corporation

3D Camera as Smart Surveillance Sensors

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A few words about ESPROS

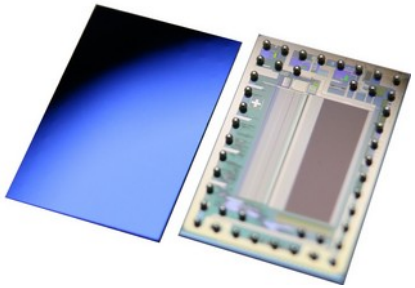
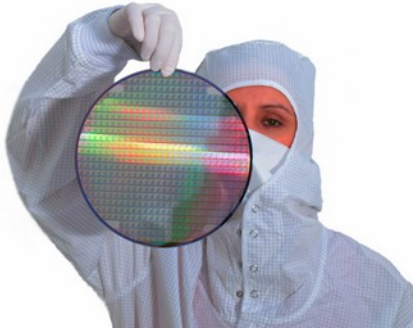
Locations

- Sargans, Switzerland (est. 2006)
- USA, China

Activities

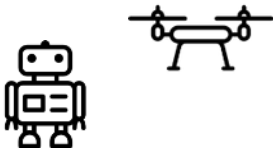
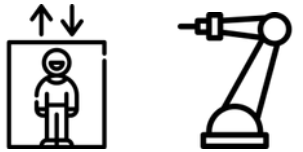
- Design and manufacturing of photonics chips and TOF cameras
- Sales in 2021
  - >10k 3D TOF cameras sold in 2021
  - >500k camera chips sold
  - >15m chips sold in 2021

ESPROS' Offerings

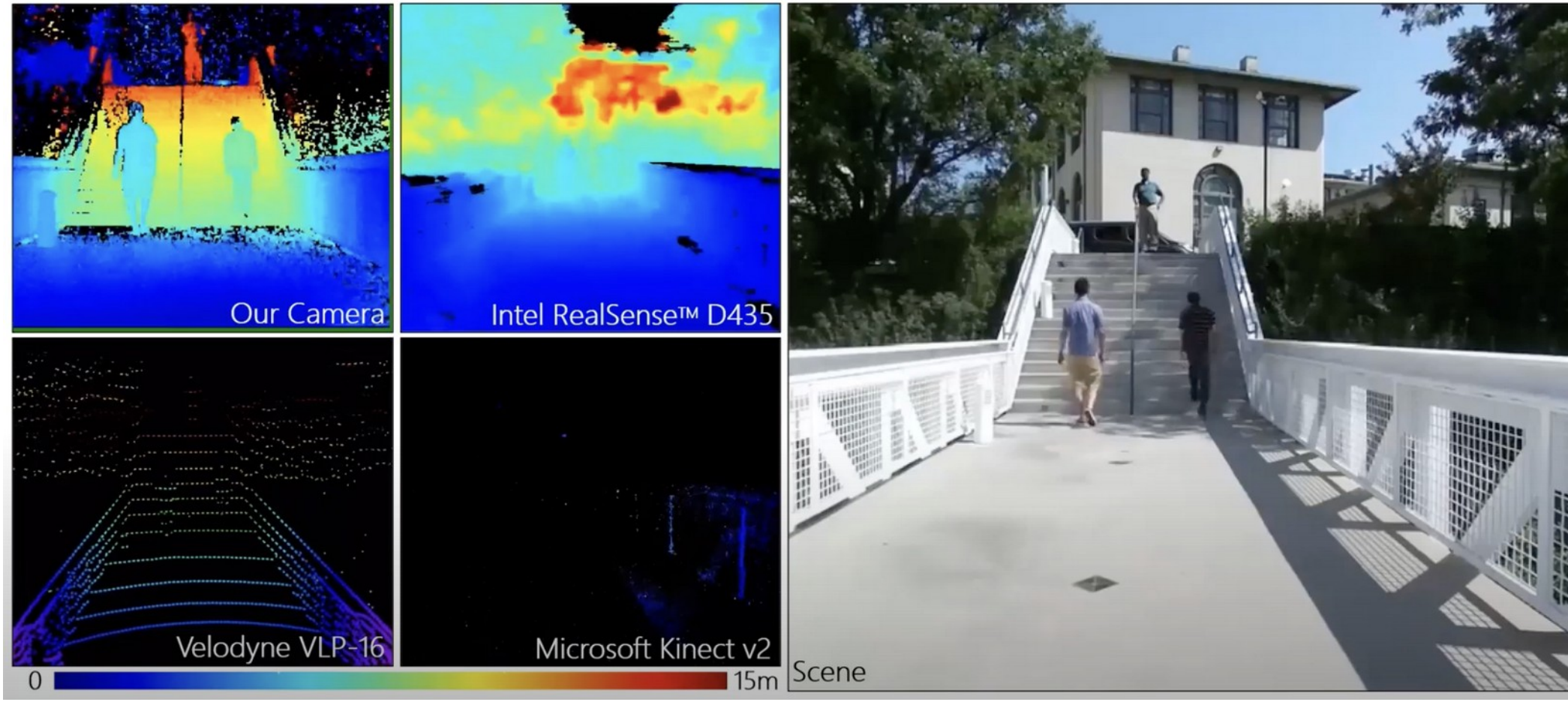
Key offerings	Standard Chips	ASIC and Foundry	Modules
			

Selected key features	▪ TOF 8 x 8
	▪ TOF 160 x 60
	▪ TOF 320 x 240
	▪ Line Imager 1024 x 1
	▪ Photo diode amplifiers
	▪ Photo diode arrays
	▪ High voltage output switches
	▪ Spectral sensing
		▪ 150nm CMOS process
		▪ 8” wafer size
		▪ 6 metal layers
		▪ 1 poly layer
		▪ 1V8 core, up to 12V mixed signal
		▪ Photonics ASIC, focused on
		  ▪ cwTOF
		  ▪ pTOF / LiDAR
		  ▪ TDI imaging
		  ▪ Ultrafast imaging
		▪ Pixel design
		▪ TCAD simulation
		▪ IP building blocks
		▪ Project management
		▪ PDK for Cadence design environment
			▪ TOFrange-611
			▪ TOFcam-611
			▪ TOFcam-635
			▪ TOFcam-660
			▪ Custom modules

ESPROS' Key Markets

Markets	Automotive	Mobile Robotics	IoT / Automation
			
Technical Capabilities	• Long range LiDAR: >250m • High resolution: better 0.05° • High frame rate: >100 fps • At full sunlight and at night • QE>70% at 905 nm	• cwTOF • pTOF/LiDAR • Low power • Flash and scanning • SLAM	• cwTOF • CCD technology • Imaging with up to 20 Mfps • Very high near infrared sensitivity • High sensitive photodiode amplifiers • Low cost photodiode arrays
Applications	• Autonomous vehicles • Driver assistance systems • Long range LiDAR sunlight • High resolution • Object classification • Night vision • In-cabin monitoring • Gesture control • 360° surround view • Driver monitoring	• Obstacle collision avoidance • Step sensing • Camera auto-focus • Hospitality and retail robots • Household robots • Consumer and security drones • Delivery robots	• Rotary and linear encoder • Triangulation • Surface scan • Silo monitoring • TDI imaging • Nursing home monitoring • People counting • Automatic door sensors • Elevator door sensors

See the difference



This comparison clearly shows why our technology has achieved a breakthrough for outdoor applications. The study was independently carried out by the Carnegie Mellon University in Pittsburg/USA (https://www.cmu.edu).

3D camera as a surveillance sensor: Nursing home use cases

3D camera as a surveillance sensor: Nursing home use cases

Source: https://www.nursinghomeabuseguide.org/news/what-to-look-for-with-nursing-home-accessibility/

Trends

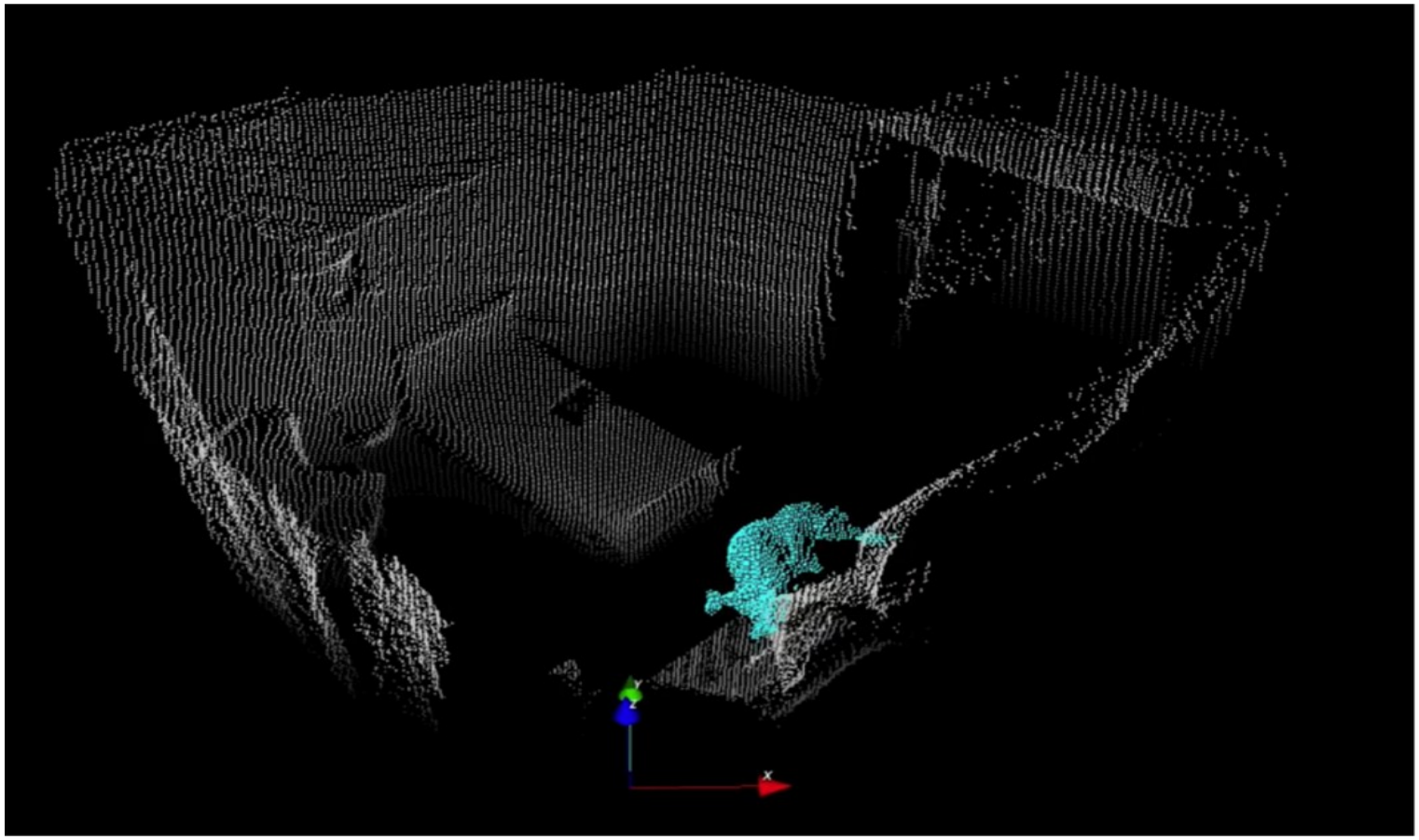
- The aging population increases
- Available professionals is decreasing
- Automation is required to reduce the number of professionals

Current Situation

- At night, nurses visit the residents approx. every 3 hours
- In between these visits, no real time information is available
- Thus, undiscovered incidents can occur and can lead to a fatality

Undiscovered falls

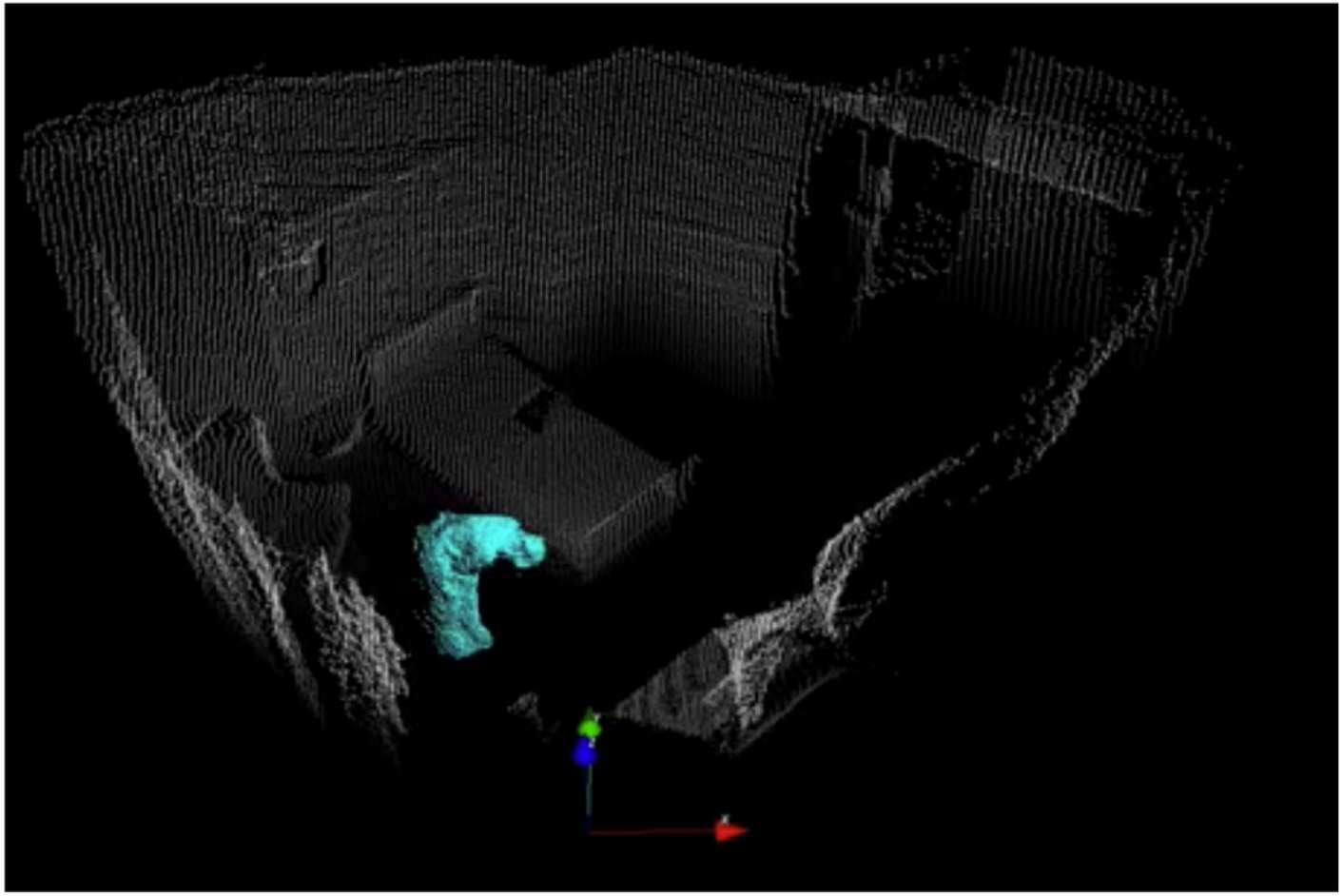
One in two persons aged over 75 has a fall every year!



Source: Kaspard, 36, rue boulevard du souverain, 1170 Bruxelles, Belgium

Wandering

Residents wander around too long, become anxious and get exhausted.



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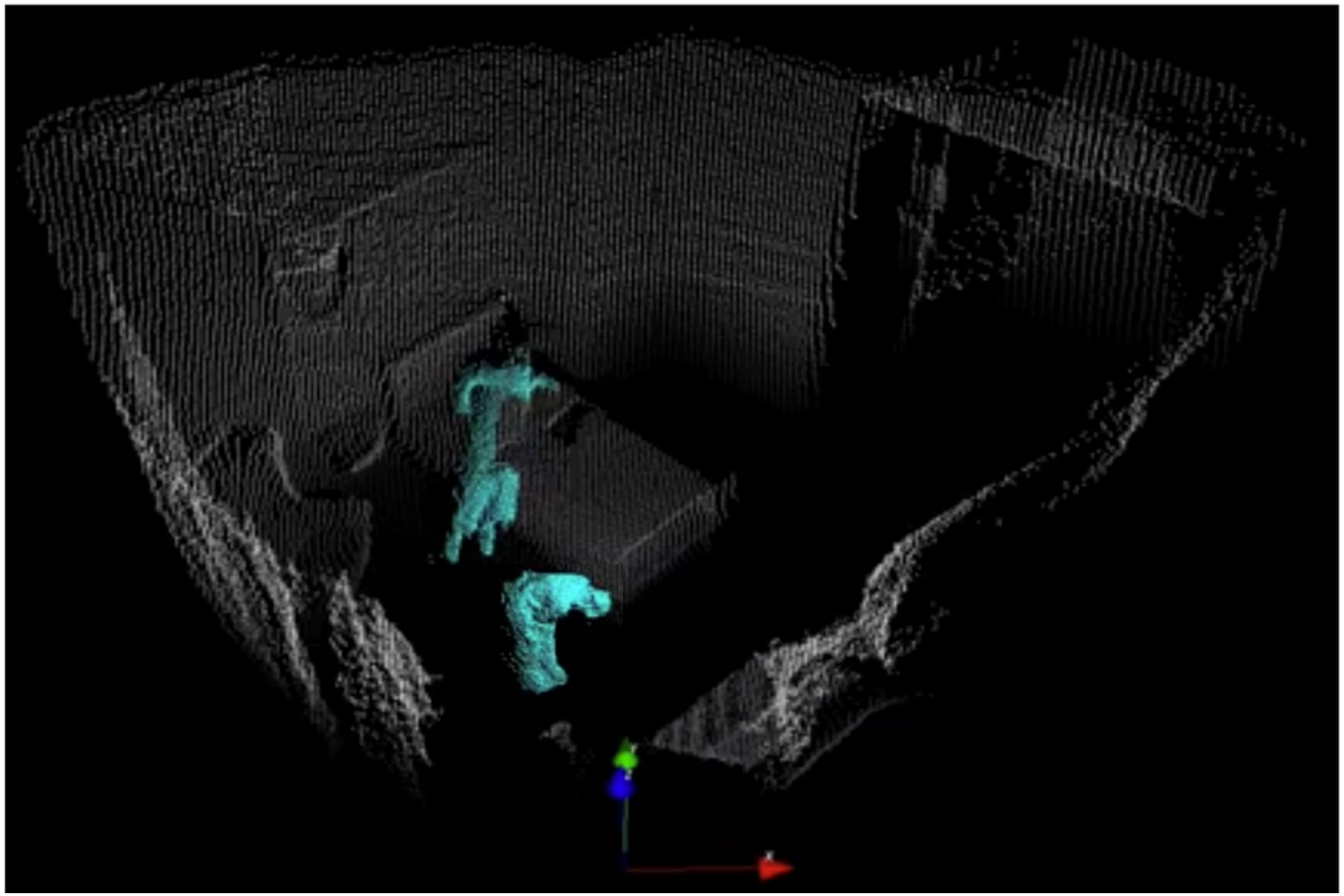
Intrusion

Unwanted visits to the other rooms



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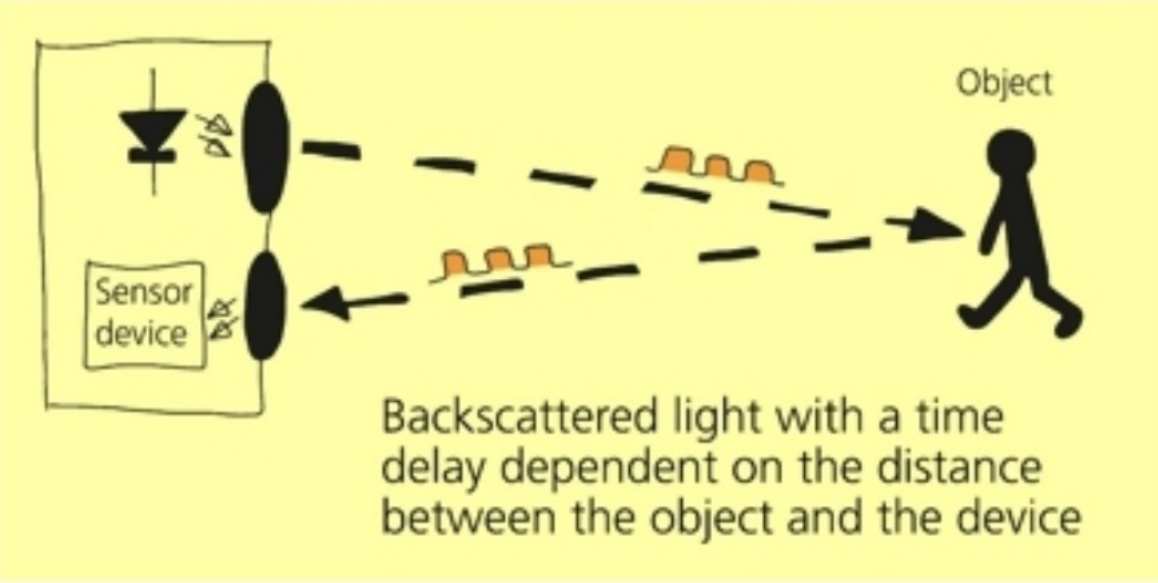
How to implement nursing automation?

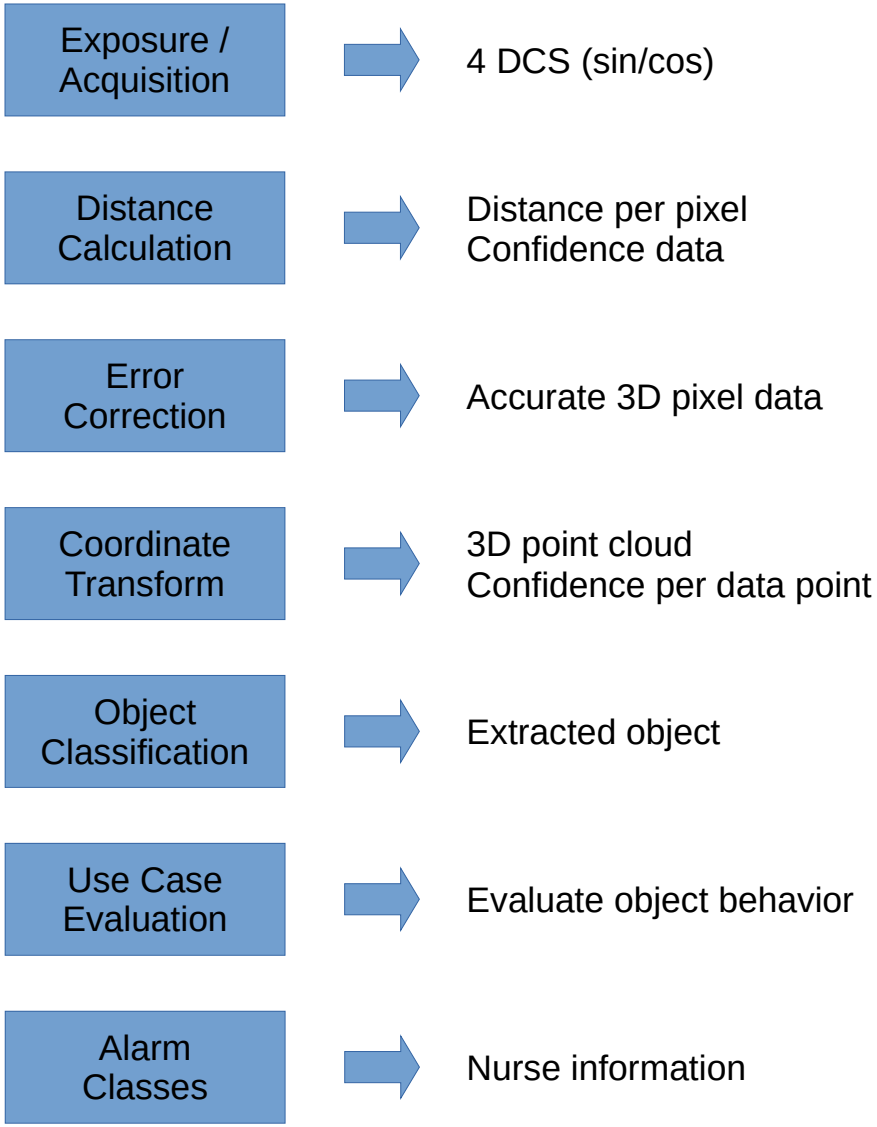
Use a 3D Camera



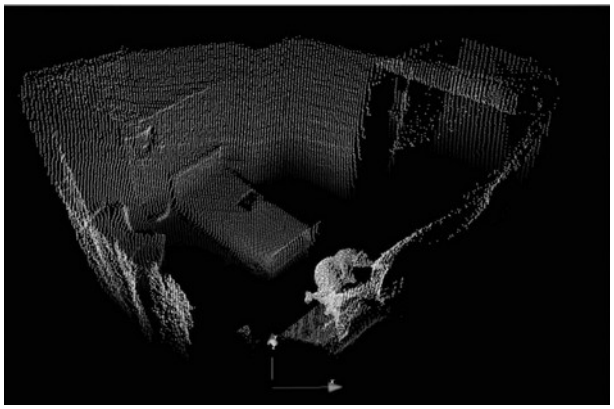
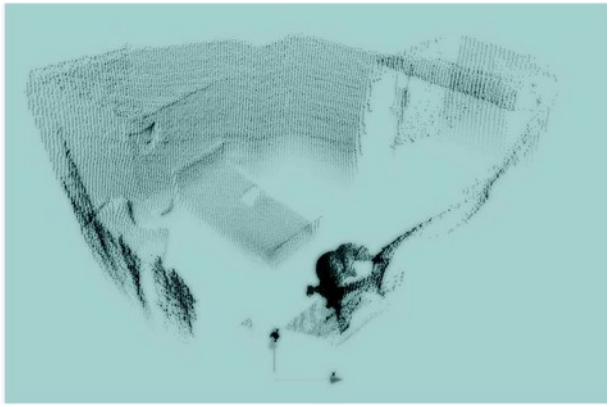
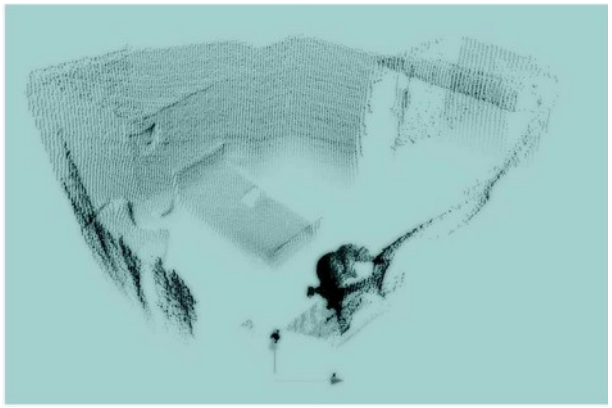
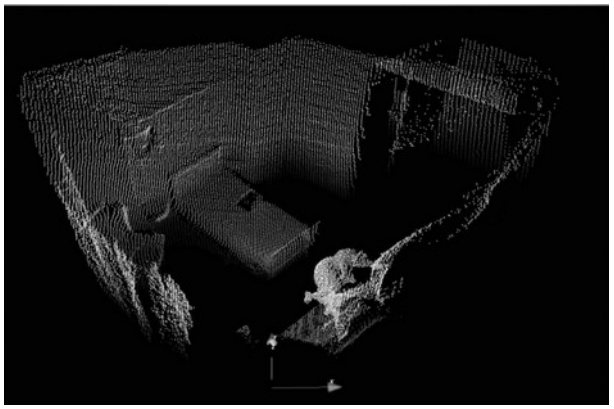
Source: ESPROS Photonics AG

How does it work?

Camera Operation: 7 Steps Processing Pipeline



DCS Acquisition

	0°	180°
SIN		
COS		

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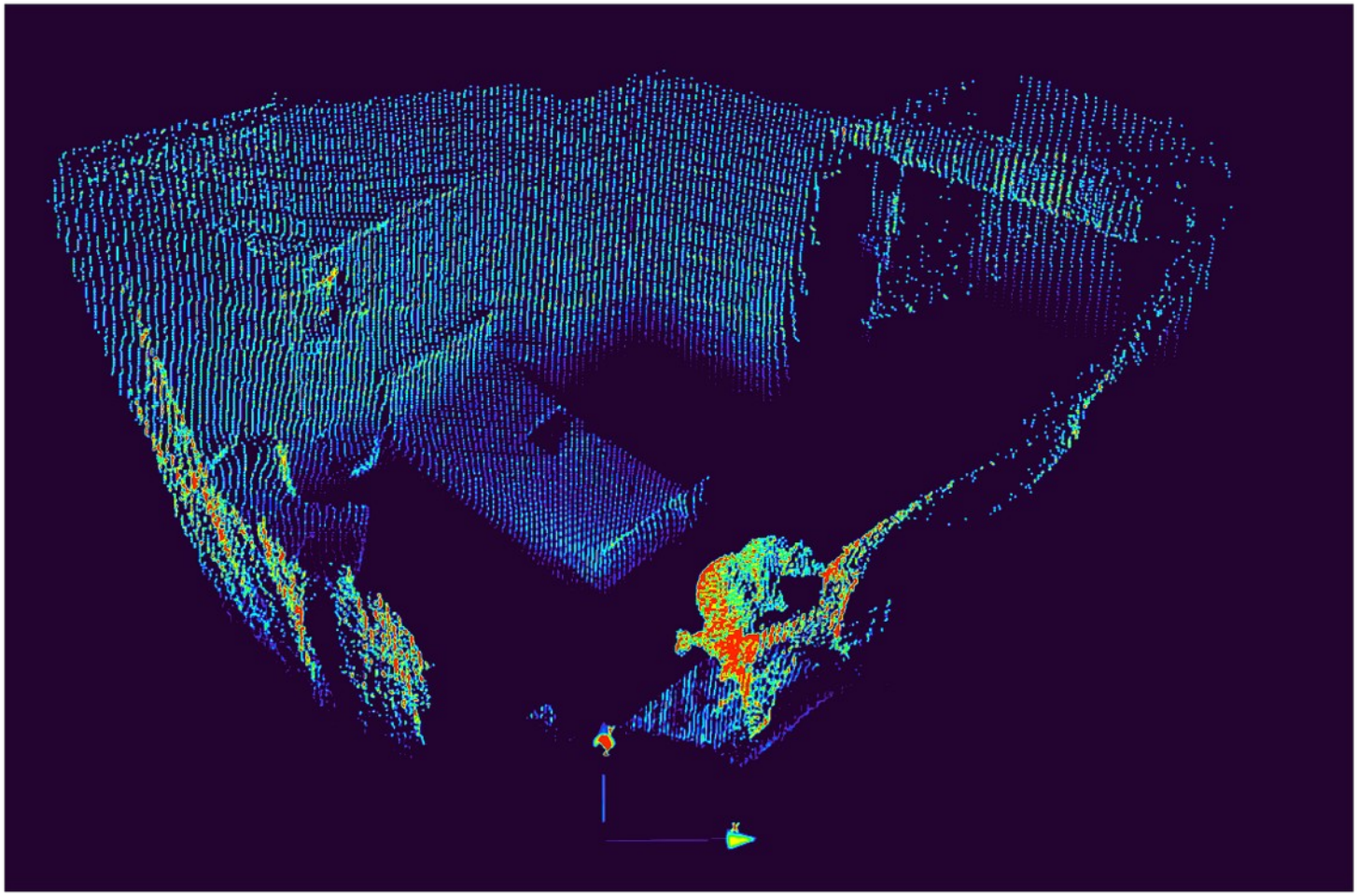
Point Cloud



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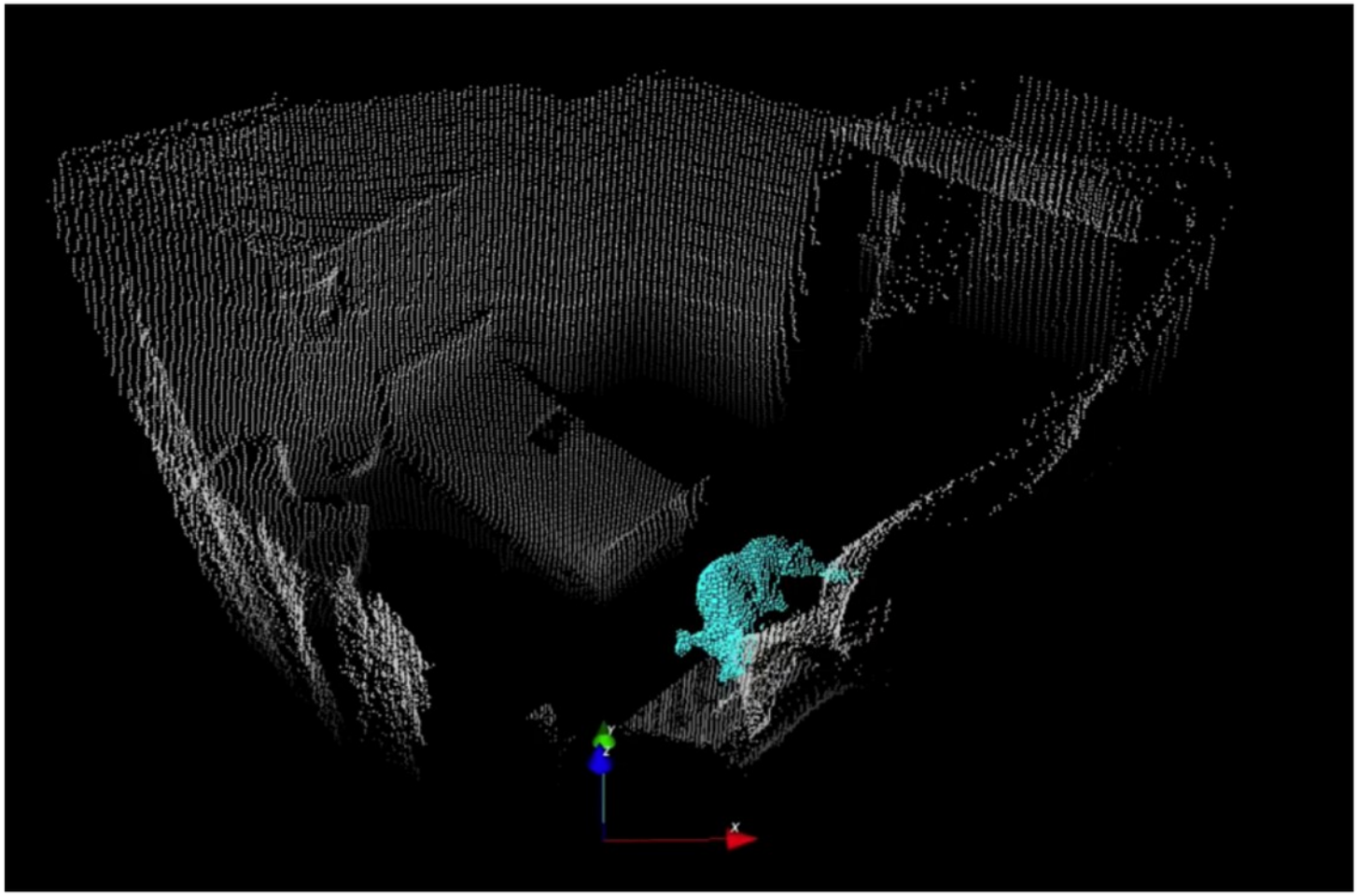
Object Discrimination and Classification



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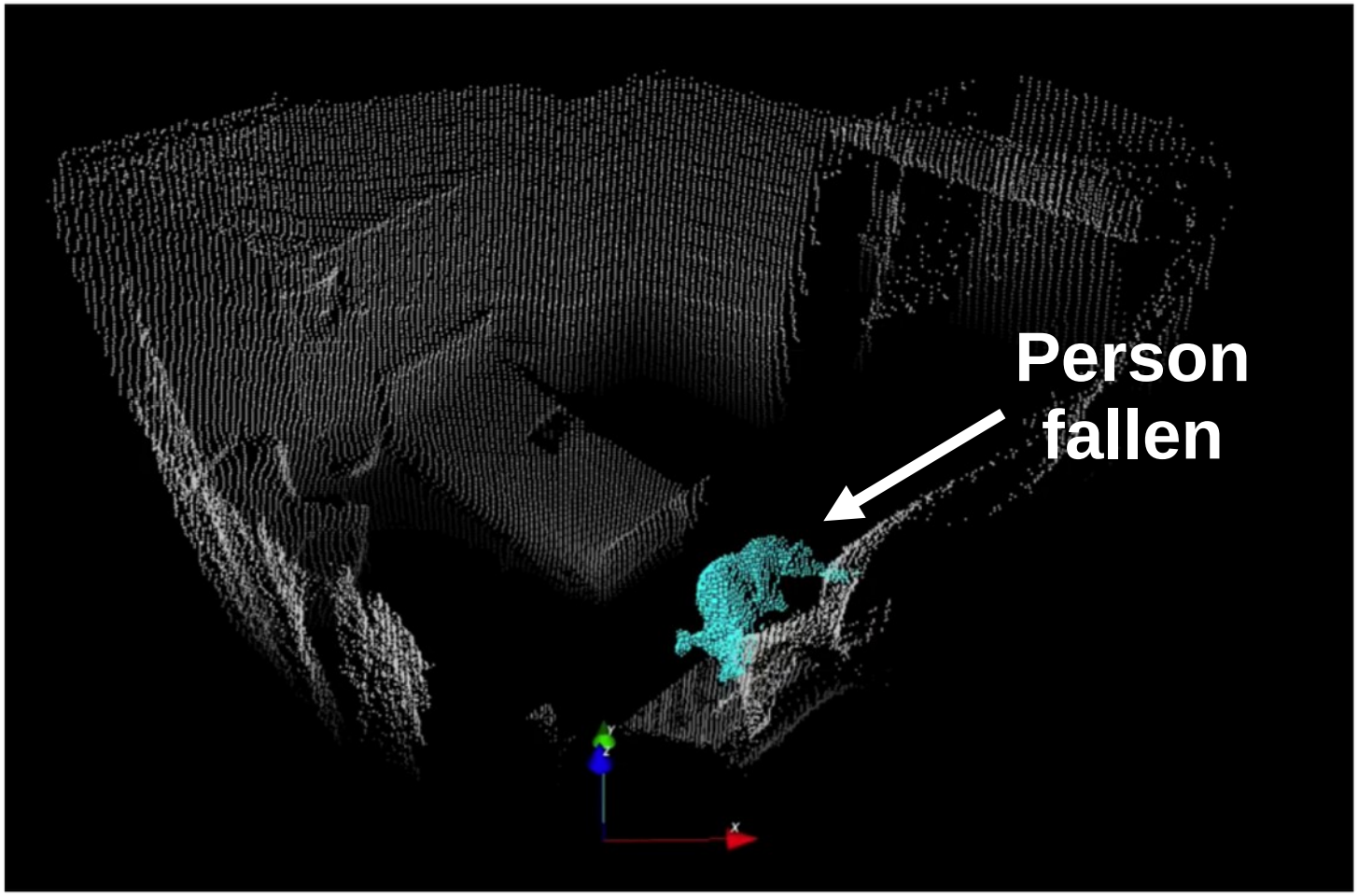
Use case evaluation



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It's all done with this

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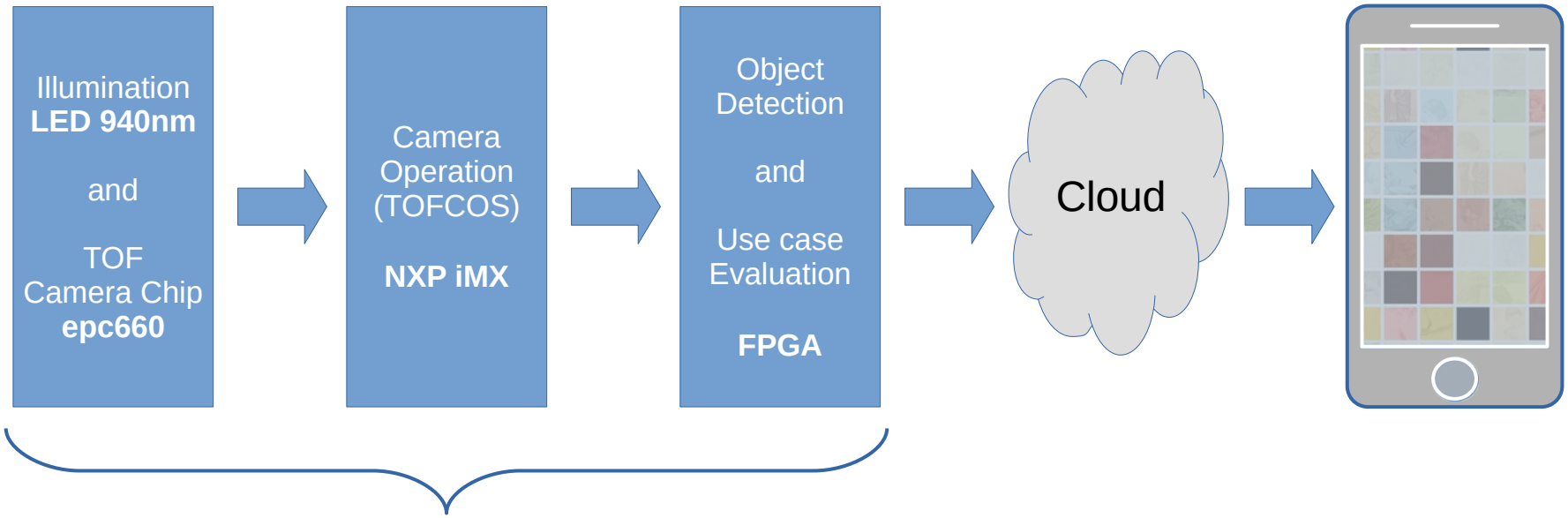
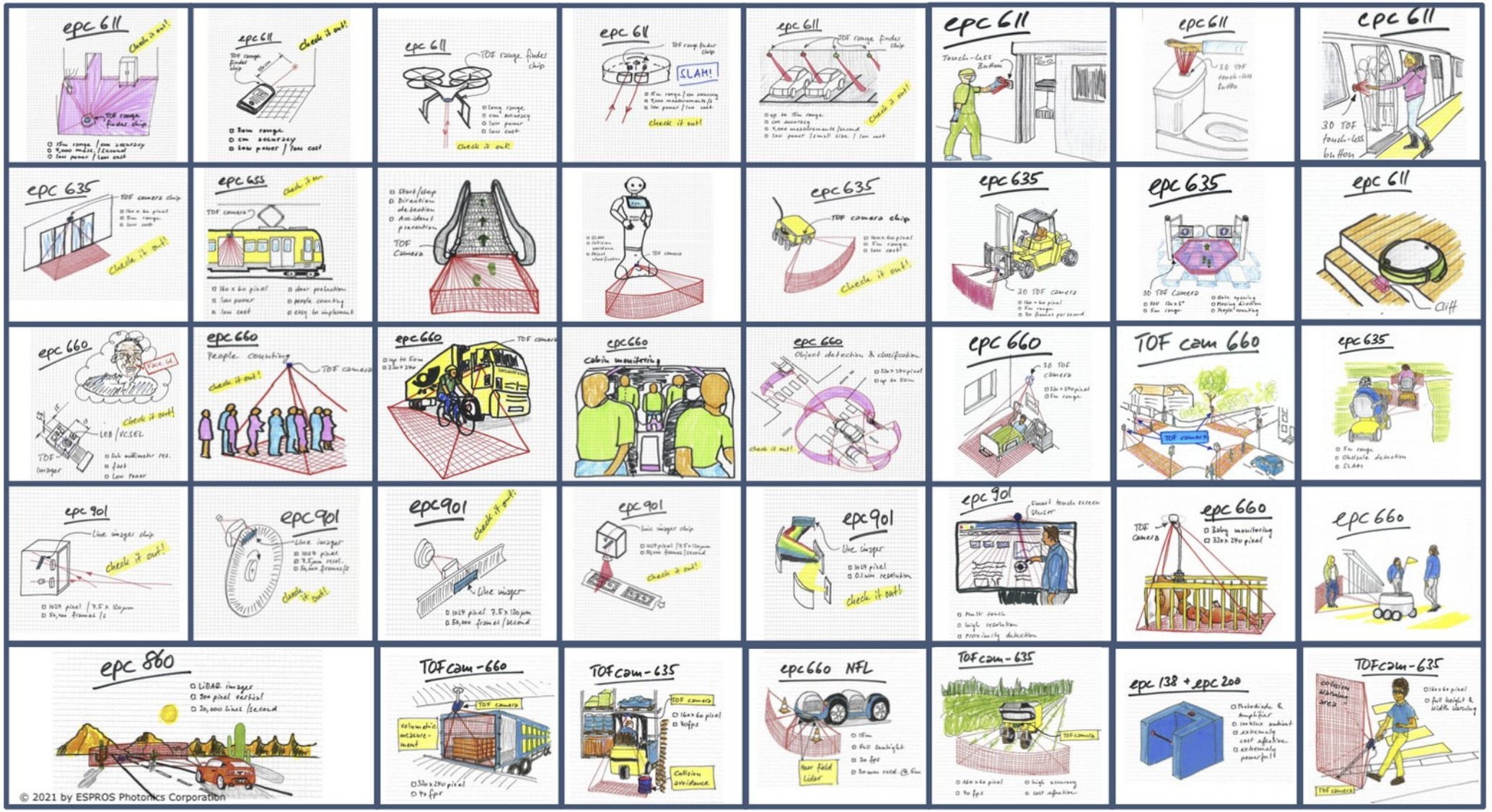


Implementation Details

- 3D camera TOFcam-660 from ESPROS
- Use case evaluation on XILINX SOM board (FPGA)
- Invisible NIR 940 nm LED
- PoE / Ethernet or WiFi to cloud
- Low power, no cooling fan
- App on smartphone or PC

- Most important: **Privacy of residents ensured!**

Thank you!



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