Goermicro

3D ToF PRODUCT LINE INTRODUCTION

June, 2024

Goermicro

Contents

01

Company Profile

Company Profile/
Global Strategic Presence/
Product and Solutions

02

ToF PL Introduction

3D Vision Technology Definition/
3D Vision Technology Applications/
3D Vision Technology Classification/
ToF Technology Basic Principle/
The Main Applications at a Glance/
ToF Technology Applications

03

ToF Products Introduction

ToF PL Developing Story/
Strength of the ToF Team/
Standardized Industrial Products /
DS Series / NYX Series/
Customized Products

Company Profile

Goermicro

Goertek Microelectronics Co., Ltd. (Goermicro) was established in Oct. 2017, which is one of the leading technology companies in MEMS field worldwide.

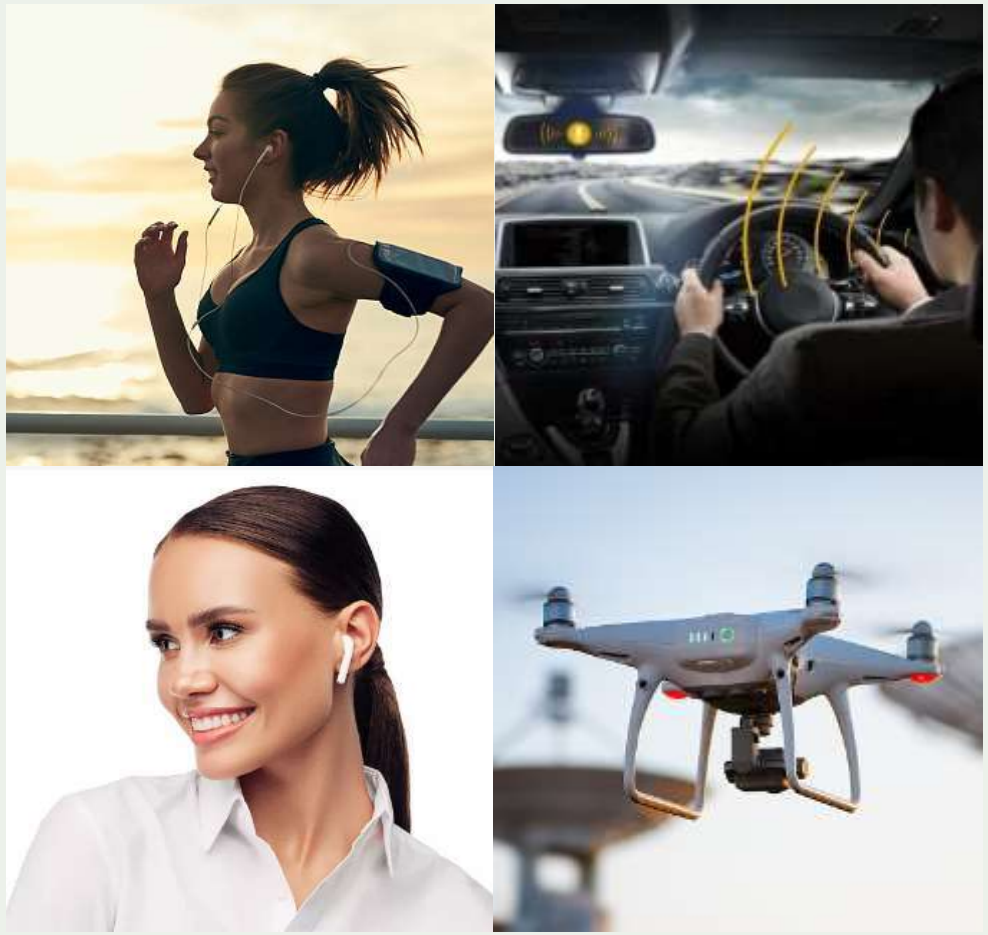
Goermicro is a semiconductor company that focuses on the R&D, production and sales of MEMS devices and microsystem modules.
Our business covers key links in the industry chains such as chip design, product development, packaging testing and system applications.
Through vertical integration, we provide accounts with "chips + devices + modules + systems" one-stop solutions.

Basic Information

established in 2017

changed to Goertek Micro-electronics Inc. in 2021

2200+ employee and 600+ R&D engineers



Main Data

1800+ granted patents

Annual operating income exceeds 400 million USD

R&D investment accounts for more than 8% of revenue

Global Strategic Presence

Goermicro

The Headquarters

Qingdao

R&D and Sales Centers

Qingdao Weifang Beijing Shanghai
Shenzhen Wuxi Korea United States

Manufacturing Center

Qingdao Weifang Rongcheng Vietnam

Qingdao

Weifang

Rongcheng

Vietnam

Product and Solutions(Devices + Modules + Systems)

Goermicro

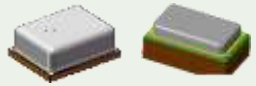
Our products include MEMS/ASIC chips, MEMS acoustic sensors, pressure sensors, inertial sensors, device-level modules, system-level modules etc..

MEMS Devices

MEMS Acoustic Sensors

MEMS Pressure Sensors

MEMS Inertial Sensors

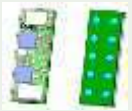


MEMS Integrated Sensors

Microsystem Modules

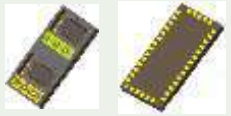
TWS Modules

Power Management Modules



Bluetooth Modules

Heart Rate Modules



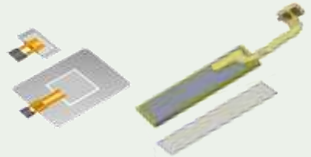
RF Modules

3D ToF Modules

CHIPS/ MATERIAL

Design and Development of Chips

Development of Piezo-electric



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ToF Technology Applications

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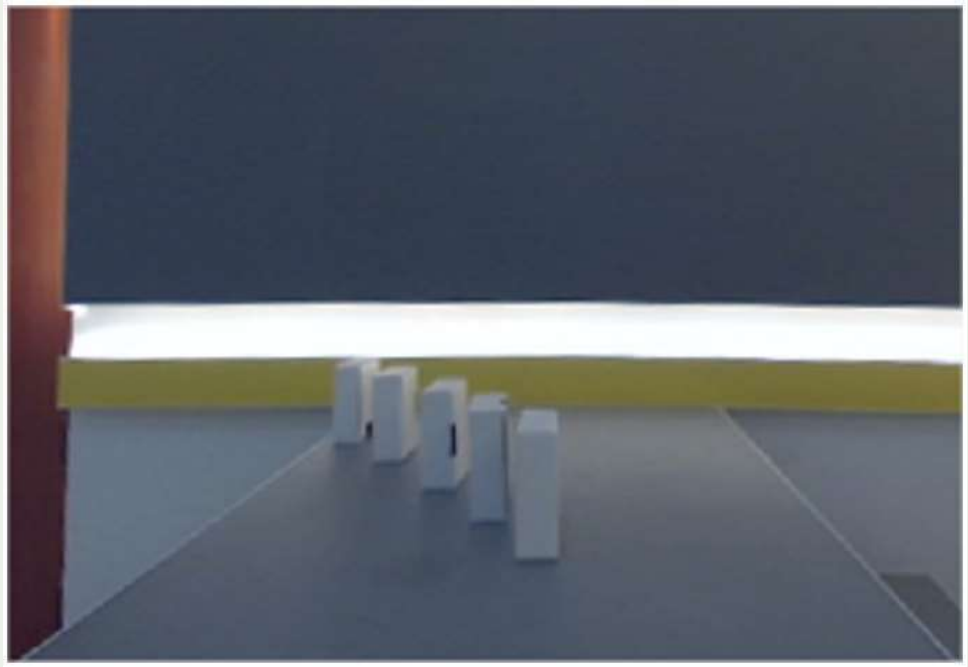
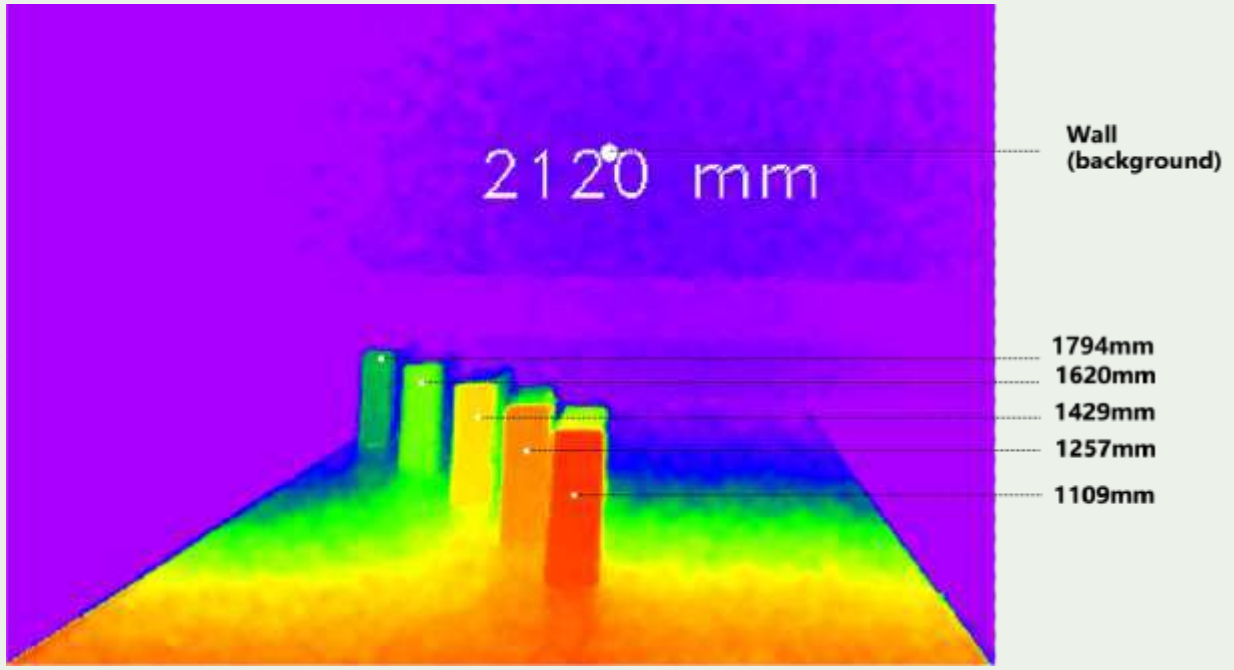
3D Vision Technology Definition





2D Color Image:

Each PIXEL has a

Color (Red-Green-Blue) Value

Depth Image from a Depth Camera:

Each PIXEL has a Depth (distance from camera)Value

which is visually shown by the colors mapped to a range

3D Vision Technology Applications

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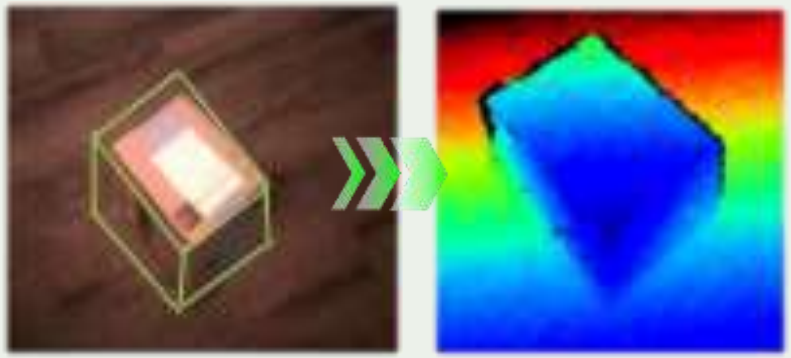
3D Depth provides information that 2D cannot – information that helps us understand shapes, sizes, distances and to move around in 3D space

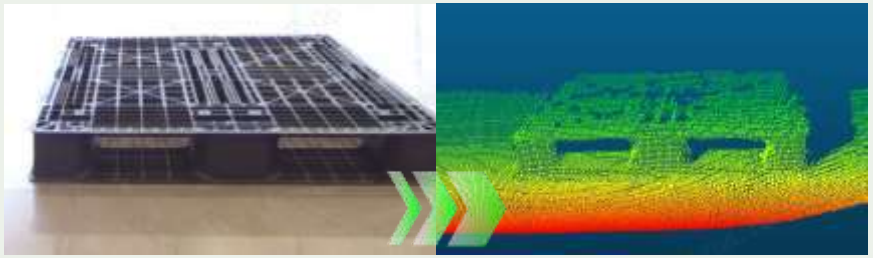
1 Size and Volume - Ex Measurements



2D Color image showing frontal view of life sized flat mannequins stacked one behind the other creating an"**Optical Illusion**"

Depth image solves the "Optical illusion"- tells us how many images, their position in space, i.e. distance from camera

3 Object Recognition and distance from camera



4 Obstacle detection & Collision Avoidance

5 3D Modeling

3D Vision Technology Classification

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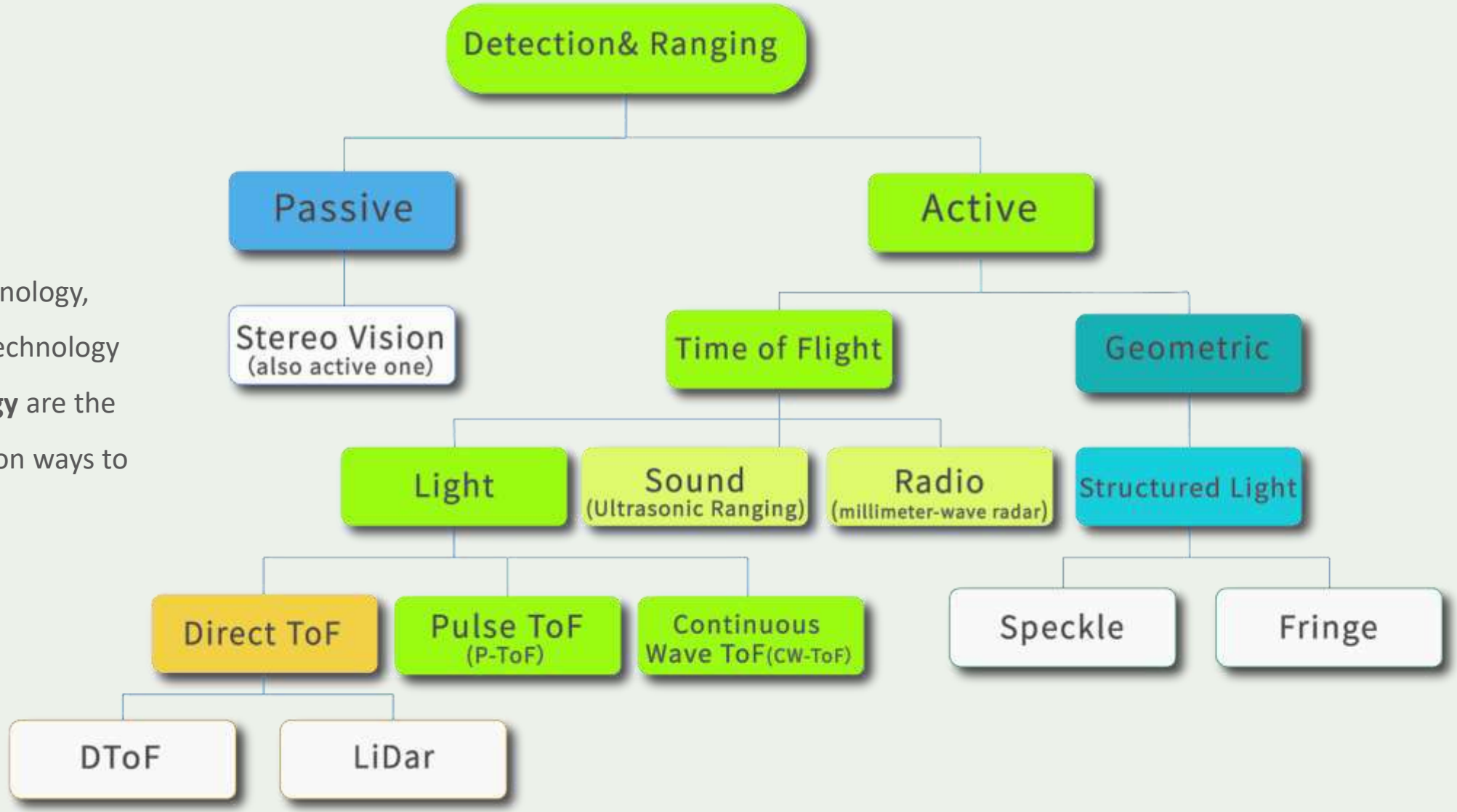
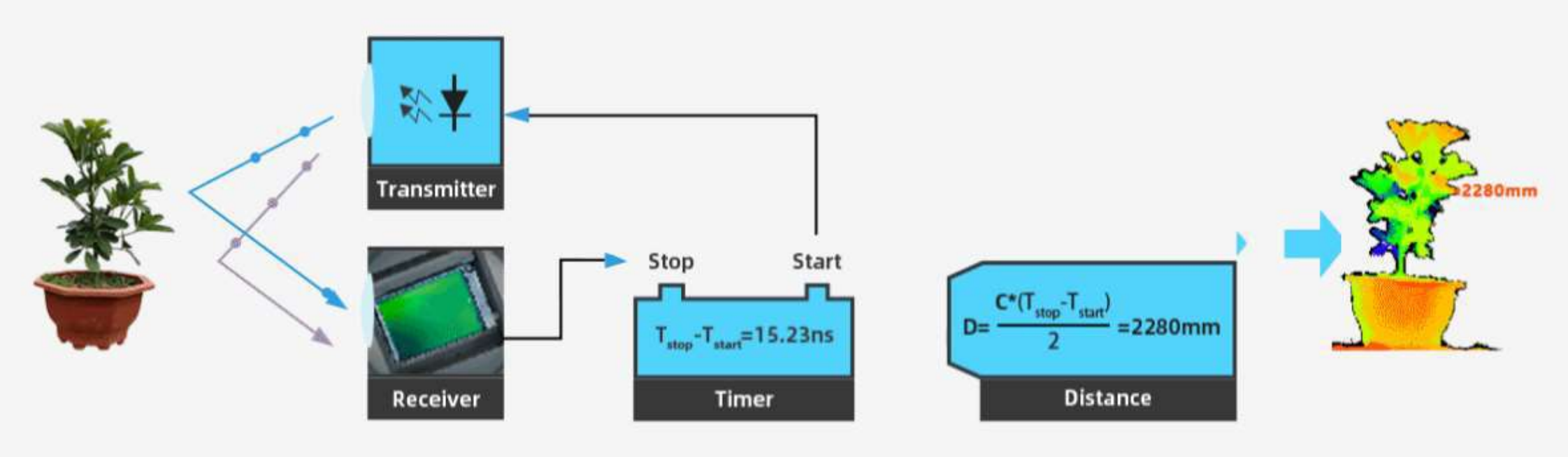
Stereo Vision Technology, Structured Light Technology and **ToF Technology** are the three most common ways to realize 3D vision;



ToF Technology Basic Principle



ToF(Time-of-Flight) camera is a type of active depth sensing camera that measures the time it takes for light to travel from the camera to an object and back. By measuring the time delay, the TOF camera can calculate the distance of objects from the camera and generate a depth map.

$$(d = (C*\triangle t)/2)$$

The Main Applications at a Glance

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Smart City	Robotic	Logistics	Autonomous Transport
• Privacy security • People counting • Elevator load rate	• Collaborative robots • Safety perimeter • Human machine collaboration • Workpiece identification • Automatic palletizing& depalletizing	• Object identification& tracking • Piece separation • Measurements	• AGVs • SLAM/Path planning • Precision approach& docking • Obstacle detection& collision avoidance • Truck load rate

Application - AGV/AMR PALLET RECOGNITION & COLLISION AVOIDANCE

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- The 3D ToF RGB-D Cameras capture pallet images and work with image processing algorithms to help the AGV forklift identify cargo and adjust the fork direction intelligently.
- Use the ToF camera **to identify the surrounding environment and ensure the safe travel** of the AGV.

Application - Vision Guidance and Bin Picking Scenarios

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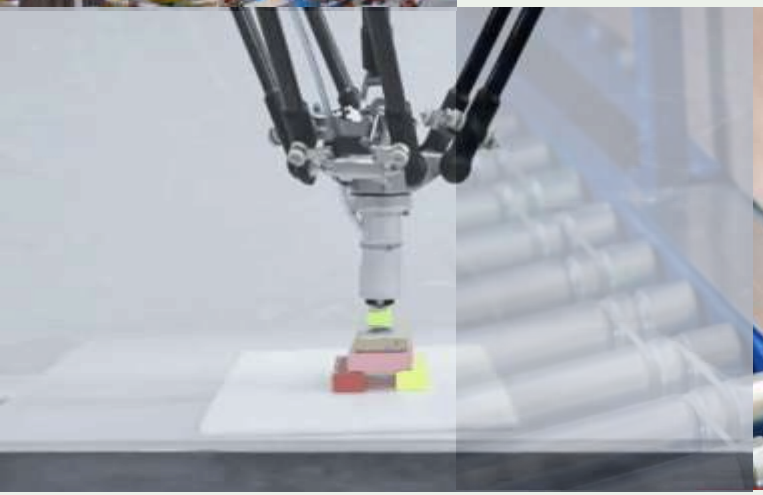
The 3D ToF Cameras identify and capture the position, color, size, shape,and other physical attributes of items on the high-speed conveyor belt, and cooperate with the parallel robot to complete the **grasping, sorting, packingand stacking**



Application - Dimension Measurement

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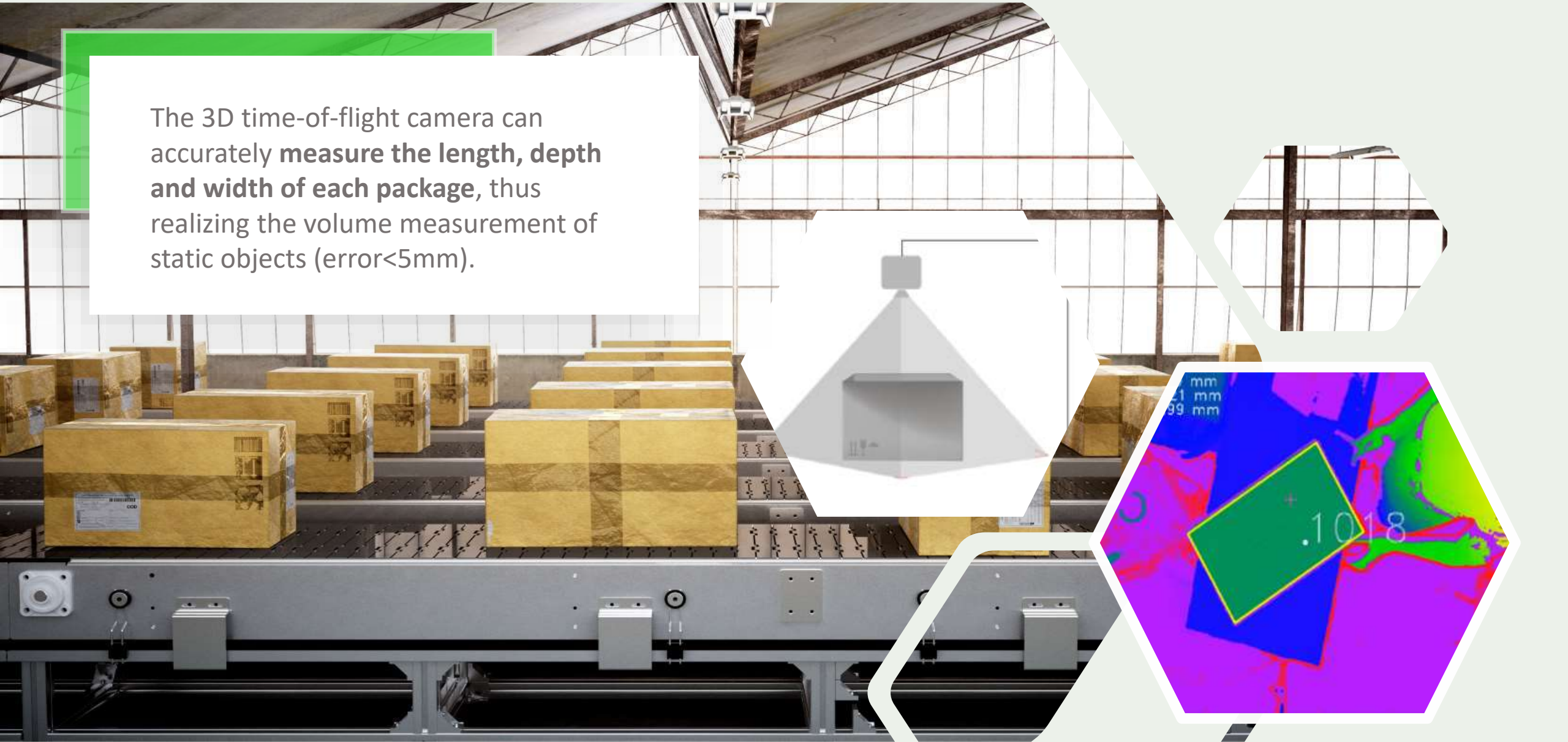
The 3D time-of-flight camera can accurately **measure the length, depth and width of each package**, thus realizing the volume measurement of static objects (error<5mm).



Application – Privacy Security

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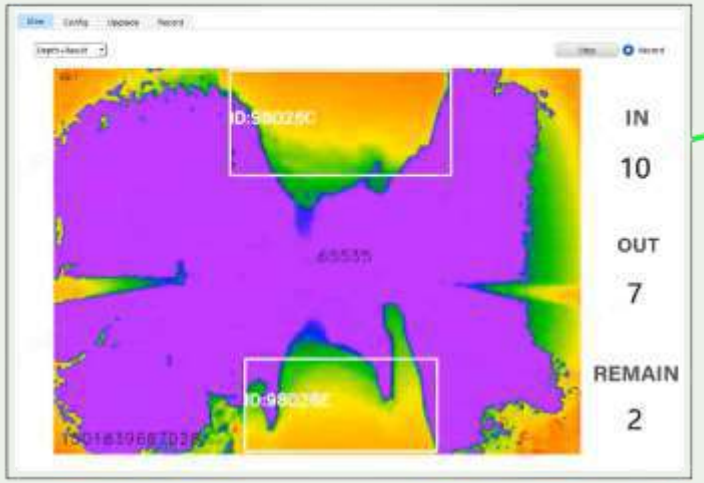
Privacy security is implemented based on the combination of ToF technology and AI technology.
People counting is one of its most typical applications.

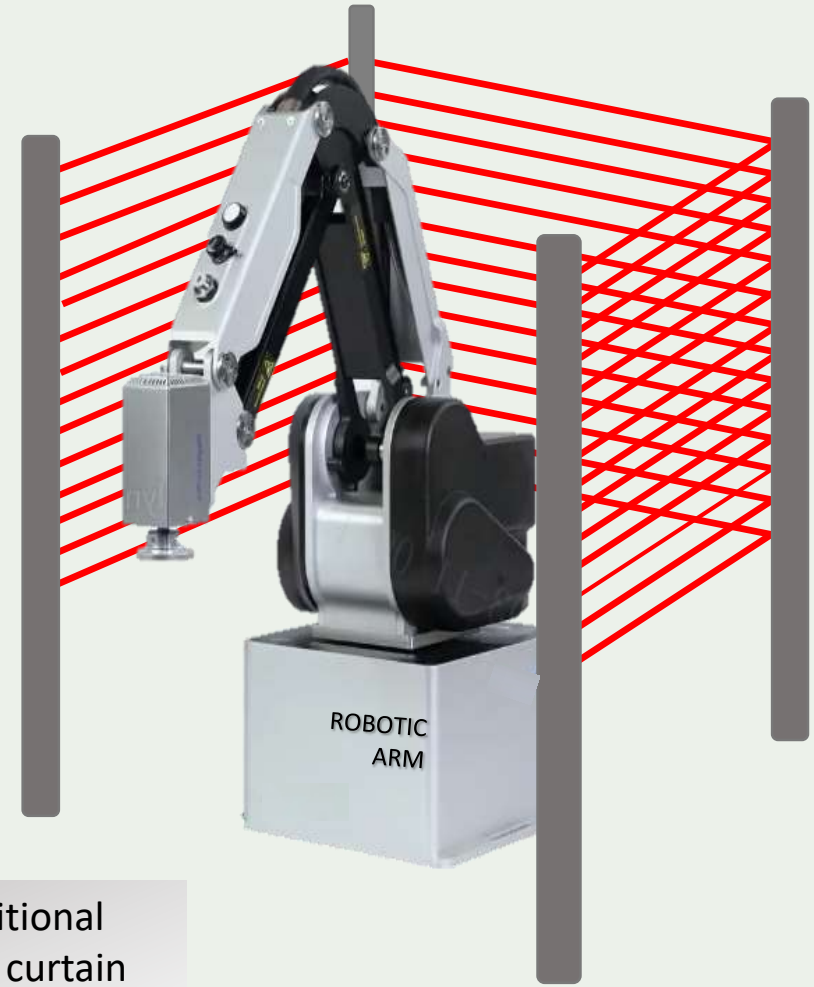


Suitable for:

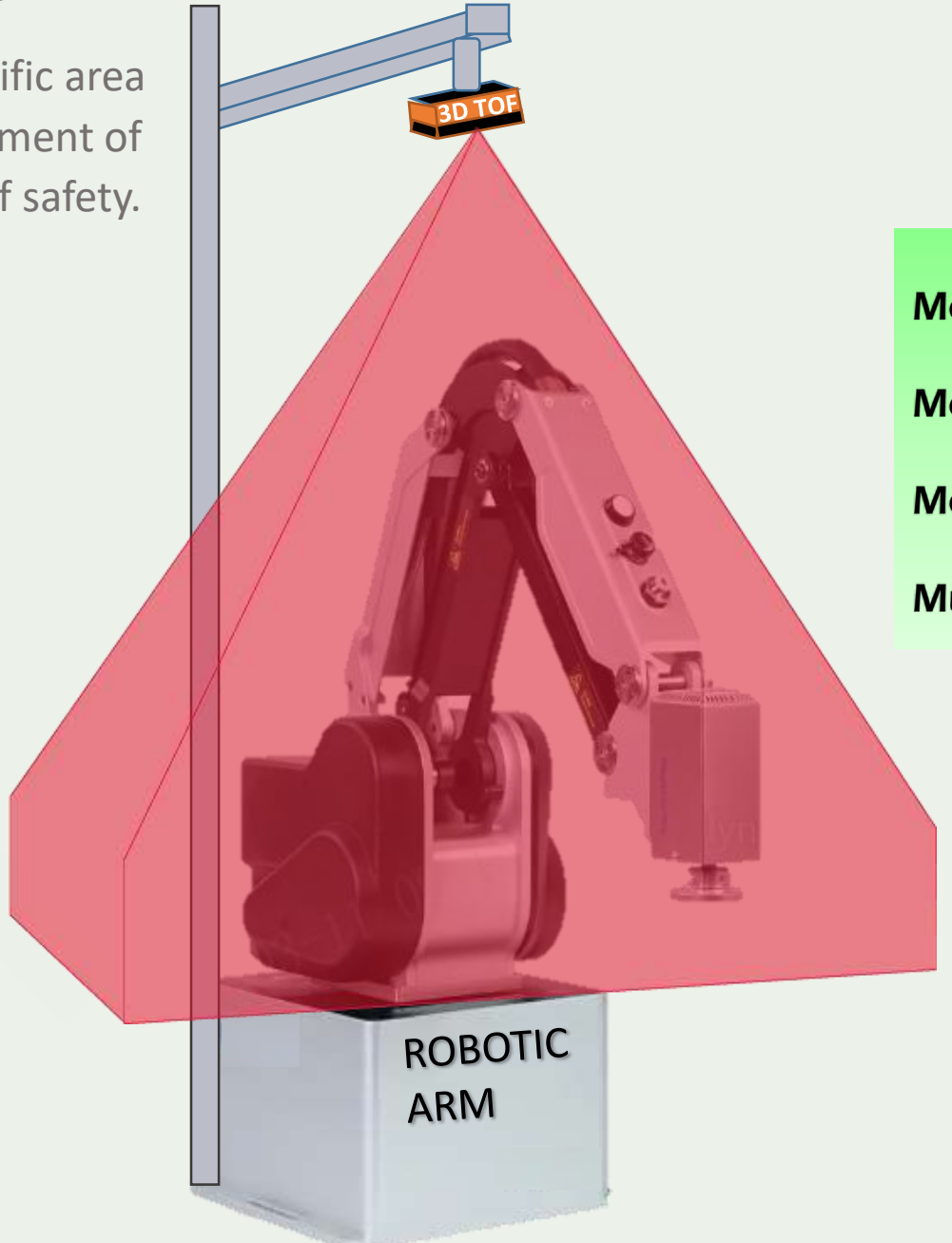
- **Customers with privacy and security needs**
- **People counting in subway stations etc.**

Application – Robot Safety

When unexpected objects get into a specific area covered by ToF depth cameras, the movement of the Robot will be stopped to make sure of safety.



Traditional light curtain



Smart monitor system based on ToF

More flexible (adjustable)

More well-looking (no fences)

More concise (smaller)

Much Safer (no blind spot)

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ToF Technology Basic Principle/
The Main Applications at a Glance/
ToF Technology Applications

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Customized Products

ToF PL Developing Story

Goermicro

- The team has long been engaged in research in the direction of ToF technology.
- We have served hundreds of accounts and developers around the world.

2016

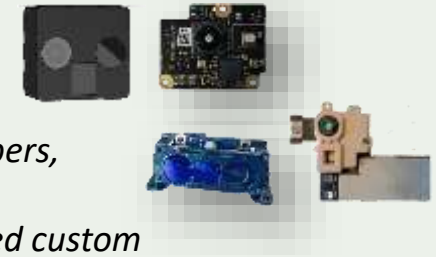
At a well-known VR company worldwide, we began evaluating 3D sensors, eventually selecting a ToF sensor, and began research and developing.

2017

Released ToF modules DCAM100 and DCAM710, announced SDK and graphical tools

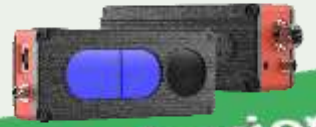
2019

Supported over 400 developers, conducted evaluations and development, and completed custom development for over 10 projects.



2020

Our products began to Transform to professional and systematic ones



2022

Industrial grade products development completed and put into test in the field.

2023-

Receiving positive feedback from industrial-oriented customers and realizing revenues

Strength of the ToF Team

Goermicro

- 7 years R&D experience in TOF Technology,
- Over 10 designed independently and mass produced TOF products;
- Dozens of TOF technology related patents covering mass production, post-processing, application algorithms, etc.;
- Independently developed TOF products that can calibrate the technology fast according to the equipment and environment ;
- Extremely strong TOF hardware module customization ability to accomplish quick delivery.

R&D strength

SDK

Technical Supportive

Size Customized (L*W*H)

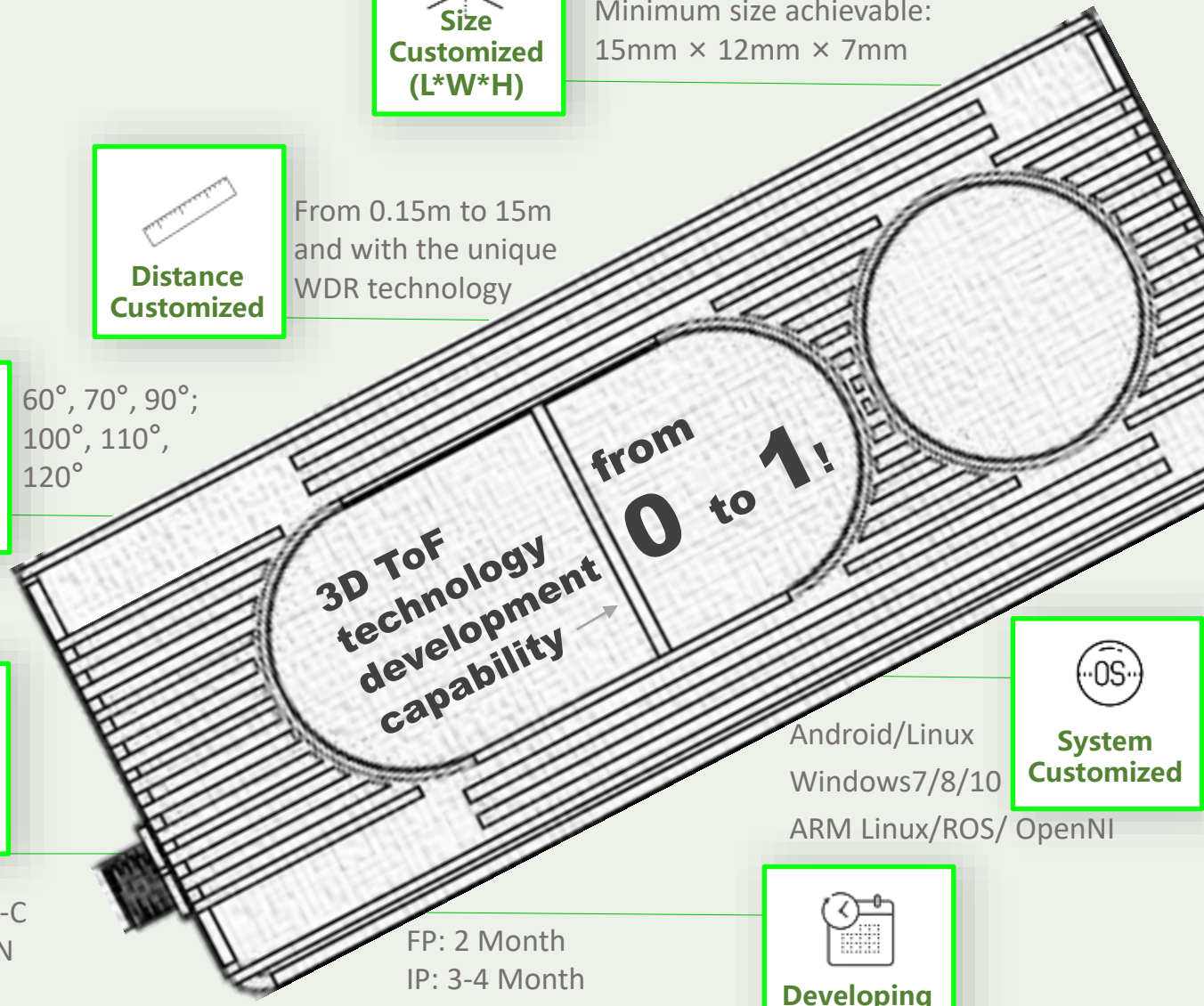
Minimum size achievable:
15mm × 12mm × 7mm

Distance Customized

From 0.15m to 15m and with the unique WDR technology

Angle Customized

60°, 70°, 90°;
100°, 110°,
120°



Interface Customized

MIPI/USB2.0
USB3.0/ Type-C
Ethernet/ CAN

System Customized

Android/Linux
Windows7/8/10
ARM Linux/ROS/ OpenNI

Developing Period

FP: 2 Month
IP: 3-4 Month
Mass: 5 Month

Standardized Industrial Products

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	SONY CW-iToF Camera Series	NUVOTON Pulse-iToF Camera Series
CAMERA SYSTEMS	 DS Series ✓ Phase Modulation ✓ High accuracy ✓ Low jitter ✓ HDR supported	 NYX Series ✓ High frame rate ✓ Long working range ✓ Large dynamic range ✓ Strong resistance to light
Software Development Kit	Windows	Linux ROS
Application Algorithms	People Counting (independent R&D)	Smart Sorting Pallet Recognition
		Posture Recognition Dimension Measurement

Product Introduction- DS 86&87

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DS 86& 87 Series

NEW HOT

- Aviation Plugs
- IP67 Enclosure
- PoE+ supported

DS86

DS87

- ✓ Phase Modulation
- ✓ High accuracy
- ✓ Low jitter
- ✓ HDR supported

Model	DS87 Series	DS86 Series
Sensor	Sony DepthSense ToF CMOS	
Illumination	940nm VCSEL * 2	
ToF Resolution/Frame rate	640*480, Max.15fps	
ToF HDR Mode	Supported with Max. 10fps	
ToF FOV	67°(H)*50°(V)	
RGB Camera	1600*1200, Global Shutter, 70° (H)*50° (V)	
Output Format	16bit (Depth) + 8bit (IR) + JPEG (RGB)	
Transmission Technology	1000Mbps Ethernet	
Physical Connection	Aviation Plug x 2	RJ45
Power Supply	12V~24V DC or PoE+	12V~24V (DC)
Accuracy	<1%	
Working Range	0.15m to 5m	
Working Temperature	-20° C to +50° C	
Operation System & Platform	Windows/Linux/Arm Linux/ROS1/ROS2	
SDK	C/C++/Python	
Enclosure Rating	IP67	IP42
Conformity	CE, FCC, FDA	

*The accuracy and detecting distance will vary depending on the reflectivity of the surface of the object being measured

Product Introduction- NYX650& 660

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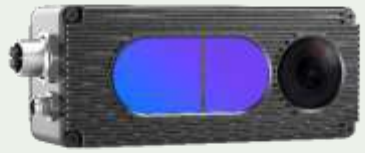
NYX650& 660 Series

HOT

- Aviation Plugs
- IP67 Enclosure
- PoE+ supported

NYX650



NYX660

- ✓ High frame rate
- ✓ Long working range
- ✓ Large dynamic range
- ✓ Strong resistance to light

Model	NYX660 Series	NYX650 Series
Sensor	Nuvoton Depth Sense ToF CMOS (Originally Panasonic Semiconductor)	
Illumination	940nm VCSEL*2	
ToF Resolution/Frame rate	640*480, Max.30fps	
ToF FOV	70°(H)*50°(V)	
RGB Camera	1600*1200, Global Shutter, 71° (H)*55° (V)	
Output Format	16bit (Depth) + 8bit (IR) + JPEG (RGB)	
Transmission Technology	1000Mbps Ethernet	
Physical Connection	Aviation Plug x 2	RJ45
Power Supply	12V~24V DC or PoE+	12V~24V (DC)
Accuracy	<2%*	
Working Range	0.3m ~ 4.5m*	
Working Temperature	-20° C to +50° C	
Operation System & Platform	Windows7/8/10/11/ Linux/Arm Linux/ROS1/ROS2	
SDK	C/C++/Python	
Enclosure Rating	IP67	IP42
Conformity	CE, FCC, FDA	

*The accuracy and detecting distance will vary depending on the reflectivity of the surface of the object being measured

Customized Products

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We also specialize in **full-system customization of TOF products** to satisfy specific engineering challenges. Benefited by our leading engineering capabilities, our accounts have more flexible design options in product size, measuring range, interface, field of view, OS and algorithm, etc.

Range

OS

Dimension

I/F

FOV

Thank you!