January 7th 2025

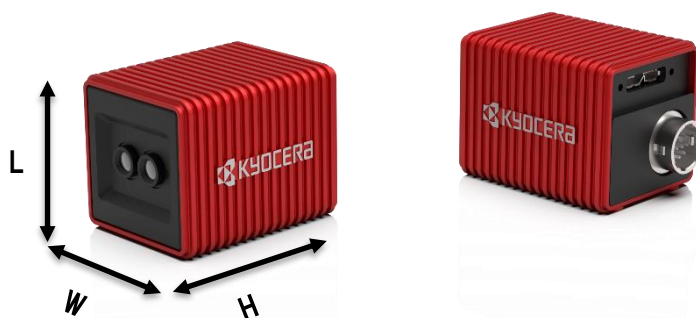
Kyocera's AI-Based High-Res Depth Sensor for Close Imaging
New Records

World's first to deliver 100µm resolution at 10cm range, even with tiny, reflective or semi-transparent objects;
ideal for highly accurate measurement towards flexible automation.

Kyocera Corporation *(President: Hideo Tanimoto; hereinafter: Kyocera)* today announced a high-resolution AI-based depth sensor for measuring tiny objects that have been difficult to measure using conventional depth-sensing technologies. Kyocera's new camera delivers record-setting depth measurements with 100µm resolution at a 10cm range, even from reflective or semi-transparent objects.[1] Kyocera's innovation will support manufacturing, medicine, logistics and a variety of other fields requiring automated identification and precise depth measurement, unlocking the potential of AI and robotics with vision capabilities far exceeding the human eye.

Size (L x W x H): 29 x 20 x 43 (mm), Weight: 65 (g)

■ **Features: Kyocera's AI-Based High-Res Depth Sensor for Close Imaging**

1. Dual-lens sensor measures tiniest objects

A unique configuration incorporating two lenses on a single sensor, Kyocera's AI-based depth sensor provides the industry's highest-resolution depth measurements to date among stereo cameras. The exceptionally narrow baseline of Kyocera's depth sensor allows it to calculate the positional disparities of an object through the left and right lenses at a shorter distance than conventional methods. This precision enables the sensor to make accurate measurements of even the smallest objects.

2. AI stereo vision algorithms measure reflective or semi-transparent objects

Kyocera's AI stereo vision algorithms enable precise depth measurements of reflective or semi-transparent objects. Traditional stereo vision algorithms involve matching objects between left and right images. However, reflective or semi-transparent objects often lack the necessary contrast, or are challenging to identify as the same object, causing measurement errors. Kyocera's AI-based methods leverage extensive training data to measure accurately, even with challenging reflective or semi-transparent objects.

Along with their advantages, AI-based approaches often include high annotation costs and extended training times due to the extensive data required for high accuracy. Kyocera therefore developed two key technologies to reduce training costs:

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[1]Record-setting performance: AI-based depth sensor capable of measuring extremely small objects with measurement resolution of 100µm at a distance of 10cm from the object, including reflective and semi-transparent objects; source: Kyocera Corporation research, as of November 2024.

1. **Label-free pre-training**
2. **Data generation using computer graphics for 10x more precise measurements**

Kyocera's distinctive AI solution utilizes pre-training technology without labels, providing equivalent recognition with only 10% of the training data. To address the issue of conventional AI requiring large amounts of training data, Kyocera developed a computer graphic data-generation technology. This technology enables the automatic generation of training data in a CG simulation environment that accurately reproduces the target objects and settings. Additionally, Kyocera improved and accelerated the CG rendering calculation method. This CG simulation for AI training makes it possible to adapt to new objects and environments, allowing for highly accurate 3D distance measurement, even with reflective or semi-transparent objects.

Kyocera's label-free pre-training technology has been recognized internationally for its novelty and effectiveness, including acceptance at BMVC 2024 (The 35th British Machine Vision Conference), one of the world's leading conferences in the field of machine vision.
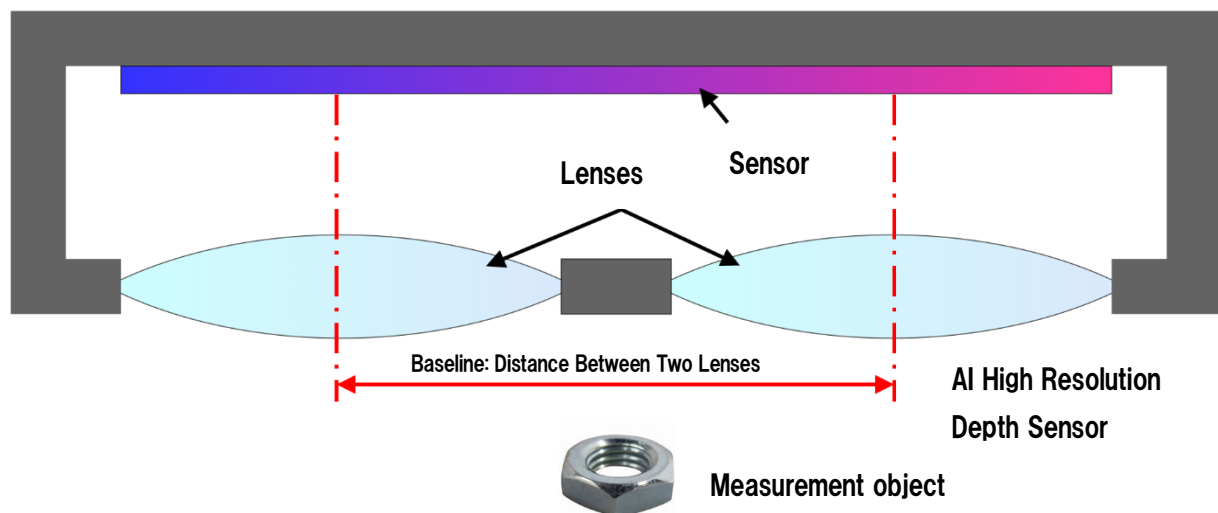

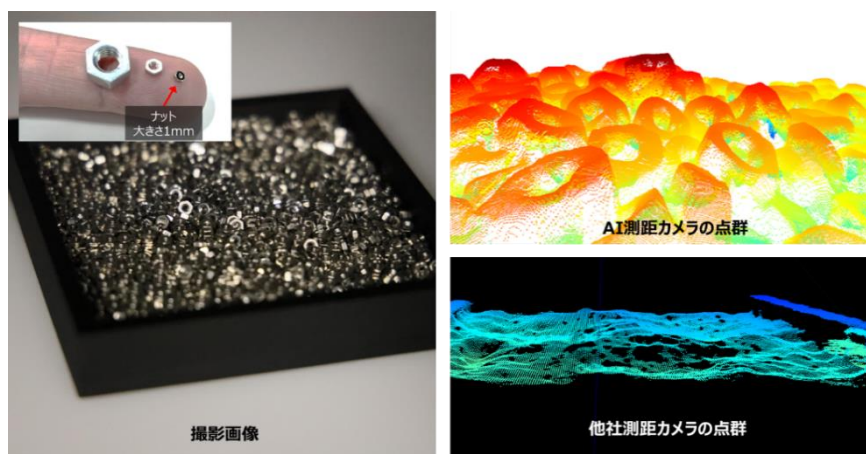**Figure 1: Diagram of Kyocera's AI-Based High-Res Depth Sensor for Close Imaging**

Figure 2 (upper left): Objects measured using Kyocera's AI-Based High-Res Depth Sensor for Close Imaging

and a conventional stereo camera;

(upper right) Kyocera's depth map; (lower right) conventional camera's depth map.

■**Future Developments**

Kyocera's high-resolution AI-based depth sensor has many applications, including integration with robotic arms in manufacturing for precise depth measurement of objects as small as 1 mm. With this level of precision, robotic arms could select individual parts from a batch in a warehouse and recognize high-resolution body measurements or reflective surgical instruments in the medical field. Transport robots in logistics and retail could also more accurately monitor surroundings with this new innovation, helping to address labor shortages and boost societal productivity.

■**CES2025 Outlook**

This technology will be exhibited at one of the world's largest technology trade shows, CES 2025, held in Las Vegas, Nevada, USA, from Tuesday, January 7 to Friday, January 10, 2025.The Company's latest innovations in Aerial Display technology, Underwater Wireless Optical Communications, Millimeter-Wave Sensing, Camera-LIDAR Fusion Sensors, Bifocal Mirrors, and more solutions to further safe, autonomous driving will be showcased at the booth.

Date	January 7th to January 10th, 2025
Venue	Las Vegas Convention Center
Booth location	Vehicle Tech & Advanced Mobility Zone, West Hall.
Booth number	#4816

For more details, please click here https://global.kyocera.com/ces/2025/index.html

About KYOCERA

Kyocera Corporation (TOKYO:6971, https://global.kyocera.com/), the parent and global headquarters of the Kyocera Group, was founded in 1959 as a producer of fine ceramics (also known as "advanced ceramics"). By combining these engineered materials with metals and integrating them with other technologies, Kyocera has become a leading supplier of industrial and automotive components, semiconductor packages, electronic devices, smart energy systems, printers, copiers, and mobile phones. During the year ended March 31, 2024, the company's consolidated sales revenue totaled 2 trillion yen (approx. US$13.3 billion). Kyocera is ranked #672 on *Forbes* magazine's 2023 "Global 2000" list of the world's largest publicly traded companies, and has been named among "The World's 100 Most Sustainably Managed Companies" by *The Wall Street Journal.*

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