

Press Information

Kyocera Develops World's First¹ Automotive Night Vision System with White and Near-Infrared Light Diodes Integrated into a Single GaN Laser Device

Solution combines RGB-NIR sensors and proprietary image-fusion AI technology for safer driving, better visibility at night and in inclement weather.

Kyoto/London, 16. November 2022. KYOCERA Corporation announced that it has developed an Automotive Night Vision System that can accurately identify collision-risk objects in low-visibility driving conditions, such as at night, or in rain, snow, fog, or smoke. The system is expected to reduce traffic accidents and promote safer driving.

Kyocera's Automotive Night Vision features the first headlight in the world that can emit both white (RGB) and near-infrared (NIR) light on the same optical axis; this allows higher accuracy object recognition than alternative technologies. The system integrates RGB-NIR sensors and a unique "Image-Fusion AI Recognition Technology" developed by Kyocera for high performance object recognition. In addition, Kyocera has developed another generative AI feature to create training data for more cost-efficient learning and product development.

Video: Introducing Kyocera's New Automotive Night Vision System

In order to get better insights into Kyocera's New Automotive Night Vision System, the company published a video. By clicking the following link, the video shows further information concerning the system: <https://www.youtube.com/watch?v=q3Am3wZJXpE>



Automotive Night Vision System

¹ For headlights using white and near-infrared light in a single SMD device (Kyocera research, September 2022).

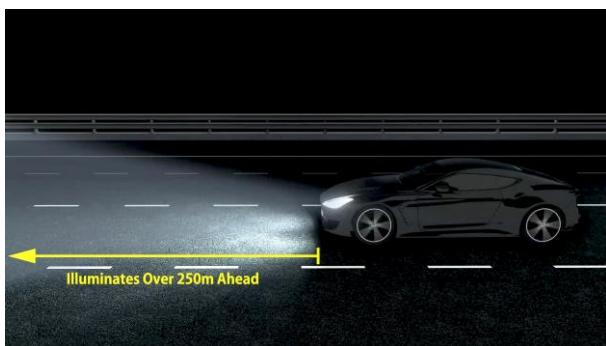
Development Background

To reduce traffic accidents and promote autonomous driving, automakers will require more advanced hazard-detection systems. The global market for Automotive Night Vision Systems was estimated at approximately \$2.17² billion in 2020. Furthermore, the market is expected to grow at a compounded annual rate of more than 16.5%³ from 2020 to 2027. Kyocera's new night vision system will help prevent traffic accidents by notifying drivers of hazards in adverse driving environments, a benefit made possible only through the innovative integration of visible and near-infrared images using proprietary fusion recognition AI technology.

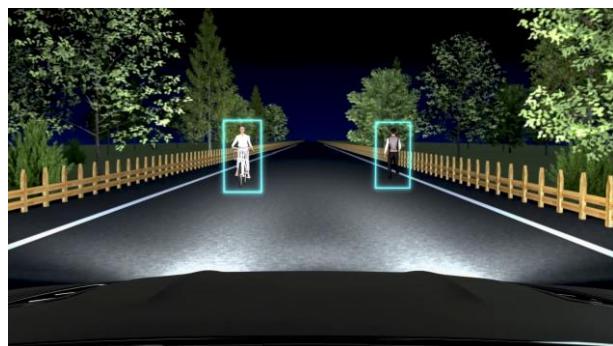
System Features and Background

1. Laser headlight integrates white and near-infrared light on the same optical axis

Kyocera's system integrates both white and near-infrared light from a laser headlight on a single optical axis. This eliminates image parallax and greatly enhances image recognition. The integrated headlight also incorporates an extremely bright, high-efficiency, miniaturized GaN laser developed by [KYOCERA SLD Laser](#), Inc. Furthermore, the system has automatic "beam shaping" functionality for the RGB and NIR light that prevents glare for oncoming drivers by automatically shifting visible light into a low-beam pattern when necessary, while the NIR light can remain in high-beam mode.



Illumination Image



Sensing Image

2. More accurate object recognition using Kyocera's proprietary fusion recognition AI technology

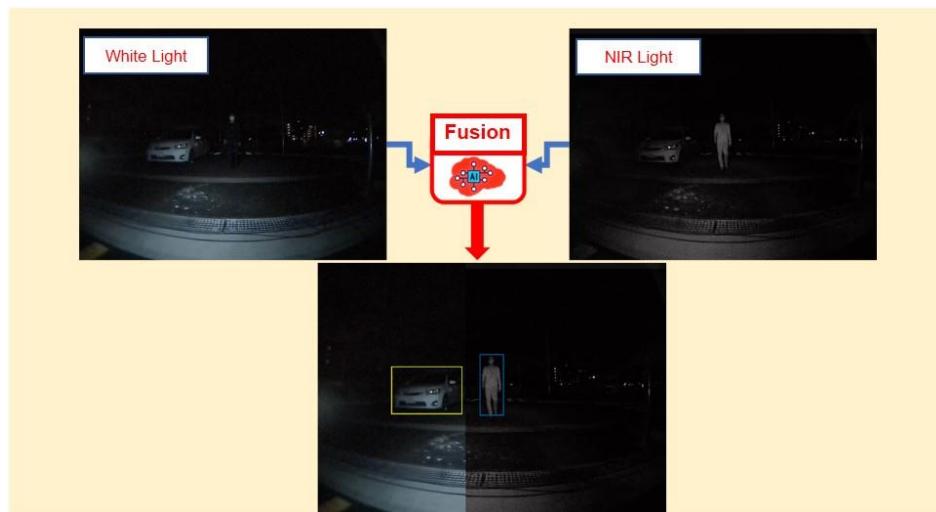
Kyocera's vehicle-mounted RGB-NIR sensor uses original fusion recognition AI technology⁴ developed by Kyocera's Advanced Technology Laboratories. Instead of simply combining the image data from the two sources, Kyocera's system uses qualitative

² Source: Reportocean, "Global Automotive Night Vision System Market by Technology Type" Nov. 3rd, 2021.

³ Source: Reportocean, "Global Automotive Night Vision System Market by Technology Type" Nov. 3rd, 2021.

⁴ Received the Symposium and Sensing via Image Information (SSII) Distinguished Academic Award.

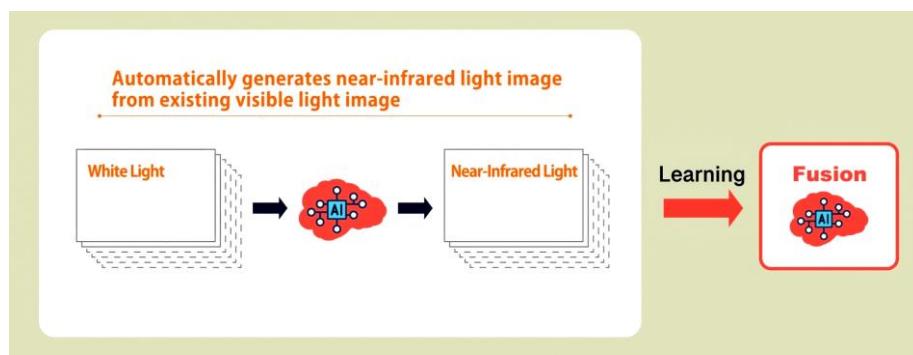
AI to compare and assess both RGB and NIR images, differentiating between pedestrians and vehicles with high accuracy even in low visibility conditions.



Fusion recognition AI Technology

3. AI significantly reduces development costs while improving recognition performance

Conventional methods require collection of vast amounts of NIR training data, a time-consuming and costly process. Conversely, Kyocera's AI technology generates training data automatically. As a result, this approach can significantly reduce training costs while maintaining high accuracy in recognition performance.



Training Data Generation AI Technology

Future Developments

Kyocera will continue R&D for this system, aiming for commercialization after 2027. We will also contribute to making transportation safer and more secure through traffic-monitoring infrastructure technologies, such as smart road-side units (RSUs) and other equipment, while



adapting our technologies to other diverse applications ranging from nighttime security to delivery systems.

For more information on Kyocera: www.kyocera.co.uk

About Kyocera

Headquartered in Kyoto, Japan, KYOCERA Corporation is one of the world's leading manufacturers of fine ceramic components for the technology industry. The strategically important divisions in the KYOCERA Group, which is comprised of 298 subsidiaries (as of March 31, 2022), are information and communications technologies, products which increase quality of life, and environmentally friendly products. The technology group is also one of the most experienced producers of smart energy systems worldwide, with more than 45 years of know-how in the industry. The company is ranked #665 on Forbes magazine's 2022 "Global 2000" listing of the world's largest publicly traded companies.

With a global workforce of over 83,000 employees, Kyocera posted sales revenue of approximately €13,42 billion in fiscal year 2021/2022. The products marketed by the company in Europe include printers, digital copying systems, semiconductor-, fine ceramic-, automotive- and electronic components as well as printing devices and ceramic kitchen products. The KYOCERA Group has two independent companies in the United Kingdom: KYOCERA Fineceramics Ltd. and KYOCERA Document Solutions Ltd.

The company also takes an active interest in cultural affairs. The Kyoto Prize, a prominent international award, is presented each year by the Inamori Foundation — established by Kyocera founder Dr. Kazuo Inamori — to individuals worldwide who have contributed significantly to the scientific, cultural, and spiritual betterment of humankind (approximately €710,000* per prize category).

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