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Development and Mass Production of a Stereo Camera for Forklifts that Will Contribute to the Prevention of Accidents in Workplaces

RICOH Industrial Solutions Co., Ltd. (President: Hiroshi Takemoto) has jointly developed a stereo camera for forklifts with Toyota Industries Corporation (President: Akira Onishi) for the industrial vehicle industry.

There is a growing need for better safety during forklift operation due to the occurrence of vehicle-to-person/goods contact accidents at workplaces where forklifts are used around people and goods. RICOH Industrial Solutions utilizes proprietary optical design, calibration, and real-time parallax computation technologies cultivated in stereo cameras for on-board advanced driver assistance systems (ADAS) for forklifts, enabling them to operate in complex environments. They can quite accurately detect people and objects three-dimensionally from surrounding obstacles.

Wide-angle technology gives this product a wide range of detection, with a horizontal angle of 130°. Furthermore, its 3D based recognition technology allows for tagless detection for an unspecified number of people, unlike conventional methods where workers carry detection tags. In addition, it has an IP67^{*1} rated high weather resistance, allowing it to operate even in forklift workplaces with severe usage environments. The product provides a compact, single package form by incorporating both image processing and power supply functions in the camera. Installation and operation are easy, and users can attach it to existing forklifts operating on-site.

Toyota Industries launched the newly developed SEnS^{*2} with stereo camera for forklifts in May 2021 through 40 Toyota L&F dealers across Japan, as a safe driving support system that distinguishes people from obstacles in the detection area and notifies operators of their approach with a notification buzzer and light. In August 2021, the SEnS+ (Sense Plus)^{*3} rear human detection operation support system was launched, with functions to control driving speed and start-up added as a new inter-connection with the vehicle.

The development of stereo cameras for forklifts is a business activity that supports the promotion of two SDGs (Sustainable Development Goals): #3, Good Health and Well Being, and #11, Sustainable Cities and Communities. It uses optical technology and parallax calculation technology to detect and avoid obstacles, contributing to improved safety for operators and the surrounding environment.

RICOH Industrial Solutions will continue to provide stereo cameras for industrial and construction vehicles, in addition to the field of advanced driver assistance systems, where needs are expanding and becoming even more sophisticated. We will use 3D spatial information obtained to help visualize customer workplaces, and with the Ricoh Group providing digital services positioned as future value we will contribute to the realization of a safer society.

- *1 IP67: A protection rating for foreign matter such as dust and water entering electrical equipment as stipulated by the IEC (International Electrotechnical Commission) and JIS (Japan Industrial Standard).
- *2 SEnS: Smart Eye Sensor
- *3 SEnS+: Smart Eye Sensor Plus: Launched for an optional product of 'Ecore' (Compact electric forklift) series.



stereo camera for forklifts



image of stereo camera equipped on forklift

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With cultivated knowledge and organizational capabilities nurtured over its 85-years history, Ricoh is a leading provider of digital services and information management, and print and imaging solutions designed to support digital transformation and optimize business performance.

Headquartered in Tokyo, Ricoh Group has major operations throughout the world and its products and services now reach customers in approximately 200 countries and regions. In the financial year ended March 2021, Ricoh Group had worldwide sales of 1,682 billion yen (approx. 15.1 billion USD).

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