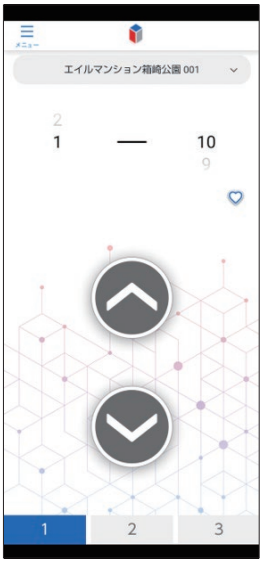
6. Building Solutions

6.1 Delivery of ELCLOUD Cloud Service

Courtesy: Sakushushoji Co., Ltd.

View of EIR Condominium Hakozaki Park



Example of Smartphone Call Service screen

Courtesy: Sakushushoji Co., Ltd.
Robot Collaboration Service

Elevator-calling service using smartphone and robot autonomously riding elevators utilizing ELCLOUD cloud service

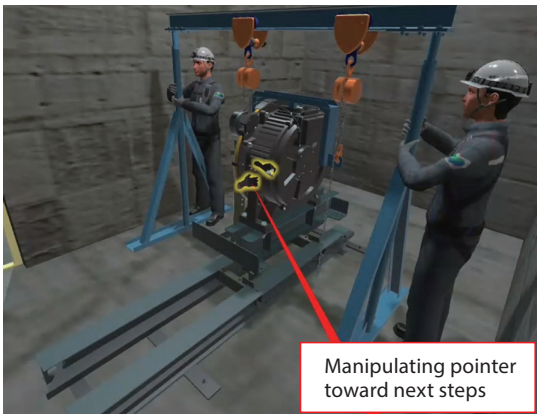
In April 2024, Toshiba Elevator and Building Systems Corporation delivered ELCLOUD, a suite of cloud services that provide new value for elevators, to EIR Mansion Hakozaki Park, a condominium sold by Sakushushoji Co., Ltd. ELCLOUD is equipped with a cloud connection interface to communicate with external systems which enhance convenience.

The Smartphone Call Service allows residents to register boarding and destination floors from their smartphones. Touchless operations and reduced waiting times help improve elevator convenience. As a new touchpoint with residents, the Smartphone Call Service is expected to help us to understand elevator usage patterns and act as a tool that inspires the creation of new services. In addition, the Robot Collaboration Service allows elevator cars to communicate with robot servers and other systems, enabling seamless service robot movement.

At EIR Mansion Hakozaki Park, we verified the benefits of ELCLOUD in streamlining condominium management, contributing to the realization of new lifestyles and values for residents and caretakers.

6.2 VR Technology for Elevator Design and Installation

Virtual elevators and escalators



Demonstration of VR-based safety training

Utilization of three-dimensional (3D) technology for design and installation work is growing in popularity in the construction industry. Virtual reality (VR) is one technology that is attracting much attention.

With this in mind, Toshiba Elevator and Building Systems Corporation has developed VR technology for elevators. Conventionally, computer graphics (CG) images were used to review the functions and shapes of elevators in the design phase. We have now created a virtual elevator and introduced VR headsets by leveraging digital technology, allowing users to experience virtual elevator design and a riding sensation close to reality. This helps enhance customer understanding and streamline the specification development process.

Because of the high risk of injury at installation sites, it is essential to provide thorough safety training. By analyzing past labor accidents, we have created a safety training program, focusing on high-risk tasks for inexperienced workers. VR technology allows users to experience the consequences of incorrect operations through their avatars. Experiencing mistakes that are unacceptable in reality helps improve safety training effectiveness.

6.3 ViewLED Solution Service Using Camera-Equipped Lighting Fixtures to Enhance Safety of Manufacturing Sites

Camera-equipped lighting fixture "ViewLED"

Overview of application of ViewLED-based AI image processing in on-premises safety monitoring service

Toshiba Lighting & Technology Corporation has launched ViewLED Solution, an artificial intelligence (AI) image analysis service for factories and warehouses with a new safety monitoring feature to detect safety rule violations such as failure to wear protective gear in manufacturing environments.

ViewLED is a light-emitting diode (LED) lighting fixture equipped with a camera. The ViewLED Solution service helps improve safety management and productivity by analyzing captured images. The Safety Monitoring software identifies behaviors such as failure to wear protective gloves, hats, helmets, and glasses as well as walking with hands in pockets.

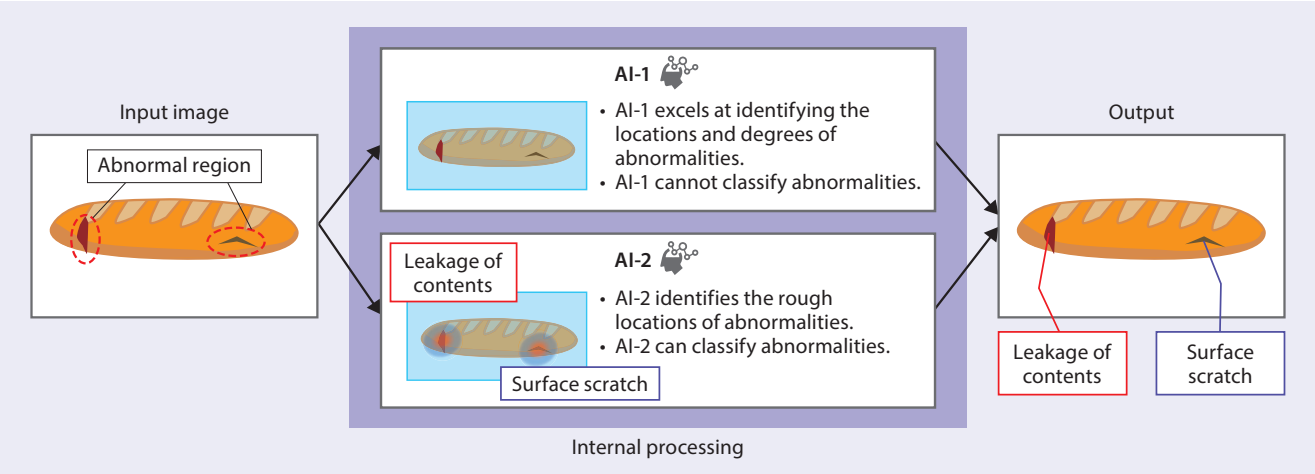
Also, the Visual Incident Report software provides a detailed report and analysis of safety rule violations and other detected unsafe behaviors. Additionally, behaviors before and after

detection can be reviewed in video format, making it possible to identify the causes of unsafe behaviors. Visual Incident Report allows users to track and manage safety actions easily, ensuring a safer and more efficient workplace.

Safety Monitoring incorporates an AI model to identify people in images and a visual question answering (VQA) model, a type of visual language model, which answers questions about images. For example, if a user loads an image of a person wearing a helmet into VQA and asks, "Is this person wearing a helmet?" it will respond with "Yes." VQA can be used interactively to detect unsafe behaviors of people in images captured by ViewLED.

The advantage of using VQA with Safety Monitoring is its scalability. VQA can respond to any kind of question, and we are continuously working to expand its capabilities and enhance performance to detect all types of unsafe behavior in manufacturing environments.

6.4 AI-Powered Machine Vision Inspection System for Food Industry



AI machine vision inspection process

The manufacturing industry faces the pressing need to automate and streamline production processes to compensate for labor shortages due to a declining birthrate, an aging population, and young people's tendency to shun manufacturing jobs.

The food industry in particular relies heavily on skilled workers for visual inspection because of the need to inspect a wide variety of differing items, leading to concerns over inconsistent inspection accuracy and overburdened workers.

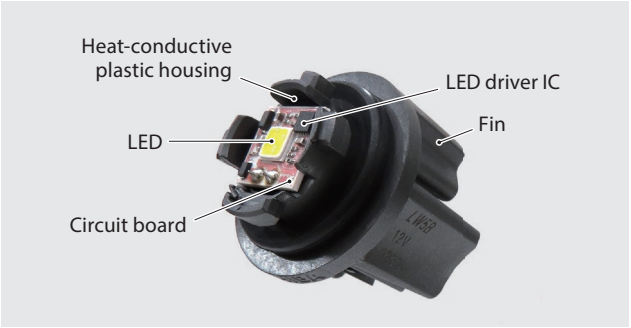
With this in mind, Toshiba Lighting & Technology Corporation develops machine vision inspection systems for the food industry. Conventional inspection methods rely on rule-based judgments using information such as image brightness, edges, and patterns. However, it is difficult for these methods to handle natural variations in food items and ambiguous defect criteria, sometimes posing barriers to introducing them to the market.

To overcome this, we have developed an AI-powered machine vision inspection system with two distinct AI models, AI-1 and AI-2, which provides higher operability and inspection accuracy than a system with a single AI model. AI-1 excels at identifying abnormal locations in an image and calculating the degrees of abnormalities based on preset thresholds. However, AI-1 cannot classify the types of abnormalities. In contrast, AI-2 can classify the general locations and types of abnormalities in an image, but it performs poorly when measuring the degrees of abnormalities. Therefore, AI-1 and AI-2 complement each other to identify both the types and degrees of abnormalities. For a given defect mode, the new machine vision system achieved an inspection accuracy of 96%, compared to approximately 40% achieved by a system with a single AI model. We have also optimized the new AI models for hardware execution and increased their speed through quantization, achieving inspection speeds equivalent to rule-based methods.

We will begin shipment of the new machine inspection system in March 2025.

6.5 Socket-Type White LED Compliant with UNECE Regulations

Lighting fixture example



Product

The transition to using LEDs for automotive exterior lighting is gaining speed, driving demand for socket-type LEDs in automotive applications. These LEDs are currently being standardized under the United Nations Economic Commission for Europe (UNECE) Regulations(*).

With this in mind, Toshiba Lighting & Technology Corporation is expanding its lineup of socket-type LEDs compliant with UNECE Regulations. We began mass production of LEDs for brake and taillights in 2021 and for turn lights in 2023. We have recently developed a socket-type white LED suitable for both daytime running lights (DRLs) and reverse lights.

The new product is housed in thermally conductive plastic to reduce weight and incorporates a metal body between the LED (heat source) and the housing fins to improve heat dissipation efficiency. To reduce the number of external parts, the new product incorporates an LED driver integrated circuit (IC) with a temperature control function as well as a function to change the number of LED elements that light up to maintain LED lighting voltage in the event of a drop in battery voltage. The total luminous flux of 350 lm is optimal for DRLs and reverse lights.

The new product was adopted for vehicles for overseas markets, and we began mass production in April 2024.

(*) Unified safety and environmental standards for vehicle structures and equipment established by the UNECE