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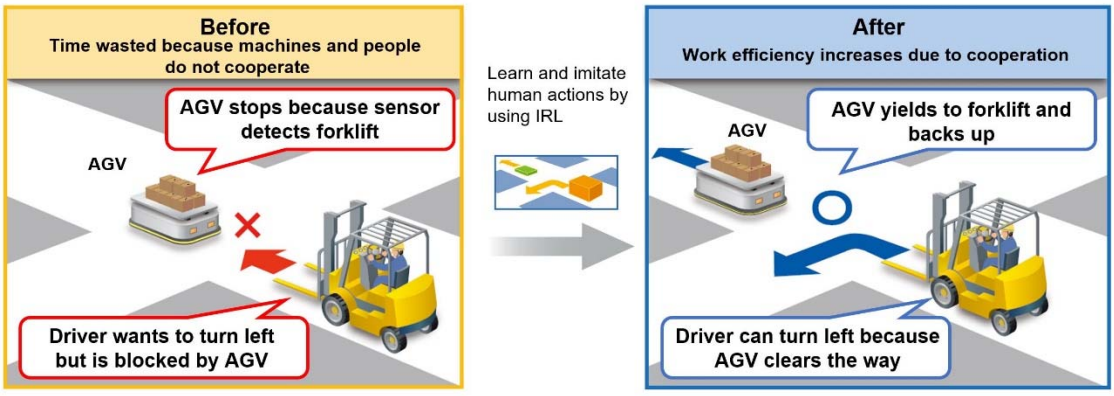
Mitsubishi Electric Develops Cooperative AI for Human–Machine Work

AI technology improves productivity in factories and plants

TOKYO, June 3, 2020 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it has developed a cooperative artificial intelligence (AI) technology that enhances work collaboration between humans and machines by using inverse reinforcement learning (IRL) to learn and imitate the actions of skilled workers. IRL, one of the key features of Mitsubishi Electric's Maisart®* AI technology, enables machines to imitate human-like actions based on relatively small amounts of data. The new cooperative AI technology will be further refined through test deployment in automated guided vehicles (AGVs) and robots at production and distribution sites where machines operate alongside humans. Eventually, the technology is expected to be used in autonomous driving vehicles and other applications.

* Mitsubishi Electric's AI creates the State-of-the- ART in technology Maisart



Example of cooperative AI deployed in AGV

Key Features

1) Improves efficiency in environments where both humans and machines work

In mixed-work environments populated with humans and machines, Mitsubishi Electric's collaborative AI technology enables AGVs to use images from video recordings of these work areas to learn and imitate the actions of humans. By learning actions such as yielding, the technology helps AGVs to avoid unwanted situations such as collisions or stalemates. In-house simulations conducted by Mitsubishi Electric raised operational efficiency by about 30 percent compared to operations in conventional mixed-work environments populated with less intelligent machines.

2) Maisart's IRL reduces amount of operational data required for learning

To enable AI to learn and imitate human actions, conventional machine learning requires huge amounts of operational data -in this case video data- which incurs time and cost burdens. Mitsubishi Electric's Maisart AI, however, uses IRL to reduce the amount of data required to learn and imitate human actions. In simulations, the new technology required only 10 percent or less video data used normally.

Future Development

Going forward, Mitsubishi Electric will continue to develop its new cooperative AI for eventual application in commercial facilities. The envisioned benefits include improved operational efficiency, enabling workers to maintain social distancing and allowing machines and humans to operate alongside each other safely in settings such as factory production lines and logistics warehouses as well as in applications for autonomous-driving vehicles.

Background

When machines such as AGVs and human operators work together in factories and warehouses, the optimized operations of machines tend to take precedence and this can impair efficiency due to poor coordination and operational deadlocks. To enable machines to coordinate effectively with humans, video of human actions must be learned and imitated, and this process that can be enhanced with IRL to reduce the amount of required video data. Ultimately, the commercial application of such technology is expected to improve efficiency in environments where humans and machines coexist, such as factories, warehouses and roads populated with autonomous driving cars.

About Maisart

Maisart encompasses Mitsubishi Electric's proprietary artificial intelligence (AI) technology, including its compact AI, automated design deep-learning algorithm and extra-efficient smart-learning AI. Maisart is an abbreviation for "Mitsubishi Electric's AI creates the State-of-the-ART in technology." Under the corporate axiom "Original AI technology makes everything smart," the company is leveraging original AI technology and edge computing to make devices smarter and life more secure, intuitive and convenient.

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About Mitsubishi Electric Corporation

With nearly 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Mitsubishi Electric enriches society with technology in the spirit of its corporate statement, "Changes for the Better," and environmental statement, "Eco Changes." The company recorded a revenue of 4,462.5 billion yen (U.S.$ 40.9 billion*) in the fiscal year ended March 31, 2020. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥109=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2020