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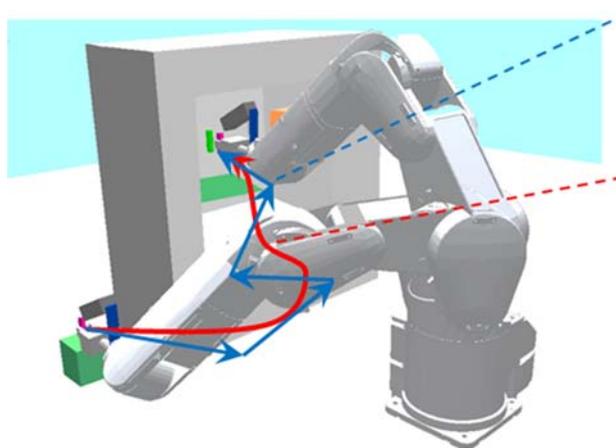
Mitsubishi Electric's Fast Stepwise-learning AI Shortens Motion Learning

Ideal for efficient startup of production equipment

TOKYO, February 13, 2019 – [Mitsubishi Electric Corporation](http://www.mitsubishielectric.com) (TOKYO: 6503) announced today that it has developed an artificial intelligence (AI) technology capable of fast stepwise learning using a simulator to efficiently complete motion learning in a relatively short time. The new technology combines the company's latest proprietary Maisart^{®1} compact AI technology and reinforcement learning, which enables machines to explore optimal actions through highly efficient trial and error. Supported with the company's smart-control AI technology that adapts rapidly and nimbly to changing conditions², the new AI technology learns and responds to changes in actual environments in real time to enable smooth machine operation. Going forward, Mitsubishi Electric will continue developing the technology for improved equipment startup efficiency and autonomous operation.

¹ Mitsubishi Electric's AI creates the State-of-the-ART in technology  **Maisart**

² Mitsubishi Electric Develops Smart-control AI Technology that Adapts Rapidly and Nimbly to Changing Conditions <http://www.mitsubishielectric.com/news/2018/0208.html> (February, 8, 2018)



First stage: Route information

Generates route from start to goal.



Second stage: Action learning

Learns actions that are close to the path, completing learning in a short time.



Actual work (using newly developed technology)

Shortens operation time.

Examples of application in industrial robots (behavior learning to achieve goal in shortest time)

Due to declining workforces in ageing societies such as Japan, securing sufficient human resources is becoming increasingly difficult, which in turn is raising the demand for AI that can support efficient mechanized operations. New production facilities, however, present special challenges due to differences in pre-learned and actual shop environments, resulting in huge amounts of time having to be devoted to teaching AI before it can be implemented on a full scale. Mitsubishi Electric’s new AI automatically creates control programs for actual environments after short learning to support optimized operations.

Main Features

The new AI technology achieves quick stepwise learning with the help of Maisart’s reinforcement-learning capability, a significant improvement over conventional methods that require enormous learning time to test various content and their combinations. Mitsubishi Electric drew on its expertise in factory automation equipment, machine tools and autonomous-operation technology to refine its AI’s reinforcement-learning capability, focusing on simplifying work-process learning step by step. Instead of attempting to learn everything at once, the company simplified learning contents and added simple, automatic stepwise learning for faster and more efficient learning. In-house testing found the time required for program creation³ is a mere one tenth⁴ that of manual processes.

³ Including repeat operation correction and operation confirmation

⁴ Adjustment work required using an industrial robot

To shorten the takt time (average time to produce one unit and begin work on the next unit) using production equipment such as industrial robots, skilled workers conventionally must make many adjustments to the production equipment. With Mitsubishi Electric’s new AI, however, adjustments of route, speed, acceleration, etc. are performed automatically. Action is learned beforehand using a simulator, allowing the AI to make adjustments automatically to shorten the takt without using an image sensor. The result is productivity equal to or higher than that of equipment adjusted by a skilled worker.

	Function	Time required for adjustments
Developed technology	Programming with AI	1/10 th of conventional method
Conventional method	Manual program creation	1

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.

Patents

Patents for the technology announced in this news release number five in Japan and five outside Japan.

Pending patents for the technology announced in this news release number three in Japan and three outside of Japan.

Maisart is a registered trademark of Mitsubishi Electric Corporation.

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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. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 4,444.4 billion yen (in accordance with IFRS; US\$ 41.9 billion*) in the fiscal year ended March 31, 2018. For more information visit:

www.MitsubishiElectric.com

*At an exchange rate of 106 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2018