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Mitsubishi Electric Develops High-Speed Training Algorithm for Deep Learning

Training function on embedded systems applications in vehicles, robots and more

TOKYO, October 14, 2016 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it has developed a high-speed training algorithm for deep learning that incorporates necessary inference functions for identification, recognition and prediction of unknown facts based on known facts. The new algorithm is expected to simplify the implementation of deep learning in vehicles, industrial robots and other machinery by drastically reducing memory usage and the computational time for training. It also will enable low-cost solutions in which artificial intelligence (AI) systems with training functions perform high-level inference directly within the embedded system according to the embedded system's peripheral environment.

Mitsubishi Electric will present its new system at the International Conference on Neural Information Processing (ICONIP2016), which will be held at Kyoto University from October 16 to 21. A paper also will be published in *Lecture Notes in Computer Science*. The technology was originally introduced in a news release entitled *Mitsubishi Electric Develops Compact AI* dated February 17.
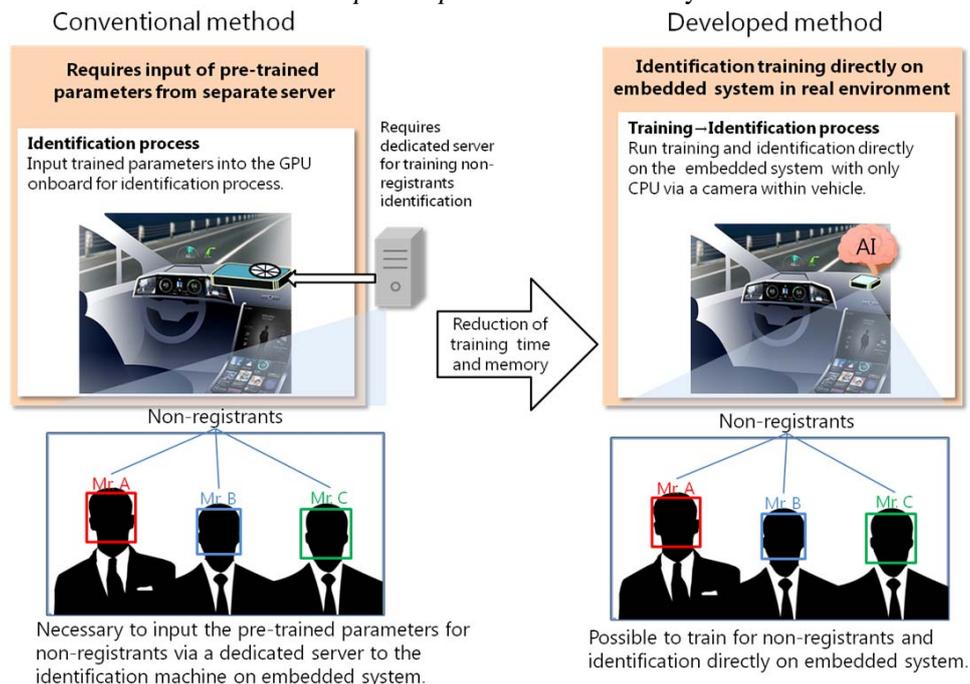
Example application for driver face recognition

The algorithm reduces the training time, computational cost and memory requirements to approximately one-thirtieth of that of conventional AI, as it can achieve a further reduction of approximately 30 percent from Mitsubishi Electric's existing Compact AI, which itself reduced the computational cost and memory requirements for image recognition by 90 percent compared to conventional AI, according to Mitsubishi Electric's own research as of October 14.

Mitsubishi Electric's system should help expand AI's range of utilization thanks to its compactness and overall low cost. It will reduce the costs of AI deployment by eliminating needs for servers and network facilities, because of its compactness and high-level inference to be performed directly in embedded systems. Conventional machine-learning algorithms for deep learning require deep neural networks comprising costly memory resources.

The new algorithm adapts to the specific purposes of each system, because it uses learning data and high-level inferences about the operating environment. This advantage will help to support the effective structuring of networks and reduce the trial and error of design.

Mitsubishi Electric's new system will enable AI to be used in diverse business fields, such as high-level information processing. The AI market was estimated to be worth 3.6 trillion yen (approximately US$ 35 billion) in 2015 and annual growth is expected to average 30 percent, according to Ernst & Young Institute Co., Ltd.

Patents
Pending patents for the technology announced in this news release number three in Japan and three abroad.

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About Mitsubishi Electric Corporation
With over 90 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 4,394.3 billion yen (US$ 38.8 billion*) in the fiscal year ended March 31, 2016. For more information visit:
www.MitsubishiElectric.com
*At an exchange rate of 113 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2016