

News Release

FOR IMMEDIATE RELEASE

Autonomous Decentralized Control Technology Realizing Overall Optimization by Real-time Collaboration between Systems

Targeting application in large-scale systems in an IoT society

Tokyo, March 7, 2017 --- Hitachi, Ltd. (TSE: 6501, Hitachi) today announced the development of autonomous decentralized control (ADC) technology that realizes overall optimization by enabling real time cooperation between systems, and continuous adjustment and decision-making on actions. Unlike the Centralized Control Method (CCM)(Figure 1) which integrates data into one location and performs calculations to optimize the whole system, this technology distributes the optimization process to the individual systems, thus enabling a flexible response to increased number of items to be controlled or unexpected environmental fluctuations. A prototype environment of a group of factories with production control systems using this technology was created, and changes in the overall profitability of the entire plant was measured. Results indicated that the same level profit could be achieved 50 times faster than with CCM.

Hitachi will further develop this technology with the aim of applying it to large-scale system in an IoT society.

In recent years along with progress in IoT, societal infrastructure such as electric power, transportation, logistics, etc. are becoming increasingly large scale and more complex. Currently, for example, in large-scale power infrastructure operations which consist of a large number of power plants and substations, data such as the amount of electricity generated is collected at a central control center for computation using CCM, and instructions related to generation and distribution are returned. In the future, however, it is expected that overall optimization based on CCM will require even greater computational resource and real-time response will become more difficult as operations become more complex with the proliferation of smart grids (next generation electric power transmission networks) and deregulation of electricity.

To address this challenge, Hitachi developed ADC technology that realizes overall optimization by enabling systems to coordinate and determine actions among individual systems. In this technology, an algorithm to continuously perform the following actions is introduced into the individual systems.

1. Exchange data with other cooperating systems
2. Mutually request actions between each system based on data
3. Execute the action most requested from among the requests from each system

To verify the effectiveness of this technology, a prototype environment was constructed simulating 16 factories that had introduced production management systems. In the prototype, after cooperating factories exchange data on respective production efficiency, each system mutually requests factories with high productivity to increase production and those with low productivity to reduce production, to decide the production plan (Figure 2). When change in the total profitability of the factories as a whole was measured, it was confirmed that equivalent profitability could be achieved 50 times faster than when calculated using CCM.

Hitachi will continue to develop this technology further using AI (Artificial Intelligence) and through open innovation in order to establish a societal system capable of autonomously adapting to humans and the environment, and thus contribute to the realization of an IoT society.

A part of this research achievement will be announced at “SICE International Symposium on Control Systems” to be held from 6th to 9th March 2017, at Okayama University, Japan.

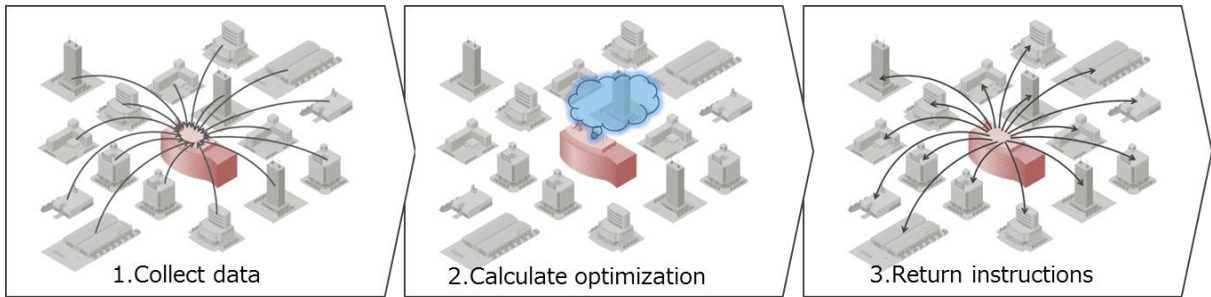


Figure 1. Conceptual diagram of Centralized Control Method

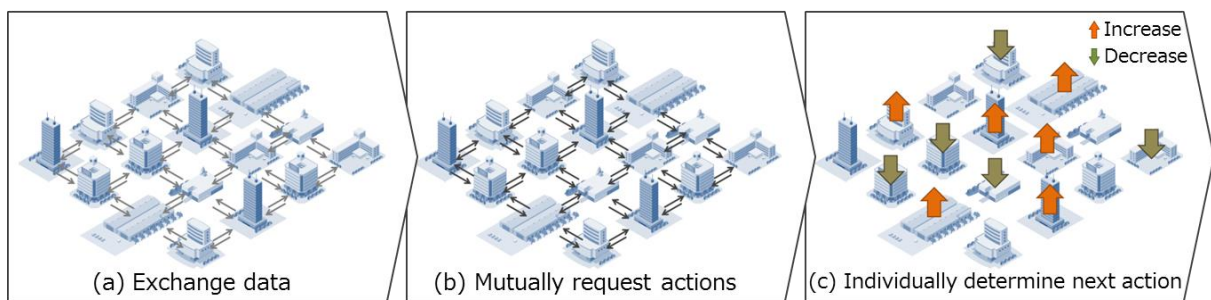


Figure 2. Conceptual diagram of Autonomous Decentralized Control technology
(Prototype environment simulating production in a factory group)

About Hitachi, Ltd.

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, delivers innovations that answer society's challenges. The company's consolidated revenues for fiscal 2015 (ended March 31, 2016) totaled 10,034.3 billion yen (\$88.8 billion). The Hitachi Group is a global leader in the Social Innovation Business, and it has approximately 335,000 employees worldwide. Through collaborative creation, Hitachi is providing solutions to customers in a broad range of sectors, including Power / Energy, Industry / Distribution / Water, Urban Development, and Finance / Government & Public / Healthcare. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

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