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Mitsubishi Electric Develops Radar-Based Tsunami-flooding Prediction AI

Highly accurate predictions will support rapid evacuation planning

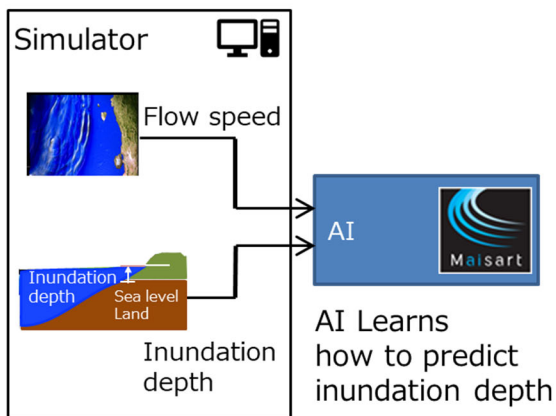
TOKYO, February 4, 2021 – [Mitsubishi Electric Corporation](https://www.mitsubishielectric.com) (TOKYO: 6503) announced today that the company has developed an artificial intelligence (AI) technology that uses data on a tsunami’s velocity detected by radar to forecast water inundation depths¹ in surrounding inland areas, working in collaboration with the Society for the Promotion of Construction Engineering of the General Incorporated Foundation. The AI incorporates Mitsubishi Electric’s Maisart^{®2} AI technology to generate highly accurate predictions just seconds after a tsunami is detected, thereby supporting the rapid formulation of evacuation plans to prevent or mitigate disasters in local inland areas.

¹ Height of water level measured from the ground

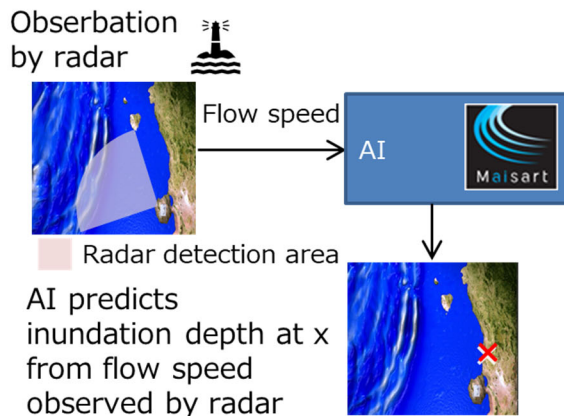
² Mitsubishi Electric's AI creates the State-of-the-ART in technology.



Learning phase



Operation phase



Learning and operation phases of radar-based AI for tsunami inundation depth prediction

Key Features

Maisart predicts inundation depth with high accuracy immediately after tsunami is detected

- AI learns the relationship between tsunami speed and inundation depths using simulations of various earthquake epicenters, degree and direction of fault displacements, and so on.

- The AI accurately predicts inundation depths with a margin of error of about 1 meter.³ The prediction is performed as soon as the tsunami's speed and direction are detected with radar.
- Rapid prediction supports fast evacuation planning, helping to prevent or mitigate disasters.

³ Results of simulation evaluations using various test environments simulating possible earthquakes in the Nankai Trough

Comparison of new and conventional methods

	Inundation prediction method	Performance
New technology	AI learns from simulations to predict inundation depths based on tsunami velocity data	Predictions with 1m error margin within few seconds
Conventional methods	Predictions are performed based on simulation data without AI processing/analysis	Predictions with around 3m error margin within few minutes

Future plans

To date, evaluations have focused on theoretical earthquakes in the Nankai Trough, a major fault line that extends roughly in a northeast/southwest direction off the coast of Japan. Going forward, theoretical earthquakes in other areas of Japan also will be evaluated to study how tsunamis might possibly impact various harbors and other coastal infrastructure and municipalities. In addition to fault displacements, the study will also consider tsunamis created by undersea landslides, which are particularly difficult to predict using conventional methods.

Background

In earthquake-prone Japan, there is always concern about tsunamis causing potential damage in coastal areas. To formulate effective evacuation measures, inundation depths must be predicted quickly and accurately before a tsunami reaches the land. Conventionally it takes several minutes to predict inundation depths with around 3m error margin, but Mitsubishi Electric's new technology accurately generates predictions within just a few seconds to support the rapid formulation of appropriate evacuation plans.

Accurate prediction of inundation depths requires information on ocean surface currents over a wide area. Mitsubishi Electric, after confirming that such information could be gathered within a range of up to 50 km using special radar equipment, subsequently developed the necessary technology.⁴ The new radar technology was then combined with Mitsubishi Electric's Maisart AI technology to enable highly accurate predictions⁵ of water inundation within just seconds.

Although the new technology initially requires simulating various possible tsunami conditions (earthquake epicenters, degree and direction of fault displacements, etc.) using terrain data, the AI is able to learn the results and predict inundation depths at high speed once an actual tsunami is detected.

⁴ "Mitsubishi Electric Develops Enhanced Tsunami Detection Technology," January 25, 2019 <https://www.MitsubishiElectric.com/news/2019/0125-b.html>

⁵ An initial simulation, performed with massive computations using extensive radar data on ocean surface currents, enabled a theoretical tsunami to be calculated with an error margin of just several centimeters. AI-based predictions were then performed to calculate the difference in margin of error compared to the initial simulation.

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.

Maisart is a registered trademark of Mitsubishi Electric Corporation.

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About Mitsubishi Electric Corporation

With 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 "Changes for the Better." 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