

# Japan in Depth / Japanese robots aren't much help in disasters

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Tatsuo Nakajima / The Yomiuri Shimbun

The knees of HRP-2 Kai, a robot made by Japan's National Institute of Advanced Industrial Science and Technology, suddenly broke, causing it to fall on its back.

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By Tatsuo Nakajima and Sho Funakoshi / Yomiuri Shimbun Staff Writers Japanese teams were badly beaten at a recent competition for robots that work at disaster sites people cannot approach, such as the Fukushima No. 1 nuclear power plant.

Immediately after the outbreak of the crisis at the Fukushima plant, Japan did not have robots capable of working at sites full of debris. Those mobilized at the nuclear plant were all foreign-made, mainly from the United States.

The results of the international robot competition indicated that Japan still faces significant challenges in developing robots for work at disaster sites, even though more than four years have passed since the crisis began.

The Robotics Challenge Finals 2015 was held early this month on the outskirts of Los Angeles, organized by a research division of the U.S. Defense Department.

**Slide 1 of 1**



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This photo taken on June 6 shows a team from the University of Tokyo carrying its unmovable robot on a stretcher.

The event is aimed at promoting the development of robots with practical applications at nuclear accident sites. Each competing robot had to drive a car, get out of the vehicle, pass through a door and operate tools such as a valve and a drill.

Among the 24 participating teams, 12 were from the United States, five from Japan and three from South Korea. The competition was conducted under severe conditions — wireless telecommunication lines to remote-control the robots were intentionally cut off, for example.

The Japanese teams' robots often fell down or became unable to move. The top-finishing Japanese team, the National Institute of Advanced Industrial Science and Technology, came in 10th.

First prize was won by the Korea Advanced Institute of Science and Technology (KAIST), a South Korean university, which defeated the powerful U.S. teams.

The KAIST team has participated in the event since its preliminary rounds 1½ years ago and remodeled its robot repeatedly. Its robot cleared all eight tasks without falling down once.

Prof. Oh Jun Ho of KAIST said, "We aimed to make a robot that would not break down, fall down or die."

Japanese robots come up short in practical capabilities

Japanese teams were concerned that entering a competition held by the Pentagon could invite the misunderstanding that they had cooperated in U.S. military research. Such concerns delayed their decision to participate.

"Japanese disaster-response robots are not designed to conduct specific operations, but are instead designed to deal with various things. They did their best despite poor preparation," said Kazuo Furukawa, chairman of the New Energy and Industrial Technology Development Organization (NEDO). NEDO granted research subsidies to the Japanese teams.

However, there is doubt whether such robots would be helpful at a disaster site, where the situation could develop in unexpected ways, as there were some functions they were unable to perform under limited conditions in the competition.

Osaka Institute of Technology Prof. Yukio Honda, who watched the competition, said the problem was that the Japanese robots were not very reliable. "The Japanese robots broke soon after they fell over," Honda said.

In contrast, robots made by more successful teams were able to continue their operations even after taking a tumble, as they recovered their balance with a help of a crane.

Tokyo Institute of Technology Emeritus Prof. Shigeo Hirose said: "Japanese parts and technologies [for such things as motors and sensors] are excellent. But their practical capabilities — created by combining these excellent things — to resolve urgent problems remain weak."

Establishing a consistent plan

Development of the robots began in the wake of a nuclear accident in 1999 at facilities run by the nuclear fuel processing firm JCO Co. in Tokai, Ibaraki Prefecture.

However, the development had not been put to practical use due to the lack of a consistent development plan.

When the nuclear accidents occurred at the Fukushima plant, Japanese robots were unable to deal with the disaster. They were not even able to investigate inside the nuclear reactor buildings.

Electric power companies and some manufacturers later established the International Research Institute for Nuclear Decommissioning (IRID), which made it possible to systematically advance the development of robots required for decommissioning the nuclear power plant.