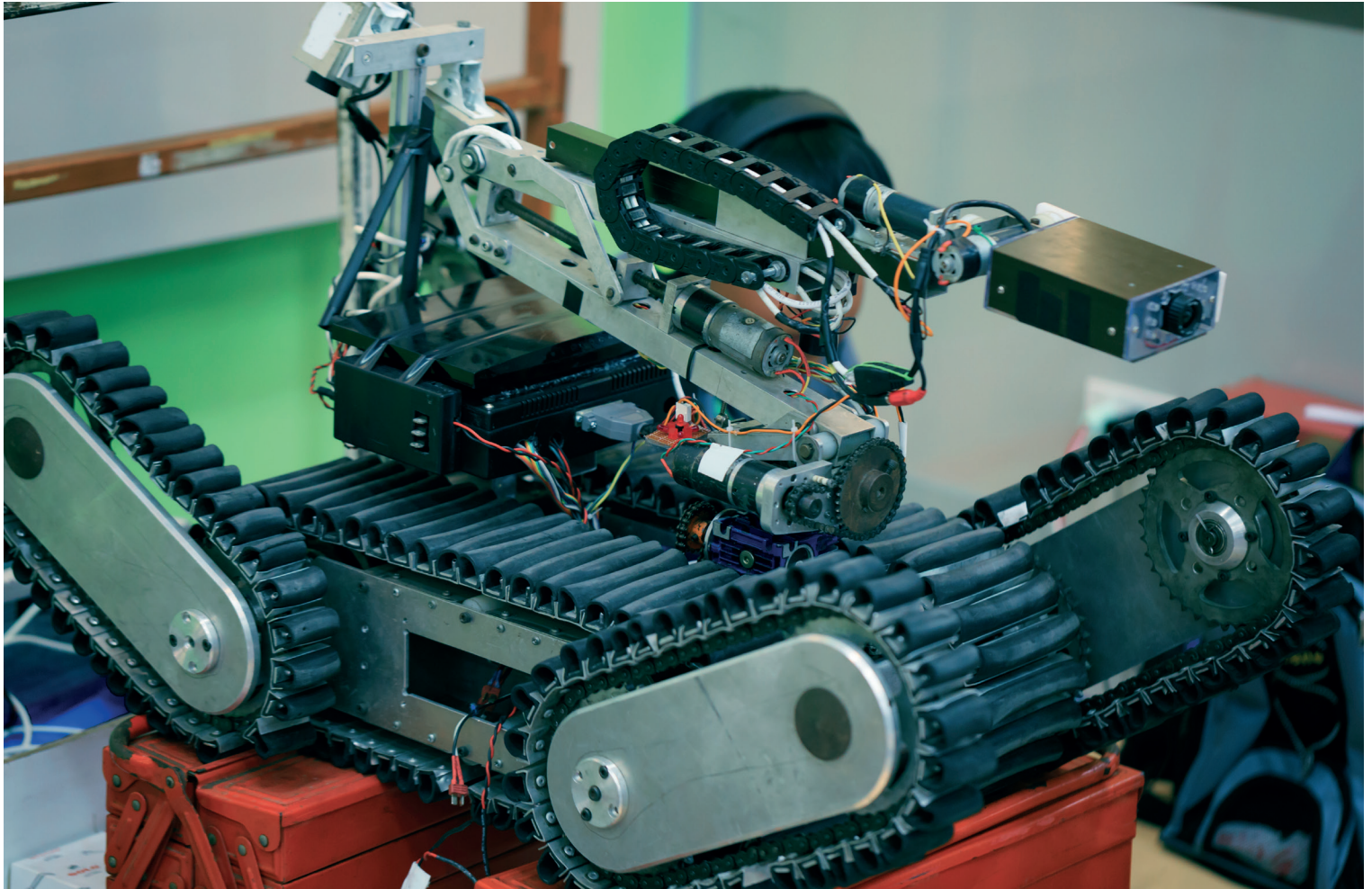
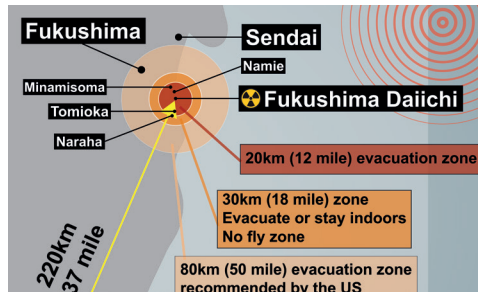


Pushing the realms of the possible one robot at a time



The Japan Atomic Energy Agency is working to test and refine the future of robotics using motion capture analysis to drive development

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The Fukushima Daiichi nuclear plant is helping to create a brave new world for robotics and a platform to test new systems and equipment to speed the cleanup process.

Recovering from the 2011 events at the plant will take many decades, as it is hampered by the inability to use humans in the work.

This is where the Japan Atomic Energy Agency (JAEA), a government body working on the clean-up, comes in. At its facility the Agency invites companies in to test their equipment in conditions closely resembling those at the former power station. Each mission into the radioactive area requires intense planning, training and coordination, leading to an innovative new facility with multiple training areas. Many Japanese companies are coming to the Agency's facility to test the robots and systems that they are developing to handle the clean-up. Time is of the essence during missions into the radioactive area. Even the most advanced robots on the planet are vulnerable to the conditions they will face, the JAEA test centre has been purpose-built to provide the three key environments found at the Fukushima Daiichi plant:

- An underwater area with a five metre deep pool
- A set of stairs with varying tread depth and height – something notoriously difficult for robots to encounter
- A motion capture system with a volume of 15 by 15 by 7 metres to test both ground and air robots

Each of these environments is providing unique learning experiences. Robots tested at the Agency's facility are being prepared for the myriad of highly rigorous environments faced on-site at the nuclear plant. Radiation

causes circuitry to fail, making wireless communications with the robots impossible, and the robots need to be shielded to protect their vision systems.

On top of this, debris presents a surprisingly large part of the challenge. In Japanese, the word 'gareki' is a simple one with a myriad of different meanings. Gareki does not just mean rubble, from small to large – it encompasses an environment of radiation, twisted staircases, debris-filled water and complete darkness.

The worst scenario for a robot facing gareki in its many forms is to break down. When that happens, the robot becomes just another piece of gareki that future missions need to account for.

Equally drones are not immune to the challenges of gareki. While useful for surveillance, the areas the drones are assigned to survey are dark and filled with unpredictable conditions. Interference from radiation makes controlling them even more difficult, and a single wrong move can lead to a new piece of gareki to deal with.

This is where the JAEA's three training and test facilities come into their own. Because each is designed to help solve a different challenge and equipped with cutting-edge technology, planning here pays off in the tough real-world environment.

At the test pool, human operators trial new robots in the tank, simulating the conditions of the water precisely.

They can then spend hours testing new robots on the stairs, stairs that can be altered to exactly match those – and the damage they have incurred – at the plant. Here each test is recorded using Vicon's Vero motion capture cameras, capable of tracking the robot's movement precisely, down to the millimetre.

An added bonus of this system is its ability to be moved to different locations within the testing facility, easily.

"JAEA provides a detection and measurement service to all the companies working in the clean-up zone," the Agency stated. "For that reason, we need to be able to switch quickly between robots with different capabilities – for example air, ground and stair climbing. The Vicon motion capture system gives us the capability to accurately and quickly change the setup."

When testing in the motion capture lab, robots are put through their paces to exacting standards. The robots need to be able to carry out minute, accurate movements, so the lab uses Vicon's T-Series cameras, that offer the level of precise feedback that the JAEA needs.

Engineers at the Agency's facility are using the Vicon system daily and are impressed with how easy the software is to use and the accuracy of the cameras.

Hand-in-hand with this, companies coming in to test their robotics systems in the facility come away with a highly positive experience of the ability and flexibility of the Vicon system, particularly when it comes to the Vero system on the stair set-up.

While the clean-up of the Fukushima Daiichi Nuclear site is incredibly complicated, and the environment as challenging as anywhere on earth or in space, Vicon is playing a key part in supporting the JAEA and is pleased to be a part of the unique solution needed to rehabilitate the site.

From this work will come some of the most advanced robots ever seen, advances that will be felt in many types of different industries for years to come, thanks to the testing carried out at the Agency's facility.

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