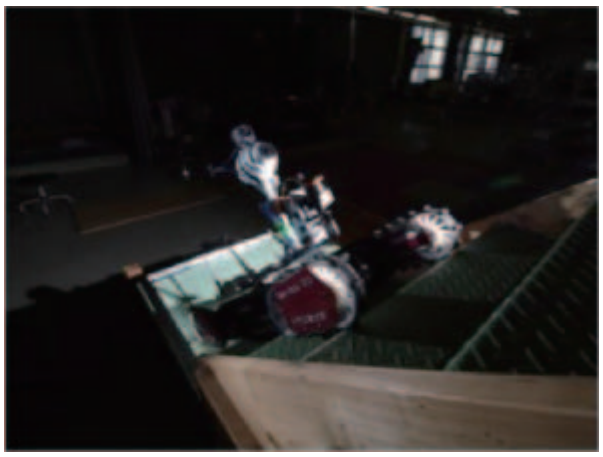
February 2013

CHIBA INSTITUTE OF TECHNOLOGY

・"Strategic Advanced Elemental Robot Technology Development" Project (FY2006-FY2010)

A Rescue Robot Displaying High Driving Performance at Disaster Sites with Stairs and Rubble

Japan has a lot of natural disasters such as earthquakes, tsunami, floods, and violent winds. Also, with recent progress in urbanization, threats of urban disasters in such as underground or in skyscraper buildings, and terrorism using harmful substances are being pointed out. While threats for such disasters continue to increase, our country having world leading advanced technology is also a superpower in creating robots. Accordingly, great expectations are being held for the popularization of robots that can perform rescue activities and gather information in places that are difficult for a human to enter, such as inside collapsed buildings or spaces filled with chemical substances. With an aim to develop the robot industry into becoming one of the fundamental industries of our country, NEDO implemented the "Strategic Advanced Elemental Robot Technology Development Project" as part of the "Robot and New Machinery Innovation Program". In this project, while promoting the development of a wide variety of robots including industrial robots and daily life activity supporting robots, research and development projects of a robot capable of corresponding to disasters had also been conducted. The disaster corresponding robot "Quince", researched and developed in this project by such as the Chiba Institute of Technology and Tohoku University, is capable of remote activities in a closed disaster affected space, and has also been put to use in gathering information from inside the Fukushima No. 1 Nuclear Power Plant where the accident occurred due to the Great East Japan Earthquake.



"Quince" climbing stairs assuming the inside of the Fukushima No. 1 Nuclear Power Plant

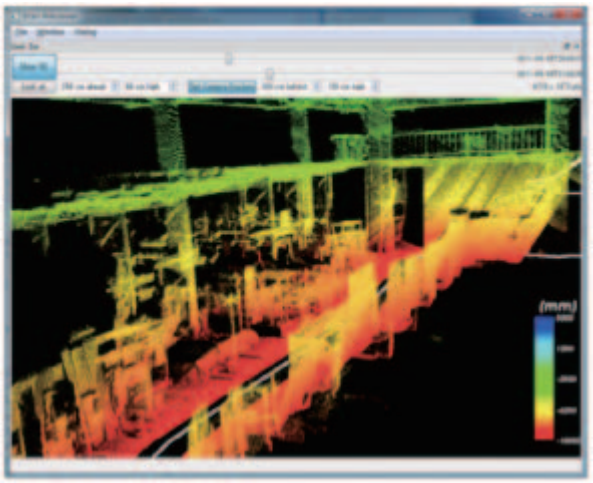


Image of the inside of a campus building of the Chiba Institute of Technology recorded by "Quince" with a laser scanner (image courtesy of Chiba Institute of Technology fuRO)

Q. Why did this project start?

This research fuse advanced elemental technology such as IT and intelligence technologies with robotics and machinery technology that has been the backbone of the Japanese manufacturing industry will spur development and commercialization of next-generation robots that will play a role in a wide range of situations, including the home, medical and welfare fields, as well disaster response. Research and development into robotic systems required for improving productivity and human lifestyles is currently being organized under joint initiatives by the relevant ministries. In particular is the field of disaster response, where Japan, with its immense RT (robotics technology), is expected to make contributions on an international scale, given the high frequency of large-scale natural disasters in Asia (590,000 people died of natural disasters in the 1990s, with approximately 70%, or 410,000, of those in Asia). If Japan can take a leading role in the international arena in this field, it is expected that it would bring major benefits to the country that would be difficult to attain with other methods. With this background in mind, NEDO conducted research and development into robotic systems capable of acquiring information quickly from within damaged buildings (including subways, underground malls and high-rise buildings), one aspect of natural or man-made disasters that is extremely dangerous and calls for RT.

Q. What was the aim of the project?

The key aim of this project was to develop numerous remotely operated robots so that they could scout around damaged buildings that have stairs or doors, and move much quicker and more efficiently than humans in certain areas. Potential disaster scenarios included subway stations, underground malls, airports and high-rise buildings (such as offices, large stores or theaters). Essential items (issues) raised in the development mission included coordinating multiple robots (with a compact size and weight so that they could be carried by humans) in such areas, and navigate around obstacles without getting in the way of people evacuating. The robot should be able to open doors (doors with round knobs or levers that are unlocked) and pass through them, create its own path without using existing infrastructure (such as communications) and acquire video and other data quickly on the way to a specific location. This project consisted of numerous demonstration tests to verify the effectiveness of such robots.

Q. What is the role of NEDO?

This project was run with a "Stage Gate System" to bring on innovation and ensure competitive research and development amongst organizations in order to achieve the objectives above. NEDO put out to form research and development groups consisting of companies, universities, research institutes and other agencies, with numerous research and development groups selected to accomplish each mission. NEDO maintained close contact with the Ministry of Economy, Trade and Industry and research and development supervisors, and ensured appropriate operation and management in line with the project targets and objectives. Operation and management was updated by requesting the opinions of outside specialists it organized at committee meetings and technical review sessions, and project progress reports were released every quarter by the project leader. The project was split into "Stage 1" (FY2006 to FY2008) covering the first three years, and "Stage 2" (FY2009 to FY2010) covering the last two years. Evaluations were run at the end of "Stage 1" with one group in general eventually being selected for each mission. The technology required to cover ground quickly by numerous robots is not only limited to disaster response, but is also core foundation technology for various RT systems including construction robots, plant maintenance robots, security robots, agricultural robots and outdoor autonomous vehicles. NEDO provided this support as it considered the knock-on effects of such technology to be extremely valuable.