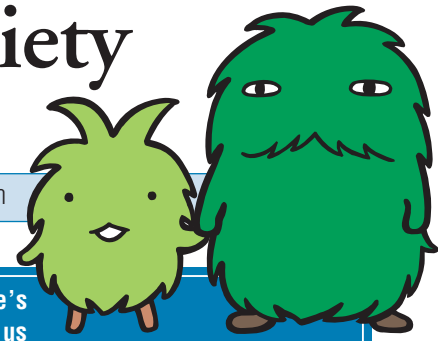# Initiatives for an Aging Society
at EXPO 2005 AICHI, JAPAN

Ministry of Economy, Trade and Industry, Japan (METI) / Japan Association for the 2005 World Exposition

Through new technology and international exchange based on the theme of "Nature's Wisdom," the 2005 World Exposition in Aichi, Japan (EXPO 2005 AICHI, JAPAN) will help us to take another look at the wonderful forces of nature. EXPO 2005 will also feature the Robot Project, an experiment for realizing an affluent aging society through the utilization of advanced robotic and information technologies.

I. Realizing better lifestyles for society with robots

JAPAN'S robotic technology is one of the most advanced in the world, and is set to become a key industry in the future. According to a study by a private organization, the size of the robotics market in 2010 is predicted to be ¥3 trillion, and within this, the market for robots that will coexist with people in a daily lives is expected to be ¥730 billion. Along with the falling birthrate and the aging population, and the transition to a service economy in the 21st century, there are increased expectations for robots to provide support for a wide range of activities in industrial fields as well as consumer lifestyles, public services, medical care and social welfare fields. In particular, robots are expected to meet substantial market needs in the immediate future in the lifestyle fields of communication, security and cleaning. One very important factor for the incorporation of robots into the daily lives and society is the current issue of the aging population. With the advancement of more affluent lifestyles in society using robotics, there are expected to be substantial needs for robots in the social welfare field. Given this situation, EXPO 2005 is developing the Robot Project to demonstrate and to experiment with a wide variety of robots, so that visitors can experience a future society where robots and humans coexist.

AS part of the Robot Project, there will be a wide range of robotic demonstration experiments and events onsite.

(1) Work robots

Five types of work robots, cleaning, security, customer service, childcare and next-generation wheelchair robots will work within the site. A demonstration experiment will be held at the Robot Station in a specially installed course for next-generation wheelchair robots. In

Welfare and assistance robots

–Next-generation wheelchair robots
(Aisin Seiki Co. Ltd., and Fujitsu Ltd.)
These wheelchair robots are able to move automatically and safely to a destination without the need of a helper. The wheelchair moves its occupant safely to the destination while avoiding obstacles through the use of an automatic drive function.
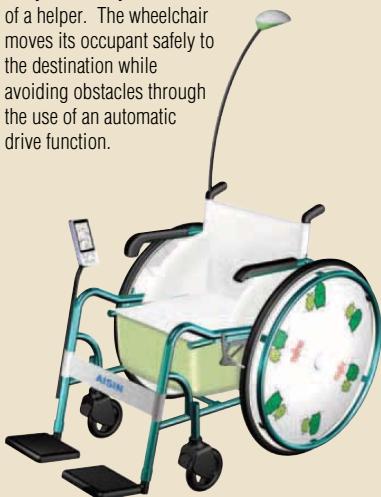
–Rehabilitation training robots
(Osaka University Graduate School)
Elderly people who have impaired arm movement will be able to receive rehabilitation training from a robot. Patients can receive assisted exercise training for their entire arm, including the wrist. Following a training program that is shown on a screen, the user operates a special robotic arm with a high degree of movement in a three-dimensional way.

–Muscle suits for the arms
(Tokyo University of Science)
This "wearable robot" helps to train the muscles of those in need of nursing care to become independent. The suit containing artificial muscles and the technology helps the wearer by activating the artificial muscles for simple operations.

order to approximate the actual usage situation, visitors will be able to ride in the chairs through a special course that replicates the street environment, and experience the automatic drive and obstacle avoidance technology.

(2) Prototype robot exhibition

At the Morizo & Kiccoro Messe, 60 types of robots, including welfare and assistance models will be displayed. These prototype robots hold a lot of promise for the future, but are still not ready for practical-use.

(3) Robot Station

The base for Robot Project, where various robot demonstration will be held including welfare and assistance robots.

T HE importance of the Robot Project is outlined by the following two points:

(1) Obtaining ample data

While serving as a setting for application of robot technology for a large numbers of visitors, the EXPO site also makes it possible to prepare the necessary environment for robot operation in advance, and will be a very efficient location for a demonstration experiment involving the interaction of humans and robots. An experiment with a high degree of freedom can be carried out over a long period of time. Data on such as individual robot performance can be linked to future R&D and commercialization for the providers, and we can also expect to obtain information that can be used for other robots, including data on safety operation. In fact, we hope that the corroborative data gained here will be useful for governments in creating a single set of next-generation robot safety standards.

(2) Appealing to users

By holding exhibits and presentations on robot prototypes during a specific period, and by actually demonstrating the technology components and systems now being produced by universities, companies and other research institu-

tions, we are able to present the current state of robot capabilities to the general public, who will eventually become robot users. The needs of users remain to be defined – which is a major reason that the market for next-generation robots has not yet taken off – but this is because the desires for robots tend to be unrealistic, and unreasonable expectations stem from users' limited knowledge of robots' actual capabilities. Given this lack of awareness, by experiencing the actual technology level, the general public will be able to obtain a good understanding of the daily needs that robots are able to fulfill. Moreover, market formation is lagging in some fields due to psychological resistance to using robots for such tasks as transferring care recipients in the welfare field. Under these circumstances, Expo 2005 can present a wide variety of robot applications.

I N addition to the appearance of about 100 working and prototypes robots, robots from companies and research labs are also expected to be on display, and the sheer number of robots alone will attract a lot of attention.

Thanks to EXPO 2005, many people including users and manufacturers will be able to participate in the robot market, and it is expected to be an opportunity for the robotics business to grow as a single industry and to help realize a comfortable lifestyle for people in an aging society.
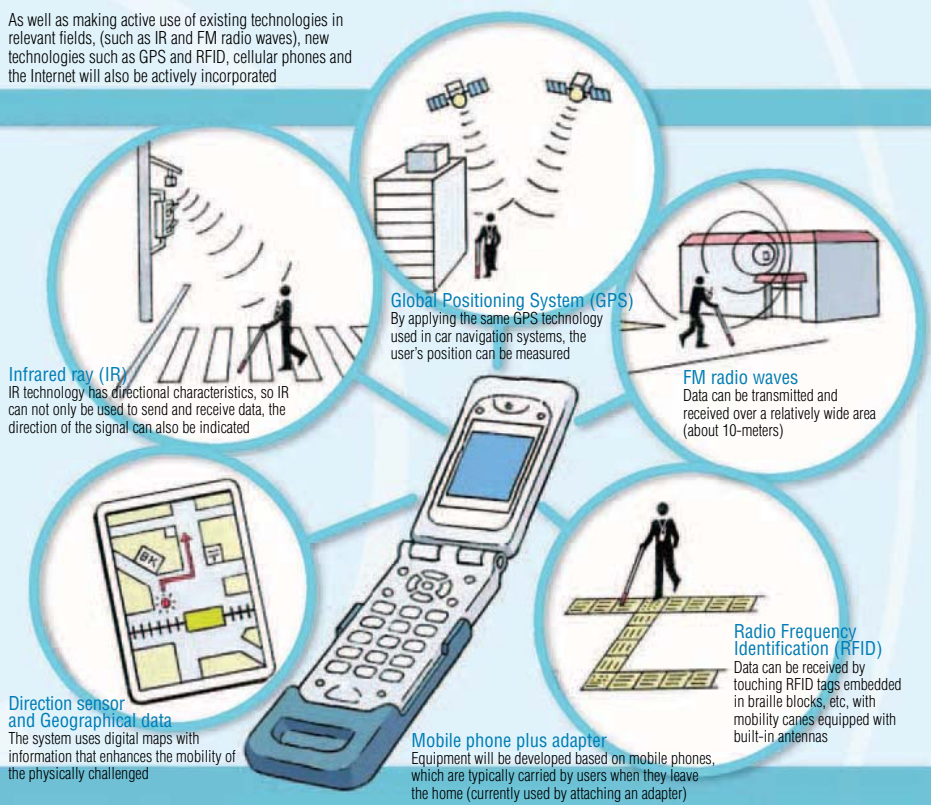
II. Demonstration trials of an IT-driven mobility support system for physically impaired individuals and other users

1. Mobility assistance for seniors and people with disabilities

For seniors and people with disabilities, to increase their mobility and actively participate in society, it is essential that they can obtain information on locations and surroundings and to be quickly and safely transported to their destinations.

Currently, typical mobility assistance measures include blister-paving blocks and crosswalk audible signal devices to help visually impaired people, or access ramps and lifts to help wheelchair

As well as making active use of existing technologies in relevant fields, (such as IR and FM radio waves), new technologies such as GPS and RFID, cellular phones and the Internet will also be actively incorporated

Global Positioning System (GPS)
By applying the same GPS technology used in car navigation systems, the user's position can be measured

Infrared ray (IR)
IR technology has directional characteristics, so IR can not only be used to send and receive data, the direction of the signal can also be indicated

FM radio waves
Data can be transmitted and received over a relatively wide area (about 10-meters)

Direction sensor and Geographical data
The system uses digital maps with information that enhances the mobility of the physically challenged

Radio Frequency Identification (RFID)
Data can be received by touching RFID tags embedded in braille blocks, etc, with mobility canes equipped with built-in antennas

Mobile phone plus adapter
Equipment will be developed based on mobile phones, which are typically carried by users when they leave the home (currently used by attaching an adapter)

users. Although the objective for this kind of assistance is mostly to eliminate mobility barriers and ensure safety, systems are also needed to help people move safely, reliably and rapidly from one location to another.

2. Barrier-free IT Project for Individuals with Physical Impairments

This project is being implemented by the Ministry of Economy, Trade and Industry (METI) and the New Energy and Industrial Technology Development Organization (NEDO). The objective is to promote mobility assistance technology based on various technology platforms, including infrared ray, FM radio waves, GPS and non-contact IC tags (RFID) all of which are being researched and developed simultaneously. The project is also developing mobile terminals that can seamlessly send and receive information.

R&D on mobile terminal user-interfaces, suitable for different types of disabilities, is being conducted for visually impaired users and those who have difficulty operating a keyboard due to hand or arm impairment. Along with the construction of such systems, there are plans to establish guidelines and standards for the necessary items, as well as tests on functionality and operability.

3. Demonstration experiment at EXPO 2005 AICHI, JAPAN

(1) NEDO plans to demonstrate a mobility assistance system being developed for seniors and people with disabilities at the EXPO site and welcomes expert project leaders. The project is being undertaken primarily by a consortium of electronics manufacturers, including NEC. The EXPO site is a place to evaluate this system in an environment that approximates actual usage conditions, and is also the ultimate venue for showing the future of barrier-free technology to a large, international audience.

(2) The development of mobile terminals using mobile phone technology is underway for this demonstration experiment. The specifications for these user-terminals include infrared ray and FM radio wave formats, mainstream technologies in the present mobility support system, for obtaining information such as general location and movement direction. There are plans to make the terminals compatible with the GPS and RFID, which are useful for pinpointing position. The terminals also incorporate the Bluetooth wireless technology, which can send users information on nearby shops and restaurants.

In addition to this kind of hardware, user interfaces suitable to the particular needs of people with disabilities are being created. For example, to meet the needs of visually impaired individuals, a vibrating hazard warning system to alert users of potential dangers and a system to input destinations verbally, are being developed. For those with upper limb physical mobility impairments, there are functions such as "scan inputting" where a list of potential destinations is shown on a screen. A cursor scrolls down the list, allowing the user to simply activate a switch when the desired destination is highlighted.

BASED on the results obtained from these trials, guidelines will be formed in cooperation with the relevant parties concerning the ease of use and the hardware user-interface function of the assistance terminals themselves. This information can then be applied when building infrastructure and setting up information and guidance systems in communities. Through the popularization of these kinds of mobility assistance systems, it is hoped that seniors and people with disabilities who now have difficulty getting about on their own will achieve greater independence, and the scope of their participation in society will be increased. **JS**