Information and Robot Technology Research Initiative

東京大学 THE UNIVERSITY OF TOKYO

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Press Release

The University of Tokyo

Regarding mobile support technologies using Personal Mobility units that support independent lifestyles for seniors

1. Overview

THE Information and Robot Technology (IRT) Research Initiative at the University of Tokyo has developed a technology that supports independent lifestyles for seniors using personal mobility units (single-passenger transport robots). This is one of the core technologies for robots that will support health and "meaning of life" in Japan's aging society.

2. Details

SINCE 2006, the University of Tokyo, Toyota Motors Corp., Olympus Corp., Sega Corp., Toppan Printing Co. Ltd., Fujitsu Laboratories Ltd., Panasonic Corp., and Mitsubishi Heavy Industries Ltd. have been participating in the planning of the "Special Coordination Funds for Promoting Science and Technology" project, supported by Formation of Innovation center for fusion of Advanced Technologies offered by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). This has also involved cooperating in a project entitled, "IRT Foundation to Support Man and Aging Society"(*1) The project is directed by University of Tokyo President Komiyama, and conducts R&D with the goal of producing major innovations(*2) in the next 10 to 20 years.

IRT Research Initiative at the University of Tokyo, which is the leading agency in the implementation of this project, has developed a technology that enables seniors and persons with physical disabilities to move around freely and safety in the home and outside, in order to support independent day-to-day lifestyles.

TWO of the unique features of IRT Robots that will be active in an aging society are that robots will approach and stay close to people, for example in the home, and that information from the real world and the cyber world can be used actively. One of the core science/technologies will independently control the operations of the Personal Mobility unit even if the user's physical condition changes, so that the individual can move safely and comfortably using simple operations. It can also use external information obtained through the Internet, to provide information that is useful while outside the home or in day-to-day lifestyle situations. Based on these technologies, by using the Personal Mobility unit, users will be able to enjoy futuristic functions; for example, they will be able to go outside with peace of mind even at night, to commute while reading, or to travel to their destination even in unfamiliar areas, by listening to the audio guidance.

THE technologies that were developed for the Personal Mobility unit include: (1) Technology to enable simple operation of the unit; (2) Technology to enable the robot to independently control movement even in crowded or complex situations; (3) Technology for measuring positions even without creating complex maps; (4) Technology for controlling the robot or returning it to a storage area using independent movement; and (5) Technology for realistic communications with persons outside using panorama video images.

AT present, the Personal Mobility unit announced plays the role of a platform for the development and testing of elemental technologies. The final robot design will be changed based on future studies, and in keeping with societal acceptance and societal needs.

(*1) Japan is relatively advanced in these issues, and its aging and shrinking population is becoming an issue for the whole society, including not only the generation in need of nursing care, but also those about to retire, and those of working age through to children. In an aging and shrinking society, there are many causes for concern, such as labor shortages due to declining numbers of workers, increasing health concerns and social security costs due to increasing numbers of elderly people, an increasing domestic workload due to more single-person and elderly households, and an increasing nursing-care workload as the number of people requiring it increase. The use of robots can play a major role in addressing these types of concerns. Creation of "New industries in support of people and society" through a joining of universities with industry holds great promise to help bring robots into practical use even one day earlier. By integrating Information and Robot Technologies (IRT) with the Social Sciences, the "IRT Foundation to Support Man and Aging Society" project will create new innovation to support people and society and help Japan maintain its level of prosperity in light of an aging and shrinking population. Its goal is to produce leading-edge, joint creations and new industries through equal industry-academic cooperation, to follow after automobile and computer industries.

(*2) According to the Basic Science and Technology Plan, the definition of "Innovations" is: "Innovations that bring about new social and economic value by combining scientific discoveries and technology inventions with insight, to achieve further developments." (Ref: Ministry of Education, Culture, Sports, Science and Technology Homepage: http://www.mext.go.jp/a_menu/kagaku/kihon/main5_a4.htm)

3. Outline of Personal Mobility Unit

– Functions and features of technologies that support independent lifestyles for seniors using personal mobility units (single-passenger transport robots).

(1) Technology to enable simple operation of the unit

Mobility units for outdoor use are operated by an interface that enables accurate movement based on inward or outward movement of the user's arm; when moving forward or back the unit supports the body's weight and minimizes the burden on the muscles. In the case of the Mobility unit for indoor use, we have developed a technology for operating the unit based on estimations of operating intent; for example, the position of the user's center of balance, or the status of contact with the seat. In this way, the unit can be operated with movement of the body alone, so that hand movements are not needed.

(2) Technology to enable the robot to independently control movement even in crowded or complex situations;

In the inverted Mobility Unit for outdoor use, we have developed a technology that controls the tires, swing arm, and seat slider are simultaneously using a 3-D physical model, so that the unit can run with stability even in locations with slopes, steps, or uneven surfaces. We have also incorporated functions that recognize surrounding persons or obstacles using a built-in laser range sensor, to change the route of movement and avoid collisions.

(3) Technology for measuring positions even without creating complex maps

In the Mobility Unit for indoor use, we have incorporated functions for embedding positional information into the floor patterns that cannot be recognized by humans, so that the unit can be moved to a specified location in a room based on this information. The unit can also visually recognize the position of a person gesturing with a hand, and move close to that person.

(4) Technology for controlling the robot or returning it to a storage area using independent movement

In the Mobility Unit for outdoor use, we have incorporated a function for automatically generating a map of the area surrounding the storage facility using a laser range sensor, estimating the unit's current position, and automatically generating a path to the destination while avoiding any obstacles. With this function, after the user has dismounted from the Mobility Robot the unit can return to the storage facility independently.

(5) Technology for realistic communications with persons outside using panorama video images

Using remote operations of the outdoor mobility unit from the indoor Mobility Unit, the user can enjoy a highly realistic experience of a remote location via a panorama video while remaining in his or her own room.

Structure of Personal Mobility Test Unit

[For outdoor use]

Dimensions: Height: 1,000 mm (when vacant) – 1,100 mm (while running); Width: 700 mm

Weight: 150 kg; Running performance: 6 km/h; climbing slopes up to 10°

(This unit uses a Mobility Robot Platform developed by Toyota Motor Corp.)

[For indoor use]

Dimensions: Height: 1,300 mm x Width; 660 mm x Length: 640 mm

Weight: 45 kg

4. Public demonstration

A public demonstration will be held on November 15 (Sat.) at the Tokyo University Homecoming Day

URL: http://www.alumni.u-tokyo.ac.jp/hcd/index.html

Date and time: November 15 (Sat.); 1:00 – 3:00 pm

5. Contact Information

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6. Attached materials

Detailed explanation materials

These materials can be downloaded from the following address:

URL: http://www.irt.i.u-tokyo.ac.jp/pressrelease/irtpmr.pdf