Press Release

Technologies that help senior citizens to lead safe and comfortable life

1. Overview

The University of Tokyo under the Information and Robot Technology (IRT) Research Initiative has undertaken research and development of "recall support technologies" that help senior citizens and people suffering from memory disorders to lead a healthy and comfortable life. 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 "Special Coordination Funds for Promoting Science and Technology" project, which is supported by the science and technology incentive funds offered by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. The "IRT Foundation to Support Man and Aging Society" project was conceived by President Komiyama, University of Tokyo. This project aims at conducting R&D activities and developing significant innovations in the next 10 to 20 years. This project is carried out under the IRT Research Initiative (Director: Isao Shimoyama), University of Tokyo. Under this project, technologies for supporting recall have been developed, which help seniors and people suffering from memory disorders to lead a healthy and comfortable life.

Forgetfulness, which increases with age, involves both short- and long-term memory loss, e.g., misplacing eyeglasses and remote controls. Seniors frequently spend a great deal of time searching for these objects. Forgetfulness can also lead to serious problems, e.g., forgetting to take medicines. In order to assist seniors in these situations, the IRT Research Agency has developed technologies that remind users to take their medicines or the storage location of everyday objects, by using a combination of robots and environmental cameras.

The two recently developed technologies are (1) a technology that stores the location of everyday objects that a user or a robot has handled and assists the user in recalling those locations and (2) a technology that enables robots to recognize the actions of human beings by using wide field multiresolution cameras and assists the user to recall whether an action has been performed (e.g., taking medicine).

•Functions and features of recall support technologies

(1) Technology that remembers the storage location of everyday objects that a human being has handled or items that a robot has put away, and assists the user in recalling those locations.

Cameras installed in rooms or robots are used to create a database of images showing the location of everyday objects handled by human beings or robots on the basis of user's instructions; this database can be used to assist users in recalling the location of objects. This technology combines several elemental technologies, including event detection technology that selects the appropriate stored images, image matching technologies that searches for known objects from the stored images, and network distributed computation technologies that rapidly process large volumes of data. This technology informs a user when the object in question was last used and where it is placed.

(2) Technology that allows robots to recognize the actions of a human being using wide field multi-resolution cameras, and assists the user in recalling whether an action has taken place (e.g., taking medicine)

A robot observes user's actions during the course of a day and determines whether actions that are carried out daily (e.g., taking medicines) have been performed, in order to remind the user in case he/she forgets. This technology, which has been developed through a joint program with Fujitsu Laboratories, combines several elemental technologies including compact, wide field multiresolution cameras, tracking of human movement, focus on movement of the user's hands in a specified location, and two-eye 3-D vision for comparing relative depth.

(Note 1) "Creation of IRT Platforms to Support People in an Aging Society" Project

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 of concern, such as labor shortage due to declining numbers of workers, increasing health concerns and social security costs due to increasing number of seniors, increasing domestic workload due to increasing single-person and elderly households, and increasing nursing-care workload due increasing number of people requiring nursing care. The use of robots will aid in addressing these concerns.

The creation of the "new industries in support of people and society" through the collaboration of universities and industries holds great promise for the introduction of household robots. By integrating 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.

The goal of this project is to produce leading-edge, joint creations and new industries through collaboration between industries and universities, to follow after automobile and computer industries.

（Note 2） According to the Basic Science and Technology Plan, an innovation is defined as a new thing or method that brings about new social and economic value by combining scientific discoveries and inventions, paving the way for further developments. (Ref: MEXT homepage http://www.mext.go.jp/a_menu/kagaku/kihon/main5_a4.htm）

3. **Contact Information**
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4. Attached documents:
 Supplementary information   (attachment)
 Details on IRT Research Initiative, University of Tokyo (pamphlet)

Images for press release

From left: Robot for watching human's actions; home assistant robot for putting away everyday items; indoor personal mobility unit that stays close to the user and remembers everyday items.

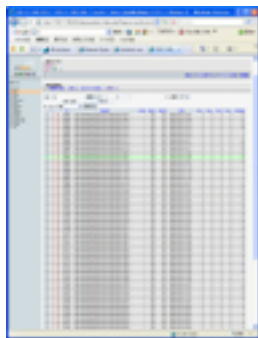# Basic IRT technologies that support recall

Storage location recall support:
  Displays location of everyday objects, and advises of location by robot's pointing, etc.

Action recall support:
  Advises whether or not everyday actions have been undertaken or forgotten
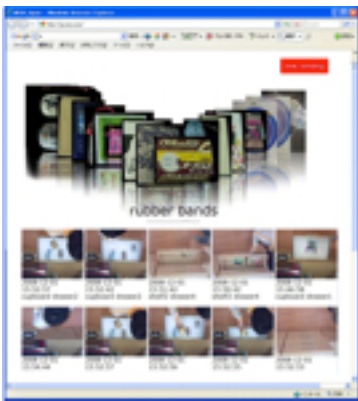
Everyday object browser:
  Select desired object

Everyday item database:
  High-speed parallel processing using 56-CPU cluster

Recall support IRT technologies:
Presentation viewer
  Positions of robot and user are recognized using SLAM and RFID

Object information acquisition/Database construction technologies
  Captures images using a ceiling camera, and uses high-speed parallel recognition to create a database of objects stored in cabinets around the room
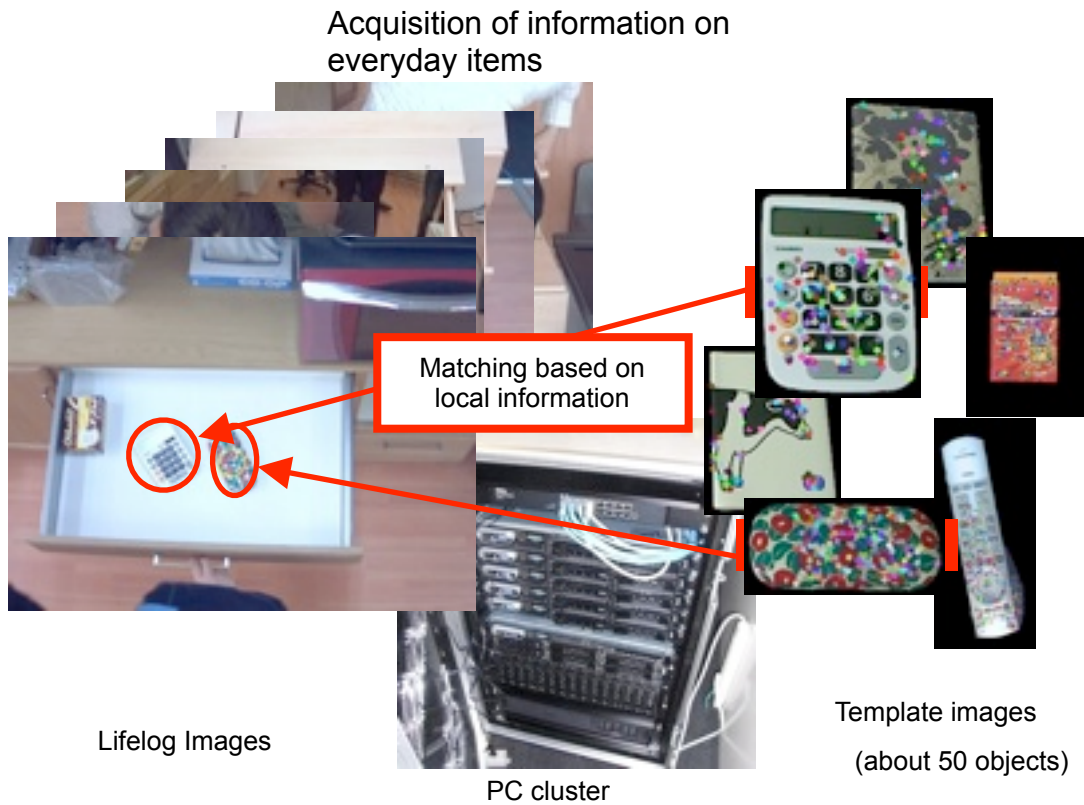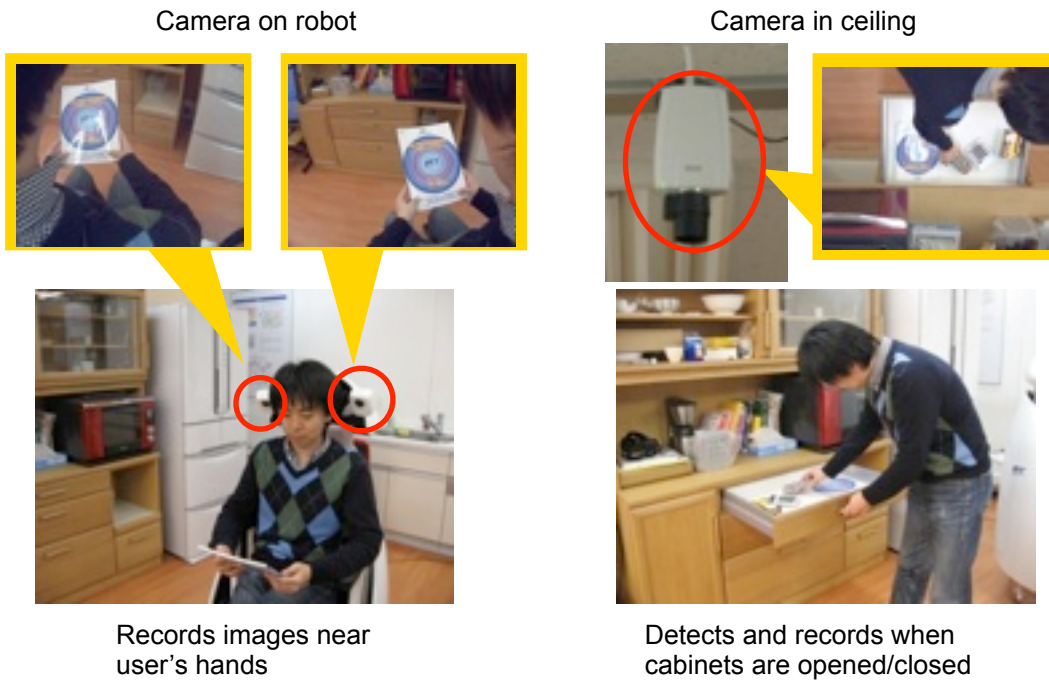

Action database construction technologies
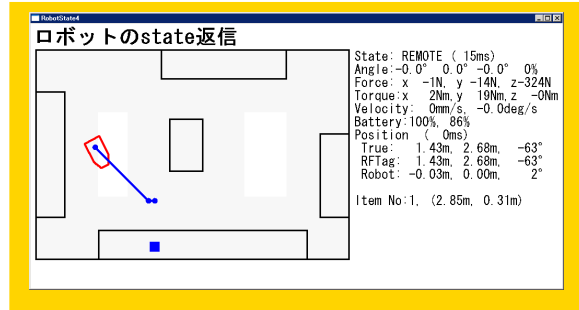 Recognizes whether the user has taken medicine using high-speed visual hardware and multi-resolution visualization

(1) Explanation materials for technology that remembers the storage location of everyday objects that a human being has handled or items that a robot has put away, and assists the user in recalling those locations
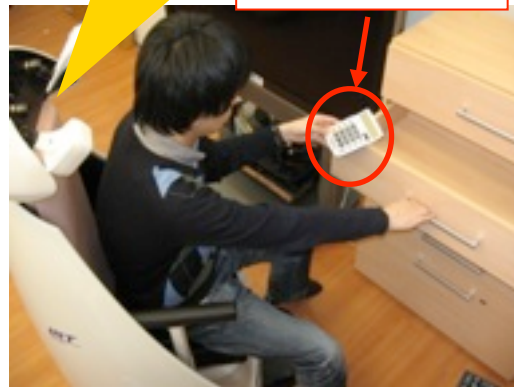
Camera on robot

Camera in ceiling

Records images near user's hands

Detects and records when cabinets are opened/closed

Acquisition of information on everyday items

Matching based on local information

Lifelog Images

PC cluster

Template images

(about 50 objects)

Parallel computation/image matching

Search using GUI/remote control

Move to storage location using robot

Object of search

Everyday item search

2) Explanation materials for technology that allows robots to recognize the actions of a human being using wide field multi-resolution cameras, and assists the user in recalling whether an action has taken place (e.g., taking medicine)
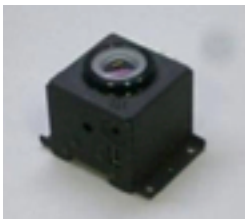

Situation requiring monitoring

Monitoring robot:
"Mamoru"

Height	40 cm
Weight	3.8 kg
Degree of freedom	4 (head: 2; arms: 1x2)
Vision	Wide-field, multi-resolution camera
	Fujitsu Vision Board
Hearing	16-ch. microphone
Audio	Speaker

Wide-field, multi-resolution camera
    Simultaneously captures 180º wide view images and multiple telephoto images

Fujitsu Vision Board
    High-speed processing performance (6x that of standard PCs) when detecting movement and calculating pattern matching

Mamoru watches the subject taking medicine.
Visually recognizes and remembers when the subject brings the medicine box and prepares to take the medicine

Visually recognizes when subject takes medicine
Uses a combination of facial pattern recognition, focus on face and hands using 3-D recognition, and depth comparison