NICT NEWS

独立行政法人 情報通信研究機構

National Institute of Information and Communications Technology

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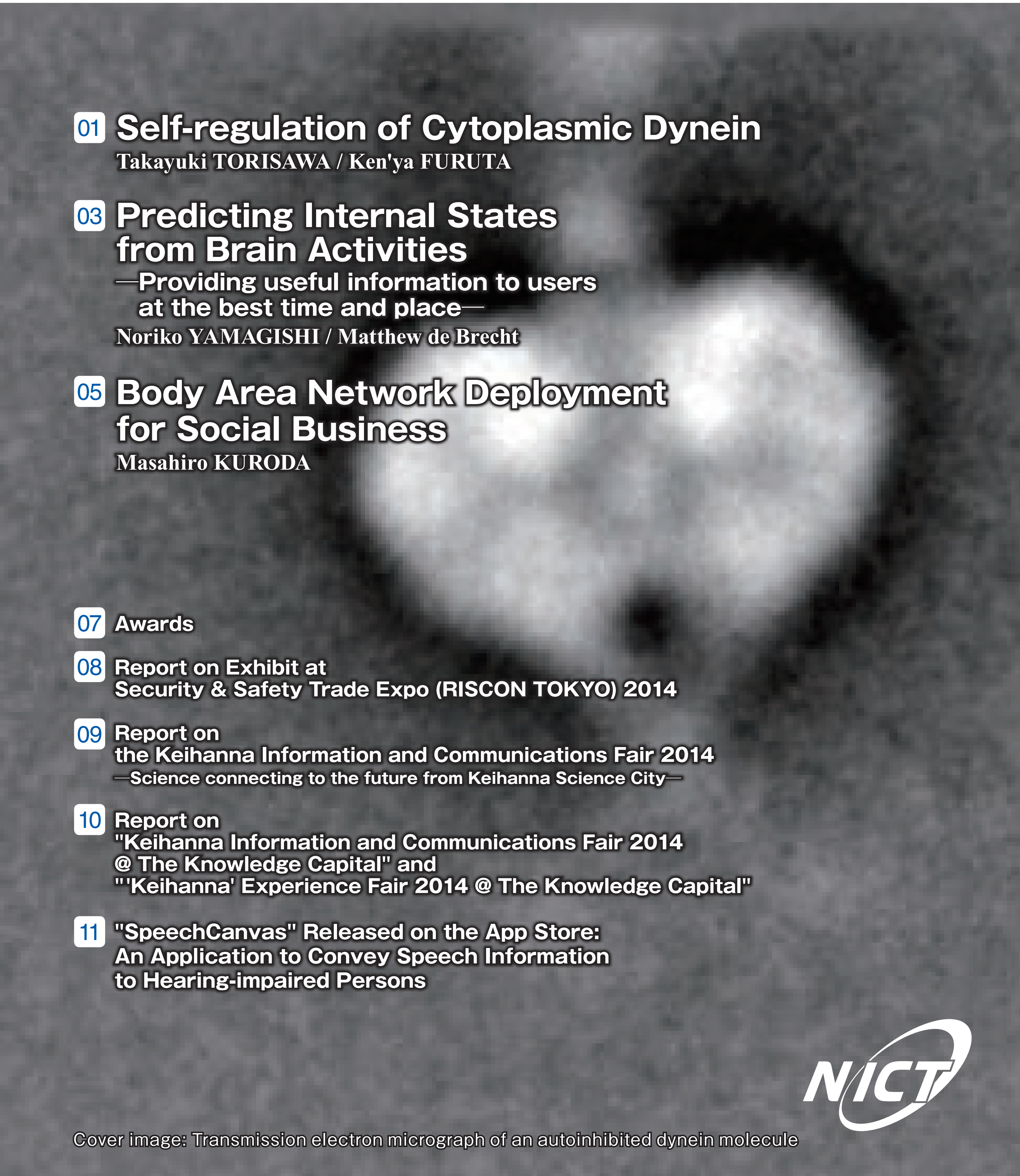


Cover image: Transmission electron micrograph of an autoinhibited dynein molecule

Self-regulation of Cytoplasmic Dynein

Takayuki TORISAWA

Researcher, Bio ICT Research Laboratory, Advanced ICT Institute

After completing graduate school, joined NICT in 2014. Engaged in research on self-assembly mechanisms of motor proteins and cytoskeletons. Ph.D. (Science).

Ken'ya FURUTA

Senior Researcher, Bio ICT Research Laboratory, Advanced ICT Institute

After completing graduate school, became a Research Fellow of the Japan Society for the Promotion of Science, and then joined NICT in 2009. Engaged in research on physical properties of protein machines using DNA nano-structure. Ph.D. (Science).

Introduction

In daily life, distribution systems move the things we need to where we need them. These systems strictly control what is moved where and by whom (Figure 1, left). In the same way, the flow of cargo within our bodies is also carefully controlled. There are protein filaments such as microtubules and actin filaments, whose diameters are less than one-thousandth the width of a human hair, running throughout our cells and providing trackways for transporting cargo. Cargos are transported by proteins called molecular motors, which act like transport trucks (Figure 1, right). However, there is a big difference between the distribution systems that support our daily life and the transport performed within cells. Our distribution systems generally have a central department that issues instructions, such as a distribution center. On the other hand, there is a completely different mechanism used within cells: each molecular motor makes its own decisions and operates autonomously within a cell. This type of transport mechanism found in cells is called self-distributed, whereas the distribution mechanism used by human beings is called centrally-controlled.

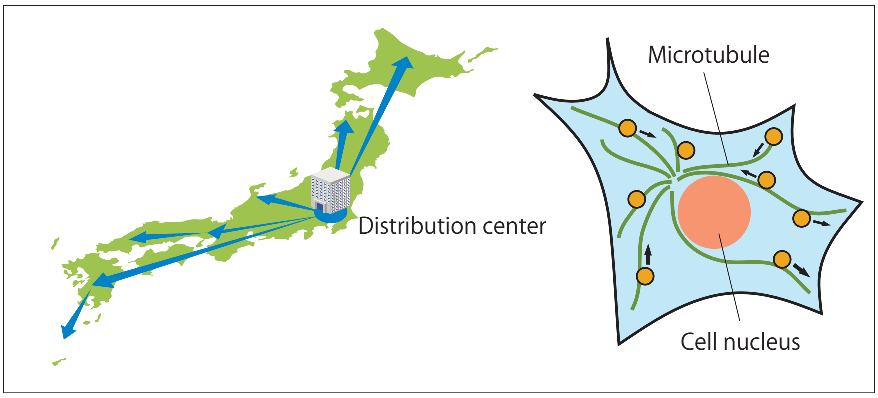


Figure 1 Human distribution systems and intracellular transport

Molecular motors as cargo transporters within cells

Molecular motors, which are cargo transporters within cells, undergo structural change when they hydrolyze adenosine triphosphate (ATP), a source of chemical energy in living organisms. This mechanism is thought to be used for moving along protein filaments. The tracks on which these molecular motors move are called microtubules or actin filaments, which have many protein monomers linked together in a fibrous structure. We have focused on two major microtubule-based transporters. One is called kinesin, and it moves cargo toward the plus ends of microtubules. "Plus end" refers to the direction (polarity) of the microtubule, where the plus end is generally located outside of the cell, and "minus end" is located in the center of the cell. The other transporter is called dynein, and it moves cargo toward the minus ends of microtubules. Dynein is actually a complex composed of multiple-protein subunits and it has a microtubule-binding structure that looks like two legs (Figure 2).

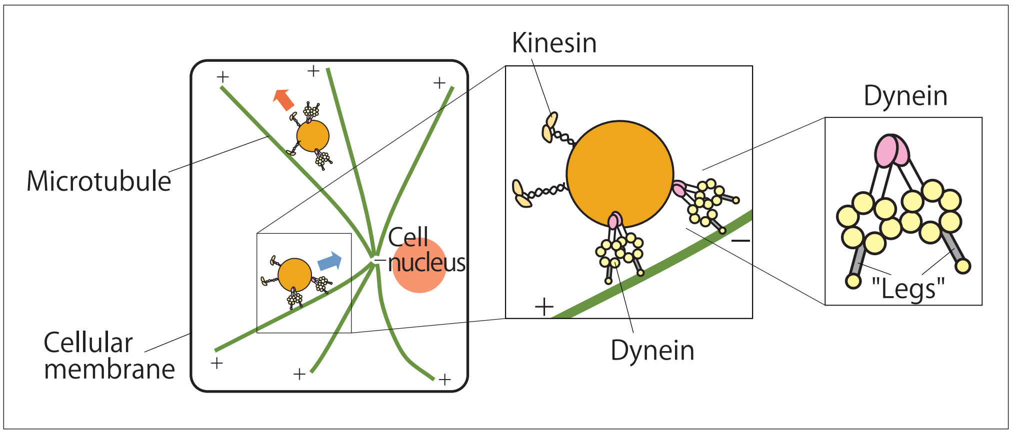


Figure 2 Intracellular transport and molecular motor diagram

Regulation of dynein

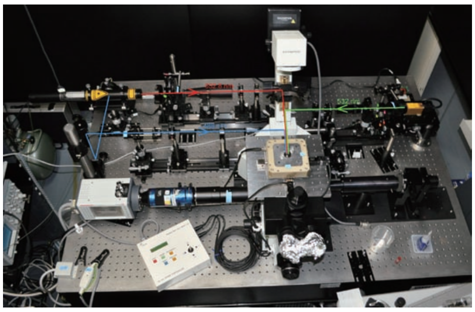
A variety of kinesin-family proteins are used to transport toward the plus end, depending on what is being transported and to where. In contrast, there is only one type of dynein handling all transport toward the minus end. In earlier research, the regulation of dynein has been described to be achieved by various dynein-binding proteins, enabling a single type of dynein to handle many types of task. In our recent research, we showed that, in addition to this control mechanism using regulatory proteins, dynein also has a mechanism for inhibiting itself. We give a simple overview of this mechanism in the next section.

Dynein autoinhibition

When individual dynein molecules were observed using a total internal reflection fluorescence microscope (Figure 3), they only showed back-and-forth motion along the microtubule, without clear directional bias. Careful observation of dynein molecules using an electron microscope revealed that the two "legs" of the dynein had a characteristic twisted shape and they were not able to move as usual (Figure 4). We then physically separated the two legs of the dynein using genetic engineering techniques. This prevented the two legs from twisting, and the behavior of the dynein changed to unidirectional. This result showed that the twisted legs of the dynein correspond to an autoinhibited state in which it limits its own movement. We also conducted experiments using artificial cargo, showing that when multiple dynein molecules are engaged with the same cargo, they are able to move the cargo as a group. That is to say, they use a mechanism by which the dynein molecules wait in their inhibited state until the cargo arrives, and when the cargo is loaded, they automatically begin transport. This suggests they are capable of autonomous, distributed transport. In the future, we hope to gain a full picture of the complex distribution systems within cells by elucidating how operation of each of the transporters within cells is controlled and what mechanisms they use.

Future prospects

Concern has been raised that the conventional centrally-controlled mechanisms such as the distribution system and client-server network will not be sustainable because the risk of failure in the overall system and energy consumption increase exponentially as complexity increases. The transport networks within cells appear to be autonomous, distributed systems that are able to adapt flexibly to their environment. We hope to abstract the essence of design principles from these systems and apply them in various fields, such as computing or network control, creating low-energy, autonomous and distributed technologies based on entirely new principles.



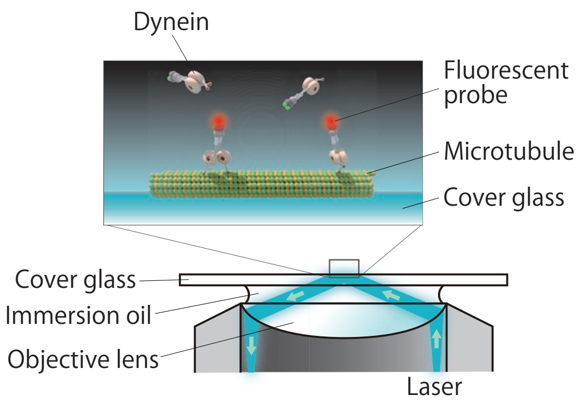


Figure 3 Total internal reflection fluorescence microscope (left) and diagram of single-dynein tracking (right)

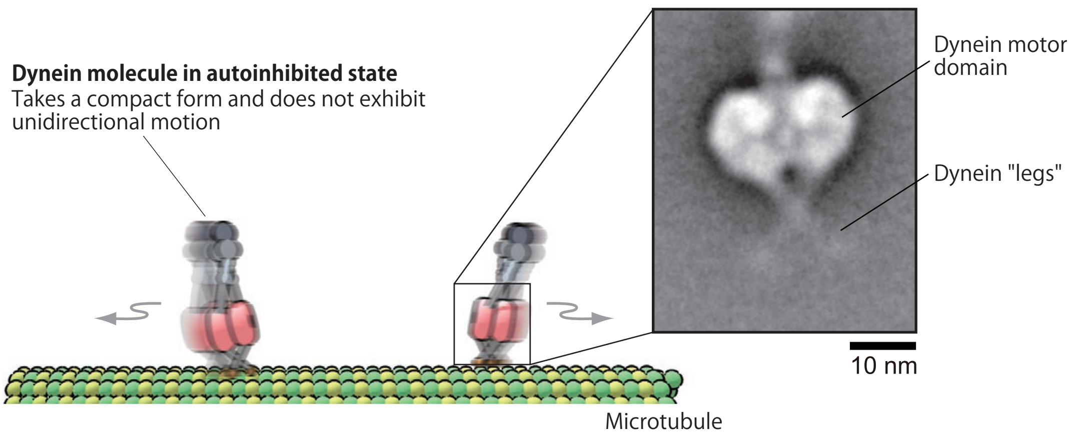


Figure 4 Diagram and transmission electron micrograph of an autoinhibited dynein molecule

Predicting Internal States from Brain Activities

—Providing useful information to users at the best time and place—

Noriko YAMAGISHI

Senior researcher, Brain Networks and Communication Laboratory, Center for Information and Neural Networks

After being awarded a Ph.D., she worked as a post-doctoral research fellow at University of California, San Diego, and at Royal Holloway, University of London, and worked as a senior researcher at Advanced Telecommunications Research Institutes International (ATR). She joined NICT as a senior researcher in 2013.
Her research has focused on cognitive neuroscience, especially on mechanisms underlying human cognition, attention and readiness that are closely related to human consciousness. Ph. D.

Matthew de Brecht

Researcher, Brain Networks and Communication Laboratory, Center for Information and Neural Networks

After being awarded a Ph.D., he joined NICT in 2010. His research has focused on machine learning, visual attention, neuro-decoding, and mathematical logic.
Ph.D. (Informatics).

Introduction

Research and development is advancing on information environments that connect all people and all things, use information and communications technology (ICT) in all facets of our lives, and can benefit everyone, at anytime and anywhere. One area of this research is on the creation of *ambient intelligence*, in which anyone can obtain any information they require in natural ways. In our laboratory, we are conducting research and development on fundamental technologies for building *adaptive ambient intelligence*, which will organically combine technologies for testing psychological and physiological indicators, for online decoding, and for information display to provide the desired information at the best possible time and place (Figure 1).

It is becoming clearer that the usability of information systems, and the effects they have on performance of intellectual tasks done using them, depend not only on the quality of the functional design, but also on the internal state of the user at that particular time. For example, if a person's awareness (or attention) is not directed toward what the eyes are seeing or the ears are hearing, the person will not recognize it and could overlook important information. Conversely, when attention is directed at something, it is recognized more quickly and more-detailed information is processed. Even for the same person performing the same task, the person will perform better if fully ready internally, and will perform worse if not fully ready.

This shows that, even if an information environment is implemented that always provides useful information to users, they will not be able to benefit from that information environment if the desired information is not provided at the best time and in the best place. In other words, if a person's intentions, focus of attention, and state of readiness for the next intellectual task can be anticipated, it will be possible to present the necessary information at the best time and place suited to those conditions, and the environment will support human cognitive activity, resulting in greater creativity.

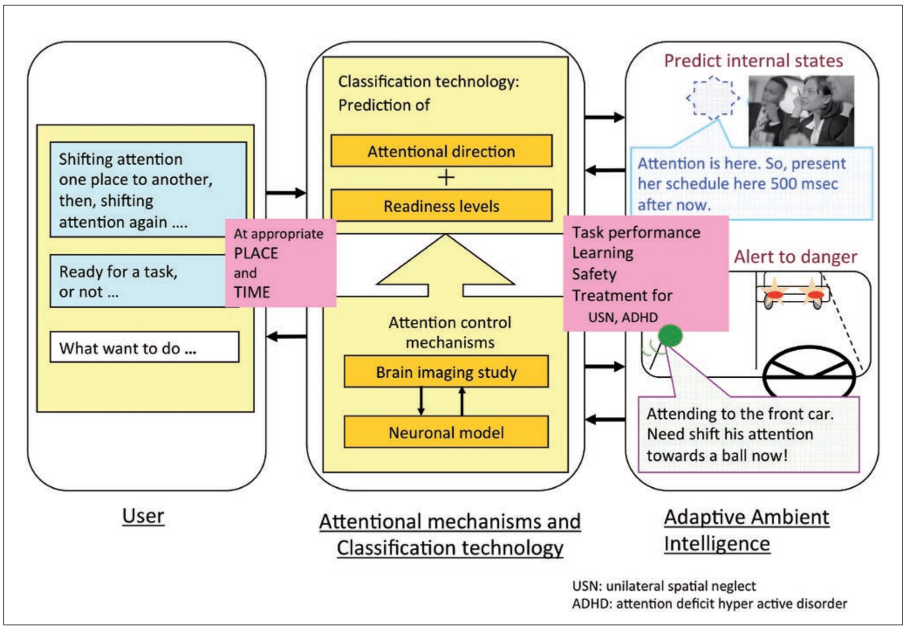


Figure 1 Primary Goal
Research and development of adaptive ambient intelligence in which the desired information is provided at the best possible time and place

Explaining cognitive processes by measuring brain activity and developing decoding technology that uses neuroscientific knowledge

To achieve these objectives, our laboratory is elucidating the mechanisms of attention and readiness through psychological and behavioral experiments and integrated use of brain activity measuring technologies such as functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) (Figure 1). We have shown that directing the attention results in changes in activity of the lower-level visual cortex before the stimulus is presented (Figure 2, above). We also found that the size of this change is correlated with the rate of correct responses in perception tasks done afterwards. Regarding readiness for a task, we found that when changing the activity in the cingulate motor cortex, the magnitude of the change corre-

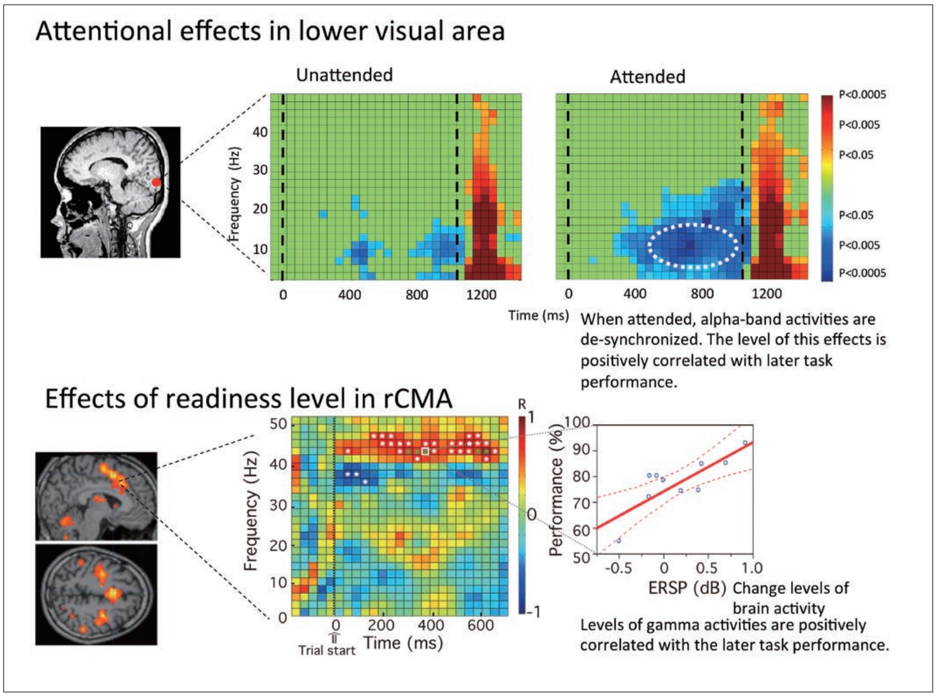


Figure 2 Explaining human cognitive processes by measuring brain activity
We are attempting to explain attention and readiness mechanisms with experiments measuring brain activity. (Above) At time t=0, a direction to place attention is given (right or left). At t=1000, a left-right directional visual stimulus is presented. The subject responds by pushing a button for the stimulus orientation where their attention is directed. (Below) At time t=0, the subject is directed to monitor their own state of readiness for the visual task. When the subject feels ready for the visual task, they press a button, a stimulus is presented and they respond with the orientation.

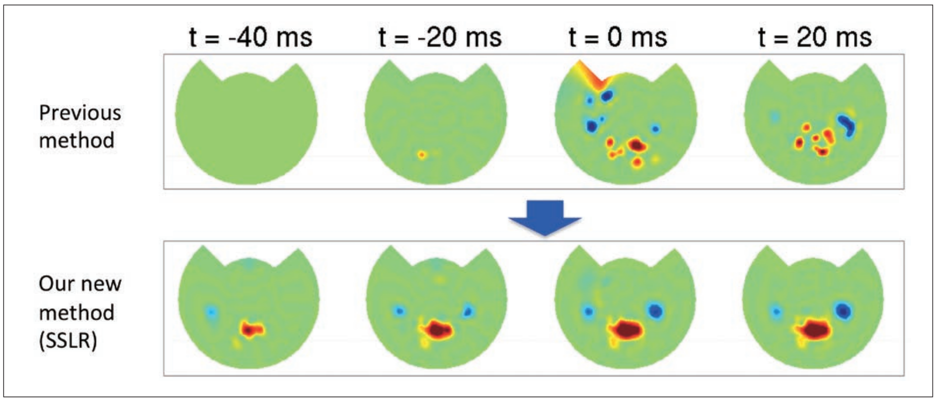


Figure 3 Development of coding methods utilizing neuroscientific knowledge
Neuroscientific interpretation of decoding results becomes easier and more accurate using smooth sparse logistic regression (SSLR), which calculates a weight vector that is smooth and sparse both temporally and spatially. In this example, the button is pushed at time t=0. With the new method, brain activity is shown smoothly from preparation for action until after the button was pushed.

lates to performance in the task (Figure 2, below). This knowledge shows that, conversely, a person's internal state can be predicted (decoded) by monitoring characteristics of specific parts of the brain.

Our laboratory is also working to develop decoding technology using neuroscientific knowledge (Figure 1 center: Online decoding technology). The structure and activity patterns of the brain differ from person-to-person, so to interpret brain activity, a person-specific decoder must be created using machine learning. We are developing learning methods for highly-accurate decoders that utilize neuroscientific knowledge and knowledge gained through experimentation. Decoding that uses the new methods we have developed gives more accurate predictions, resulting in easier neuroscientific interpretation (Figure 3).

Online decoding of direction of attention

Using the fact that alpha waves in the lower-level visual cortex change with attention, we conducted experiments monitoring these changes to predict the direction of attention (Figure 4). We used the new decoding technology that we have developed to predict direction of attention from brain activity. We were able to predict the direction of a person's attention successfully, whether left, right, up, or down, through online analysis of changes in brain activity measured over time using MEG. This indicates that in the future, such prediction results can be used to build adaptive ambient intelligence that presents the information a person needs, where their attention is directed.

Conclusion

This article has introduced our laboratory's initiatives toward building user-friendly, adaptive, ambient intelligence. In the future, we will further elucidate mechanisms of human internal state, and develop better prediction technologies using the knowledge gained. By advancing the cycle of basic understanding of cognitive mechanisms and applied research, we hope to contribute to humanity, both scientifically and in society.

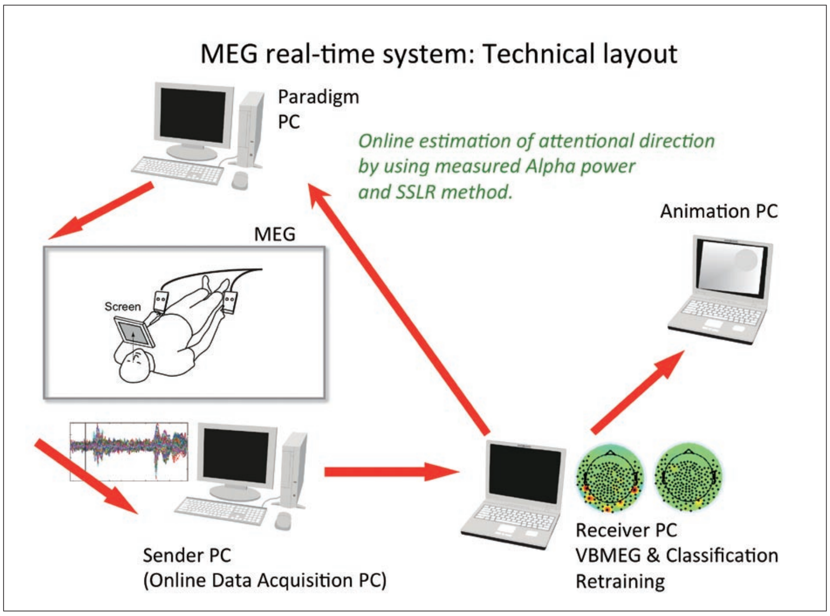


Figure 4 Online decoding of attentional direction
Monitoring brain activity to predict the direction of attention.

Body Area Network Deployment for Social Business

Masahiro KURODA

Manager, Standardization Promotion Office, International Affairs Department

After completing a Master's degree program, joined Mitsubishi Electric Corporation in 1980, and then joined Communications Research Laboratories (CRL, currently NICT) in 2002. Engaged in international standardization activities for short distance wireless network (especially, BAN), focusing on next generation mobile networks, medical and health fields, R&D on power networks and security, and international standardization of Healthcare M2M at the ITU-T. Ph.D. (Engineering).

Background

The term, "social business," is becoming more common. Initiatives to resolve societal issues in areas such as the environment and poverty are being developed as sustainable businesses and gaining wide attention for promoting independent development, not only in developing countries, but also in rural areas of Japan. A well-known and typical example of this is the Grameen Bank, which was awarded the Nobel Peace Prize in 2006 for its support of independence for the poor through low-interest loans.

Japan has long been called a hyper-aged society, and with this trend, healthcare and health management services utilizing information and communications technology (ICT) have become familiar. There are initiatives, proposing various healthcare initiatives and field trials, oriented to enabling everyone to live with security in the regions to which they are accustomed. However, from a perspective of sustainability, healthcare ICT devices have been difficult to operate for users and not enough thought has been given to operating costs for services after the field trials, so these initiatives have not expanded significantly. The key to sustainable services that fully consider our super-aging society may be to first create a social business model, and then implement it, incorporating ICT that is both low cost and easy to use.

With healthcare and health management services, when gathering data for those being cared for, cable-less short-range wireless networking is one potential type of ICT. Bluetooth and ZigBee are two names often heard in this field, but there have been reports that these are not as convenient as expected. For example, when attempting to gather temperature and blood pressure measurements from residents in an elderly care facility using a tablet and Bluetooth, a manual Bluetooth connection had to be made for each measurement, requiring more time than simply recording it with pen and paper. Also, the specifications for these devices are decided by industry organizations, so they are fine if they can handle the desired task, but if not, the service provider or device manufacturer must join the organization and have the specification extended. These activities incur additional cost.

Recently, an ICT able to gather data on a tablet or other device from multiple sensors and other compact devices in the body area (in, on, and around the body), easily and conveniently, is called the *body area network* (BAN). A type of BAN that ensures reliability and safety, particularly for medical applications, is called the *medical body area network* (MBAN), for which successive, open, international standards have been established. MBAN enables configurations to be created easily, consisting of multiple simple, portable, and compact medical instruments, biological sensors and smart phones. These open, international standards consider wireless for medical instruments in hospitals as well as medical and healthcare management applications in various other locations. We introduce an example of a social business applying BAN technology to a unified service that provides group health checkups and remote diagnosis in Bangladesh.

Introducing BAN for portable health clinics

Portable Health Clinic (PHC) is an easy to use, remote preventative medicine system proposed by the Medical Information Center and the Graduate School of Systems Life Sciences, both at Kyushu University, and the Global Communication Center of Grameen Communications in Bangladesh. Women who want to work can purchase a PHC using the independence-supporting low-interest loan system, as one possible social business that is robust and sustainable. These women can use the PHC to perform health checkups and remote diagnosis as small-business owners, collect user fees from users, and gradually repay the loan. Health improvement in users can be expected through use of PHCs, as well as a brighter, more-productive overall society in developing countries.

NICT has supplied the user-friendly, secure BAN used between the PHC measuring devices and the terminal collecting the data. Initially, the Kyushu University Hospital Medical Information Center was intending to use existing measuring devices equipped with Bluetooth for PHC, but they found that measured data could not easily be gathered in one place from the devices. Thus, they became interested in the R&D on BAN at NICT. Bluetooth cannot be used to build a BAN because it is based on one-to-one communication and few compact examination devices support with the specification. Thus, a BAN based on the IEEE 802.15.6 specification was selected for application in the PHC (hereinafter called BAN-PHC). This specification can simultaneously handle multiple measuring devices that send single readings, such as a sphygmomanometer, as well as sensors that send continuous data, such as a pulse oximeter. In addition to the basic BAN technology, other NICT BAN technologies were used to enable BAN-PHC to be used in regions where the power supply is poor. These include

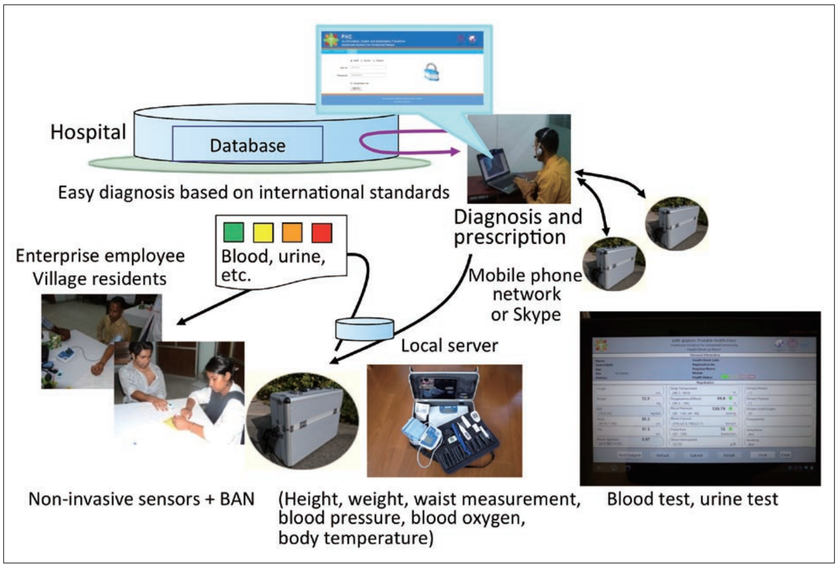


Figure 1 BAN Portable Health Clinic (BAN-PHC)

a low-power short-range wireless network configuration to enable battery operation and an automated encryption-key generator (Figure 1).

Portable health clinic operation

The PHC service includes an interview at the checkup venue, explanation of informed consent, automatic measurement using each of the BAN devices (Figure 2), and blood and urine tests. The data from these measurements is encrypted and stored on the android terminal, and an automated triage is performed by the terminal, classifying subjects as either "Healthy" (green), "Needs attention" (yellow), "Needs treatment" (orange), or "Needs emergency treatment" (red). For subjects that are classified as either "Needs treatment" or "Needs emergency treatment", remote diagnosis is performed. Doctors are stationed at a remote medical center in the capital city, Dhaka, and they provide remote diagnosis using Skype while referring to test results that have been automatically sent to the data center. They give health advice, issue prescriptions to patients with high blood pressure or diabetes remotely, or advise patients to see a doctor at a medical facility. Recipients of remote diagnosis are given results in the form of prescriptions or descriptions, printed using a portable printer, and prescriptions can be filled at a local pharmacy. These services were received by approximately 17,000 people at five rural locations and five factory or office locations. Almost 5,000 patients classified "Needs treatment" or above received remote diagnoses and significant improvements and other results. Photographs from checkups being done at the rural and urban factory locations are shown in Figure 3.

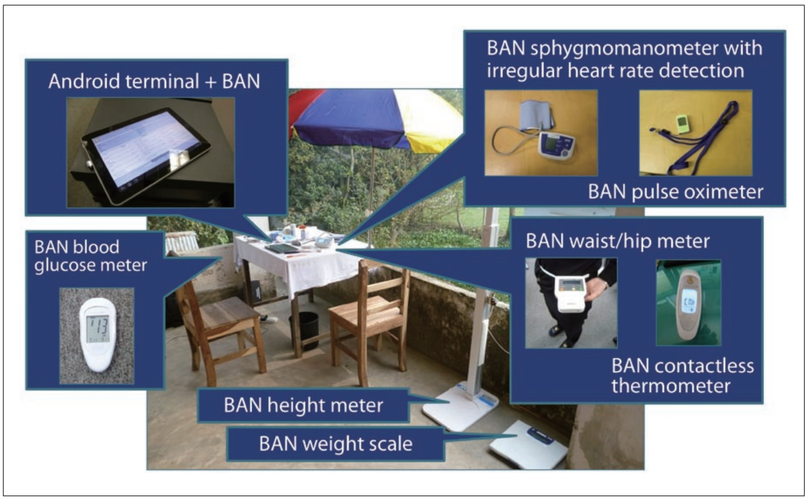


Figure 2 BAN devices

Future prospects

BAN was introduced into PHC which has business model in advance and it supported a large-scale preventative health checkup and remote diagnosis project in Bangladesh. This constituted a practical demonstration of a BAN system that can be used in developing countries and in disaster situations.

As is often said, testing and actual operation are different. In rural Bangladesh, electricity is not always available. Even if sensors, medical instruments, Android terminals and the BAN operate on batteries, the service cannot be provided if the wireless LAN access point cannot operate on batteries. If different measurement instruments are used, the measured data can also vary, which can affect diagnoses and epidemiological research, so there are some devices that cannot actually be used. These sorts of issues must be resolved before the system can move into actual operation. Practical use of technology requires not only research results; knowledge of the surrounding environment and technologies must be incorporated, in cooperation with all related parties.

With the miniaturization of sensors recently, many sensors for biological and lifestyle factors, called biosensors, are appearing. Highly-reliable, extremely-low-power BAN is a technology that will make these sensors easier to use. New medical and healthcare applications are promising, but before they become practical, the usage environment will need to become more stable.

Also, even if a technology is sustainable, if the operations cost including system maintenance is not estimated and there is no clear prospect for securing it, it will be difficult to establish as a service. It is very important to consider caretaking or health-management network services with a social business approach, built on a basis of sustainability. Use of BAN-PHC in Bangladesh is a step in that direction.

Figure 3 Physical checkups in rural (left) and urban (right) regions

Awards

Recipients ● **Yusuke YOKOTA**/ Researcher, Brain Imaging Technology Laboratory, Center for Information and Neural Networks
Yasushi NARUSE/ Associate Director, Brain Imaging Technology Laboratory, Center for Information and Neural Networks

◎Award Date: September 11, 2014

◎Name of Award: Best Presentation Award

◎Details:
How much are you using your brain?: Basic research for evaluation of brain activation level using ASSR

◎Awarding Organization:
Human Interface Society

◎Comment from the Recipients:

We have developed a basic technology that quantitatively evaluates workload from neural activity. The Human Interface Society recognized our achievements in the skillful use of neuro-scientific knowledge in neuro-engineering research, and in the development of mobile electroencephalography equipment. In the future, we will use our mobile EEG to measure brain activity in real environments, in an effort to contribute to developing neuro-information and communications technology.

From the left: Yusuke YOKOTA, Yasushi NARUSE

Recipients ● **Hiroshi HARADA**/ Managing Director, Social ICT Research Center
Fumihide KOJIMA/ Research Manager, Smart Wireless Laboratory, Wireless Network Research Institute

Co-recipient:
Mitsuru KANDA (Toshiba Corporation Social Infrastructure Systems Company)

◎Award Date: September 12, 2014

◎Name of Award:
Minister for Internal Affairs and Communications Award of 12th Annual Merit Awards for Industry-Academia-Government Collaboration

◎Details:
A great contribution to the successful promotion for Industry-Academia-Government Collaboration

◎Awarding Organization:
Cabinet Office, Government of Japan

◎Comment from the Recipients:

This award recognizes results of R&D at NICT on SUN wireless, which have met demand from domestic industry well, and contributed to society through standardization and certification. We are proud that it reflects NICT's basic mission in this way.

We would like to express thanks to the many within and outside of NICT for their cooperation in this endeavor. We intend to continue our R&D, keeping the above ideals in mind, and working to implement good social ICT.

From the right: Toshiyuki TAKEI, Assistant Vice-Minister, Minister's Secretariat, MIC, Hiroshi HARADA and Fumihide KOJIMA, Mitsuru KANDA, Counselor of Toshiba Corporation Social Infrastructure Systems Company

Recipient ● **Chang CAI**/ Limited Term Technical Staff, Brain Networks and Communication Laboratory, Center for Information and Neural Networks

Co-recipients:
Koichi MORI, Shuntaro OKAZAKI, Minae OKADA
(Research Institute of National Rehabilitation Center for Persons with Disabilities)

◎Award Date: September 28, 2014

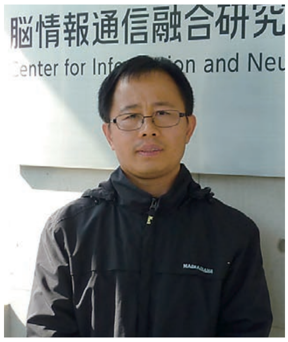
◎Name of Award: Best Paper Award

◎Details:
Characteristic Patterns of Brain Activation in Adults with Developmental Stuttering in Reading Katakana Words Aloud

◎Awarding Organization:
The Phonetic Society of Japan

◎Comment from the Recipients:

Approximately one percent of the population suffer from stuttering, but its neural mechanism is still not clear. In this research, we measured brain activity using functional magnetic resonance images (fMRI) while subjects read katakana stimuli aloud and we identified the activity differences between stuttering and normal speakers. Based on the three kinds of katakana stimuli (familiar, unfamiliar and pseudo-words) applied in the study, consistency with the dual-route model for word reading was further discussed.



Recipient ● **Ikuhiro KIDA**/ Senior Researcher, Brain Imaging Technology Laboratory, Center for Information and Neural Networks

◎Award Date: October 3, 2014

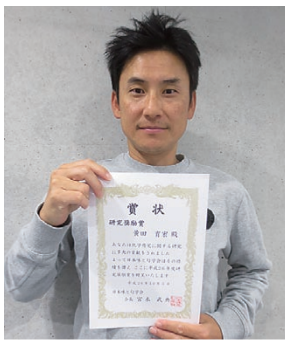
◎Name of Award:
2014 The Takasago Award for Research Encouragement

◎Details:
Gustatory and olfactory maps in small animals by functional magnetic resonance imaging

◎Awarding Organization:
The Japanese Association for the Study of Taste and Smell

◎Comment from the Recipient:

I have been trying to understand neuronal mechanisms of gustation and olfaction using functional magnetic resonance imaging at ultra-high magnetic fields. I am extremely honored and grateful to receive the award for my achievements regarding the chemical senses. I would like to express my deep gratitude to everyone involved and providing support for this research. I want to keep working hard to understand neuronal processing for the chemical senses.



Report on Exhibit at Security & Safety Trade Expo (RISCON TOKYO) 2014

NICT exhibited at the Security & Safety Trade Expo (RISCON TOKYO) 2014, held at Tokyo Big Sight, West 1 and 2 Halls, from October 15 to 17. We introduced technologies useful in times of disaster and technology for non-destructive building inspection. RISCON TOKYO is held at Tokyo Big Sight, with special cooperation from the Tokyo Metropolitan Government. It is a comprehensive risk-management exhibition dealing with domestic and international products, technologies, services and information related to risk management. It covers disaster prevention and mitigation, security, and even counter-terrorism measures.

At the exhibition, NICT presented the following disaster and non-destructive inspection technologies.

- 3D display of localized heavy rainstorms observed using phased array weather radar

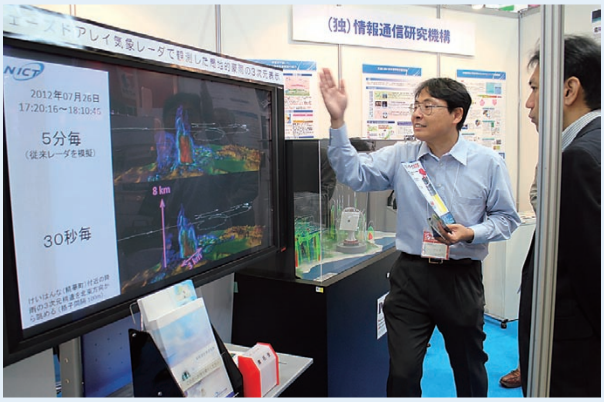
  Detailed and high-speed observations of heavy, localized rainstorms—so called guerrilla rainstorms—were taken at 30-second intervals, which is not possible with conventional radar using parabolic antennas. These were made into 3D videos and displayed together with explanation.
- Observations of Mt. Ontake using the Polarimetric and Interferometric Airborne Synthetic Aperture Radar System, Pi-SAR2

  Technology able to observe the volcano crater beneath the smoke was introduced, using 84-inch display equipment to show the images.
- Non-destructive sensing technology utilizing electromagnetic waves

  A technology for detecting the internal structure, cracks and other features within walls using microwave radar was introduced.

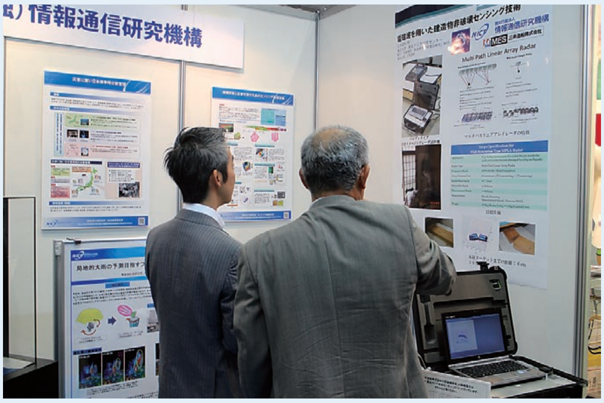
The Security & Safety Trade Expo (RISCON TOKYO) 2014 was a great success, with attendance reaching 54,051 over the three days, and many also visiting the NICT booth and learning about NICT initiatives related to natural disasters.

NICT Booth



Phased-array weather radar


Mt. Ontake observations using Pi-SAR2



Non-destructive sensing of structures using electromagnetic waves

Report on the Keihanna Information and Communications Fair 2014

—Science connecting to the future from Keihanna Science City—

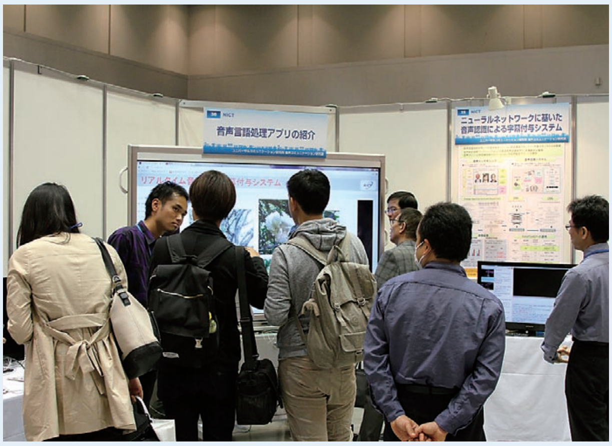
From November 6 to 8, 2014, NICT, together with institutes and universities related to information and communications, held the Keihanna Information and Communications Fair 2014, as a joint regional event presenting research results through lectures and exhibits. This was the sixth year for this fair, and it consisted of 13 presentations and exhibits from 17 institutes over the three days.

From NICT, Eiichiro SUMITA, Associate Director General of Universal Communications Research Institute, gave a lecture entitled "Realizing a Multilingual Speech Translation System in Society for the Olympics—Global communication project—," and Ryu MIURA, Director of Dependable Wireless Laboratory, Wireless Network Research Institute, gave a lecture entitled "Peer Aware Communication Network that Works Independently from Infrastructure —Network testbed using the Seika Kururin Bus—." There were also a wide range of other lectures introducing the latest research results from nearby businesses, laboratories and administrations as well as trends in the Keihanna region.

There were exhibits in fields such as translation, data analysis, and ultra-realistic communications technologies, as well as communications experiments using the Wideband INternetworking engineering test and Demonstration Satellite "KIZUNA" (WINDS) by NICT Wireless Research Institute. Researchers, technologists, students and residents had a chance to get familiar with the latest research results.

Ceremony

Lecture



Exhibits

Report on "Keihanna Information and Communications Fair 2014 @ The Knowledge Capital" and "'Keihanna' Experience Fair 2014 @ The Knowledge Capital"

As pre-events to the "Keihanna Information and Communications Fair 2014," and in cooperation with local organizations in Keihanna Science City, NICT held the "Keihanna Information and Communications Fair 2014 @ The Knowledge Capital" and "'Keihanna' Experience Fair 2014 @ The Knowledge Capital" events from October 17 to 19, 2014. They were held at the Grand Front Osaka, The Knowledge Capital, which opened last year on the north side of JR Osaka station (Umekita).

At the events, for the first time, NICT presented a special project displaying 3D video of the Bato Kannon, which is a standing statue of a horse-headed Kannon, using a 200-inch multi-view, glasses-free 3D display developed by NICT. The Bato Kannon is an important cultural property that is not normally on public display and resides at the Daianji temple, one of the seven great Nara temples.

Also exhibited were the multilingual speech-to-speech translator application "VoiceTra4U", developed by NICT to build understanding among people around the world, and the application "KoeTora" for supporting hearing-impaired persons.

Auditorium

200-inch 3D image: "Bato Kannon" of Daianji temple

Exhibit area

"VoiceTra4U" and "Koetora" exhibits

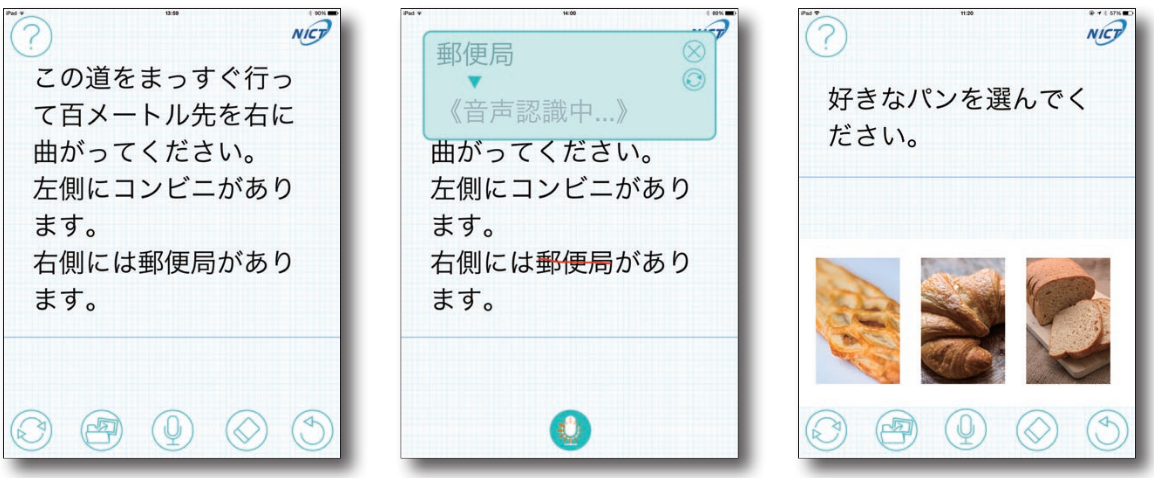
"SpeechCanvas" Released on the App Store: An Application to Convey Speech Information to Hearing-impaired Persons

NICT has developed an application called "SpeechCanvas" for iPad (iOS 6.0 or greater), which automatically converts speech to text in order to help hearing users convey information accurately to hearing-impaired persons. It can be downloaded from the App Store and used free-of-charge.

This application was developed using NICT's highly accurate speech recognition technology. The KoeTora application released last year was mainly to support hearing-impaired users. On the contrary, SpeechCanvas is intended mainly to support hearing users that do not know sign language.

SpeechCanvas…

◆An application that provides powerful support, using speech recognition technology, for conversation between users that are hearing-impaired and those that are not.
◆Spoken words are shown successively in text on the screen, and characters or pictures can be drawn on the screen by tracing them with a finger.
◆Operation is simple and easy, so anyone can use it.
◆Speech recognition is done without an Internet connection, so it can be used reliably anywhere and at any time.
◆It is helpful when obtaining service at public offices or when shopping, and in various other life scenarios in the workplace, at school, or in the home.



Application screen shots

◉ Getting the application: Search for "SpeechCanvas" and download from the App Store.
◉ Support page: http://speechcanvas.nict.go.jp/ (Japanese only)

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