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情報通信研究機構

NICT NEWS

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2

Information and Communication Technology using Brain Information

—Study of brain mechanism of flexible language comprehension—

Aya Ihara

Senior researcher
Brain ICT Laboratory, Advanced ICT Research Institute

National Institute of Information and Communications Technology. After completing a doctoral course of postgraduate school, served as a research fellow in National Institute for Physiological Sciences. Joined NICT in 2005. Has been engaged in research of brain functions for language comprehension. Doctor of health science.

Introduction

Aiming at qualitative innovation of information and communications technology so that people can obtain the information they really want and convey the information they truly want to convey, the Brain ICT Laboratory has been researching and developing information and communications technologies that utilize brain information from brain activities by objectively determining from those brain activities the state and behavior of the human mind while communicating. To make effective use of information, it is essential to understand the information, rather than just receive a lot of information. The brain comprehends language information very flexibly. The flexibility is shown, for example, in the fact that we can fill in the gaps in a conversation from the context even if we occasionally miss what the other person has said. The language information we receive in daily life is often ambiguous, but the brain can interpret the meaning according to the situation (Figure 1). A computer cannot do anything but what is written in its programs; they can only process "if A, then B" information. Flexible information processing that can adapt to various situations is very characteristic of the human brain. This article introduces the results of our research into non-invasive measurement of brain activity*1 and how the brain can so flexibly process and understand language information from the context.

Figure 1●Flexible language comprehension in the brain

Comprehension of ambiguous words

Language contains many homonyms, such as "bank," which can mean a financial institution or raised areas of ground. Words that have multiple meanings are ambiguous because the meaning cannot be determined from the word by itself. If you hear, "I have $10,000 saved up in the bank," however, you immediately understand without ambiguity that "bank" means "financial institution" in this context.

We have been researching how the brain solves the ambiguity of words and narrows down the choices to a single meaning. So far, we have succeeded in capturing brain activity related to activation and the determination of the meaning of ambiguous words using Magnetoencephalography (MEG) *2 (Figure 2), and have discovered that the inferior frontal region of the left hemisphere plays an important role in resolving contextual ambiguity. The results of experiments indicate that the following brain process is used to determine the meaning of an ambiguous word. When an ambiguous word is received, several candidates for the word's meaning are automatically activated, regardless of the context. This bottom-up processing alone does not return a single clear solution. Therefore, about 0.2 seconds after receiving an ambiguous word, meaning processing is initiated in the left frontal region using clues about the context (Figure 3). We call this top-down processing, where meanings inconsistent with the context are repressed and the meaning most appropriate for the context emerges about 0.5 seconds after the ambiguous word is received.

The results support at the brain activity level the multiple access model suggested by research in psychology. The model explains how multiple semantic representations, all of which are candidates here, activate in parallel and then converge into one meaning according to the context. Parallel activation of several candidates from the brain's vocabulary is considered a key mechanism of flexible meaning comprehension.

Recently, we also have been examining the process of language comprehension by stimulating the left frontal region in a non-invasive manner using transcranial direct current stimulation (tDCS) *3(Figure 2).

Figure 2●Magnetoencephalogram (MEG) (Left) and transcranial direct current stimulation (tDCS) (Right)

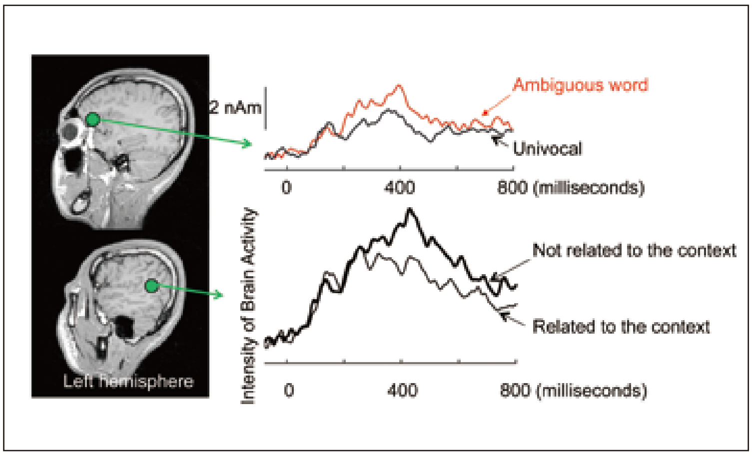


Figure 3●Brain activity when dealing with semantic ambiguity and association with context

Ambiguity processing is triggered about 0.2 seconds after the presentation of a word (top right graph), and then context processing follows shortly thereafter (bottom right graph). This shows that several meaning candidates are activated once during the process of understanding an ambiguous word, regardless of the context.

Understanding the emotion in word

We can easily communicate with each other so long as we can understand the meanings of the words (the language information). For smooth communication, however, it is equally vital to also understand the emotional information. If a child returns home one day saying, “I’ m home” in a bright tone and then, the next day, returns home saying the same words in a depressed tone, the mother receives the words differently even though the words are the same. This is because she senses the emotion in the tone and interprets it using the language information. It is empirically known that emotional information affects how we interpret the meanings of words, but the neural basis is yet to be explained. Therefore, we conducted a magnetoencephalographic experiment to examine the brain process that occurs when understanding a word according to the emotional information.

In this experiment, the subjects listened to a sound uttered with emotion (joyful, sad, or neutral). Subsequently, brain activity was measured as they read the word silently. We then compared what happens after listening to an emotional sound and then an emotionless sound. A difference was seen in the brain activity of the right frontal region about 0.3 seconds after reading the word silently. About 0.1 seconds later, a difference in the brain activity of the left frontal region was noted between a joyful sound and a sad sound (Figure 4). These results show that the frontal regions of both the right and left hemispheres play a key role in language comprehension utilizing emotional information.

The experiment successfully captured different brain activity patterns for the emotional information, even when people hear the same word. The current technology still cannot tell us exactly how people interpret the emotion contained in the information, but an objective evaluation method that provides more detailed emotion about the use of brain information is expected to be developed. The research outcome was picked up in the Nikkei Sangyo Shimbun, Nikkan Kogyo Shimbun, and other media.

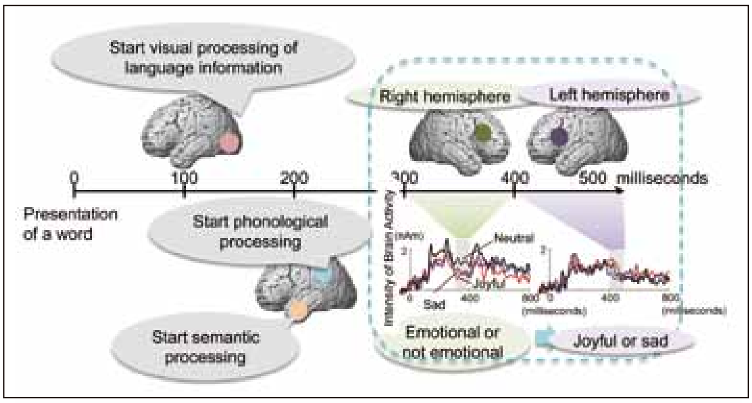


Figure 4●Brain process when understanding words utilizing emotional information

A difference is observed in the brain activity of the right frontal region about 0.3 seconds after the presentation of a word depending on whether or not it contains emotional information, and then about another 0.1 seconds later, a difference is seen in the brain activity of the left frontal region depending on whether the word contains joyful or sad emotional information.

Future perspective

Language plays a central role in communication. Research into the mechanism of how the brain understands language will eventually lead to the development of technology that will help us comprehend and better utilize information. I believe that revealing the mechanism behind how the brain understands language information will lead to the development of a communication interface that can flexibly respond to various situations.

Glossary

＊1 Non-invasive measurement of brain activity
A method of measuring brain activity without a surgical operation and does not produce pain or side effects.

＊2 Magnetoencephalography (MEG)
A technique for measuring weak magnetic fields produced in association with neural activity. Arrays of superconducting quantum interference devices—highly-sensitive magnetic sensors-are placed around the head. The technique allows us to examine brain activity with a time resolution of one millisecond.

＊3 Transcranial Direct Current Stimulation (tDCS)
A technique that uses weak direct current delivered via pad electrodes placed on the scalp. It can temporarily change the excitability at the site of the stimulus.

Understanding Brain Processing during Comprehension of External Information

—Brain activity depends on subject's perspective—

Junko Matsubayashi

Expert Researcher, Brain ICT Laboratory, Advanced ICT Research Institute

After completing a doctoral course, Matsubayashi served as a research resident at the University of Tokyo's Japan Foundation for Neuroscience and Mental Health. Since 2008, she has worked as an expert researcher at NICT on studies related to perception and how the human brain processes visual information, by noninvasively measuring brain activity. Ph.D. (Engineering)

Introduction

When people see something, the visual information projected onto the retina is transmitted to various parts of the brain and eventually we recognize the complex shapes or the movements.

We do not perceive, however, the information coming through the eyes "as is." Illusions are a good way to show how the brain processes visual information (Figure 1). In the example in Figure 1 (a), the light blue square in the middle may appear to be brighter or larger, depending on the background colors. The example in Figure 1 (b) may be hard to perceive unless you pay careful attention (the answer is at the bottom of p. 3). You must have experienced this, looking at something but not seeing it. In the same way, what your eyes actually see differs from what you think you see, and this is where the brain is involved.

Since joining NICT in 2008, I have been researching the relationship between visual perception and brain activity in human using a phenomenon called binocular rivalry. By perception, I mean what you think you' ve seen. Binocular rivalry is a phenomenon in which, when different images are presented to each eye, the subjective perception automatically switches back and forth between the images coming from the left and right eyes, although the images do not change (Figure 2); you see the image from the left eye, and then several seconds later, see the image from right eye, and perception alternates between the two images. This provides an excellent approach to reveal the underlying mechanism of visual consciousness, since subjective perception switches even though the physical quantity of the image projected onto the retina is constant.

A technique called magnetoencephalography (MEG) is used to examine brain activity while the subject is experiencing visual rivalry. MEG detects the weak magnetic field generated by current flowing through nerve cells in the brain using arrays of superconducting quantum interference devices—highly sensitive magnetic sensors—placed around the head. The technique allows us to measure changes of brain activity in milliseconds order.

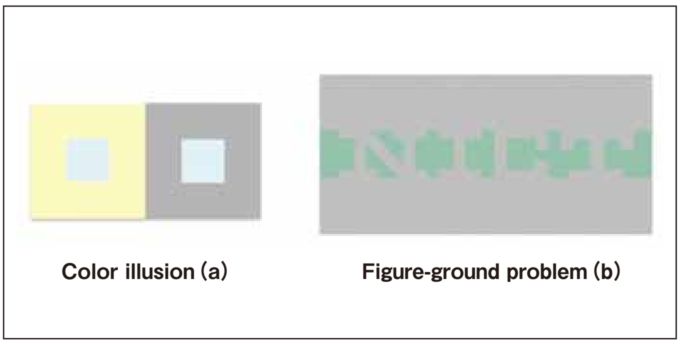


Figure 1●Example of illusion

Binocular rivalry research using magnetoencephalography

I started an experiment using an image presentation device that was completed two years after I joined in NICT. The road was not easy, but I was finally able to present the research outcome. At first, I tried to identify the brain activity during rivalry induced by an image with complex color and orientation (slope angle of oblique line in image), but I was having a hard time obtaining results that would support the hypothesis I had expected. The MEG device also was having problems, so I had to suspend the experiment. I was really frustrated because the situation did not allow me to test improvement measures, but calming myself down, I analyzed from different perspectives the data that I had collected up to that point. I noticed brain activity in our data that had not been reported before. After subsequent analysis, I found that brain activity was enhanced when the visual information presented to each eye is integrated, and also that the brain tends to perceive a patchwork in those areas where both sets of information are blended or mixed (Figure 2 (3) and (4)).

Brain activity associated with the integration of the information presented to both eyes

When I discovered the brain activity, I was using a technique called the frequency tagging approach, which played a key role in the discovery. The frequency tagging approach uses the phenomenon in which, when looking at an image blinking at a certain frequency, the brain activity enhances the same component as the blinking frequency and its harmonics, allowing us to know which perception the measured MEG signals represents. In my experiment, the tagged frequencies are 5Hz and 6Hz, so brain activity of 5Hz and 6Hz is especially enhanced compared to other components (Figure 3). If the brain really works as reported before, when the image blinking at 5Hz is perceived, the 5Hz brain activity (and its harmonics) should be enhanced, and when

The correct answer for Figure1 (b) is "NICT".

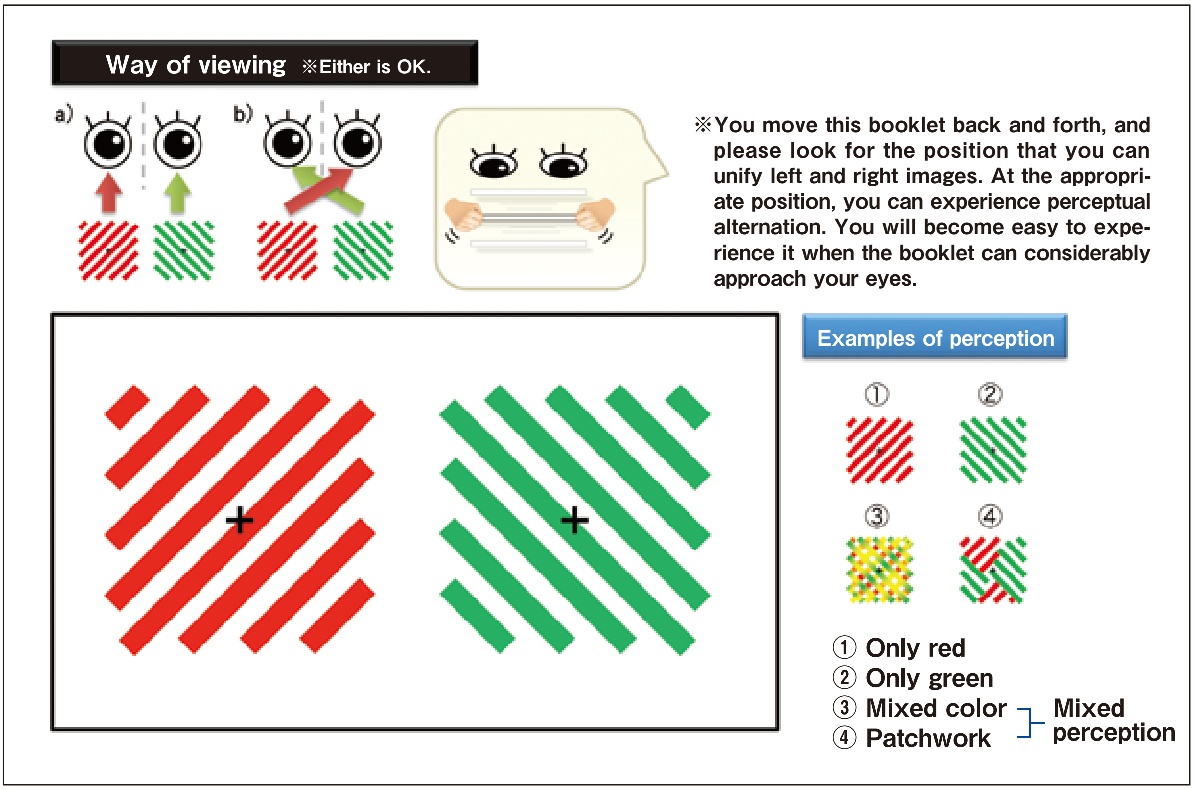


Figure 2●Example of binocular rivalry

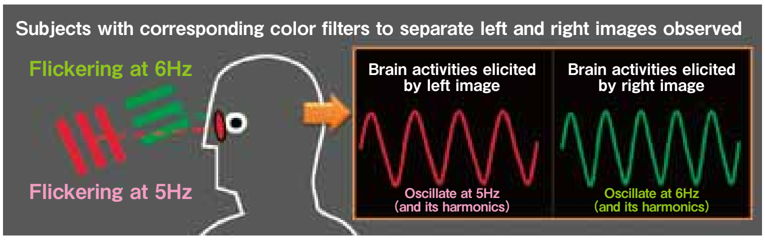


Figure 3●Conceptual diagram of MEG signals enhanced by frequency tagging

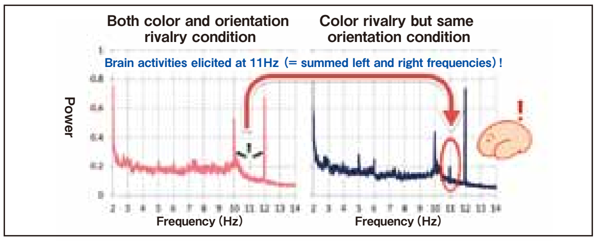


Figure 4●Results of experiment

it is 6Hz, the 6Hz brain activity (and its harmonics) should be enhanced, but I could not confirm such a trend in my experiment. I thought the reason might be that I was targeting color perception, so I considered starting another experiment that wouldn't use colors. But then, through an analysis I conducted before starting the experiment, I discovered 11Hz brain activity that is not tagged.

Furthermore, I discovered that whether or not 11Hz brain activity appears depends on the experimental conditions; the 11Hz brain activity was more enhanced when the orientations were the same and the blended colors were easily perceived, whereas it was less when the orientations were orthogonal and normal color rivalry took place (Figure 4). The fact that the blended colors are perceived means that the brain recognizes the images presented simultaneously to both eyes. On the other hand, to generate 11Hz brain activity, it is necessary to use both the 5Hz and 6Hz frequencies for the right and left images together, and also process them non-linearly, not linearly. (For example, if based on the formula of the sum of the products of a trigonometric function, it needs to be multiplied.) The results show that even though the right and left eyes are actually looking at two different images, if a combined image is perceived, then the brain activities are integrated.

We need to develop further experiments before we can say with certainty that the 11Hz frequency is involved in integrating the perception of both eyes. We are now working on this new challenge.

Conclusion and future challenges

Simply presenting a stimulus to both eyes will not enable the information from both eyes to be perceived. In the same way, simply presenting information of any kind does not mean it will always be perceived by the receiver. From this point of view, aiming at qualitative technical innovation in communications, which is fundamental to the information and communications field, the Brain ICT Laboratory to which I belong has been researching how the brain works—how it receives, understands, and conveys information—using technology that allows us to safely measure brain activity in human.

Current brain research focuses on the brain characteristics that are common among all people. The brain, however, is a source of various behaviors that differ from person to person. Therefore, I believe we must determine the relationship between a person's sense of self or awareness and their brain activity.

(This study won the U35 Encouragement Prize at the 26th Annual Meeting of JAPAN Biomagnetism and Bioelectromagmagnetics Society.)

– Solid, reliable technology that expedites research activities –

Part 1

Prototype Development

Prototyped components that support the frontline of superconducting device research

– Fabricating block for mounting ultra-low temperature signal processing circuits for next-generation SSPD –

■ Researcher who requests prototyping

Shigehito Miki

Senior Researcher, Nano ICT Laboratory, Advanced ICT Research Institute

After completing a doctoral course and serving as a researcher at the Japan Science and Technology Agency, Miki joined NICT in 2005. He has been researching single photon detectors that use superconducting nanowires. Ph.D. (Engineering).

Introduction

Aiming to create a new information and communications device technology, the superconducting device group of the Nano ICT Laboratory, Advanced ICT Research Institute, undertakes optical and electromagnetic quantum devices utilizing superconducting phenomena, fundamental research of circuit technology, R&D of high-speed superconducting single photon detectors in optical communications wavelengths (1,550 nm), and superconducting optical interfaces, as well as applied research in quantum information and communications and ultrafast photonic networks. Superconducting devices, our research subject, are usually cooled to less than 4K using various ultra-low temperature refrigerators, but the operating environment required for each superconducting device depends on the type and application of the device. Therefore, it is imperative to establish different operating environments that will work at an ultra-low temperature in the limited space inside a refrigerator in order for us to persue the R&D. The problem, however, is that the ultra-low temperature refrigerator is surrounded by a vacuum case, so we cannot peek inside once the cooling process starts. Moreover, an ultra-low temperature environment presents unique phenomena that differ greatly from those at room temperature, so we must follow a process of trial and error until we can achieve the ideal operation environment. We are currently establishing such an operating environment using components fabricated for us by the Prototype Development team.

Most of those components are used in ongoing research projects, so I cannot introduce all of the cases here, but I would like to share some of them with you, especially those that have already born fruit.

Prototype Example

Superconducting single photon detectors (SSPD[*1]) can operate with higher sensitivity, at a higher rate, and with lower dark counts than conventional semiconducting photon detectors. These features allow the new detectors to play a key role in various fields, not just quantum optics/quantum information and communications technology, but also space communications, biomedical, semiconductor LSI inspection, and near-infrared radar application. This raises expectations that the detectors will lead to the discovery of new phenomena and innovative technologies. We successfully developed a general-purpose multi-channel SSPD system and applied it to a Tokyo quantum key distribution (QKD [*2]) network and other applications. Right now, we are proceeding with R&D on a next-generation SSPD that will maximize the SSPD's potential performance.

As a core technology for the next-generation SSPD, we are focusing on ultrafast signal processing technology using Single Flux Quantum (SFQ[*3]) circuits. SFQ circuits allow the signals coming from several SSPD elements to be processed at an ultrafast pace (over several tens of GHz). Therefore, the block on which the SFQ circuits are to be mounted should have several coaxial connector ports that can pass high-frequency signals with low loss. In addition, the SFQ circuits must be installed along with the SSPD elements in the limited space inside a refrigerator, so the mounting block must be as small as possible. We asked the prototype development team to fabricate the small mounting block shown in Figure 1. Thirteen high-frequency connectors with a diameter of 3 millimeters are installed in an area of just 30 mm × 30 mm × 5 mm. The use of the prototype enabled us to install prototype SFQ and SSPD inside a refrigerator, as shown in Figure 2, which made us the first in the world to succeed in verifying SSPD operation using SFQ signal processing circuits. The results was published in the journal, Applied Physics Letters, and selected as an important paper in the application superconducting field by the Virtual Journal of Applications of Superconductivity (Nov. 2011).

We are also using a group of components that the prototype development team fabricated for us to create an operating environment for various superconducting device studies. For example, Figure 3 is a photo of the inside of a dilution refrigerator for measuring superconducting quantum bit elements; most of

Many research activities at NICT require parts that cannot be found in the market. Such parts must be made in-house. "Prototype Development", one of the services offered by the R&D Activities Support Office of the Outcome Promotion Department, is meeting these needs by fabricating the parts that researchers require. This article is the first in a four-part series on the achievements of Prototype Development from the researchers' viewpoints.

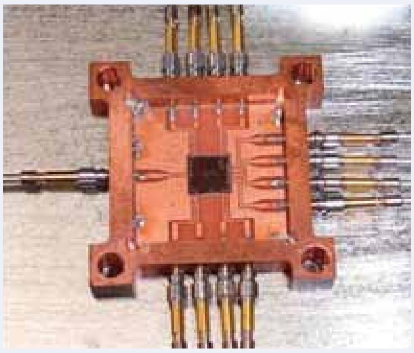


Figure 1●Small block for mounting SFQ circuits

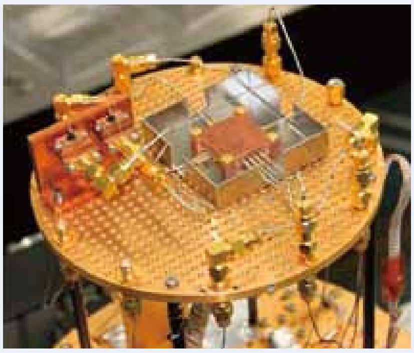


Figure 2●SFQ circuits mounted in an ultra-low temperature refrigerator

Figure 3●Superconducting quantum bit measurement environment in a dilution refrigerator

the components were created by the prototype development team. Our current R&D activities make maximum use of those components.

Conclusion

To be honest, the superconducting device group of the Nano ICT Laboratory knew about the prototype development service offered at NICT Headquarters (Koganei city, Tokyo), but our group is doing research in the Advanced ICT Research Institute (Kobe city, Hyogo), far from headquarters, so we had not used the service until about 2 years ago. Through our first experience in using the service, we learned that it was possible to have thorough discussions with the prototype development staff, even though we were not in the same place. Since then, we have requested them to create a considerable number of components, especially from the superconducting project. All of the components are effectively utilized in the frontline of our R&D activities. In Not just in the case introduced here, but in other R&D fields, as well, it is vital to materialize ideas as they occur to you. The prototype development service, which allows us to do that internally, gives us a great edge. We will continue to conduct research with the help of the prototype development team and other relevant departments engaged in manufacturing.

■ Glossary

*1 SSPD
Superconducting Single Photon Detector

*2 QKD
Quantum Key Distribution

*3 SFQ
Single Flux Quantum

■ R&D Activities Support Office

Junichi Komuro

Expert, R&D Activities Support Office, Outcome Promotion Department

As mentioned above, the prototype requests from the group are mostly for ones that are very small and complexly shaped and require precision work, so we use numerically-controlled machine tools, such as a milling machine and wire electric discharge machine, to process them. The primary material we use is oxygen-free copper, so we must be careful not to break or damage thin tools, including end mills and taps. In addition, as the material tends to deform to a greater extent during processing, we process it after annealing it so that we can minimize deformation.

On the site of prototype development, we keep on hand several thicknesses of annealed oxygen-free copper plates so that we can quickly respond to a prototype request.

It is also imperative to keep up with the latest technologies, since machining technology, equipment, and tools evolve over time. Our greatest motivation is to see the prototypes we've worked hard to design and fabricate being utilized in research and experiments, leading to better research outcomes.

Prize Winners

Prize Winner ● Hobiger Thomas / Researcher, Space-Time Standards Laboratory, Applied Electromagnetic Research Institute

◎Date：2011/7/5

◎Name of Prize：

FELLOW OF IAG

◎Details of Prize：

Dr. Hobiger was named Fellow for his highly evaluated contribution to the International Association of Geodesy (IAG) from 2007 to 2011

◎Name of Awarding Organization：

The International Association of Geodesy

◎Comments by the Winner：

It is a true honor to be a fellow of the International Association of Geodesy. I would not have reached this without the generous support and guidance from many senior associates. I would like to take this opportunity to express my deep gratitude.

I continue my research in the field of space-time and try to expand NICT's footprint in this field.

Prize Winner ● Tatsuya Yamazaki / Research Manager, Planning Office, Universal Communication Research Institute

Joint Prize Winners：

Masato Eguchi (NTT Communications Corporation)
Takumi Miyoshi (Shibaura Institute of Technology)
Kyoko Yamori (Asahi University)

◎Date：2011/7/14

◎Name of Prize：

Research Award of the Technical Committee on Communication Quality

◎Details of Prize：

Structuring Relational Models between Users' Situation Factor and Their QoE Evaluation

◎Name of Awarding Organization：

Technical Committee on Communication Quality of IEICE

◎Comments by the Winner：

The paper has been regarded as especially excellent research among the 89 papers published in 2010 by the Technical Committee on Communication Quality of IEICE. The paper demonstrates that users have different QoE (Quality of Experience) evaluations, even under the same delay conditions, depending on their situation factors, using one of the covariance structure models. I believe it will allow us to control the service quality as it is actually experienced by users. I would like to express my deep appreciation to the co-authors and all persons concerned.

Prize Winner ● Shunsuke Yoshida / Expert Researcher, Ultra-realistic Video Systems Laboratory, Universal Communication Research Institute
Hiroshi Ando / Director, Multisensory Cognition and Computation Laboratory, Universal Communication Research Institute

Joint Prize Winners：

Sumio Yano, Former Research Expert with NICT (currently with NHK Science & Technology Research Laboratories)

◎Date：2011/7/14

◎Name of Prize：

Excellent Paper Award

◎Details of Prize：

Glasses-free Tabletop 3D Display Using Light Field Reproduction for Omnidirectional Viewing

◎Name of Awarding Organization：

3D Image Conference 2010

◎Comments by the Winner：

We received the award for our research on a glasses-free 3D display, which presents 3D images on a table where nothing actually exists. The 360° image can be viewed without wearing special glasses. The highest evaluation was given to the idea that no display device is placed on a table, as well as the implementation method of the software and hardware to make that happen. Taking the award as great boost, we will be further committed to our R&D activities in a bid to improving the image quality and putting it to practical use.

From left, Hiroshi Ando, Shunsuke Yoshida

Prize Winner ● Shinobu Ishigami / Research Manager, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute
Kaoru Gotoh / Senior Researcher, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute
Yasushi Matsumoto / Director, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute

Joint Prize Winners：

Masashi Yamada (Sony Corporation)
Haruki Kamiya (Canon Inc.)
Masamitsu Tokuda (The University of Tokyo)

◎Date：2011/8/18

◎Name of Prize：

2011 Richard Schultz Transactions Prize Paper Award

◎Details of Prize：

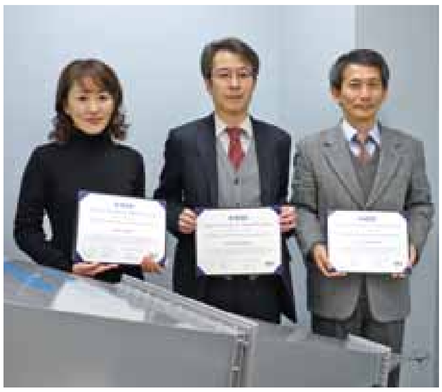
The paper titled "A New Method of Interference Evaluation Between an Ultrawideband System and a Wireless LAN Using a Gigahertz Transverse Electromagnetic Cell" is selected to the 2011 Richard Schultz Transactions Prize Paper Award, which is an award for the best paper published in IEEE Transactions on Electromagnetic Compatibility in 2010

◎Name of Awarding Organization：

IEEE Electromagnetic Compatibility Society

◎Comments by the Winner：

The paper is a collective accomplishment of the research outcome produced through the communications system EMC projects, opening up the new application field of evaluating the interference between broadband wireless communications systems using a GTEM cell, which is originally used for electromagnetic compatibility tests on electronic equipment. We are truly honored, especially to know that we are the second group in Japan to receive the award. We would like to thank the co-authors engaged in the research and everyone who kindly gave us guidance and support. The award gave us great encouragement and we will continue to proceed with research.



From left, Kaoru Gotoh, Shinobu Ishigami, Yasushi Matsumoto

Prize Winner ● Shouhei Kobayashi / Senior Researcher, Bio ICT Laboratory, Advanced ICT Research Institute

◎Date:2011/9/2

◎Name of Prize:

Encouragement Prize

◎Details of Prize:

In recognition of the excellent presentation titled "Analysis of cellular mechanism to sense foreign DNA using microbeads incorporated into living cells" at Symposium 2011 on Antisense, Gene, and Delivery

◎Name of Awarding Organization:

Symposium 2011 on Antisense, Gene, and Delivery

◎Comments by the Winner:

The interface technology that connects living cells and artificial materials holds the potential to not only develop bio-inspired information and communications technology, but also expand into a wide variety of fields, such as drug delivery. The award is recognition of our success in revealing how living cells recognize the biological/non-biological hybrid materials incorporated into them, with high spatial and temporal resolution using correlated light and electron microscopy. I would like to extend my deepest gratitude to everyone who has supported me.

Prize Winner ● Morio Toyoshima / Director, Space Communication Systems Laboratory, Wireless Network Research Institute

◎Date:2011/9/14

◎Name of Prize:

Distinguished Contributions Award of Communications Society

◎Details of Prize:

In recognition of great commitment in the operation of Communications Society as a research expert member and significant contribution to invigorating academic interaction

◎Name of Awarding Organization:

Communications Society, the IEICE

◎Comments by the Winner:

I had the honor of being involved in planning and organizing domestic study clubs and international conferences as an assistant secretary and secretary of the Technical Committee on Space, Aeronautical and Navigational Electronics (SANE), Communications Society, the IEICE, for three years from 2008. The area of expertise ranges widely as a system technology centering on observation, communications, and navigation, which afforded me truly valuable opportunities to interact with many researchers from various fields. I would like to express my deep appreciation to all concerned from the academic society and technical committees who kindly supported me during the activities.

Prize Winner ● Komei Sugiura / Expert Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute
Naoto Iwahashi / Expert Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute
Hideki Kashioka / Director, Spoken Language Communication Laboratory, Universal Communication Research Institute

◎Date:2011/9/29

◎Name of Prize:

IROS 2011 Robocup Best Paper Award

◎Details of Prize:

Motion Generation by Reference- Point-Dependent Trajectory HMMs

◎Name of Awarding Organization:

RoboCup Federation

◎Comments by the Winner:

It is a great honor for our paper to have been selected as one of the seven papers to receive an award at IROS. IROS is one of the biggest international conferences in the field of robotics, and has accepted 790 papers, an acceptance rate of 32%. We are proud to have received the RoboCup Best Paper Award. We would like to thank Dr. Yutaka Kidawara, Director General of the Universal Communication Research Institute, for his continual guidance, and all the laboratory members for their generous support. This great honor will inspire us to continue our work and collaboratively create innovative systems.

From left, Naoto Iwahashi, Komei Sugiura, Hideki Kashioka

Prize Winner ● Takanori Senoh / Expert Researcher, Ultra-realistic Video Systems Laboratory, Universal Communication Research Institute

◎Date:2011/10/17

◎Name of Prize:

Commendation of Industrial Science and Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry for 2011 Industrial Standardization Work

◎Details of Prize:

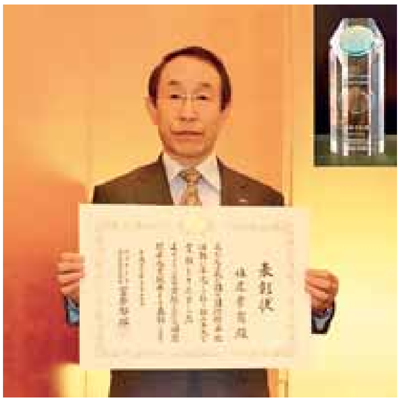
Leadership and enormous contributions to international standardization activities in Japan

◎Name of Awarding Organization:

Industrial Science and Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry

◎Comments by the Winner:

The award was granted to me in recognition of over twenty years of contributions to the standardization activities of the ISO/IEC's MPEG standard, which is used in digital broadcasting, optical discs, cell phones, etc. I could not have received the award without the warm understanding and support of many people that helped me continue working on the standardization activities. I would like to extend my sincerest gratitude to everyone. It would be a great honor if I could contribute my humble efforts to the further prosperity of the country through technological development and its standardization activities.



Report on Science and Technology Festa in Kyoto 2011

NICT participated in the Science and Technology Festa in Kyoto 2011 held December 17 and 18, 2011, at the Kyoto International Conference Center. The event was held to raise the interest of participants, especially young people, in science technology through lectures and exhibitions introducing Japan's cutting-edge science technology.

NICT exhibited the Dagik Earth, a four-dimensional digital globe that was jointly researched and developed with Kyoto University, the National Museum of Nature and Science, Shizuoka Science Museum, and Shizuoka University. Dagik Earth is an system to express the globe by projecting images on a spherical screen with a projector. It can also display animated images of the changes in the earth's environment. This time, we made it extra exciting by using a sphere 2 m in diameter, which is taller than most people's height. To rotate the globe and conduct other kinds of operation, we used a balance board (a familiar controller used in home-use game consoles) that is controlled by weight-shifting. Therefore, even small children were able to learn in a matter of minutes how to operate the four dimensional digital globe.

Figure 1●Children and students freely rotating the globe by shifting their weight

Our exhibition was well-received in its familiarity by a wide range of participants. The exhibition seemed to have helped them feel a bit more familiar with science about the earth environment.

We received many inquiries from people involved in education about the use of the Dagik Earth for educational purposes.

We not only displayed the earth and other astral bodies on the globe, but also ran a movie of atmospheric waves spreading in a wavelike form from near the epicenter, which was observed in the ionosphere in the wake of the 2011 off the Pacific coast of Tohoku Earthquake, in order to demonstrate the visualization of NICT's observation and research results.

Figure 2●Explaining how atmospheric waves spread

NICT will further enhance the use of this technology, such as for the visualization of research and observation results.

For more details on Dagik Earth, please visit:
http: //www.dagik.net/english/

Support for exhibition:
Dagik Team, Integrated Earth Science Hub, the Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University

The Dagik Earth project is jointly researched by Kyoto University (Graduate School of Science/Faculty of Science and Informatics), the National Institute of Information and Communications Technology, the National Museum of Nature and Science, Shizuoka Science Museum, and Shizuoka University. The system and educational program are being developed with by special coordination funds for the promotion of space development and utilization offered by the Ministry of Education, Culture, Sports, Science, and Technology between FY 2009 and FY 2011.

Report on Public Symposium: "Utilization of Remote Sensing Technology Aiming to Minimize Weather Disasters"

Mamoru Ishii, Director, Planning Office, Applied Electromagnetic Research Institute
Shinsuke Satoh, Research Promotion Expert

●In the venue of the symposium

NICT and ICT Forum for Security and Safety held a public symposium, "Utilization of Remote Sensing Technology Aiming to Minimize Weather Disaster," on Wednesday, January 18, 2012, at the International Convention Hall of the Osaka Chamber of Commerce and Industry. Along with the launch of test operations of a next-generation Doppler radar (phased-array weather radar) this Spring at Osaka University's Suita campus, the R&D activities for which were jointly promoted by NICT, Toshiba Corporation, and Osaka University, the conference was held to promote more effective needs-seeds matching by providing an opportunity for municipality officials who are potential users of the weather radar, as well as data users, and radar developers to come together. We also introduced the Polarimetric and Interferometric Airborne Synthetic Aperture Radar (SAR), considered to be effective for observing the mountainous area of Wakayama prefecture that was hit hard by typhoon No. 12 last September, and Doppler Lidar, which can measure a wide range of wind distributions with high resolution. We discussed promoting the utilization of those technologies in the private sector to reduce the impact of disasters.

The symposium started with the organizer's greeting from Toshio Iguchi, Director General of Applied Electromagnetic Research Institute, followed by the guest greeting from Masaaki Nozu, Director-General of the Kinki Bureau of Telecommunications, Ministry of Internal Affairs and Communications.Then, Eiichi Nakakita, Professor at the Disaster Prevention Research Institute Kyoto University (DPRI), gave the keynote,"Localized Torrential Rain and MP (multi parameter) Radar of the Ministry of Land, Infrastructure, Transport and Tourism." Yoshita Koyama, Osaka District Meteorological Observatory, Japan Meteorological Agency, then gave a lecture on heavy rainfall in Osaka, and Masahito Ishihara, Director of the Acerological Observatory, Japan Meteorological Agency, talked about the expectations for new radars. Fumihiko Mizutani of Toshiba Corporation, and Tomoo Ushio, an Associate Professor at Osaka University, spoke about the development of and the verification experiments for phased array weather radars, respectively. As a speaker from NICT, Seiho Uratsuka, Director, talked about Polarimetric and Interferometric Airborne Synthetic Aperture Radar, and Motoaki Yasui, Director, gave a lecture on Doppler Lidar. Panel discussions subsequently were held with the persons concerned from the Kinki Regional Development Bureau, the Ministry of Land, Infrastructure, Transport and Tourism, and the Bureau of Construction, Kobe City, and others about the limitations of existing radars and the expectations for new radars, and the utilization of remote sensing for disaster prevention. With over 190 participants, the audience actively asked questions and offered comments. To wrap it up, Director General Iguchi proposed holding a tour after construction of the radar is completed. The symposium ended on a high note, attracting attention to further development in the future.

We would like to express our sincere appreciation to everyone who helped organize the symposium, including those from the Kinki Bureau of Telecommunications, the Ministry of Internal Affairs and Communications, and the Kinki Information Communication Conference.

●Panel discussions

For more details about the program and lectures, please visit
http: //ictfss.nict.go.jp/osaka2012/

ICT MentorPlatform
http://www2.venture.nict.go.jp/
PROGRAM2011

Announcement of the 14th Conference for Information and Communications Venture Business Plans 2011

No participation fee

The Conference for Information and Communications Venture Business Plans has been held since 2002. The 14th conference will be held March 7, 2012 at Nikkei Hall in Tokyo. We have received many applications for business plans; those passed the selection will get the chance to be presented.

People in information and communication venture companies, considering starting an information and communication company, as well as being involved in information and communication venture companies, who are interested in presentation of business plans or exhibition of products and services, are welcome to attend the conference.

Date / Venue

Wednesday, March 7, 2012

NIKKEI Hall
3F NIKKEI Building 1-3-7 Otemachi Chiyoda-ku, Tokyo JAPAN, 100-8066
http://www.nikkei-hall.com/access/index.html

Schedule (subject to change)

12:00～	Reception, Opening
13:00～	Greeting
13:05～	Panel discussion I
13:45～	Outline of the conference
13:50～	Business plan presentation (five companies)
	(10-minute Intermission)
15:05～	Panel discussion II
15:35～	Business plan presentation (five companies)
16:40～	Presentation by previously participating company
	(10-minute intermission)
17:00～	Announcement of contestants for Entrepreneurs Koshien
17:20～	Award ceremony
	(Grand Prix, Award for Excellence, and Key Firm Award)
17:35～	Information exchange party

For application / contact

Please visit the website for the Information and Communications Venture Support Center.
http://www.venture.nict.go.jp/event/bp

Information for Readers

The next issue will take up security measures for networks that are diversifying and becoming increasingly complicated, and the research being undertaken to enhance light communications infrastructure.

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4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795, Japan
Tel: +81-42-327-5392 Fax: +81-42-327-7587
E-mail: publicity@nict.go.jp
<NICT URL> http://www.nict.go.jp/

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