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NiCT

Smooth Reconstruction of Rapid Movements From Brain Activity

A Large Step Toward a Dexterous Brain-Machine Interface

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Hiroshi Imamizu is the group leader of biological group of Kobe Advanced ICT Research Center, and the director of Cognitive Mechanisms Laboratories in Advanced Telecommunication Research Institute (ATR). His research interest includes systems neuroscience and experimental psychology. He has investigated neural mechanisms in human brain underlying flexible sensorimotor learning and dexterous tool usage, and its application to telecommunications. He received his B.S., M.S., and Ph. D. degrees in Psychology from University of Tokyo. He was an invited researcher in ATR Human Information Processing Laboratories, the leader of Computational Psychology Group in Kawato Dynamic Brain Project, Japan Science and Technology Cooperation, a senior researcher in ATR Human Information Science Laboratories, and the head of Department of Cognitive Neuroscience of ATR Computational Neuroscience Laboratories. He is a visiting associate professor in Graduate School of Frontier Biosciences in Osaka University.

Background

Brain activity-based human movements reconstructing technology is attracting interest as a basic technology for brain–machine interface. Masa-aki Sato, Director, ATR Neural Information Analysis Laboratories of the Advanced Telecommunications Research Institute International (ATR) and we have successfully reconstructed swift hand movements (movement time approximately 0.4 sec) from brain activities obtained by noninvasive measurement in a smooth way (at intervals of 0.02 sec). For the first time, the present research has demonstrated the successful reconstruction of natural and smooth movements at high precision, without the need of training the user, by efficiently extracting the brain information relative to hand movements from the natural brain activities exhibited during daily exercise. This performance is considered to pave the way for BMI to be widely used as a natural and easily applicable interface not only for medical purposes but also for general information and communications.

Mainly researchers in the United States succeeded in reconstructing movements from brain activities by using an invasive method of inserting electrodes into the brain. However, the danger involved in surgical operations and the fear for viral infection have led to the promotion of studies using brain activities measured by noninvasive approaches. As a conventional, noninvasive method, manipulation of the computer cursor with brain waves is well known, which requires a long period of training the users so that he or she can generate brain wave patterns that can readily be picked up by the computer. Reconstruction of fast movements without the need of training has indeed been the case in the past. However, that case had to use the signals measured by a sensor installed outside the head without processing, and thus there was no way of knowing where the signals had been generated, resulting in the difficulty in effectively extracting the brain activities related to hand movement.

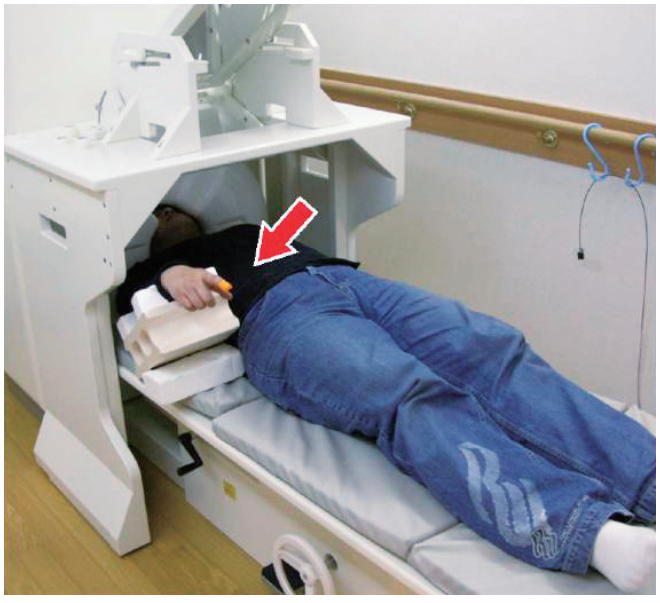


Figure 1●A view of experiment with MEG equipment. The arrow mark points the tip of a forefinger.

Experiments and analyses

In this study, we have presumed (reconstructed) the fingertip position at time intervals of 0.02 sec from the brain activity while a human being is swiftly moving the fingertip in various directions. To measure the brain activities related to fast movements, we used magnetoencephalography (Figure 1) that enables the measurement at a high temporal resolution. Magnetoencephalogram (MEG) is a device to detect a minute variation in magnetic field generated by neural cell activity. However, since MEG measures the magnetic field by using sensors installed outside of a head, the point where a received signal is generated cannot be exactly determined. Similarly, since a sensor signal received comprises a variety of signals generated from different portions of a brain (Figure 2A), each brain activity related to a hand movement cannot efficiently be singled out. Accordingly, we assumed a function (inverse filter) that converts a sensor signal into a current signal on the surface of a brain (Figure 2B). For the inverse filter computation, we used the "hierarchical variational Bayesian method" developed by the Director Sato. This method can compute the cortical current (indicated with an orange arrow mark in Figure 3) that is the source of a signal from a sensor at precision of a few millimeters by additionally using the data of functional magnetic resonance imaging (fMRI) that can measure the variation of a cerebral blood flow with excellent temporal resolution. Use of the cortical current covered by this method allowed us to expect the successful

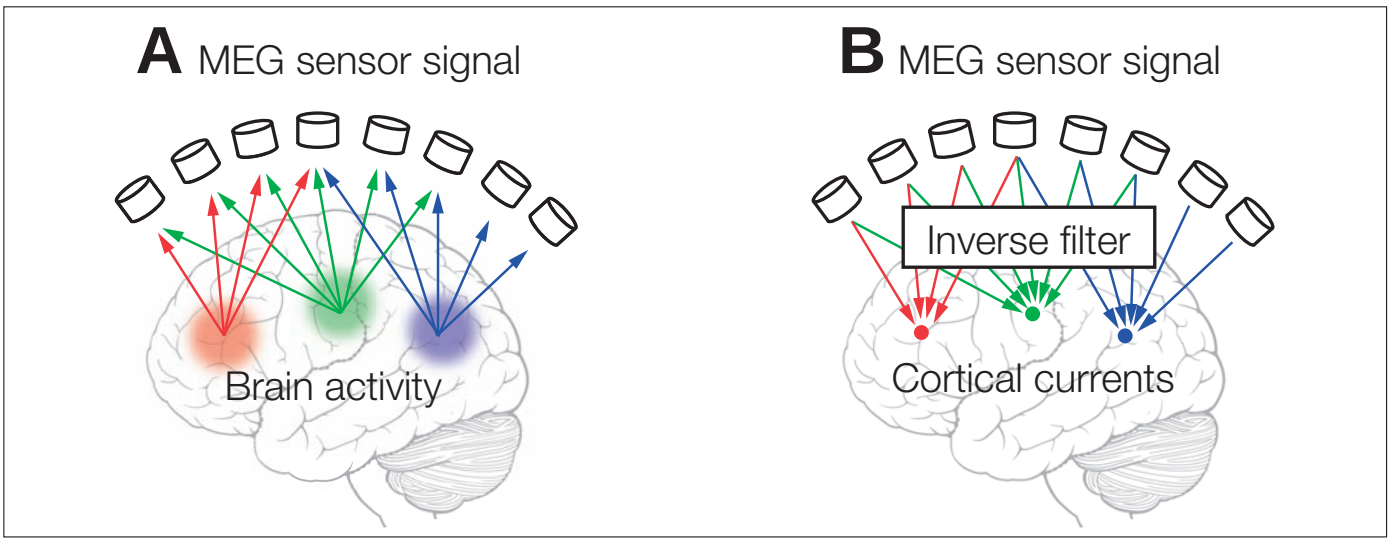


Figure 2●Each MEG sensor signal comprises brain activity signals from various portions (A). The inverse filter serves for assuming brain activities from sensor signals (B).

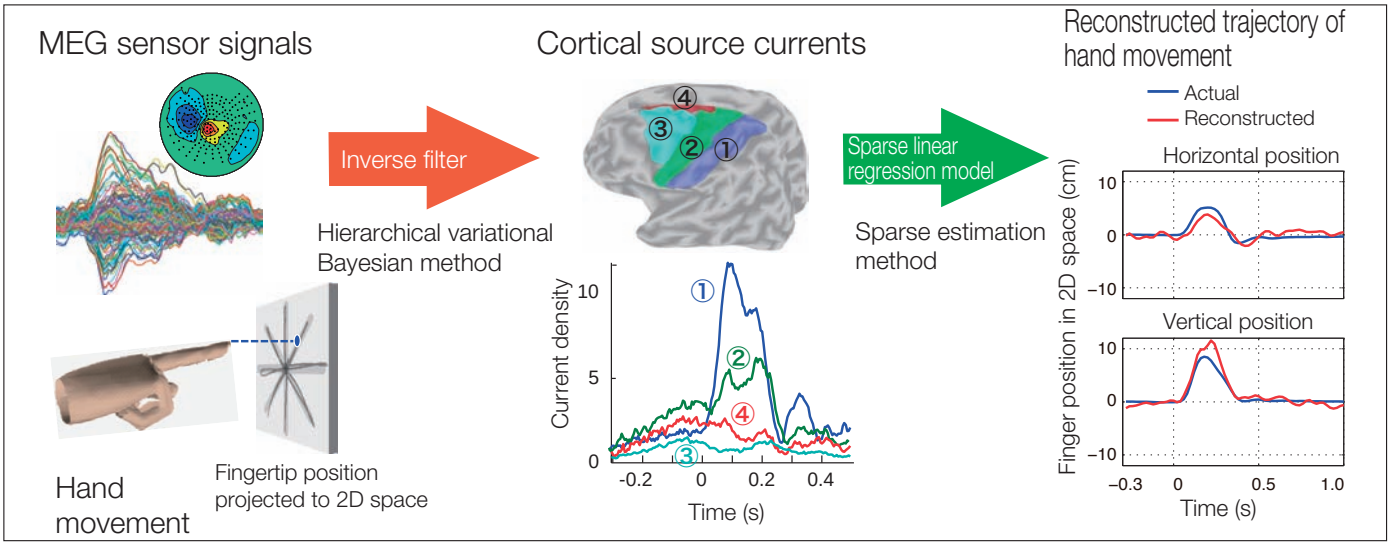


Figure 3●Overview of the approaches for reconstructing hand and fingertip movements from brain activities

reconstruction of movements at high precision by selectively extracting the signals related to hand movements. In fact, as we made use of the "sparse estimation" that was developed by Director Sato to select important elements of cortical current and to predict the fingertip position by referring to the weighted sum of the selected cortical currents (linear prediction model, the green arrow mark in Figure 3), we were able to predict the positions at higher precision than that by using the bare sensor signals as such.

Significance of this study

Conventional noninvasive BMIs have mostly been either identifying the type of movement from a brain activity pattern or, out of several targets, predicting which target the hand would reach, and thus very few cases would reconstruct the swift movement of a human being. In contrast, by smoothly reconstructing swift movements, the user can have enhanced domination and manipulation feelings as if he or she "is manipulating by him/herself." These feelings are indispensable typically when controlling a robot arm from a remote location.

Future Perspective

In this study, we have analyzed brain activities and conducted the reconstruction on an off-line basis, and now we plan to develop the real-time system for the movement reconstruction. Similar methods have potential applications of reconstructing from the brain activities in a stage of imaging or even before actually moving the hands, and thus those methods are expected to trigger the development of the interface for manipulation by mere intending to do something. Information terminals in these days involve increasingly complicated operation, consequently causing persons unable to master the operating methods to be away from information, and the society will end up with the so-called information divide in society. Thus, the interface that will allow a user to operate machine simply by intending to do something is considered to a substantial contribution to solving the above-mentioned problem.

The elemental technologies used in this study, "hierarchical variational Bayesian method" and "sparse estimation" are part of the results of the contract study "brain activity measuring technology through integration of a plurality of modalities" conducted by the ATR Neural Information Analysis Laboratories and sponsored by NICT.

Discovery of a Bio-mechanism That Breaks Barriers with Minimal Energy

Toward Implementing Molecular Communications

Tokuko Haraguchi

Executive Researcher

After acquiring a doctorate degree in 1985 (Ph. D., The University of Tokyo), she stayed at the University of California during 1985–1991 as a doctorate researcher; then in 1991, she entered the Communications Research Laboratories (CRL) (NICT at present), and ever since, has been engaged in the development of live-cell imaging method of and studies on cell structures. Since 1996 to present, she has concurrently been entitled as a visiting professor at the Graduate School of Science, Osaka University. In 2005–2007, she was Affiliate Professor at the National Institute of Genetics, Research Organization of Information and Systems. Since 2008 to present, she has concurrently been entitled as a visiting professor at the Graduate School of Frontier Biosciences, Osaka University, associate editor of the international academic journal CSF, Advisory Committee member of the Japan Society for Cell Biology, Advisory Committee member of the Japanese Society of Electron Microscopy for Medicine and Biology (JSEMTMB), and Committee member of Science and Technology Conference of Hyogo Prefecture.

Cells Constitute an Excellent Natural Molecular Communication System.

Cells resemble an autonomously operated city. What take parts in the urban functions are the well-developed physical distribution as well as information and communication systems. Similarly to an urban area, cells have networks of physical distribution as well as information and communications networks to facilitate the flows of substances and information. While automobiles and electric cars facilitate physical distribution where the means of communication is signals through radio waves and wires, the media used by cells for information flow are proteins, nucleic acids, and lipids. By using these molecules for transporting materials and exchanging information, the cells can autonomously repair and reproduce broken parts to adapt to the environment for survival. Cells are thus considered to form an excellent communication system that can actually work free of power.

Control of Molecular Transportation into a Cell Nucleus

In a cell, DNA, which carries genetic information, is packed in a compartment called the nucleus. A variety of signals from outside and inside a cell are carried into the nucleus and used for the reproduction and mapping of DNA information. Then, how is the transport of substances into the nucleus carrid on? In the special double-membrane structure called nuclear envelope , there is a porous structure with innumerable pores, each having a diameter of approximately 40 nanometers (Figure 1). The entire transportation of materials into the nucleus is effected through these pores. The porous structure called nuclear pore complex functions as a barrier restricting the transportation of information molecules into the cell nucleus, while proteins with a molecular weight greater than approximately 60 kDa (spherical protein with a diameter of approximately 5 nanometers) cannot freely pass through the pores. For these proteins to pass through the pore, they must be directly or indirectly coupled with either importin ß or exportin that plays the role of a truck. A cargo protein that is bound with importin ß is transported from the cytoplasm to the nucleus, while another cargo protein that is bound with exportin is transported from the nucleus to the cytoplasm. The direction of transport is determined by the nucleotide (GTP or GDP in this case) binding protein called Ran. GTP-bound form of Ran exists predominantly within a nucleus, while GDP-bound form exists predominantly in a cytoplasm. This biased localization of GTP- or GDP-bound Ran determines the direction of transport by changing a binding property of truck protein to the cargo, although the chemical difference between GTP and GDP is no more than a single phosphate residue. This mechanism ensures that a specific molecule is exclusively transported in the right direction, the nucleus or the cytoplasm.

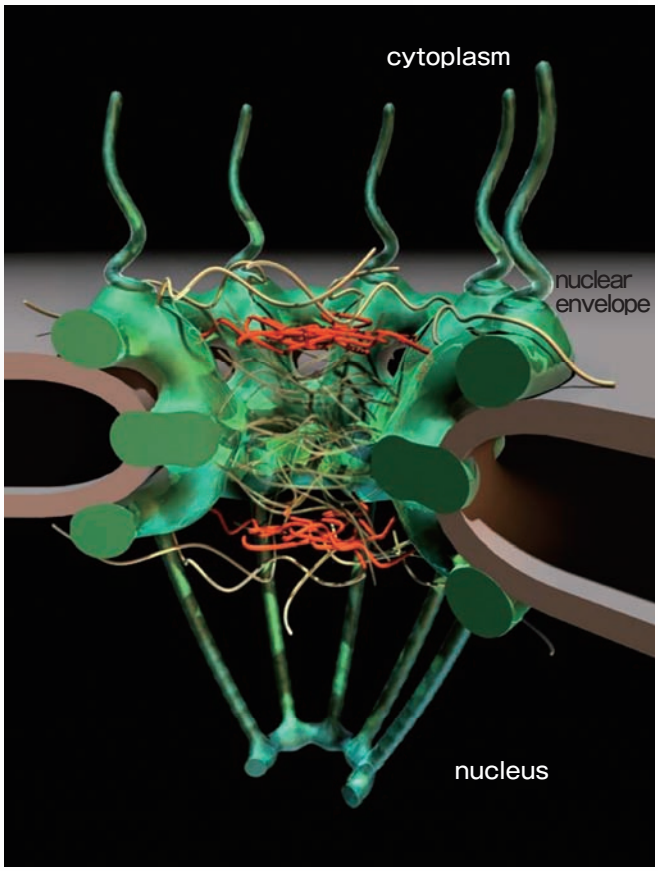


Figure 1●Nuclear pore complex
A porous structure observed in the nuclear envelope (in a sheet form). This structure selectively allows specific substances to pass through the channels. In each channel through which a substance passes, proteins in a spaghetti-like form (red and yellow) with an elastomeric consistency exist and constitute a hydrophobic gel.

Discovery of a Mechanism That Varies the Nuclear Envelope Permeability

The nucleus and the cytoplasm around it are clearly separated from each other by the nuclear envelope. However, in the case of higher animals or plants, the nuclear envelope collapses in the process of cell division, and after chromosomes are split into two halves, it is reformed around the chromosomes. Since the partition between the nucleus and the cytoplasm disappears during this period, the components of each are mixed together. In contrast, living organisms such as yeast maintain the structure of their nuclear envelope and the nuclear pore complex even in the process of cell division. Thus, the function of the nuclear envelope as a barrier has been considered to remain totally unchanged. In our research using fission yeasts, on the other hand, we found a phenomenal fact. In a particular period during meiosis*1, even though the structure of the nuclear envelope and that of the nuclear pore complex remains unchanged, the selective protein transport function was interrupted and the substances outside and inside the nucleus migrated and intermingled as if the nuclear envelope had disappeared (Figure 2).Since there was no physical change of the nuclear envelope, we name this phenomenon "virtual nuclear envelope breakdown" (Reference 1). This phenomenon was attributed to the transfer of a protein called RanGAP1*2 into the nucleus. Thus, the intrusion of a single molecular species gives an effect equivalent to that of the nuclear envelope breakdown, even if none of other energy-consuming methods is employed. Since meiosis is a mode of fission that takes place when nutrition is depleted, any method that requires ample energy cannot be called rational. In that sense, causing a "nuclear envelope breakdown" simply by the transfer of RanGAP1 is indeed a clever approach.

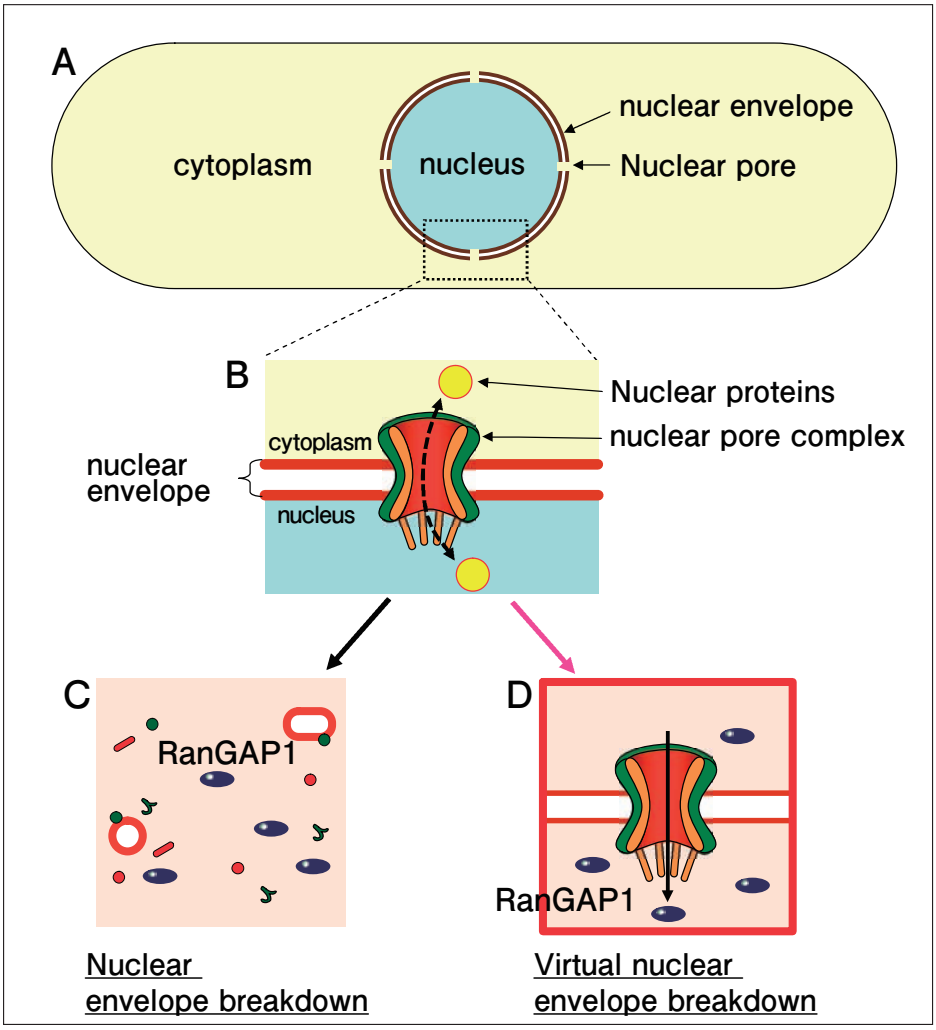


Figure 2●Nuclear envelope breakdown and "virtual nuclear envelope breakdown" in the process of cell division
A. Conceptual illustration of a cell. Nucleus is in the middle, nuclear envelope covers the nucleus, the gaps in the nuclear envelope are nuclear pores, and the substance other than the nucleus is cytoplasm.
B. Magnified view of the peripheral area of a nucleus pore. The structure in the middle is the nuclear pore complex. Double lines denote the nuclear envelope. Yellow circles indicate the substance transferred to the nucleus.
C. Nuclear envelope breakdown observed in the cell division period of higher-order animals and plants. Temporary breakdown of both nuclear envelope and nuclear pores causes the substances inside and outside the nucleus to mix together. Orange circular lines represent the fragmented pieces of a nuclear envelope, blue circles denote the RanGAP1, and the small circles and lines indicate the fragmented pieces of a nuclear pore complex.
D. Virtual nuclear envelope breakdown found in fission yeast. While maintaining the structure of nuclear pore complex, the selective substance transporting function is interrupted for in- and outward nucleus mass-transfer and mixing. The RanGAP1 that is normally found in the cytoplasm moves into the nucleus.

Toward the Molecular Communications Technology

This discovery indicates that when cells are on the verge of survival (nutritional depletion), a method requiring high-energy costs can be autonomously replaced with an energy-saving method, and thus part of the flexible information processing mechanism of life is revealed. Sending only a single type of protein molecules into the other side of a dissepiment successfully nullifies the physical barrier effect pertaining to the dissepiment. This piece of knowledge suggests that the molecular communication can generate a great output by giving a minimal input, and thus can contribute to the application to the development of the communication technology that employs molecules.

Reference:

1）Asakawa H, Kojidani T, Mori C, Osakada H, Sato M, Ding DQ, Hiraoka Y, Haraguchi T, Virtual breakdown of the nuclear envelope in fission yeast meiosis. Curr. Biol. 20, 1919-1925, 2010.

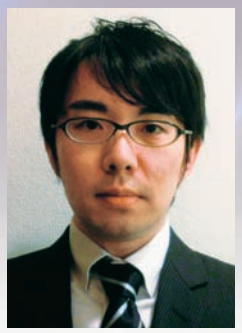
Terminology

*1 Meiosis
This is a form of cell division occurring during genital cell formation. At a single time of chromosome reproduction, cell division (first meiosis and second meiosis) occurs twice to form a genital cell having a half number of chromosomes (the original number of chromosomes is recovered when fertilization occurs). While a large number of living organisms reiterate the breakdown and reformation of the nuclear envelope at every cell division, certain living organisms are found to resume the division without breaking the nuclear envelope during second meiosis.

*2 RanGAP1
RanGAP1 is an abbreviation of "Ran GTPase activating protein 1". It is a type of protein, having a function to activate a GTP-binding Ran (protein) by hydrolyzing the thus bound GTP into GDP.

New-Generation Optical Access Architecture Based on WDM-direct

—To Provide High-Speed and Diversified Network Services —



Takaya Miyazawa

Researcher, Network Architecture Group, New Generation Network Research Center

He received Ph.D. degree from Keio University in 2006. From April 2006 to March 2007, he was a visiting researcher at the University of California, Davis, USA. In April 2007, he joined NICT. He has been engaged in researches on optical network architecture.

Background of the Study

With the increasing demand for high-speed access to the Internet, the number of subscribers to the "fiber-to-the-home" (FTTH) connection services has increased, exceeding 17 million at the end of 2009, and is predicted to increase further.

Of the customarily called optical access networks essentially consisting of the line from the Optical Network Unit (ONU) of a subscriber to the Optical Line Terminal (OLT) of a provider, the Gigabit Ethernet-Passive Optical Network (GE-PON) occupies the mainstream. In this system, about several tens of the optical fiber lines from subscribers are treated as a unit and put together at a remote node (an optical coupler)*1, and the remote node and the OLT are connected with a single optical fiber. Since a plurality of users shares a band on that single optical fiber and the OLT dynamically assigns a band on a time axis to each subscriber, the best-effort*2 traffics such as web-site browses and e-mail transfers can be efficiently achieved.

Regarding the new-generation networks assumed in the decade of 2020 and later, services quality must be secured for such challenging demands in the upcoming applications requiring the Gigabps to Tera-bps high-speed and real-time (specifically, grid computing, cloud, online games, remote medical treatments, ultra-high-definition video transmission, etc.) in addition to the current best-effort services. Since we assume that the GE-PON and its extension systems in the sense of transfer rate will not be competent to meet the above-mentioned requirements, we have carried on the design of optical access architecture from scratch.

"WDM-direct",the Key Concept of the New Generation Optical Access

Optical access networks include two topological types, namely, the passive double star type represented by GE-PON and the single star type (Figure 1). Here in this paper, we introduce the single star type architecture. The single star type can provide each user with different services by laying a dedicated optical access line and can upgrade each one discretely. Moreover, its line signal loss is less than that of passive double star type; consequently, it is advantageous in long-distance applications. Thus, we believe that the single star type is topologically effective for the new-generation optical access.

The new-generation optical architecture employs a concept called WDM-direct. WDM-direct is a concept to directly connect multiple wavelengths to each ONU. Simultaneous data transmitting and receiving by using multiple wavelengths (wavelength groups) via each ONU not only facilitates the high-speed network access,

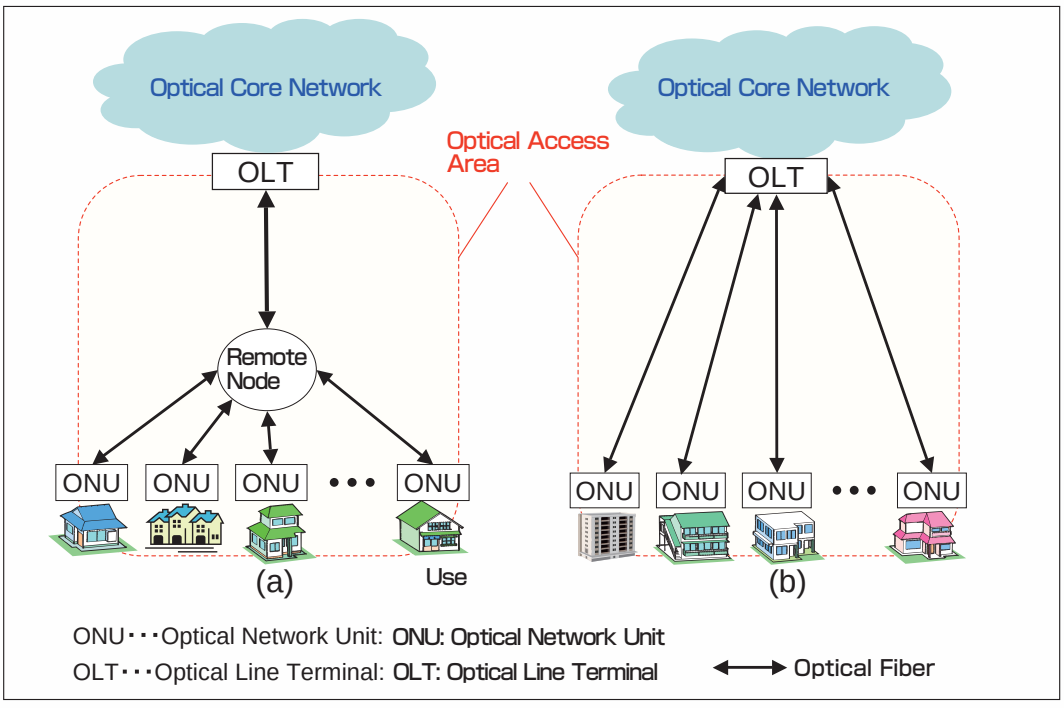


Figure 1●(a) Passive double star type optical access network; (b) Single star type optical access network

but also provides the users with the conventional bandwidth-shared services that transmit best-effort data in specific wavelength groups and simultaneously provides the users with bandwidth-guaranteed services in other wavelength groups, and is expected to contribute to the creation of new applications and new type of business.

Conceptual Design and Demonstration Test

The packet data transmitted via the bandwidth-shared services are first subjected to the optical-electrical conversion at the OLT and then transferred along the optical core network by using the bandwidth-shared protocol. For the data on the bandwidth-guaranteed services, single optical path*3 or, if required, two or more optical paths are established between a transmission source user to a receiving user through the optical core network. Then, the data are transferred on the established single or multiple optical paths (Figure 2). One of our original ideas is that we will attempt the effective use of bandwidths by transmitting the control messages for lightpath establishment as a packet data by using a wavelength group for bandwidth-shared services. We have so far conducted a series of experimental demonstration of a 25 km-long single star type new-generation optical access system (Figure 3). In the OLT, MEMS*4 optical switch is controlled in accordance with the bandwidth reservation control message for lightpath establishment received from each ONU, and for each wavelength signal, packet transmission and optical path transmission are switched, and thus the feasibility of switching of services was verified.

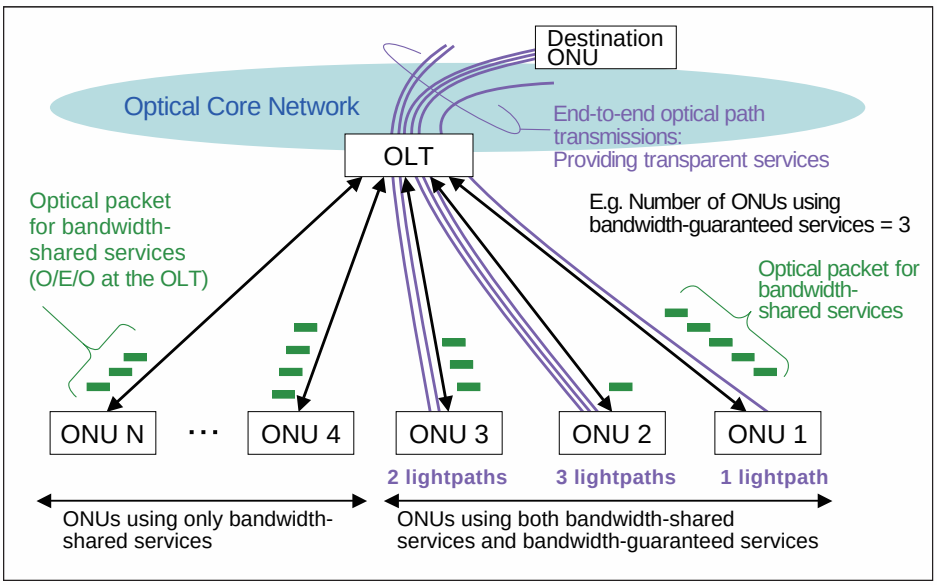


Figure 2●Conceptual design of the single star type optical access

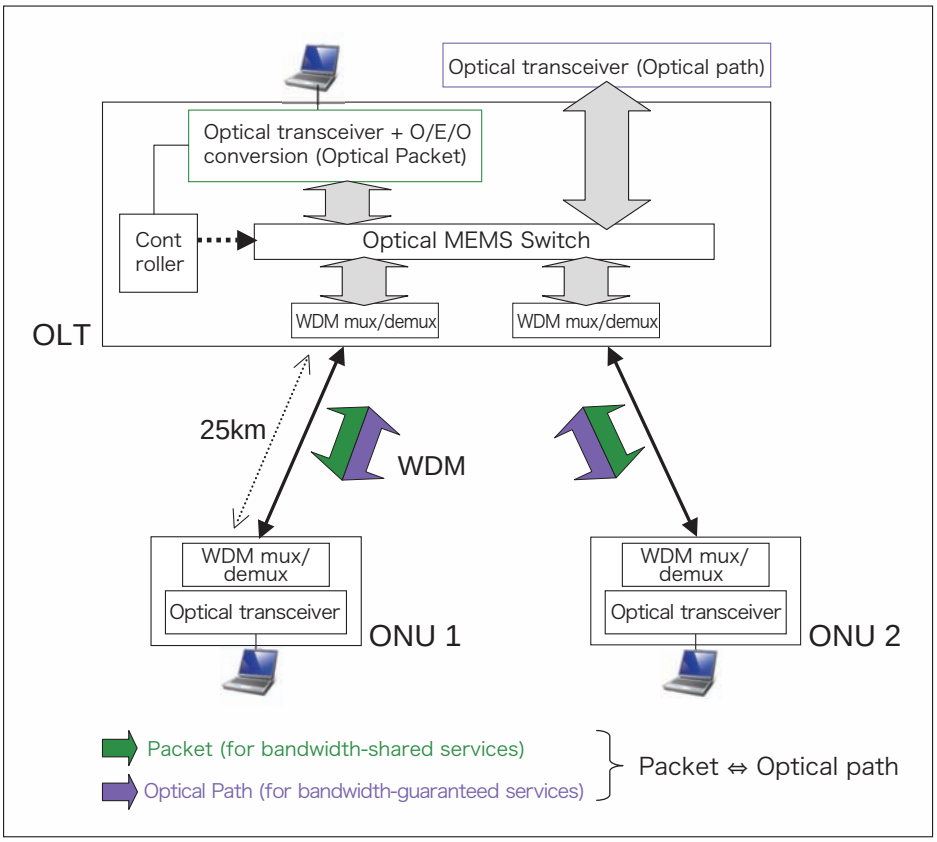


Figure 3●Schematic illustration of experimental demonstration configuration

Toward the Integration of Optical Packets and Optical Paths Also in Optical Core Network

We have achieved the design of the architecture to provide both the bandwidth-shared services by packet transmission and the bandwidth-guaranteed services by path transmission in the optical access network, and conducted the experimental demonstration for the verification of principles in advance. Currently, we are promoting the research and development on optical core network technologies that can provide both optical packet switching and path switching on the common fiber infrastructure and under the unified control interface. We are conducting designing architecture, development of node prototype and control systems, and performance evaluation of various characteristics by using an experimental network. To enhance the commercial applicability of our research results, we will continue to upsize facilities, upgrade control protocol functions, and further expand the common use of hardware.

Terminology

*1 Optical coupler
A device that splits a single optical signal into a plurality of signals and combines a plurality of signals into a single optical signal

*2 Best-effort
Whereas communications quality is not guaranteed, good faith efforts will be made to provide the results that are as close as possible to the required quality.

*3 Optical path
An optical communication channel that occupies a bandwidth between transmitting and receiving ends

*4 Micro-electromechanical system (MEMS)
A system combining minute mechanical structure of micrometer scale and electrical functions

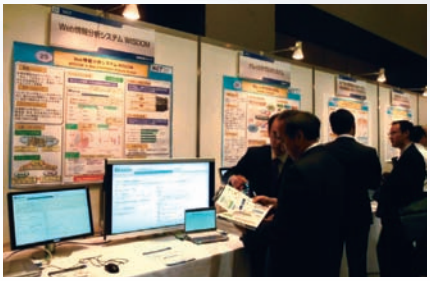
Report On the Keihanna Information and Communications Research Fair 2010
-Touch the Future!-

Keihanna Research Laboratories of NICT are based in Keihanna Science City and carrying on the research and development of "universal communication", that is, establishing a system to allow everyone to handle a wide variety of information anywhere, anytime, and with anyone. During the 3 days from November 4(Thu.) to 6(Sat.), NICT and associated organizations jointly held a community-based event called "Keihanna Information and Communications Research Fair 2010" with the objectives to publicize research results and strengthen the mutual collaborative ties.

○Knowledge Creating Communication Research Center

The Knowledge Creating Communication Research Center addresses the research and development of the multi-language translation system to overcome language barriers, the vocal dialog processing technology to realize the communication by "hearing" and "talking", and the information analysis technology to extract the essential and reliable pieces of information from overwhelming information in the world. The multi-language voice translation system VoiceTra allows the user to get the vocal output in other languages of his or her speech that is input in the automatic translation system through the smart phone. At present, the system can handle traveling conversations in five different languages. At its exhibition booth, officers of foreign consulates in Osaka experienced the system's performance. Additionally, the VoiceTra is being offered for free downloading via iPhone (until end March, 2011). Similarly, the web information analyzing system WISDOM helps the user to retrieve reliable and valuable information by automatically extracting things like "who" describes "what" and "how" and by displaying them in a readily understandable way. The advantageous point that desired information can be reviewed from multi-faceted views eliminating any prejudice has been widely accepted.

Members of the Forum with Kansai Consulates-general experienced the multilingual voice translation system.



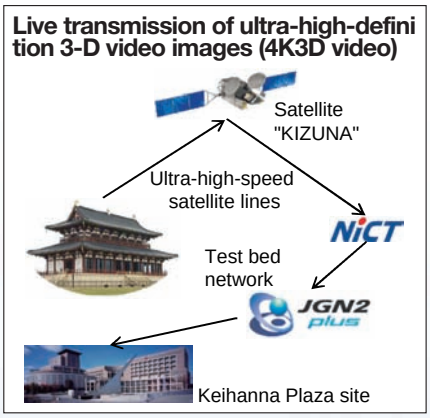
The web information analyzing system WISDOM that is useful for objective information analyses

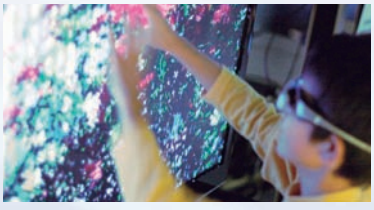
○Universal Media Research Center

The Universal Media Research Center, conducting researches and developments in ultra-realistic communication technology, aims to enable individuals separated in time or space to feel like they are sharing the same sensations.

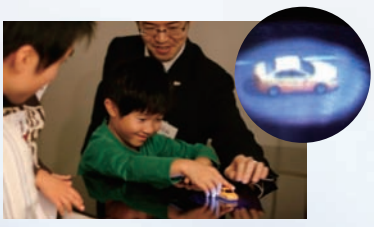
A live experiment was conducted to demonstrate the transmission of ultra-high-definition (Hi-Vision) 3-D video images (4K3D video) of the scenes of the commemorative event for the 1300th anniversary of Nara Heijo-kyo Capital through the ultra-high Internet satellite (KIZUNA) and the test bed network "JGN2plus".We succeeded a large number of people experience the "supernatural" feeling by demonstrating the stereoscopic video images that can be enjoyed without using special eyeglasses, the stereophonic sounds to give natural feeling to everyone by adjusting the size and form of his or her head and ears, and the multi-feeling interaction system that allows a user to get a tactile impression even though he or she is not really touching the object.

Ultra-high-definition three-dimensional video images (with the video images for left and right eyes overlapped)





Flowers look easy to hold!



Comparing a floating stereo-image with the actual object

○Research Results Presentation Meeting

At the research results presentation meeting held on Friday, November 5, Executive Directors Nakamura and Inoue gave a brief overview, then the group leader of each research promotion group gave lecture on the summary of research results gained in the current medium term plan (fiscal years 2006 through 2010). The question and answer sessions were carried out in an enthusiastic atmosphere.

Satoshi Nakamura, Executive Director of Knowledge Creating Communication Research Center(Director General, Keihanna Research Laboratories)

Naomi Inoue, Executive Director of Universal Media Research Center

Kentaro Torisawa, Group Leader

Eiichiro Sumita, Group Leader

Hisashi Kawai, Group Leader

Yutaka Kidawara, Group Leader

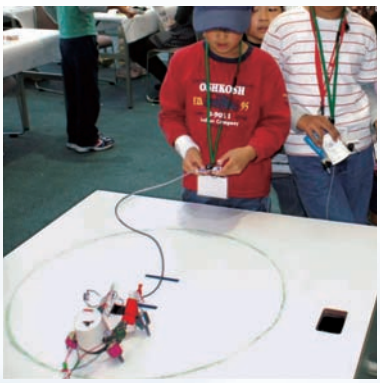
Hiroshi Ando, Group Leader

Taiichiro Kurita, Group Leader

A scene from a Q&A session

○Keihanna Childrens' Craft Workshop

On Saturday, November 6, the Keihanna Research Laboratories held a children's craft workshop with the support of the Conference for the Promotion of Collaboration among Business, Academic and Government, Keihanna Science City. In the craft workshop for making Sumo Robot, children installed motors that work as feet on both sides of a paper cup assumed to be the body to make the robots, which can play pushing sumo wrestling by adeptly adjusting the rotation of each motor. Children painted their favorite pictures on the body, and when finished, they began the sumo wrestling. In front of the sumo ring, a queue was formed for the turn of each sumo robot. In the Radio Receiver Craft Workshop, the children and their parents were taught how to apply soldering and assemble the receiver units, by specialists who came from Nippon-bashi, the electrical appliances street in Osaka. Although it involved a bit of hard work, there were smiling parents and children at the workshop listening to broadcast programs through the receiver units made by them.



Sumo Robot Craft Workshop

Radio Receiver Craft Workshop

Okinawa Subtropical Environment Remote-Sensing Center — Open House

The open day was on the Labor Thanksgiving Day, Tuesday, November 23, when good climate, without fear of typhoons, could be enjoyed by families. Open house was usually held during the summer vacation when children with their parents could participate as visitors. For this time, as we organized "Children's Science School" in the large conference room, mainly the primary school students and their parents attended and enjoyed.

On the roof of Onna Center building, children and their parents experienced the measurement of rainfall with a specially prepared tipping-bucket rain gauge.

Visitors listening to the explanation on the principle of shortwave marine radar.

Exhibits on board of a radio wave monitoring vehicle presented by the Okinawa Office of Telecommunications, Ministry of Internal Affairs and Communications. A hands-on guidance for the build-up of radio receivers was given by using electronic blocks.

A big helium gas-filled balloon for weather observation which was exhibited at the entrance hall attracted a great deal of interest from children.

Events at Children's Science School

Scientific Craft Workshop
"Let's make an anemoscope and an anemometer. Measure the direction and velocity of winds" .

Scientific Experiment Show:
Visitors enjoying the demonstration titled"measuring the characteristics of waves by using radio waves".

Scientific Experiments Class
For the topic of "Let's find out what clouds are", visitors en joyed sketching clouds on the lawn around the entrance of Onna Center building.

Prize Winners

Prize Winner ● **Kiyoshi Hamaguchi** / Group Leader, Medical ICT Group, New Generation Wireless Communications Research Center
Yozo Shoji / Senior Researcher, Space Communication Group, New Generation Wireless Communications Research Center
Hiroyo Ogawa / Managing Director, Research Promotion Department

Joint Prize Winners : Ryutaro Egawa
Eiji Suematsu(Sharp Corporation)
◎DATE : June 15, 2010
◎NAME OF THE PRIZE : **The Meritorious Award on Radio**
◎DETAILS OF THE PRIZE :
Subject of Award:In recognition of their contribution to the effective use of radio waves, specifically, the development and standardization of 60 GHz band MMIC modules and other devices for millimeter-wave video transmission systems as well as the verification of the high durability and reliability through long-term outdoor tests and the commercialization activities.
◎NAME OF THE AWARDING ORGANIZATION :
Association of Radio Industries and Businesses

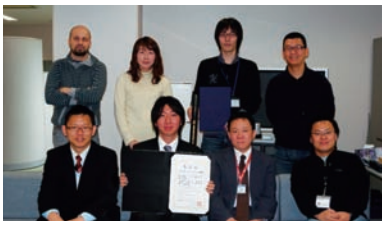
◎Comments by the Winner :
I feel greatly honored that The Meritorious Award on Radio was given to the "development and commercialization of millimeter-wave video transmission system". I understand that our series of achievements in the effective use of radio waves have been recognized, specifically, the development of the 60 GHz band MMIC modules and other devices, the contribution to ARIB and ITU-R standardization, and the verification of the high durability and reliability through long-term outdoor tests as well as commercial applications. Taking this opportunity, we would like to express our sincere gratitude to every person who guided us. We will further contribute to the R&D by fully utilizing the knowledge and experiences so far obtained through the past systems development efforts.

Left: Takashi Kawamura, chairman (at the time), Kiyoshi Hamaguchi, Hiroyo Ogawa, Ryutaro Egawa, Eiji Suematsu

Prize Winner ● **Junsoo Kim** / Guest Researcher, Hokuriku Research Center
Takashi Okada / Guest Researcher, Hokuriku Research Center
Junya Nakata / Research Expert, Hokuriku Research Center
Yasuo Tan / Invited Advisor , Medical ICT Group, New Generation Wireless Communications Research Center

Joint Prize Winners : Yuta Kiyoumi
(Japan Advanced Institute of Science and Technology)
◎DATE : June 17, 2010
◎NAME OF THE PRIZE : **2009 Internet Architecture Research Award (Technical Committee on Internet Architecture)**
◎DETAILS OF THE PRIZE :
A task allocation method considering resource availability for providing services to Home Network Environment
◎NAME OF THE AWARDING ORGANIZATION :
Technical Committee on Internet Architecture, IEICE Communications Society

◎Comments by the Winner :
We are very much honored that the paper regarding our ongoing research that took place within the collaboration of the Hokuriku Research Center and the Japan Advanced Institute of Science and Technology under the supervision of Professor Tan has been selected for the Internet Architecture Research Award. We would like to keep working on this research in order to make foundations of home network architecture in the future.


Back row, third from left: Takashi Okada, Junsoo Kim
Front row, second from left: Yuta Kiyoumi, Yasuo Tan, Junya Nakata

Prize Winner ● **Yukio Yamanaka** / Group Leader, Electromagnetic Compatibility Group, Applied Electromagnetic Research Center

◎DATE : June 25, 2010
◎NAME OF THE PRIZE : **IEC1906 Award**
◎DETAILS OF THE PRIZE :
In recognition of his technical contribution in the development of a second edition of CISPR17 and for contributions on radiated emission measurement uncertainty in the frequency range above 1 GHz.
◎NAME OF THE AWARDING ORGANIZATION :
International Electrotechnical Commission

◎Comments by the Winner :
This award has been named after the International Electrotechnical Commission (IEC) that was established in 1906, and since 2004, it has been given to an individual who has contributed to international standardization. Personally, I have been engaged in the activities in the CISPR (International Special Committee on Radio Interference) where the limits and measurement methods for radio-frequency disturbance of all types of unintentional radiators are developed. I am greatly indebted to the guidance and support offered by the people concerned both in Japan and abroad as well as those in the organizations of NICT and EMC-net. I would like to thank all of them by taking this opportunity.

Prize Winner ● **Takeshi Takahashi** / Researcher, Traceable Secure Network Group, Information Security Research Center

◎DATE : September 10, 2010
◎NAME OF THE PRIZE : **Best Paper in Track**
◎DETAILS OF THE PRIZE :
Ontological Approach Toward Cybersecurity in Cloud Computing.
(Author: Takeshi Takahashi, Youki Kadobayashi, Hiroyuki Fujiwara)
◎NAME OF THE AWARDING ORGANIZATION :
International Conference on Security of Information and Networks

◎Comments by the Winner :
We are carrying on the study of ontology as a basis for the discussion and deployment of cybersecurity operations, and this time, we presented our research results on the ontology and the evolving direction of the security under the cloud environment. The results of our study were evaluated, and thus we have been honored with the Best Paper in Track for the "Management and Models of Security and Integrity".
Since the subject ontology has been built up in collaboration with the actual security providers both in Japan and abroad, not only the academic aspect but also the value in realty of the subject is highly evaluated. Concurrently, we are exerting our efforts for the standardization activities for this ontology itself.

2010 Information and Communications Venture Business Plan Contest

NiCT

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The Information and Communications Venture Business Plan Contest has been held since 2002, and this is the 13th one. A number of business plans have been submitted for this time, and those selected by the review will be announced. Participation of people from venture companies, those attempting to establish an operation in the information and communication fields, and those who are related to venture companies in the information and communication fields, who would attend the "business plan presentation meeting" and would visit the "products and services exhibition",will widely be welcomed.

Date:

Tuesday, January 25, 2011, at noon

Program (Provisional)

12:00	Registration, opening of exhibition
13:00	Opening messages
13:10	Keynote speech
	Lectures given by knowledgeable academics in ICT field
14:00	Presentation of business plans (10 firms or so)
	(Break, 10 minutes)
17:00	Presentation by companies participated in the past
17:30	Announcement of the best business plans
17:45	Information exchange meeting (open until 18:30)

Note: This program is subject to change due to unforeseen matters.

Place:

The Grand Hall

Shinagawa Grand Central Tower, 3rd floor, 2-16-4 Konan, Minato-ku, Tokyo 108-0075

Contact for Registration and Enquiries

Please visit the web site of Information and Communications Venture Support Center, NICT:

http：//www.venture.nict.go.jp/

Information for Readers

The next issue will feature the space weather forecast with an interview and research reports.

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