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Automatic Translation Technology for Patent Documents

–We are conducting research on high-quality automatic translation technology of patent documents, which supports avoiding patent infringement and lawsuit risk of Japanese products–

SUMITA Eiichiro

03

The world's first TV White Space WiFi Prototype based on the IEEE 802.11af Draft Standard developed

MIZUTANI Keiichi / LAN Zhou / HARADA Hiroshi

Automatic Translation Technology for Patent Documents

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SUMITA Eiichiro

Director, Multilingual Translation Laboratory, Universal Communication Research Institute

He has been engaged in research and development related to machine translation and e-learning.
Ph.D. (Engineering)

1. Introduction

Lincoln, the 16th US President, once said, "the patent system added the fuel of interest to the fire of genius."

If it were not for patent systems, others would have easily stolen inventions. The patent system grants inventors exclusive rights to an invention and protects those rights over a certain period. In order to produce and sell a product, it is necessary to conduct research to make sure that your product is not infringing another person's patent. If you fail to do so and commit infringement, you will be sued and pay a large amount of compensation.

Patent systems are based in each country where applicants must apply to a country's government in that country's language such as Japanese in Japan, Korean in Korea, and Chinese in China. However, with our globalizing economy, for example if a Japanese business wants to export a product to China, they must research Chinese patents. With China being the world's second largest economy, it is crucial for Japanese companies to develop their businesses in China. At the same time, Chinese patent applications have recently soared making China the current world leader in patent applications. In fact, infringements and intellectual property suits are increasing in China[1]. Unfortunately, because the number of Chinese-to-Japanese translators is limited, human-based translation is costly and time-consuming. Therefore, the development of a high precision, automatic translation system for Chinese patent documents has become an urgent challenge.

2. Bilingual Corpus-based Automatic Translation Technology

Dramatic advancements in memory capacity and hardware processing speed as well as advancements in the amount of text and dictionaries accumulated in computers have led to technology that automatically constructs knowledge based on bilingual corpus (a collection of pairs of translation and its original sentence). The use of bilingual corpus has become a major methodology for research in automatic translation. NICT is already realizing multilingual translation systems in areas of travel conversation/e-commerce and achieving high quality translations[2].

In this method, (1) the establishment of a technique that economically accumulates bilingual corpus in a short amount of time is important because we understand that when bilingual corpus accumulates over a certain amount, translation quality hits an applicable level and that the larger the amount, the higher the quality becomes. Also, (2) we know that the performance difference based on algorithms is large even in data amounts equivalent to bilingual corpus, therefore research on good algorithms that realize high accuracy with provided data is important.

3. Important Research Challenges within Patent Translation

Translating documents for patent application is extremely difficult. In fact, the pricing for patent translation is considerably higher than translation for other areas.

One of the reasons is because the length of one sentence is extremely long, thus making translation difficult and allowing more room for errors. The second reason is that there is an enormous amount of technical terminology and no bilingual dictionary that adequately covers it all, thus requiring humans to understand specialized knowledge behind the original content. Moreover, Chinese and Japanese grammars are completely different (without being too specific, Chinese grammar is close to English grammar; Chinese and Japanese word order are completely different). Therefore, translation accuracy with conventional Chinese-to-Japanese automatic translation technology was low (like the conventional technologies A~C shown in table 1, the output of nonsensical translations is fairly common).

Table 1●Example of a patent document in Chinese and its translation

Original in Chinese	图一是表示应用本发明的车用发动机的传感器设置结构的发动机一的整体结构的图
Conventional Technology “A” Translation	図はちょっと本発明した車を応用することを示してエンジンでのセンサーであり構造のエンジンの1の全体構造の図を設置します(The figure shows the slight application of the invented car and sets a figure of the overall structure of 1 of engine’s construction with a sensor.)
Conventional Technology “B” Translation	本発明の最初の車は、図の全体的な構造を提供するエンジンセンサーのエンジンの構造に適用されます(The first car of the invention is applied to the structure of engine’s engine sensor that provides the overall structure of the figure.)
Conventional Technology “C” Translation	図は1つは応用の当発明の自動車用エンジンのセンサーが構造のエンジン1の全体の構造の図を設けると表しています(One figure shows that the applied automotive engine sensor of the invention sets the figure of the overall structure of structural Engine 1.)
Proposed Technology Translation	**図一は本発明に係る車両用エンジンのセンサ配設構造のエンジン一の全体構成を示す図(Figure 1 is a figure that shows the overall configuration of Engine 1’s engine’s sensor arrangement structure of an automotive engine pertaining to the invention.)**
Model Translation	図1は、本発明に係る車用エンジンのセンサ配設構造を応用したエンジン1の全体構成図を示している(Figure 1 shows an overall diagram of Engine 1 based on the automotive engine’s sensor arrangement structure pertaining to the invention.)

4. Towards High-Accuracy Automatic Translation of Patent Translations

At NICT, in order to resolve such challenging problem, we have advanced research (1) in section 2 “Bilingual corpus-based automatic translation technology” and constructed a large-scale bilingual corpus for patents. Moreover, we advanced research (2) and created a new algorithm that automatically accrues “translation knowledge on lexical selection” and “translation knowledge on word-order changes.” Also, through research collaboration with Japan Patent Information Organization (Japio), translations from our automatic translation system were evaluated towards “understandable translations” through the eyes of patent professionals and efficiently improved. The accuracy of “Chinese-Japanese automatic translation software developed based on new technology” determined by translators is over three times that of conventional technology. As shown in figure 1, based on this “Chinese-Japanese automatic translation software,” Japio translates and converts Chinese patent literature into a database and is planned to be commercialized as an extended version of the for-profit service “Japio-Global Patent Gateway”[3] next spring. We hope that this will assist corporate intellectual property departments, patent attorney intellectual property investigations, and patent examiner, Japan Patent Office prior art research, and also mitigate risk of Japanese corporate patent infringement.

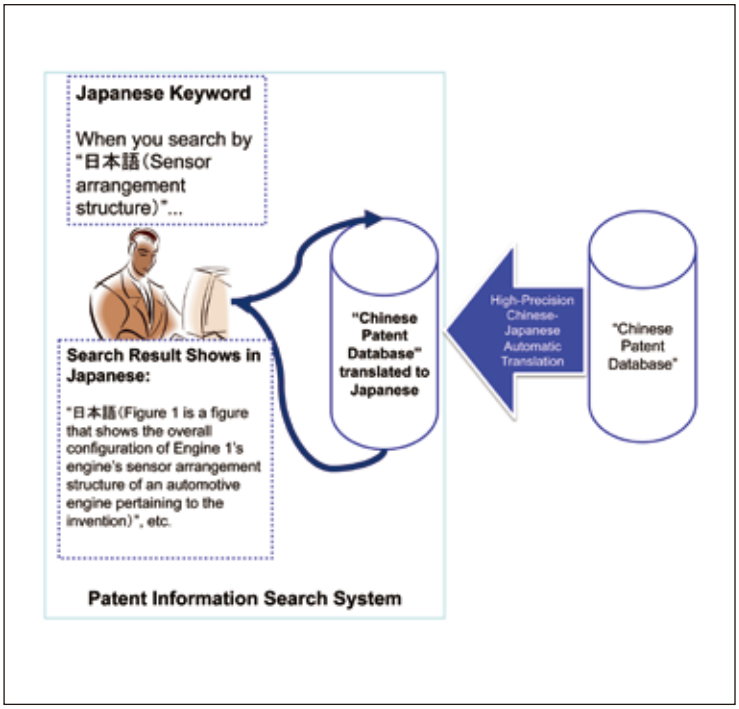


Figure 1●Chinese patent search system using automatic translation

5. Conclusion

NICT will continue research in order to further improve accuracy and speed in translation.

We also expect that this achievement in translation in the field of patent documents where long sentences are filled with many technical terms will contribute to accelerating research and development of Chinese-Japanese automatic translation in other fields as well.

References

[1] Intellectual Property Policy Committee, Industrial Structure Council, “New problems and their solutions towards a nation built on intellectual property”, June 25, 2012, (in Japanesse)
http://www.jpo.go.jp/shiryou/toushin/shingikai/pdf/tizai_bukai_18_paper/siryou_01.pdf

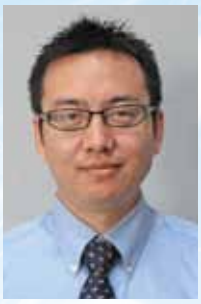
[2] SUMITA Eiichiro, “Multilanguage Automatic Translation Technology,” NICT NEWS Vol. 402, pp3–4, March, 2011.
http://www.nict.go.jp/publication/NICT-News/1103/NICT_NEWS_1103_E.pdf

[3] Japio-Global Patent Gateway (in Japanesse)
http://www.japio.or.jp/service/service05.html

The world's first TV White Space WiFi Prototype based on the IEEE 802.11af Draft Standard developed

MIZUTANI Keiichi
Researcher, Smart Wireless Laboratory, Wireless Network Research Institute

After completing a doctoral course, Dr. MIZUTANI Keiichi joined NICT in 2012. He is engaged in research, development and standardization in Cognitive Radio, Software Defined Radio (SDR), and White Spaces. Ph.D.(Engineering)



LAN Zhou
Researcher, Smart Wireless Laboratory, Wireless Network Research Institute

After completing a doctoral course, Dr. LAN Zhou joined NICT in 2005. He is engaged in research, development, and standardization in Millimeter-wave Radio, Cognitive Radio, Software Defined Radio (SDR), and White Spaces. Ph.D.(Engineering)

HARADA Hiroshi
Director, Smart Wireless Laboratory, Wireless Network Research Institute

After completing a doctoral course, Dr. HARADA Hiroshi joind Communications Research Laboratory, Ministry of Posts and Telecommunications (currently, NICT) in 1995. He is engaged in research, development, and standardization in Cognitive Radio, Software Defined Radio (SDR). Ph.D.(Engineering)

Explosively Increasing Wireless Traffic and TV White Space

In an age where everyone carries smartphones, laptops and tablet computers, communication volume is explosively increasing compared to years ago. However, the frequency resources that can be allocated for the wireless devices are limited. If the increase in traffic caused by these devices remains unresolved, there will be frequent wireless interferences. And so, there is an urgent need to effectively utilize finite radio frequencies and to develop technology that can newly expand usable frequencies.

In response to this, we have been developing a wireless communications system that uses "White Space." Frequency bands are allocated to so called "primary users," users with specific purposes such as broadcasters and telecommunication enterprises. However, like in Figure 1, depending on geographical and temporal conditions, there are cases when there is no effect on primary user communications even if using the band for other purposes. Our new communications system feature allows users other than the primary user (called the "secondary user") to use this kind of frequency.

Specifically, white space in the television frequency band is called "TV White Space," and organizations such as the FCC (USA), Ofcom (UK), and Japan's "Meeting for White Space Promotion" at the Ministry of Internal Affairs and Communications (MIC) are moving to implement "wireless communications systems that use TV White Space" and currently examining that technology. Meanwhile, various international standardization activities of wireless communications systems in white space are already underway. Among them, the leading standardization group IEEE802.11af—where NICT conducts technology proposals—released the newest tentative standard (IEEE802.11af Draft 2.0) for wireless LAN in white space, which defines the specifications of physical (PHY) and media access control (MAC) layers.

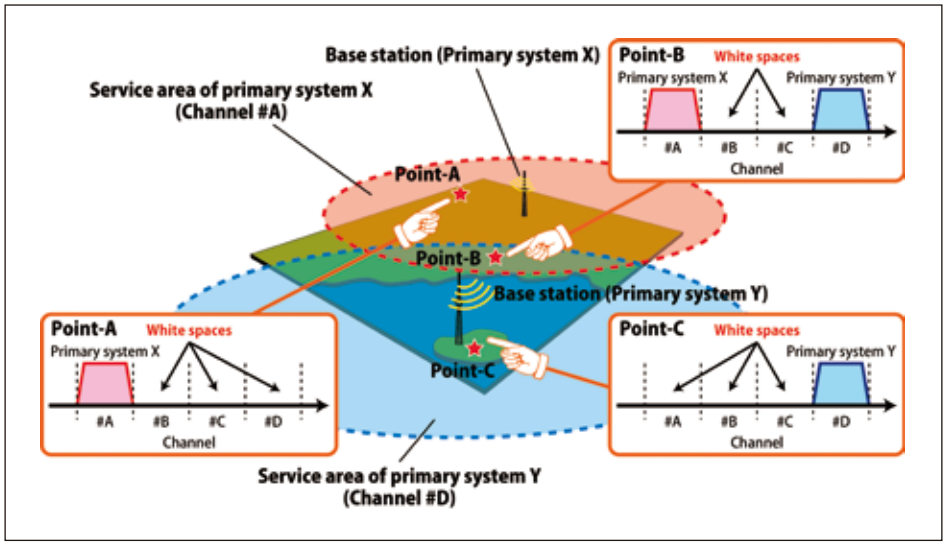


Figure 1●White Space

In this figure, it shows primary users X and Y providing services using frequency channels #A and #D, respectively, the dotted red and blue framed areas calculated via each country' s and system' s primary user protection standards, and areas where primary user communications cannot be blocked. For example, in Point-A, because #B-#D out of the frequency channels #A-#D allotted by primary users are physically and temporally unused channels (white space), secondary users do not impact primary users even when using a channel for other purposes.

Developed Access Point

NICT has developed the world's first wireless LAN system "access point" equipped with PHY and MAC layers based on IEEE802.11af Draft 2.0. We connected it to a WS database* previously developed by NICT and demonstrated that it can start wireless communication in the TV frequency band (470MHz-710MHz) and automatically select frequencies that do not affect the primary user. Frequencies that do not impact the primary user indicate frequencies where the white space database computes based on the protection guideline for interference and jamming for primary users in each country. Currently, the FCC (USA) and Ofcom (UK) are starting to maintain regulations that set these computing standards while Japan is planning a detailed study in the near future.

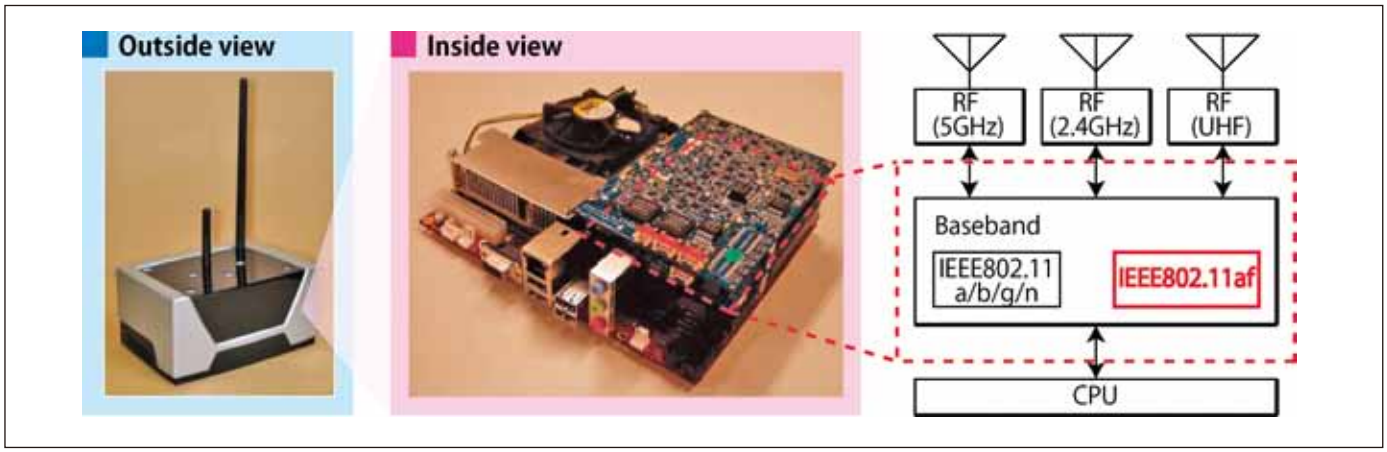


Figure 2●Outline of Developed Access Point

Table 1●Access Point Specifications (UHF Band)

Category	Specification
Frequency	470-710MHz
Bandwidth	6MHz
Tx Power (Max)	20dBm
Antenna gain	0dBi
PHY	OFDM (IEEE802.11af Draft 2.0, non_HT_duplicated mode)
MAC	IEEE802.11af Draft 2.0

An overview of the access point and the main technical specifications are shown in Figure 2 and Table 1, respectively. Besides PHY we newly developed based on IEEE802.11af Draft 2.0, the access point is also equipped with a conventional IEEE802.11a/b/g/n data communication device that operates in 2.4GHz and 5GHz bands. It can also connect with LTE, WiMAX, and PHS-like data devices via USB as a connecting means to the Internet.

The access point we developed also demonstrates MAC based on IEEE802.11af Draft 2.0. When multiple terminals establish communication with the access point using the same channel, they exert interference on one another (co-channel interference). As a result, communication quality mutually deteriorates significantly as shown in Figure 3(a). Therefore, with IEEE802.11af Draft 2.0 it can prevent the deterioration of communication quality among terminals by using local servers called RLSS (Registered Location Secure Server) to prevent interference between terminals and operating on different channels between each terminal so that co-channel interference does not occur, as shown in Figure 3(b).

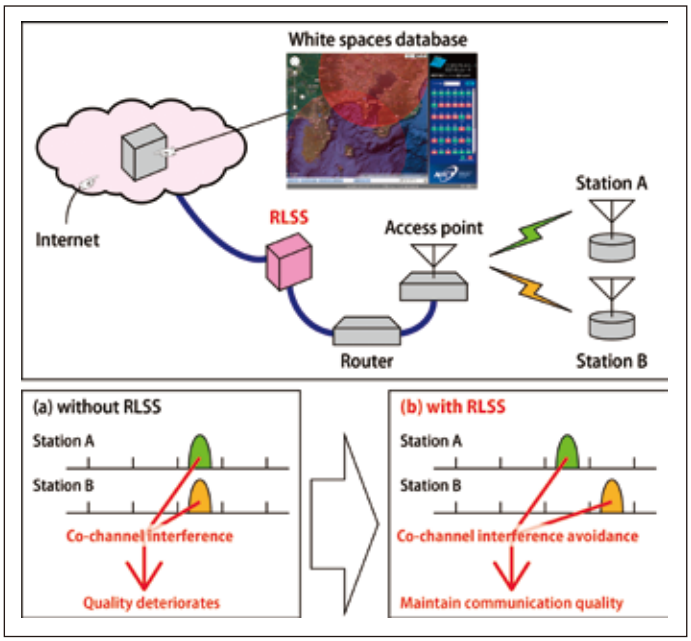


Figure 3●RLSS Chanel Management (Co-channel interference mitigation)

In (a), the terminals exert interference on one another and communication quality deteriorates as a result of selecting the same channel. In (b) where IEEE802.11af Draft 2.0 MAC is active, interference does not occur because different channels are allocated via RLSS for each terminal.

Future Prospects

The IEEE802.11af task group plans to complete the standard in 2014. NICT will continue to promote international standardization activities, examining power-saving and miniaturization of wireless devices, and actively advance technology transfers. We also plan to propose appropriate IEEE802.11af specification changes as current discussions advance in a white space promotion council examining the standard at the Ministry of Internal Affairs and Communications.

Glossary

＊White Space Database

A white space database refers to a device or feature that selects usable frequencies for secondary users based on given computing standards while taking into consideration primary user information (transmitting station location, frequency, transmitting power, etc.) and topographical information, and responds to secondary user inquiries based on the results. In Japan, discussion is expected to occur on interference and jamming computing standards and how to handle secondary user operational information.

Report on NICT Open House 2012

NICT held the "NICT Open House 2012" at its headquarters (Koganei City) on November 30th and December 1st, where approximately 1,500 visitors came over the two days. We revamped previous contents of open house in order to enhance public awareness of NICT's approaches, and this was the first time to carry out the new plan.

We featured a total of 19 presentations and 49 demonstrations/panel displays about our latest achievements, such as introductions to researches in which NICT is currently engaged as well as technical presentations on social contributions, industry-academia collaboration and industrial developments. Furthermore, in time for the schedule of this open house, the exhibition room was reopened in the main research building.

Opening Ceremony

At the opening ceremony held in the morning of the first day, after an opening greeting from MIYAHARA Hideo, President of NICT, OKUBO Akira, Vice President of NICT, gave a keynote speech on NICT's research and development approaches. Following on that, Mr. SHINOHARA Hiromichi, Director of Research and Development Planning Department, in charge of international standardization, NTT, held a special lecture titled "R&D Strategies of a Global Age —Making Japan's Advanced Research & Development Power a Source of International Competitiveness—".

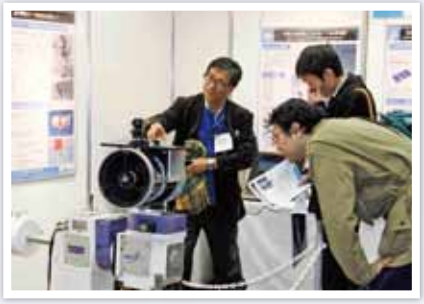
Lastly, ENAMI Kazumasa, Vice President of NICT, presented an overview of NICT Open House 2012.

●A packed hall for the opening ceremony

Presentation

In the afternoon of first day, we gave the presentations primarily for peoples related to information and communications, and the second day for the public, totaling 19 presentations (for more information on the presentation program, see the back page of NICT News, Oct. 2012).

Glimpse of the Exhibition Venue



●Small size optical communication telescope for the ground station

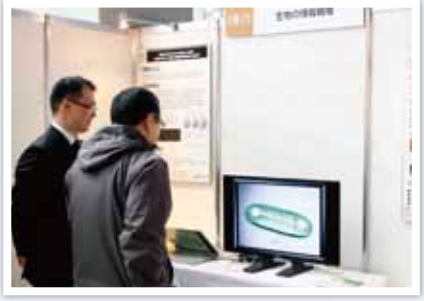
●Introduction to anti-cyber attack alert system "DAEDALUS" on a big screen

●Stream Concordance visually displaying assessment information on keywords in real time

●Electronic holography using display elements at 8K resolution (16x a household television)

●Space weather forecast room

●Regional torrential rain observed by the phased array weather radar



●Information strategies of organisms

●Technology that captures invisible terahertz light

●Realistic 3D video interaction technology

Exhibition Room

The exhibition room on the first floor of the main building was reopened on November 30th. Visitors can experience and learn about NICT's history and technology through four areas: network fundamental technology, universal communication fundamental technology, advanced ICT fundamental technology, and electromagnetic sensing fundamental technology. We also introduce examples of what NICT research results have contributed to society.

●Ribbon cutting at the exhibition room opening
From left: IMASE Makoto, Vice President, MIYAHARA Hideo, President of NICT, ENAMI Kazumasa, Vice President, and KUMAGAI Hiroshi, Vice President

The exhibition room is open 9:30-17:00 excluding Saturdays, Sundays, National holidays, the year-end and New Year's holidays.
Admission is free.
For more information, please refer to NICT Web site (http://www.nict.go.jp/about/exhibition/hq/)
Inquiries: +81-42-327-6375 / publicity@ml.nict.go.jp

Report on Keihanna Information and Communication Fair 2012

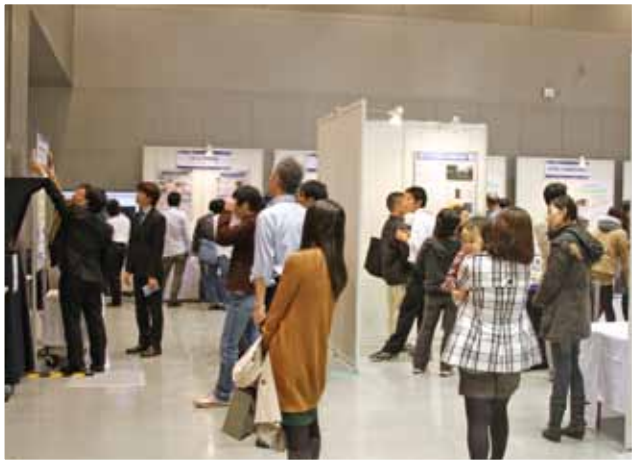
—Leading the Future of Science and Technology with Information and Communication—

From Thursday, November 8th to Saturday, November 10th, 2012, NICT Universal Communication Research Institute hosted the "Keihanna Information and Communication Fair 2012" in a community-based collaboration with "Keihanna" Kansai Science City's information and communication-related institutes. This year marking the 4th such event, 7 lectures and exhibits from 10 institutes were held over three days and welcomed approximately 2,750 visitors.

On the first day, Dr. YONEZAWA Akinori, Deputy Director, RIKEN Advanced Institute for Computational Science, gave a keynote lecture on the "K" supercomputer, which began operating this year, and explained how its research activities contribute to society via computational simulations. In the lecture session, information-communication technology and leading-edge research and development results being implemented in real life were introduced on 6 latest topics in information-communications including brain information, cyber security, cloud computing, big data, energy, and standard time.

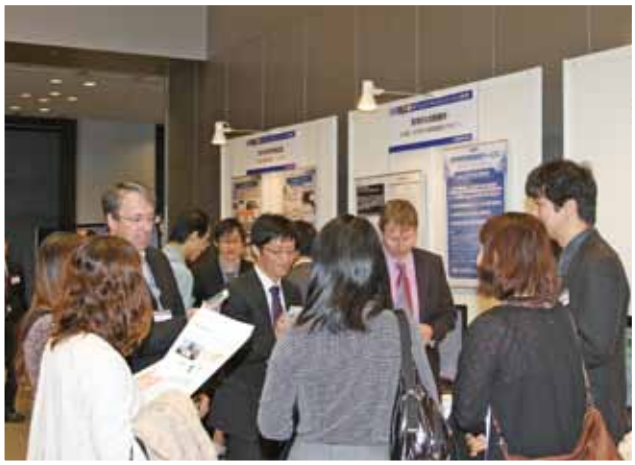
In the exhibition session, visitors experienced the latest research and development results of technology such as a device that injects six types of odors in concert with a video controlled by a PC, technology that translates Chinese patent documents into Japanese (introduced on P1-2), and a smartphone application called VoiceTra4U-M that enables voice translation dialogue in multiple languages with multiple users.

Nara Senior High School, a local Super Science High School (SSH), held their event at the same time where well-experienced researchers from "Keihanna Information and Communication Fair 2012" gave advice on students' independent research results and enjoyed intergenerational exchange with the local community.

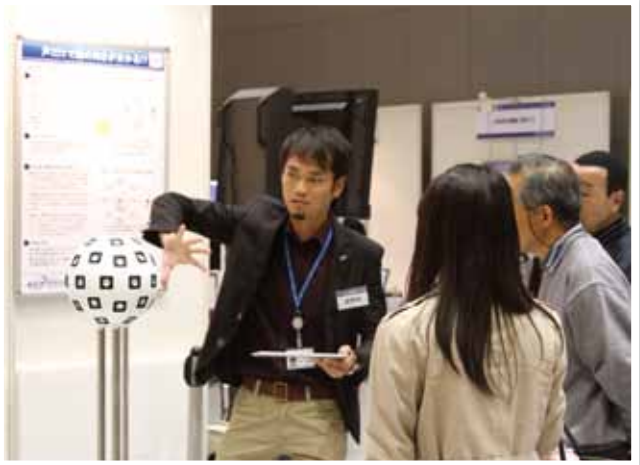


●Glimpse of exhibition venue

●Odor-injecting device



●Multilingual voice translation application (VoiceTra4U-M)



●Controlling the performer's direction with multi-speakers

2012 Kashima Space Technology Center Facility Open House "Radio Waves and Satellites Connect the Cosmos and Us"

On Friday, November 23 (National Holiday), the Kashima Space Technology Center held a public open house event. Although the event is usually held in summer, this year it was held in the fall for the first time due to restoration work on the exhibition pavilion and other premises damaged by the Great East Japan Earthquake.

In spite of the weather being cold and rainy, as many as 952 visitors came to the event. Their biggest interest appeared to be on the researches related to disaster countermeasures such as satellite communications at the time of disasters, early tsunami detections using satellites, and the possibility of practical application of these technologies.

In addition, many visitors listened intently to the guide's explanations at the exhibition corner which displayed the real-size ground movements of the Great East Japan Earthquake in each region including Kashima on the floor.

●Bustling exhibition pavilion

●Post-earthquake ground movement demonstration

2012 Okinawa Electromagnetic Technology Center Facility Open House
—The 10th Anniversary of its founding—

The Okinawa Electromagnetic Technology Center held a public open house event at its facility on Friday, November 23. In addition to a presentation on the Okinawa Center's research, a facility tour, and a presentation on observation images of The Polarimetric and Interferometric Airborne Synthetic Aperture Radar System (Pi-SAR2), there was a speed gun in which visitors could experience the principle of the radar. A demonstration on the Wideband InterNetworking Engineering Test and Demonstration Satellite "KIZUNA" (WINDS), and geo-environmental footage from a Digital 4-Dimensional Globe. In addition, we held a game entitled "Find the Fox with Radio Waves" that used simple receivers to find a radio source hidden in the yard of the venue which many children enjoyed. We also released a radio-monitoring vehicle by the Okinawa Office of Telecommunications, Ministry of Internal Affairs and Communications and conducted electrical engineering. In spite of the morning rain that day, many visitors had an enjoyable time.

●Find the fox with radio waves! Fox hunting:
children search for a "fox" with radio receivers in their hands

●Facility tour:
weather observation lookout installed on the Center's roof

Framework Agreement for Cooperation signed with CNES

On November 12, 2012 (Paris local time), NICT and the Centre National d' Etudes Spatiales (CNES: organization established December 19, 1961 responsible for planning, managing, and implementing France's space policy) concluded a research cooperation agreement at CNES headquarters (Paris) that establishes the framework of research cooperation in the field of ICT, in particular space technology and areas of its application.

NICT and CNES have a shared interest in areas of satellite communications, time and frequency metrology, and remote sensing of Earth's environment from satellites. One of their shared interest is focusing on the advantages of space laser communication technology that has the ability to transmit a large volume of data at high data rates, to reduce satellite's size and weight, and to operate without interference.

It is expected that the development of technology employing ultrahigh-speed optical data transmission between LEOs (Low Earth Orbits) and ground stations is as influential means of communication methods for retrieving Earth observation data all around the globe and establishing communication links including manned space stations, which correspond to space applications required for high speed data transmissions in the future.

●Mr. Yannick d'Escatha, President of CNES (left) and Dr. MIYAHARA Hideo, President of NICT (right) conclude the research cooperation agreement and shake hands.

Based on this agreement, NICT and CNES will work together for further collaborations effectively in exchanging information and researchers and holding workshops and collaborative research as we take into consideration the implementation of a new space collaborative experiment specifically in the 1.5μm band which is considered as a preferred choice for LEO to ground laser communication links in the space laser communication field.

Awards

Recipient(s) ● AKAHANE Kouichi / Senior Researcher, Lightwave Devices Laboratory, Photonic Network Research Institute

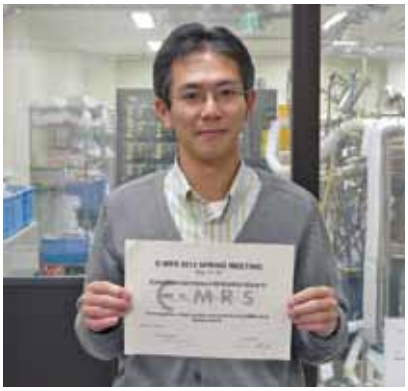
◎Award Date: May 18, 2012

◎Name of Award:
E-MRS 2012 Spring Meeting Best Poster Award

◎Details:
For presenting a distinguished conference paper that contributes to E-MRS development

◎ Awarding Organization:
European Materials Research Society

◎Comment from the Recipient(s):
At my laboratory, I conduct research and development on carbon nanotube optical communication application for the purpose of examining new ICT materials aimed at low environmental burden ICT. In this research, I found technology that controls the synthesis of carbon nanotubes by exposing it to laser light during carbon nanotube synthesis. Many people helped support advancement of this research including the Incentive Fund. I am sincerely grateful to all those involved. I hope to continue working on developing this research into the future.



Recipient(s) ● IWAMOTO Masaaki / Senior Researcher, Bio ICT Laboratory, Advanced ICT Research Institute

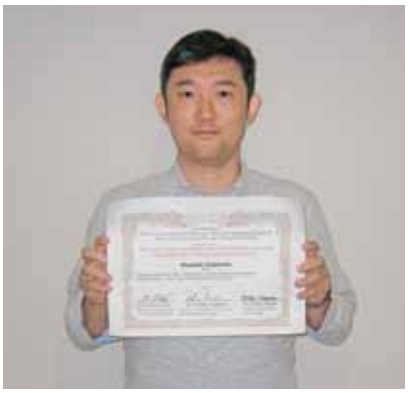
◎Award Date: May 31, 2012

◎Name of Award:
Young Presenters Award for Poster Presentation

◎Details:
For presenting a poster titled, "Biased assembly of the nuclear pore complex determines nuclear differentiation in the ciliate *Tetrahymena thermophila*," and being recognized for a distinguished presentation that went beyond areas and engaged many people

◎ Awarding Organization:
Japanese Society of Developmental Biologists and Japan Society for Cell Biology

◎Comment from the Recipient(s):
I received this award at both The 64th Japan Society for Cell Biology and 45th Japanese Society of Developmental Biologists joint competition. Because the judges apparently had to vote on presentations in areas different from their own academic association, the Society of Developmental Biologists judges voted for my presentation due to me being a Society for Cell Biology member. I am very pleased that those of different areas thought my presentation was interesting. I would also like to take this opportunity to thank the coauthors of my presentation.



Recipient(s) ● WANG Zhen / Distinguished Researcher, Advanced ICT Research Institute

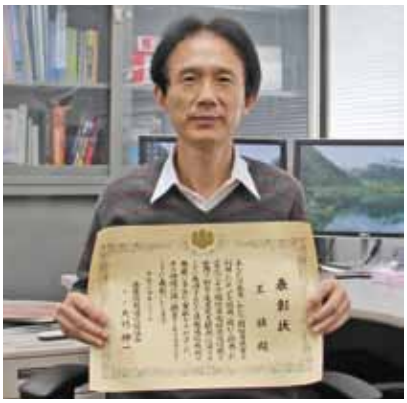
◎Award Date: June 1, 2012

◎Name of Award:
Kinki Information Communication Conference Chairman Award

◎Details:
In recognition for being involved in device development that uses superconductive phenomenon and contributing to the development of information-communication technology over many years such as successfully applying a developed niobium nitride superconducting electromagnetic receiver to radio astronomy observation for the first time in the world.

◎ Awarding Organization:
Kinki Information Communication Conference

◎Comment from the Recipient(s):
I am honored to receive the Kinki Information Communication Conference Chairman Award and for my achievements in radio astronomy observation application and development of a superconducting niobium nitride electromagnetic receiver of which I have researched and developed for over 20 years. I am sincerely grateful to those involved in NICT and research collaborators in Japan and abroad who have supported this research and development for many years. With this award as an incentive to devote myself to further research, I hope to continue to do what I can for the development of information-communication technology.



Recipient(s) ● NISHINAGA Nozomu / Director, New Generation Network Laboratory, Network Research Headquarters

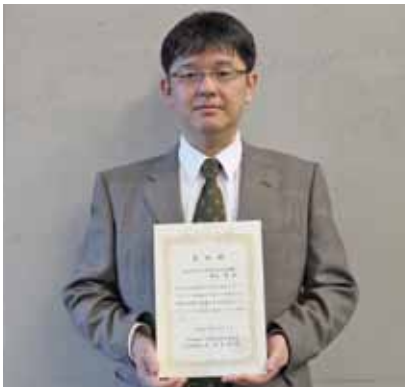
◎Award Date: June 21, 2012

◎Name of Award:
Distinguished Service Award

◎Details:
For commitment to upstream activities related to Future Networks standardization in ITU

◎ Awarding Organization:
The Telecommunication Technology Committee

◎Comment from the Recipient(s):
I was recognized for positive contributions to ITU-T Y.3001 and advising of new international standardization that decides the comprehensive directions of Future Networks, more specifically new-generation networks. Despite participating for the first time in international standardization activities, I owe this award to all those on the industry-academia-government collaboration team who have lead NeW-Generation Network (NWGN) standardization together. I wish to continue doing my best to realize dream network, say, NWGN and am looking forward to working with you all.



The Possibility of the Terahertz Waves for its Industrial Applications

—Memorial Symposium for the Establishment of Terahertz Technology Research Center—

Host: National Institute of Information and Communications Technology (NICT)
Sponsor: Ministry of Internal Affairs and Communications (planned)

Program		
12:50	Registration	
13:20	Opening Greeting	**Opening Remarks** KUMAGAI Hiroshi (NICT Vice President, Member of the Board of Directors, Director General of Terahertz Technology Research Center)
		NICT-Related Terahertz Technology Research & Development HOSAKO Iwao (NICT)
13:40	Presentation **Imaging**	**Development of THz Camera** ODA Naoki (NEC)
		THz Metrology and Applications FUKUNAGA Kaori (NICT)
14:35	Poster Session **Inter-Field Fusion**	**Poster Display by Collaborative Research Laboratory of Terahertz Technology** **(Joint Event) Briefing Session by NICT Photonic Device Lab** **Poster Display**
15:15	Presentation **Spectral Infrastructure**	**A study of terahertz frequency comb technology and its application for precise measurements** NAGANO Shigeo (NICT)
		Development of ultra short pulse laser source for a general purpose terahertz time domain spectroscopy HARA Tokutaka (Sumitomo Osaka Cement Co, Ltd.)
16:10	Presentation **High-Speed Radio Transmission**	**Recent progress and future prospects of THz communications using resonant tunneling diodes** NAGATSUMA Tadao (Dept. of System Innovation, Engineering Science, Osaka Univ.)
		High-Speed Radio Transmission Based on Radio over Fiber Technology KANNO Atsushi (NICT)
		300-GHz-band ultra-high speed wireless link technologies for proximity data transfer system KUKUTSU Naoya (NTT Microsystem Integration Laboratorie)
17:35	Closing Remarks	UEHARA Hiroshi (NICT Senior Executive Director, Associate Director General of Research Center)

Time & Venue

Wed, January 16, 2013

13:20 Start (Registration begins at 12:50)

IINO Hall & Conference Center Room A
IINO Building 4F 2-1-1, Uchisaiwaicho, Chiyoda-ku

Various research and development projects are being planned and conducted at home and abroad, focusing on terahertz technologies such as non-destructive inspection, spectroscopic analysis, and high-speed radio transmission that are finding application potential in various industries. In light of this situation, NICT established Terahertz Technology Research Center on June 1, 2012 to further promote terahertz technology research and development.

To commemorate the establishment of Terahertz Technology Research Center, we will arrange four sessions in this Symposium: Imaging, Inter-Field Fusion, Spectral Infrastructure, and High-Speed Radio Transmission, and along with an overview of research and development conducted as NICT-independent and commissioned research, we hope this becomes a starting point for discussion on future industry application.

Oral presentations will be made by researchers from NICT and individuals involved in commissioned research. Research details on related projects will be shown at the poster session. In addition, researches carried out in Photonic Device Laboratory, NICT, will also be introduced at the poster session on this occasion.

Registration is free and will be available online.

Registration

Please visit the following URL.
http://www.terahertz-sympo.com/index.html

Inquiries

Secretariate sec@terahertz-sympo.com

Information for Readers

The next issue will feature Phased Array Weather Radar that monitors tornados and sudden torrential rain as well as Cloud Profiling Radar onboard EarthCARE Satellite.

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