NICT NEWS
独立行政法人 情報通信研究機構
National Institute of Information and Communications Technology
2010 NOV No.398 11

NiCT

Millimeter-Wave Video Transmission System - Their R&D Efforts, Standardization, and Commercialization

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After completing a master course, entered the Radio Research Laboratory, Ministry of Posts and Telecommunications (NICT at present). Participated in the studies on short-range wireless technology and wireless sensor network. Ph.D. (Engineering)

Introduction

Exploitation of unused frequency bands is an impending challenge to resolve the extreme radio wave congestion caused by the ever-increasing number of users, diversifying applications, enhanced transmission rate, and range globalization. Disadvantages of the millimeter-wave band (radio waves of 30 to 300 GHz, particularly 60 GHz band discussed here) in terms of device cost and the unidirectional emission characteristic and short transmission range as compared with microwave have apparently caused a few development cases, and thus, proposals for attractive systems for availing millimeter-wave frequencies have been the most important subjects.

In 1999, we started the study comprising the systems and equipment design and radio propagation test of the "millimeter-wave video transmission system" with the objective of replacing household television feeder lines with a new wireless transmission system. The total frequency bandwidth of this system (Figure 1) required for TV broadcast waves such as V/UHF, BS, and CS reaches a few GHz, and in a residential application can be satisfied with a short wave range, we found that the 60 GHz band (one of the oxygen absorption bands) is suitable and that considering the number of TV receiver units, and thus this system can substantially contribute to the acceleration of millimeter-wave utilization.

Since 2002, we have been carrying on the R&D of "millimeter-wave vertically connected video transmission system" (Figure 2) that can provide housing complexes that cannot receive satellite broadcasting services and office or other commercial buildings that can hardly accommodate optical fiber fitting with "vertically connected" outdoor wireless paths from the roof down to the balcony of each floor of residence. Thus, the following summarizes the issues involved in the market penetration.

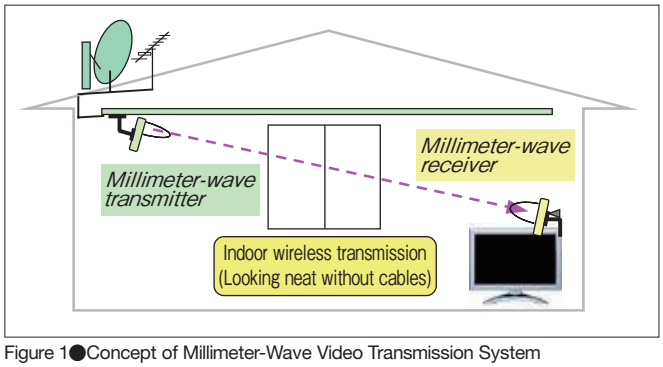


Figure 1●Concept of Millimeter-Wave Video Transmission System

In the course of these R&D activities, the "technical standards for wireless facilities using 60 GHz band" enacted in August 2000 by the Ministry of Internal Affairs and Communications incorporated the technical parameters proposed by us. In 2000, we formulated the ARIB Standard T-69 (Version 2.0 added with the millimeter-wave vertically connected video transmission system in 2004). Further, owing to the contribution to ITU-R, the ITU-R Report F.2107, Japanese original millimeter-wave video transmission system was described. Moreover, we have succeeded in the commercialization of a millimeter wave module based on ARIB Standards to put the transmission devices incorporating this module on the market.

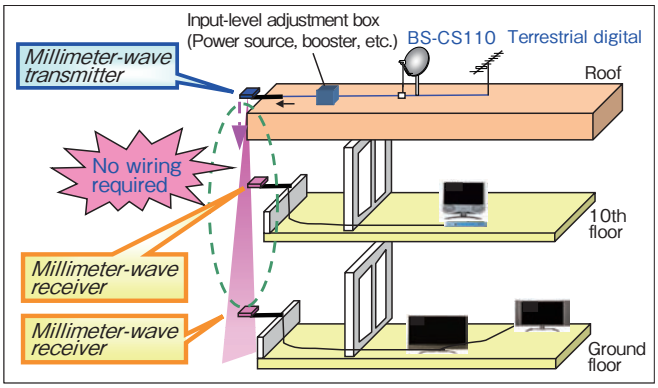


Figure 2●Concept of Millimeter-Wave Vertically Connected Video Transmission System

Although we have spent a considerable period of time to implement such systems as "millimeter wave video transmission system" and "millimeter-wave vertically connected video transmission system", their full-fledged popularization is about to start from now on.

Challenges in Systems Implementation and Viable Technologies

At that time, the indoor broad-band propagation characteristics of 60 GHz band was not thoroughly clarified and, in particular, it was empirically known that the band generates reflected waves depending on the ambience inside of housing, commercial buildings, and outdoor applications, resulting in the degradation of transmis-

sion characteristics. In the system utilizing millimeter waves, which involves cost increase potentials, we came to realize that such a simple configuration should be desirable that the broadcast signals are first frequency-converted to 60 GHz band radio wave by the transmitter, and the emitted radio wave is then converted back to the original frequency by the receiver unit.

In such a frequency conversion set-up, each of the transmitter and receiver need to be equipped with a local oscillator of millimeter-wave band. However, the frequency stabilization and reduction of phase noise of an oscillation signal obtained in a millimeter wave are technically difficult. Consequently, the signals through orthogonal frequency division multiplexing (OFDM) and multilevel quadrature amplitude modulation signal are extremely difficult to transmit in millimeter radio waves. Additionally, costly millimeter-wave local oscillators made with sophisticated frequency stabilization technology were considered to be required for both transmitter and receiver, and thus, the improvement of transmission quality and cost reduction of millimeter-wave communication systems are the contradicting requirements to be met.

To solve this problem, we have devised a new type of "millimeter-wave self-heterodyne" system that can simultaneously radio transmit a modulation signal and a local oscillator signal. This system allows a transmitter to multiplex a local oscillator signal and radio transmit, and a receiver to use it as a local oscillator signal required for reverse frequency conversion. Specifically, the system uses the frequency identical with the one used when a send signal is generated and a wireless signal having the phase fluctuating characteristic for detection (self-heterodyne detection). Thus, even when using a low-cost millimeter-wave oscillator having frequency and phase fluctuating characteristics at the transmitter, since the adverse influence can be completely removed at the detection, and as a result, a stabilized high frequency transmission characteristic and ultralow phase noise transmission characteristic can be realized. Moreover, the receiver no longer requires any local millimeter-wave oscillator that has been a major component, and consequently cost reduction has concurrently been achieved.

In the demonstration stage, we conducted a transmission test within an independent residence by using a prototype pair of a transmitter and a receiver incorporating this system with a monolithic microwave integrated circuit (MMIC). Since this prototype system of vertically connected video transmission gave rise to such problems unique to the vertically oriented system as indicated in Figure 3, we then conducted a comprehensive experiment to determine the influence of snow coverage and rainfall on image quality, and the data were accumulated.

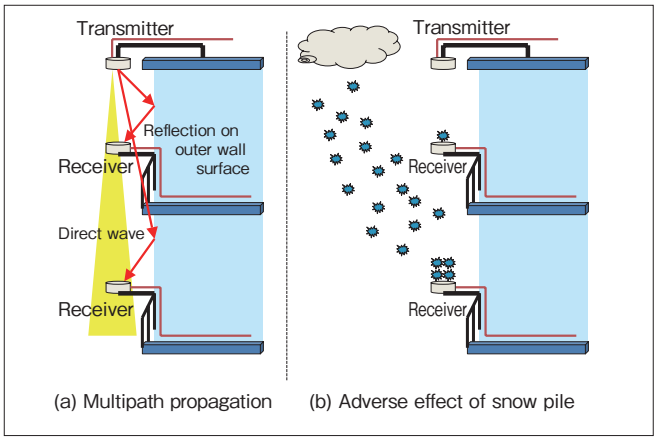


Figure 3●Problems Unique to Millimeter Wave Vertically Connected Video Transmission System

Commercializing a Millimeter-Wave Module

For the millimeter-wave module that has been commercialized for outdoor use, we employed an IF self-heterodyne system configured by merging a self-heterodyne system and a frequency multiplier scheme and embedding a small, 9 mm square into a GaAs HEMT-MMIC device in order to allow it to function with stability in a broader frequency bandwidth. This module is characterized by a high conversion gain and high-output, low-distortion characteristics without any particular external component, because it contains all the functions required for data transmission. Approximate dimensions of the transmitter with this module are 12 × 7 × 5 cm and the receiver 7 × 6 × 5 cm (Figure 4). Both have excellent weather resistance and reliability for outdoor installation.

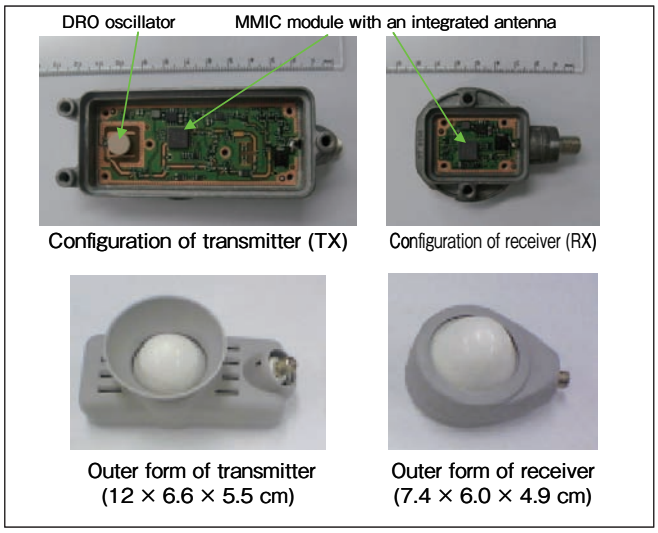


Figure 4●Commercial Model of Transceiver for Outdoor Use (Courtesy by Sharp Corp.)

Conclusion

The remarkably high transmission rate well over 2 Gbps (band conversion) of the millimeter-wave video transmitting system allows all the digital television broadcast signals ranging from terrestrial to communications satellite (CS) broadcast to be integrated and transmitted by multiplexing them, and thus high-definition television (HDTV) image signals can be transmitted without compression. The successful product development of the millimeter-wave module suggests that the system will be broadly put on the market in the near future.

Since our studies on the systems that permit the effective use of radio waves have significance in the sense of actively switching from lower frequency bands to the unused higher frequency bands and effective use of frequency resources, we are determined to further contribute to the development of technologies useful for society.

With my colleagues engaged in the subject research and development project, Mr. Yozo Shoji, Senior Researcher, the New Generation Wireless Communications Research Center and Mr. Hiroyo Ogawa, the Research Promotion Department, I had the honor of receiving The Meritorious Award on Radio for achievements in radio from the Association of Radio Industries and Businesses (ARIB). Since the development and commercialization of the subject system is the results of valuable support and cooperation by a number of people concerned, I should like to extend my heartfelt gratitude to every member concerned.

4K3D Ultra-High-Definition Three-Dimensional Image Technology

— Toward Artificial Vision —

Yoshiki Arakawa

Senior Researcher, Project Promotion Office, Universal Media Research Center

In 1980, completed the master course at the Graduate School Science and Engineering Research Department of Waseda University, and entered the Matsushita Electric Industrial Co., Ltd. In 1990, entered the Communications Research Laboratory (reorganized into the present NICT). In 2003, appointed as Research Manager ATR Intelligent Robotics and Communication Laboratories. At present, Senior Researcher Project Promotion Office, Universal Media Research Center. Engaged in research activities of geometric information, graphics, and video images. Ph.D. in Engineering. In 2001, received the Notable Invention Award of the Ministry of Industrial Trade and Industry.

Artificial intelligence and Artificial Vision

One of the dreams of mankind in the 21st century is the "artificial intelligence". Its core of the dream is the realization of "artificial vision". As the first stride to materialize the artificial vision, continuing the R&D efforts to turn out the "ultra-high-definition three-dimensional imaging technology" is considered to be of the prime importance.

4K Ultra-High-Definition Three-Dimensional Image Technology

Since 1997, we have been working on the research and development of ultra-high-definition image technology outperforming HDTV (Hi-Vision) and its transmission technology. NICT and Japan Victor Corporation (now JVC Kenwood Holdings, hereafter called JVC) have jointly conducted studies and successfully completed the basic technology of "4K ultra-high-definition image", that is, the 4K ultra-high-definition video projector (in 2001, Figure 1, left) producing 8million-pixel images with a resolution four times

Figure 1●4K Projector and 4K Camera (Both the World's First Models)

as high as HDTV (horizontally 3,840 by vertically 2,048 pixels) and the 4K ultra-high-definition color video camera (in 2002, Figure 1, right) for the first time in the world.

The ongoing Hi-Vision image has a definition of horizontally 1,920 by vertically 1,080 pixels. We call a high-definition image having 4 times larger number of pixels than the above-mentioned "4K2K image" or "4K image", since the new image has a resolution of 3,840 × 2,048 (or 2,160) pixels (equivalent to four screens of the above), and thus the horizontal and vertical resolutions are approximately 4K and 2K (thousand).

4K Ultra-High-Definition Robotic Vision

Concurrently, we have been carrying on the research and development efforts relative to the avatar communications (networked gesture communication or remote-controlled communication). In 2003, we completed a prototype "avatar robot" with newly developed five-finger hands having haptic senses and functions closely equivalent to a human hand.

Figure 2●Avatar Robot and 4K Robot Vision

On the other hand, JVC has succeeded in reducing the size and weight of the 4K camera to approximately 1/20. In 2005, this compact 4K camera shown in Figure 2 was installed in the head section of the avatar robot to serve as the robot's eyes. Thus, the robot vision that is much closer than ever to human vision was realized. As demonstrated in Figure 3, the reality-enhanced remote control of the avatar robot has been enabled by using the ultra-high-definition imagery of the 4K robot vision.

Figure 3●Video Image Captured by 4K Robot Vision (Remote-Controlled with 3D Manipulating Gloves)

4K3D Ultra-High-Definition Three-Dimensional Image Technology

In 2010, NICT and JVC succeeded in the joint development of the 4K3D ultra-high-definition three-dimensional video camera system as shown in Figure 4, by using a pair of compact 4K cameras. By implementing an extremely thin design of the cameras, we have realized the spacing of 70 mm between the cameras, which is fairly close to the 65 mm between human eyes. This has made it feasible to capture three-dimensional, natural images.

Multichannel Video Codec

We are currently carrying on the research and development of multichannel video codec composed of concurrent PCs. This transmission system allows a pair of PCs (single channel each) to encode/decode and transmit high-definition images. Since all channels can be synchronized to transmit images, 4K3D images can be transmitted by using eight pairs of channels. Thus, achieved ultra-multichannel synchronized imagery system can also transmit glasses-free 3D images, having several hundreds of viewpoints.

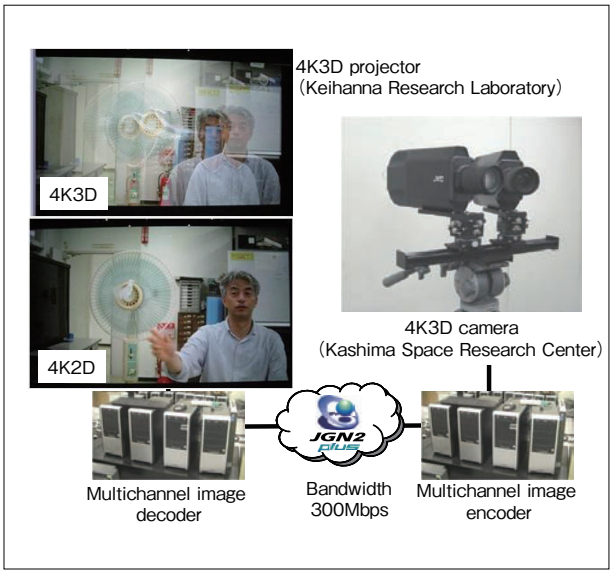


Figure 4●4K3D Live Image Transmission Via JGN2plus

Successful 4K3D-JGN2plus Transmission (World's First Achievement)

We have successfully performed the transmission experiment of live 4K3D ultra-high-definition three-dimensional images by using this multichannel video codec. On July 6, 2010, as shown in Figure 4, we established a link with JGN2plus between the Kashima Space Research Center and Keihanna Research Laboratory of NICT, and transmitted and projected the live 4K3D images by using eight channels of the multichannel video codec.

Successful 4K3D-WINDS Transmission (World's First Achievement)

On Nov. 2, 2010, we have satisfactorily conducted the transmission experiment of live 4K3D images by using this multichannel video codec and Internet satellite “KIZUNA” (WINDS: Wideband Inter-Networking engineering test and Demonstration Satellite, bend pipe mode, 400 Mbps). As shown in Figure 5, the live 4K3D image transmission was successfully achieved through the path of a WINDS mobile antenna station placed in the event site of the 1300th anniversary of the Heijo-kyo Capital in Nara -> WINDS -> NICT Kashima Space Research Center -> JGN2plus -> Keihanna Research Laboratory.

At the "Keihanna Information and Communications Research Fair" held on Nov. 4−6, the scene of the experiment was disclosed to the public to allow the audience to feel and enjoy the live 4K3D images that gave the spatial, stereoscopic feeling of the Daigoku-den building restored on the ruin site of Heijokyu Palace in Nara.

Figure 5●4K3D Live Image Transmission Via WINDS

Acknowledgment

The research and development project of 4K imaging technology has been carried out with Messrs. Mitsuo Isogai, Kenji Suzuki, Kenji Tanaka, and Hideki Kakeya (Tsukuba University). I herewith express my sincere gratitude to these gentlemen.

It should be noted that part of the achievement of 4K3D image technology is based on the query issued by the Advisory Committee of the Ministry of Internal Affairs and Communications, designated "Research and Development of eyeglasses-free three-dimensional Image Technology -- three-dimensional imagery contents technology". My heartfelt gratitude is extended to those people concerned.

The experiment of 4K3D transmission was jointly conducted with those concerned with the JGN2plus and WINDS. I extend my sincere gratitude to those collaborators.

Knowledge Cluster System

— Towards Next-Generation Web Platform for Interconnecting Environment and Society —

Project members of the Knowledge Cluster System (NICT researchers)
From left to right: Dr. Rong Zhang, Dr. Kyoung-Sook Kim, Dr. Koji Zettsu, and Dr. Takafumi Nakanishi

Koji Zettsu

Senior Researcher, Knowledge Clustered Group, Knowledge Creating Communication Research Center

In 1992, graduated from Information Engineering Section, the Tokyo Institute of Technology. In 2005, completed the doctorate course at the Graduate School, Information Science Studies Department of Kyoto University. Ph.D. (Informatics). In 1992, entered IBM Japan Ltd. In 2003, entered Communications Research Laboratory (current NICT) as Expert Researcher. In 2005, appointed as NICT researcher, and in 2007, promoted to the present position. Areas of interest include databases, information retrieval, and Web mining.

Background

Today, a wide variety of information pieces are disseminated on the Web, including the conventional consumer-generated media (CGM), records of communications between people such as blogs and chats, online footprints of people activities such as Web shopping records, life logs, and also sensor data capturing continuously changing environments. Now, the Web is playing the role of a huge memory of information reflecting the activities of society and the environment (i.e., social memory). By analyzing those huge data comprehensively, it is expected to discover latent principles and rules, as well as to integrate different domains of information separately collected by individual organizations. Eventually, a global-scale knowledge network will be formed, which can be utilized for solving social and environmental problems. We are conducting the research and development of new generationWeb infrastructure "knowledge cluster system" aiming at evolving the Web into a platform for more intellectual information acquisition and analyses.

Discovery of "Interconnection" Through Correlation Analysis

The knowledge cluster system is composed of the Knowledge GRID platform*1 and the correlation analysis engine. This system provides such functions as not only distributing and sharing data practiced in conventional Web, but also intentionally collecting specific data, extracting information on a variety of topics and events, correlating the information in different contexts, and retrieving and browsing the correlated information. For example, when a user wants to know the correlation between global climate changes and public security issues, conventional search engines could only retrieve relevant pages for a given query and consequently the user should evaluate the contents of the retrieval results him/herself. In contrast, the knowledge cluster system facilitates finding the information highlighting the fact that "in recent years in northern Africa, extraordinarily high atmospheric temperatures and conflicts over water resources are on increase", even if they are not directly specified in the query keywords.

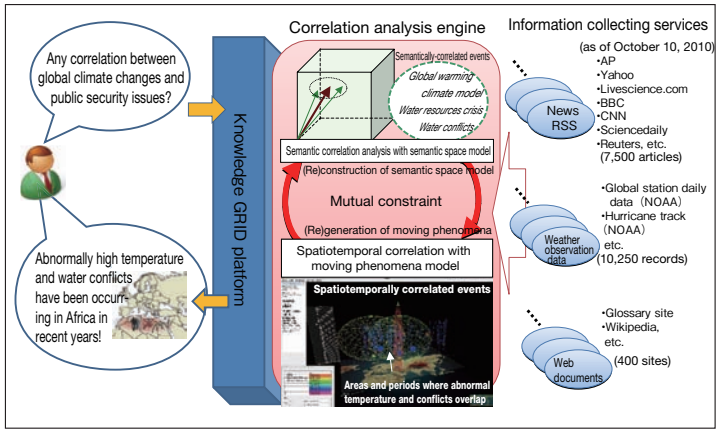


Figure 1●Correlation Analysis by the Knowledge Cluster System

Using the correlation analysis engine, we will discover such data that have semantic relations and spatiotemporal relations out of not only Web pages, but also distributed news bulletins, weather observation data, and various other mass data. In that process, there is no more need to specify any dictionary or spatiotemporal relationship in advance. Therefore, the correlations among the data in different types and from different domains can be discovered in a much easier way. To realize it, the correlation analysis engine first indexes the data by using a wide variety of features related to interested subjects. In the course of query processing, the engine discovers the optimum combination of the features characterizing the correlation (called "correlational context") and the set of highly correlated data. As a result, as shown in the above example, the system can find the set of highly correlated data in the context of "in recent years (temporal feature) in northern Africa (spatial feature), extraordinarily high atmospheric temperatures and water conflicts (semantic features) are on increase." We proposed the approach for correlation analysis based on semantic space model and Moving Phenomena spatiotemporal model. Both models have the advantages of discovering the optimum combination of features and the set of correlated data by selecting subspaces in a high-dimensional feature space flexibly and efficiently.

Knowledge GRID Platform

All the functions of the knowledge cluster system are implemented on the Knowledge GRID platform. We have built up a global network of the GRID nodes in Asia, Europe, and all the other areas in the world. On the grid network, we have constructed a service computing environment*2 based on the service-oriented ar-

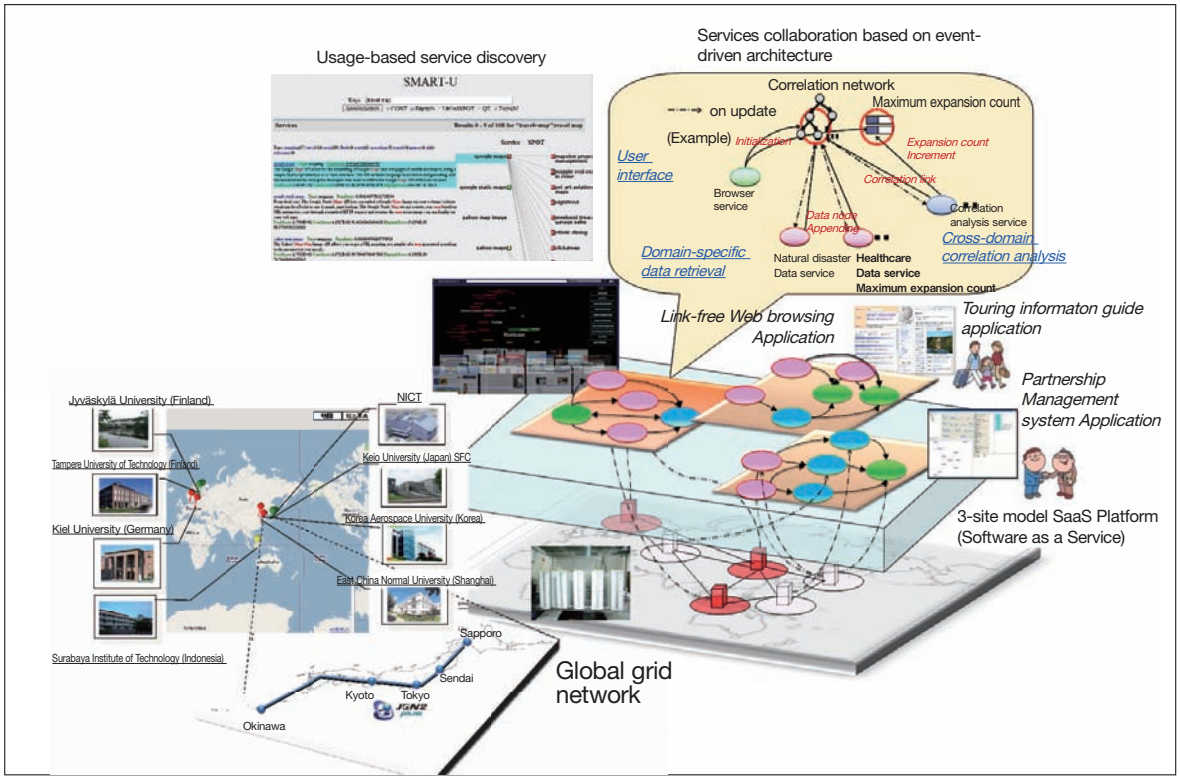


Figure 2●Knowledge GRID Platform

chitecture. On the Knowledge GRID platform, a wide variety of software services for data collection, information extraction, correlation analysis, and user interface interaction are developed and deployed in parallel at the GRID nodes. By making those services collaborate, we can realize various applications for new generation Web. The applications we have developed so far include "Link-free Web Browsing" for browsing the Web pages along their correlations regardless of hyper links, tourists guide system for recommending the information on relevant places, timings, and themes, the “partnership management system” that collects information on products, services, and technologies of companies and performs match-making under different themes. The Knowledge GRID platform provides the service collaboration mechanism and programming language for the applications development. Moreover, the platform provides the service discovery engine for finding useful services in accordance with their usage scenarios in various applications.

Future Perspective

The e-Science and data-intensive science are said to be the fourth paradigm of sciences following experimental science, theoretical science, and computation science. This new paradigm of science aims to discover and verify the principles and rules that are potentially existent by analyzing a large volume of data existing in a wide variety of fields. With emphasis on societal needs, this methodology pursues the objectives of utilizing various types of knowledge obtained through the past scientific researches for decision-making and action-support in the real life. It studies the correlations of scientific data and social data with the application-oriented principles. For example, this methodology treats such a query as "Is there any correlation between solar activities and economy activities?" Since it is hard to formulate traditional scientific models for such a query, it is expected that such methodology as the knowledge cluster system, which can discover the correlation of data in different types and/or different fields, will effectively function with a high flexibility and extensibility. In the current research project on "interdisciplinary data management services in distributed information processing platform", we are performing the research and development with the scientific data in space/earth environment and social data like news articles.

On the other hand, the Knowledge GRID platform is promoted as a basis for services collaboration platform in "value creation network" project of the New Generation Network research. We will further develop such technologies that would facilitate the seamless collaboration of services overcoming physical network restrictions by extending the paradigm of conventional service computing. It treats all the ICT resources including servers, storages, networks, terminal units, software, communicating means, and acquisition processes. Moreover, we are tackling the development of a new methodology that will implement the horizontal collaboration of services as well as the vertical collaboration between services and ICT resources at a high performance and scalability by directly implementing the service networking elements (service addressing, messaging, service discovery, coordination control, etc.) on the conventional network infrastructure.

Acknowledgment

In the course of pursuing this research project, we received valuable advice and guidance from Professor Yasushi Kiyoki, Department of Environmental Information, Keio University. I wish to express herewith my appreciation.

Terminology

＊1 GRID platform
A technology for interconnecting the computing and storage resources distributed on the network to configure a single, complex computing system that can be implemented by means of dedicated middleware. It is used for large-scale, high-performance computing (HPC) and resources management beyond the physical and organizational framework (virtual organization (VO)).

＊2 Service-oriented architecture
An approach of software engineering that facilitates the prompt and flexible build-up of a large-scale information system by defining and installing various types of information systems and software as services. The middleware technology for implementing this configuration constitutes the service-computing environment.

Launch of the Quasi-Zenith Satellite-1 "MICHIBIKI"!

Shinichi Hama

Research Manager, Space-Time Standards Group, New Generation Network Research Center

In 1980, entered the Radio Research Laboratory (NICT at present) and engaged in the research work on the very long baseline interferometry (VLBI), pulsar timing, and satellite communications. Currently working on the study of time management system of the quasi-zenith satellite system under the consignment by the Ministry of Internal Affairs and Communications.

In the evening of September 11, 2010, we got together with the residents of the island at a parking space located several kilometers away from the Tanegashima Space Center, and were looking up at the clear night sky with the fine visibility of the Galaxy. Later at 20:17:00 sharp, a swift orange light appeared without deviation greater than a second. Thus, the H-IIA rocket carrying the quasi-zenith satellite-1 "MICHIBIKI" was launched (Figure 1).

The use of an inclined orbit will allow the users to make use of the satellite at a high elevation angle even if they are located in a middle latitude area like Japan, and even a mobile object running along the urban canyon of buildings can avail radio waves of communications and broadcast programs without being bothered by shadowing (a phenomenon of inaccessibility to radio waves because of being in the rear of an object) -- in Japan, this concept was proposed in 1972 by Dr. Kouzou Takahashi, of the Radio Research Laboratory (NICT at present), which was the very outset of the study. At that time, however, much fuel was assumed to be required to keep this orbit, and thus considered to be incompetent for actual services. Nevertheless, at a later time when Mr. Kazuhiro Kimura, then Senior Researcher engaged in satellite orbit studies, proved that the quasi-zenith orbit could be availed at a fuel consumption rate similar to that of satellites in geostationary orbits to be confident of

Figure 1●At the Moment of Launching the Quasi-Zenith Satellite

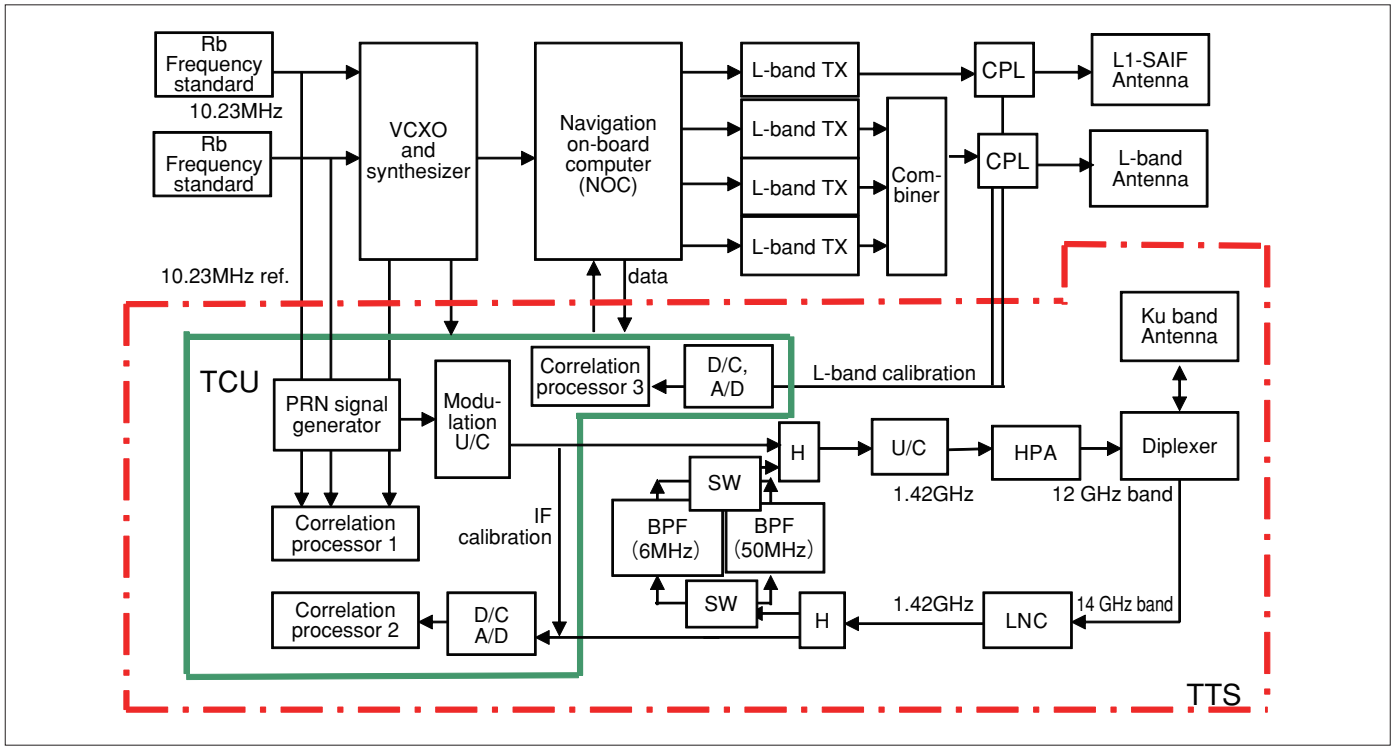


Figure 2●On-Board Units for Navigation Mission (the Section with in the Red Dash-Dotted Lines Consists of Units Developed by NICT)

the reality of a quasi-zenith satellite. Concurrently, the related industries began to propose communications and broadcasting services utilizing the quasi-zenith orbit.

On the other hand, with the increasing penetration of GPS and other satellite positioning services, voices were raised in Japan that domestically manufactured satellite positioning technologies should be developed, which led the Space Activities Commission to present its report stating that key technologies need to be developed in Japan.With such a background, the zenith satellite project was inaugurated in fiscal 2003 by the public-private partnership initiative, sharing the responsibilities of communications and broadcasting by the public sector and satellite positioning by the MEXT, MIA, METI, MLIT. NICT was consigned by the MIC to undertake the development activities relative to time management system.

Later status changes made this project limited to the satellite navigation mission of the Nation alone in fiscal 2006, and the Japan Aerospace Exploration Agency (JAXA) was assigned to coordinate the activities. The objectives of the satellite navigation mission are set to the complement of GPS (visibility enhancement by arranging inter-operative satellites at high elevation angles) and its augmentation (positioning precision improvement with the use of augmentation data carried by L1-SAIF and LEX signals).

The objective of the time management system is to coordinate the time relationship between such elements as an atomic clock on board of a satellite, earth stations linked with the Coordinated Universal Time (UTC), monitor stations for orbit determination, and the United States Naval Observatory (USNO) that generates the UTC (USNO) on which GPS is based. Of these, the time transfer between the clock on board of the satellite and the earth stations is a particularly challenging issue. Thus, we decided to conduct time transfers between them by using the two-way satellite time and frequency transfer (TWSTFT) developed and improved by NICT.

The on-board equipment consists of the time comparison unit (TCU) that constitutes the heart and communications equipment for Ku band signals between earth stations and the satellite (Figure 2 exhibits the on-board units for the navigation mission). The TCU compares on-board atomic clocks and three signals of the L band as well. The bent pipe function used as a through repeater and the TWSTFT experiment between earth stations by employing a non-stationary satellite will be conducted.

Figure 3●3.7-m Diameter Antenna of Okinawa Station

As for terrestrial system, we have installed experimental time management stations (TMS) for conducting time comparison with satellites in Koganei where UTC (NICT) is generated and in Okinawa where the satellite can be visible throughout 24 hours, and also installed the TWSTFT function in each monitoring station of three sites, Sarobetsu, Chichijima, and Kauai. Figure 3 shows the 3.7-meter tracking antenna. Since the Kauai station in Hawaii is located in the middle position between Koganei and the USNO along the U.S. east coast, it serves as a relay station for the TWSTFT connecting the both end stations. Each of these earth stations is to exchange telemetry information (remote data acquisition), commands (for actions of equipment), and data with the JAXA master control station, and consequently has come to be in need of the interface adjustment with other organizations and consistency verification tests.

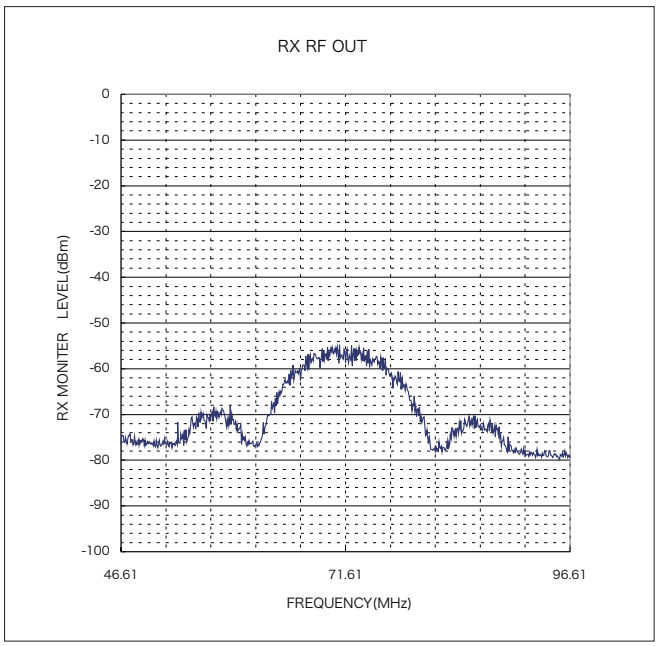


Figure 4●Spectrum of the Downlink Signal from the Satellite for Two-Way Experiment (Received at the Okinawa Station)

The reception of downlink signals from the satellite was verified at the Koganei Station on October 4, and further verified at the Okinawa Station (the spectrum of received signal is exhibited in Figure 4). Since November, we have been conducting the initial checkout of both on-board equipment and terrestrial systems. At the time point of drafting this paper (November 21), the first half of the initial checkout has been completed without any significant problems. The system is expected to enter the technology demonstration phase.

In the technology demonstration experiment, the functions and performance of the above-mentioned on-board equipment will be verified. In addition, collaborative efforts of the National Institute of Advanced Industrial Science (AIST), experiments using the LEX signals unique to the quasi-zenith satellite, development and experiments of experimental transportable TMS, and ranging tests using SLR are scheduled.

This project is being supported by a great number of people including those of the Ministry of Internal Affairs and Communications, equipment manufacturers, JAXA, AIST, and related makers. We would like to take this opportunity to thank all the people who are contributing to the successful achievement of this project.

Report on the 3rd Japan EU Symposium on the "New Generation Network"

- A Great Stride of the Japan-Europe Cooperative Relationship in the R&D for New-generation Network -

Tetsuo Aoki, Director, Strategic Promotion Office for New-Generation Network R&D, Strategic Planning Department

NICT and European Commission held the 3rd EU-Japan Symposium on the "Future Internet".
Date: Wednesday, 20th and Thursday 21st October 2010
Place: Tampere, Finland
Number of participants: 100 (40 from Japan, 60 from Europe)
Sponsored by: National Institute of Information and Communications Technology and European Commission

The "new-generation network" is being studied in Japan and Europe with the future perspective ahead of the popularly discussed next-generation network (NGN). In Europe, the new-generation network is alternately called "Future Internet". The symposium has been held annually since 2008 and sponsored by the National Institute of Information and Communications Technology (NICT) and the Information Society and Media Directorate-General (DG-INFSO) at the European Commission. Up until the last year, the symposium was centered on the introduction of studies carried out by each organization. For this year, four sessions, each allocated a total of 6 hours, have concurrently been held; each session consisted of the presentation of Japan and Europe, followed by discussion of specific subjects of joint studies. This arrangement was made to clarify the specific joint study subjects. After the discussion, each presenter prepared a joint research proposal and presented it at the last wrap-up session.

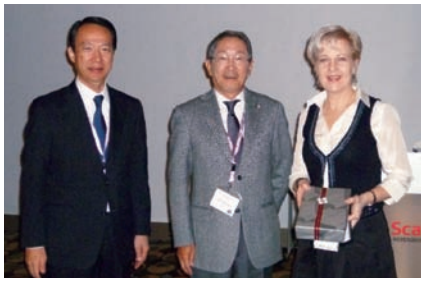
As a result, a total of 18 joint research proposals were given this time. It may be said that the Japan-EU joint research efforts have entered the proposal phase that requires specific efforts constitute the precondition, and thus the Japan-EU relations have made a great stride.

From the EU side, a preliminary proposal was made to sound out if the Japan side would be agreeable to a "coordinated call" (publicly for studies) as a framework of pursuing future joint studies. Subsequently, it has been assured by the people at the level of actual activities that the mutual efforts should be made with the objective of implementing the concept at the WP 2013 that is the last work plan of FP7 (the 7th study frame-working plan: 2007-2013 of EU). Specific schedules have already been formulated for the coordinate calls by the European Commission with Russia and Brazil for the period WP 2011-2012. Japan has started the coordinated calls of the same approach by the New Energy Development Organization (NEDO), Japan Science and Technology Promotion Organization (JST) in collaboration with the Research Directorate-General of the European Commission. We are about to exercise specific negotiations to implement the diplomatic dialogue between EC and the Ministry of Internal Affairs and Communications (MIC), detailed talks between NICT and EC, and frame-working between MIC and NICT.

A speech given by Mr. Antti Peltomki, Deputy Director-General, DG INFSO EC

An announcement was made that the next symposium was to be held in Japan, Autumn 2011.

NICT sets its objective that the R&D of the new-generation network, which is one of the key issues in the 3rd medium-term plan that will start in April 2011, should be strategically boosted in the framework of international competition and joint creation. We maintain that based on the discussion at this symposium, NICT would serve as a hub for accelerating the international joint studies with the harmonious efforts of industry, academia, and the administration for reinforcing the Japan's competitiveness and enhance the presence of NICT.


Shigeyuki Kubota, Director-General for International and Technology Policy Coordination, Minister's Secretaria (MIC), Hideo Miyahara, President of NICT, Ms. Suvi Lindn, Minister of Communications (Finland)


Discussion at one of the parallel sessions

Prize Winners

Prize Winner ● Takashi Maeno / Senior Researcher, Environment Sensing and Network Group, Applied Electromagnetic Research Center

Joint Prize Winners : **Tomo Tadokoro**
Takuo Motoyama
Hiroshi Harada
Yasuhiro Tanaka
(Tokyo City University)
Tatsuo Takada
(former Musashi Institute of Technology)

◎DATE : May 26, 2010
◎NAME OF THE PRIZE :
IEEJ Distinguished Paper Award
◎DETAILS OF THE PRIZE :
Space Charge Formation by Irradiation of Visible Light in Polyimide under DC Electric Stress
◎NAME OF THE AWARDING ORGANIZATION :
The Institute of Electrical Engineers of Japan

◎Comments by the Winner :
Although polyimide resin is available in yellowish transparent high-polymer-film form having high mechanical strength, and thus often used as a substrate for electronic circuits of mobile telephone units and thin, flat displays, its electrical properties are not necessarily excellent. In our study this time, we found that static charge is accumulated in the polyimide when exposed to light, resulting in failure. I appreciate that this discovery has become the object of the IEEJ Distinguished Paper Award.


Students of Tokyo City University (in the rear row) and Mr. Takashi Maeno (front row)

Prize Winner ● Satoshi Nakamura / Executive Director, Knowledge Creating Communication Research Center

◎DATE : June 1, 2010
◎NAME OF THE PRIZE : **Awarded by the President of the Kinki Information Communication Conference**
◎DETAILS OF THE PRIZE :
This prize was awarded to Satoshi Nakamura for his contribution to the progress of ICT, including his work in the R&D of multi-language speech translation technology as well as his leadership in its international application under the collaboration of industry, academia, and government
◎NAME OF THE AWARDING ORGANIZATION :
Kinki Information Communication Conference

◎Comments by the Winner :
Through the collaborative efforts of industry, academia, and government, I have been engaged in the practical application of multi-language speech translation technology on a global scale, and as such have been awarded this prize by the President of the Kinki Information Communication Conference. I wish to express my gratitude to all the people concerned, including the staff of the MASTAR Project and those inside and outside of the organization. I am determined to extend my full efforts for further implementation of speech translation with thoughts dedicated to extending this technology into private sectors.


Left: Sumio Fukui (chairman), Satoshi Nakamura

Prize Winners ● Teruhisa Misu / Expert Researcher, Spoken Language Communication Group, Knowledge Creating Communication Research Center
Kiyonori Otake / Senior Researcher, Language Infrastructure Group, Knowledge Creating Communication Research Center
Chiori Hori / Senior Researcher, Spoken Language Communication Group, Knowledge Creating Communication Research Center
Hideki Kashioka / Planning Manager, R&D Strategic Planning Office, Strategic Planning Department
Satoshi Nakamura / Executive Director, Knowledge Creating Communication Research Center

◎DATE : June 10, 2010
◎NAME OF THE PRIZE : **JSAI Incentive Award**
◎DETAILS OF THE PRIZE :
Construction and Experiment of Sightseeing Spot Recommendation Dialogue System for Kyoto Sightseeing Guidance Task
◎NAME OF THE AWARDING ORGANIZATION :
The Japanese Society for Artificial Intelligence

◎Comments by the Winner :
I am greatly honored that the achievements related to the studies of spoken dialog system technology conducted by the Spoken Language Communication Group have been evaluated and the JSAI Incentive Award was given. Considering the rapid increase in the volume of accumulated electronic data accessible through Web and other means, the interactive information retrieval and user support has become an increasingly important technology. We will exert efforts to produce more valuable results than earlier.


Left: Kiyonori Otake, Hideki Kashioka, Teruhisa Misu, Chiori Hori, Satoshi Nakamura

Prize Winner ● Masao Uchiyama / Senior Researcher, Language Translation Group, Knowledge Creating Communication Research Center
(Minna no Hon'yaku Development and Management Team)

Joint Prize Winners : **Kyo Kageura**
(Tokyo University),
Takeshi Abekawa
(National Institute of Informatics)

◎DATE : June 14, 2010
◎NAME OF THE PRIZE : **AAMT Nagao Award**
◎DETAILS OF THE PRIZE :
Established the community of the users Minna no Hon'yaku" (everyone's translation) and supported the voluntary translators; also greatly contributed to the accumulation of bilingual corpuses, and thus the contribution to the enhancement of the users' understanding of machine translation as well as penetration of the technology has been evaluated.
◎NAME OF THE AWARDING ORGANIZATION :
Asia-Pacific Association for Machine Translation

◎Comments by the Winner :
"Minna no Hon'yaku" (everyone's translation) is a Web site that supports volunteering translators. While volunteering translators play important roles in the global information flow, very few Web sites supporting their translation activities have so far been reported. We hope that "Everyone's Translation" will contribute to their activities. Development efforts for this site still continue. Visits from those interested are highly welcome.


Left: Makoto Nagao (first chairman), Kyo Kageura, Masao Uchiyama, Takeshi Abekawa

Memorandum of Understanding on Comprehensive Research Collaboration Signed Between the Indian Institute of Technology Hyderabad (ITTH) and NICT

Werner Klaus, Senior Researcher, International Alliance Group, Research Promotion Department

On Wednesday, Sept.29, 2010, NICT concluded a Memorandum of Understanding on comprehensive research collaboration with the Indian Institute of Technology Hyderabad (IITH) . The signing ceremony took place shortly before the opening of the second meeting of the Japan-India ICT Growth Strategy Committee at Tokyo Kaikan in Tokyo downtown. NICT President Dr. Hideo Miyahara and IITH Director Prof. U. B. Desai signed the memorandum in an amicable atmosphere in attendance of Mr. Hideo Hiraoka, Vice Minister for Internal Affairs and Communications, and Dr. J. S. Sharma, Chairman of the Telecom Regulatory Authority of India.

A survey conducted by NICT in May 2010 on the possibilities of future information and researcher exchanges with research institutes in India triggered in both parties the demand for establishing the foundation of building up cooperative relations.

Through the signing of this memorandum, collaboration between both parties in the area of information and communications technology will be promoted more consistently and rapidly in the form of information exchange, exchange of researchers, promotion of joint researches, and joint organization of workshops.

IITH is located in the suburbs of Hyderabad in the South of Central India and was established by the Government of India as the eighth school of the Indian Institutes of Technology. These institutes are known for their high educational level in technical fields. IITH itself has a strong electrical engineering and computer science faculty which carries out excellent R&D activities in the fields of sensor network, cognitive radio, multimedia content processing, and network security.

Picture taken during the signing ceremony at Tokyo Kaikan
Left to right: Mr. Hideo Hiraoka, Dr. Hideo Miyahara, Prof. U. B. Desai, Director, and Dr. J. S. Sarma.

Information for Readers

The next issue will feature a variety of subjects including reconfiguring motions from brain activities and the report on Okinawa Subtropical Environment Remote-Sensing Center Open House.

NICT NEWS No.398, Nov 2010 ISSN 1349-3531

Published by
Public Relations Office, Strategic Planning Department,
National Institute of Information and Communications Technology
<NICT NEWS URL> http://www.nict.go.jp/news/nict-news.html

Editorial Cooperation: Japan Space Forum

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