NICT NEWS

独立行政法人 情報通信研究機構

National Institute of Information and Communications Technology

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Development of Intruder Detection System that Uses Radio Waves

Hiroyuki Tsuji

Senior Researcher, Space Communication Systems Laboratory, Wireless Network Research Institute

After completing a doctoral course in engineering, Tsuji joined Communications Research Laboratory, Ministry of Posts and Telecommunications (currently NICT) in 1992. He mainly has been researching antenna array signal processing and aircraft communications systems. He is also a guest professor at the Graduate School of Yokohama National University. Ph.D. (Engineering)

Introduction

With growing attention to security, more and more people are installing security systems in their homes. The most common way to detect an intrusion or an event, such as the opening or closing of windows and doors, is to install a pyroelectric infrared sensor or door sensor for each intrusion route or object. It is troublesome, however, to install sensors on all windows, and there is the downside that other, unexpected intrusion routes or objects won't be detected.

With the help of radio waves, NICT has developed a new type of intruder detection system that can monitor an entire unoccupied space at night and during holidays. Only one system needs to be installed in each room—separate sensors for each window and intrusion route are not required. This new security system also has none of the drawbacks of traditional infrared sensors, which suffer from inconsistent detection and cannot detect objects behind other objects.

Where the Idea Came from — Learning from Mistakes —

It all started from the unexpected. About five years ago, I was trying to make a precise estimate of the position of the indoor source of radio waves using multiple antennas arranged in the space (hereinafter referred to as an antenna array). I was working with a student from Keio University, who was a trainee at that time. This was also the research theme of his graduation work. This technology can be used as a basic technology for high-speed wireless transmission and position management. We repeatedly examined the several methods and conducted experiments again and again, but we were having a hard time in achieving good results. One of the reasons for all these failures was that any little movement of the furniture or the opening of a door changed how the radio waves propagated, and the changes significantly affected the results.One day, near the end of the year, it occurred to me that if the method we had been examining was so sensitive to changes in the environment of a room, maybe we could use this method as a sensor for security purposes, rather than for detecting a position. On Christmas Eve, we conducted experiments to verify the idea. The results were better than expected. We confirmed that by installing antennas for transmission and reception in just one area of a room, the opening or closing of a door, movement of a person, or shift of the furniture could be detected without fail. This was the beginning of the system's development. As an aside, the student was able to graduate, although he had to change the theme of his graduation thesis at the last minute.

How the Security System and Antenna Array Work

Let me briefly explain the working principle of the system. As shown in Figure 1, a transmitter that emits radio waves is placed in one location in a room and a receiver with an antenna array in another location. The radio waves radiate in all directions from the transmitter and are reflected or absorbed by the floor, ceiling, windows, furniture, and other objects, following complicated routes before arriving at a reception point. These complicated routes are the key to this system. The antenna array at the reception point ultimately will receive incident radio waves from all directions. If some event occurs in the routes between the transmitter and receptor, such as an intrusion or the opening of a window, the transmitting pattern of the radio waves changes.This change is translated at the reception point as not only a change in the reception intensity but also as a change in the incident angles of the radio waves. The system detects an event because the antenna array detects a spatial change in the incidence pattern of radio waves. A previous method detected a change in the reception intensity at a reception point using only one antenna, but the method was never put into practical use because minor variations in a transmitter or trivial changes in a room altered the reception intensity and often resulted in false detections. On the other hand, this new method incorporates an antenna array that detects how radio waves are travelling spatially, so detection is more reliable. In the communications field, the complicated reflection of radio waves (called multipath) generally has been a major nuisance because it may degrade communications quality. This system, however, takes advantage of multipath and is able to detect events that occur behind objects.*

* Recently, a method that improves communications speed and quality was developed using an antenna array in a multipath environment. This new method is now used by wireless LAN and other products.

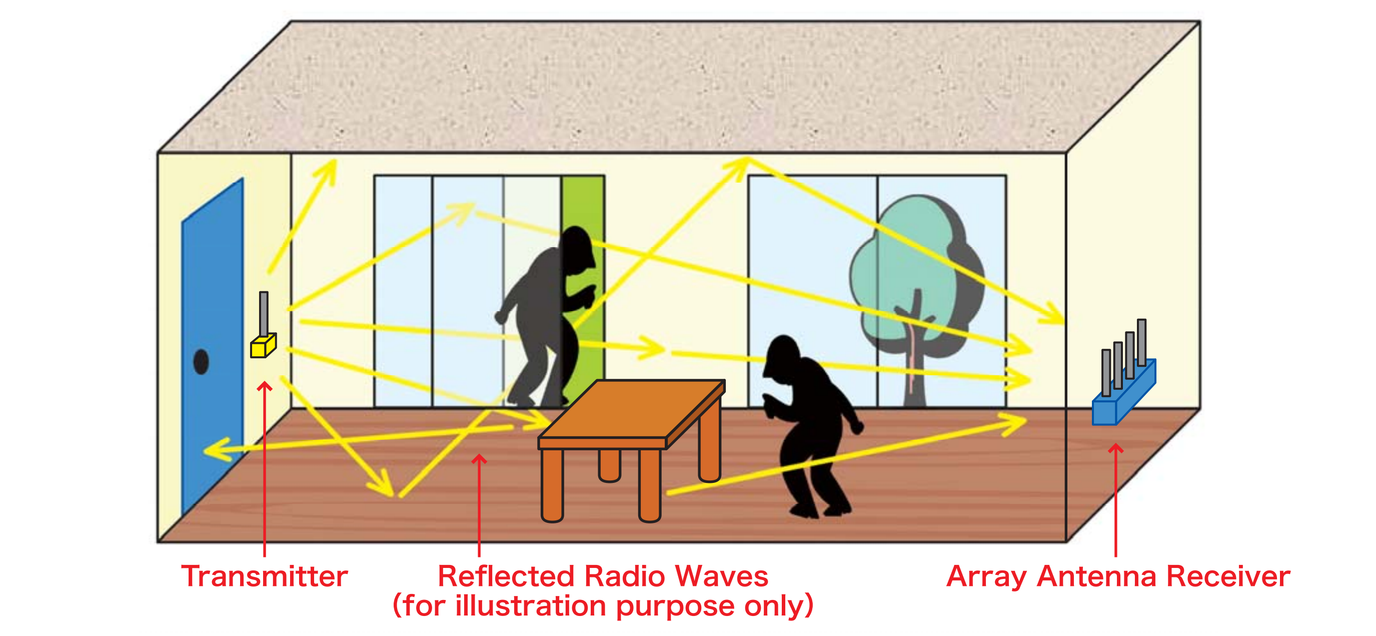


Figure 1●Mechanism of Security System Incorporating Antenna Array

Development of Real-time Event Detection Evaluation Equipment

At first, we conducted experiments and evaluations of this system by cobbling together existing equipment. Besides being very large, the equipment was hard to handle and the effect hard to see because we chose to analyze the data after collecting it. So, we reviewed the structure of the system and contrived another method for signal processing. As a result, we were able to reduce the size of the equipment and developed event detection evaluation equipment that can process data in real time using a compact microprocessor. Figure 2 shows the equipment. The equipment integrates a transmitter and a receptor and incorporates processing equipment to detect an event.This equipment is connected to antennas. The system emits an audible alert when an event occurs, such as an intrusion or the opening or closing of a window. The equipment also has a USB port for connecting the equipment to a PC, allowing the recorded data and other detailed information to be viewed and analyzed in various ways. In the future, it will be possible to make the equipment as small as a cell phone, since the structure of the hardware is simpler than that of a cell phone.

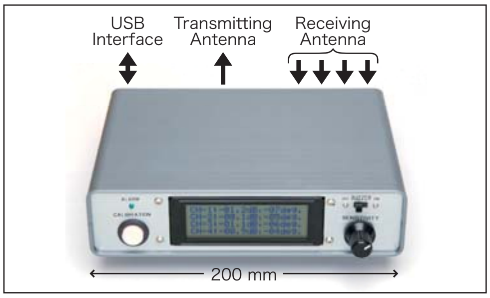


Figure 2●Real-time Event Detection Evaluation Equipment

Event Detection by Evaluation Equipment

This is an example of event detection using the evaluation equipment. Figure 3 shows the detection results when someone opens a door and enters a room. The horizontal axis is the timeline and the vertical axis is the quantified results of the changes obtained by the method. This chart shows that someone entered the room by opening the door at Time A, started walking around in the room at Time B, stopped for awhile at Time C, and left the room at Time D. As shown in Figure 3, the quantified results along the vertical axis remained close to 0 when there is no event happening, but you will see the values changed when the door is opened at Time A and when the person moved about the room at Time B. The equipment sets appropriate thresholds for those values, and once the values exceed the thresholds, a buzzer sounds to signal that an event has occurred. By adjusting the thresholds, the detection sensitivity can be optimized. The values returned to zero once the person has left the room and closed the door. Comparing the quantified results along the vertical axis after the person left the room with the values at Time C when the person stops moving in the room, you can tell that this system not only can detect the movement of people in a room but also their presence.

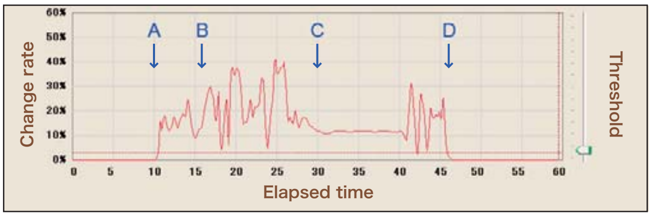


Figure 3●Example of Event Detection Results

Conclusion and Future Development

The developed system has made it possible to monitor an entire room just by installing a single system in the room. The system can detect an event even when the event takes place behind an object positioned between the transmitter and the receptor. As the equipment is simple and easy to install, it can be used together with a current alarm system. As well as detecting the movement or presence of people in a room and changes in the arrangement of the furniture, the system can detect misplaced objects. This system that uses radio waves also can be installed where motion sensor-equipped cameras cannot, such as in bathrooms. Therefore, the system may have a variety of applications in the future. For the time being, we are aiming to put the system into practical use while further improving the detection method so that it can detect events with greater consistency and accuracy.

Quantum Receiver beyond the Limit of Optical Communication Technology

–The first evidence exceeding the Bit Error Rate Limit of coherent optical communication–

Masahiro Takeoka

Deputy Director, Research and Development Office, Global ICT Strategy Bureau, Ministry of Internal Affairs and Communications

Masahiro Takeoka received the Ph.D. degree in 2001 and then joined Communications Research Laboratory (currently NICT) to work on quantum information theory and experiment, and quantum optics. He is currently transfered to the Ministry of Internal Affairs and Communications.

Introduction

The performance of optical communications is determined by the bit error rate (BER) at the detection of digital signals and the ability of subsequent error correction. The bit error rate can be lowered by eliminating the noise that may occur at the light source and receiver, but there is unavoidable noise even in principle, called quantum noise (see Figure 1). Quantum noise derives from quantum uncertainty, one of the basic principles of quantum mechanics. The bigger the transmission loss in a communications channel and the higher the signal density become, the bigger the effect appears. Traditional optical communications theory regards quantum noise as uncontrollable. Even using the most advanced coherent optical communications methods researched and developed at NICT and the world over, the noise, called the shot noise, has been thought impossible to circumvent.

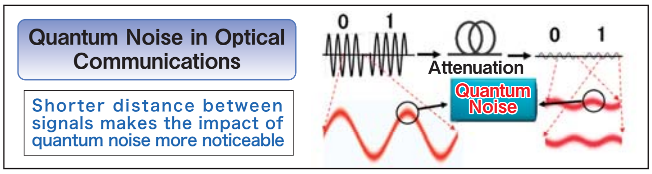


Figure 1●Quantum Noise in Optical Communications

On the other hand, when the laser was invented in the 1960's, pioneering theoretical research was underway to combine optical communications and quantum mechanics (quantum communications theory). The theory has indicated that controlling the quantum noise during signal detection might reduce the BER. At that time, however, optical communications technology was not fully developed, and the research could not rise above the level of basic theory. Taking advantage of recent progress in light detection technology and quantum information science, NICT has pursued its realization and overcome the shot noise limit in coherent optical communications for the first time in the world. This article briefly describes our research.

Identification Limit of Optical Signal and Quantum Measurement

In current optical communications, information is transmitted by modulating the intensity and/or phase of laser light and is received by their direct detection. According to current optical communications theory, which considers quantum noise as normal noise, this is an optimum detection method. The limit on the bit error rate is called the Shot Noise Limit or Standard Quantum Limit and is considered to significantly restrict communications performance, especially when the optical signals are very weak.

To overcome the limit, it is necessary to control and detect the quantum noise at the micro level. According to the quantum mechanics that describes micro-world physics, such as the atom, the state of matter is expressed by a wavefunction. We won't devote pages here to describe what a wavefunction is, but the important point is that the state looks significantly different depending on how it is measured. In other words, we cannot see the entire picture of matter (wavefunction) with just one measurement. Rather, we can only measure fragmentary information from the direction we see it, just like a shadow picture (see upper left figures in Figure 2). In the case of optical communications, measurement of the interference in the signals shows the characteristics of the phase as a wave. Measurement of the energy shows the characteristics of the intensity (i.e., the number of photons). The effect of quantum noise looks different for each measurement, but in both cases, the shot noise limit is imposed on signal identification.

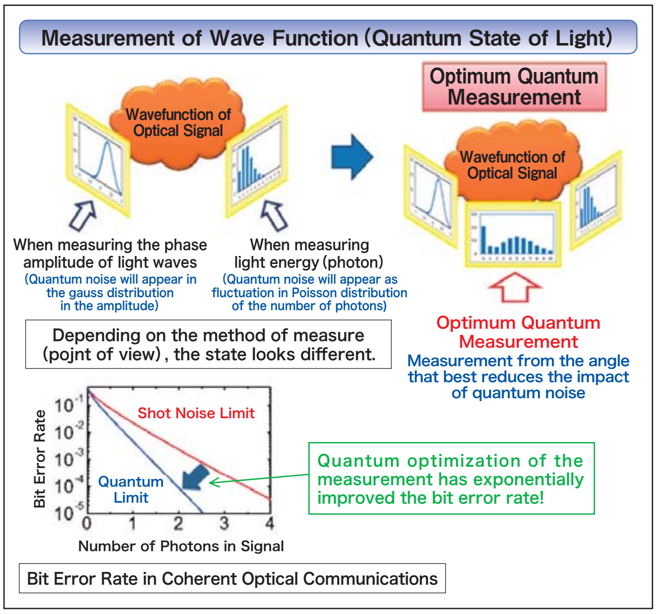


Figure 2●Measurement of Wavefunction (Quantum State of Light)

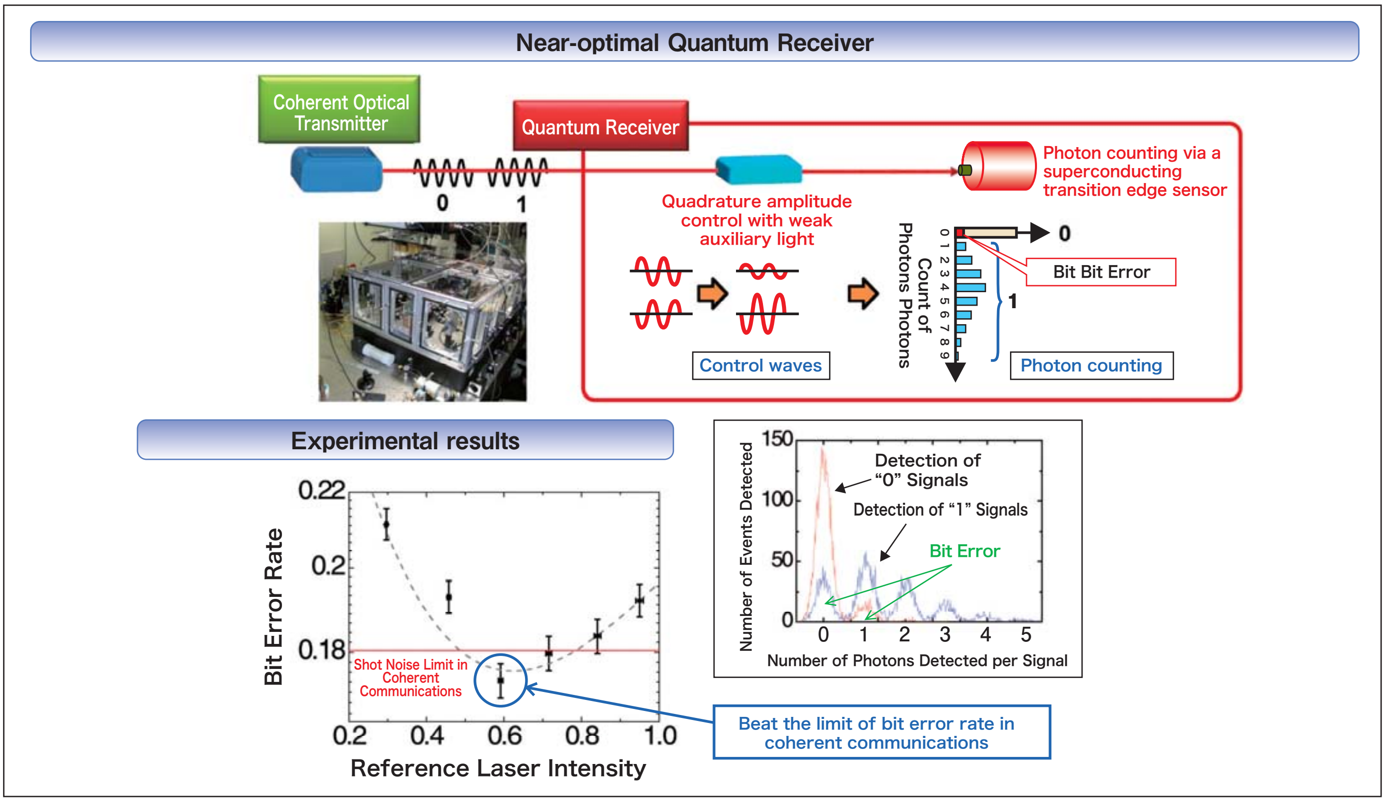


Figure 3●Near-optimal Quantum Receiver

Development of Quantum Receiver

How can we surpass the shot noise limit? We can take a measurement from an angle that circumvents most of the impact of quantum noise. The Quantum Receiver has been optimized in terms of quantum mechanics to achieve this purpose (see upper right and lower left figures in Figure 2). In theory, the optimum measurement can be perfectly expressed in a formula, but it is extremely difficult to achieve this in the real world because it is not just a simple measurement of intensity or phase. NICT has proposed a new receiver scheme that can approximate the optimum measurement by combining light interference (control of waves) and photon detection (measurement of particles) (see Figure 3). We also built a quantum receiver that incorporates the latest photon-number-resolving detector (superconducting transition edge sensor) developed by the National Institute of Advanced Industrial Science and Technology (AIST). With these efforts, we became the first to overcome the shot noise limit in coherent optical communications by transmitting and receiving weak signals with an average of 0.2 photons. Half a century after quantum communication theory predicted an existence of the quantum receiver, experiments finally proved that the theory was right.

Future Perspective

The achievement will surely advance basic science. On the other hand, you may wonder if we actually need to communicate with such weak, photon-level signals. However, in a recent field-test of satellite communications, the number of photons in the signals that reached a receiver were 100 or less, and would become increasingly weaker in the future. At the terrestrial communications level, as well, optical signals are becoming so dense in some backbone networks that the optical fibers may start melting, even as the demand for higher capacity communications continues to increase. Therefore, it has become important to reduce to a minimum the light power per bit. By incorporating quantum error correction in the quantum receiver, we can theoretically achieve the physically allowable ultimate communications capacity with signals of limited energy. To build such a quantum decoder, we must control the wavefunction of light in a more fundamental way. To do this, we need a breakthrough in experimental physics and device technology. NICT will continue to proceed with this research so that we can develop quantum communication technology into an innovative, advanced ICT technology that can respond to the ever increasing demands for larger capacity communications systems and energy savings, even after a couple of decades (see Figure 4).

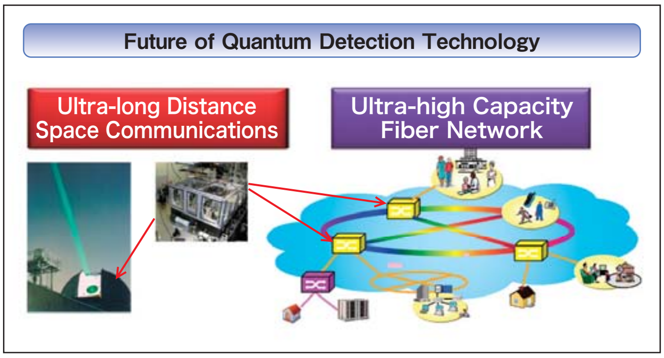


Figure 4●Future of Quantum Detection Technology

AssisTra: A Sightseeing Guidance System with Spoken Dialogue Interface

—Toward a system that can provide easy access to necessary information through natural speech—

Teruhisa Misu
Expert Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute

After completing a doctoral course, Dr. Misu joined NICT in 2008 as an Expert Researcher. He has been studying spoken language processing, especially spoken dialogue systems. He was a Research Fellow (DC1) of the Japan Society for the Promotion of Science from 2005 to 2008.

Etsuo Mizukami
Expert Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute

After completing a doctoral course, Dr. Mizukami served as an assistant at the Gakushuin University Computer Centre and as a researcher at ATR Spoken Language Communication Research Laboratories before joining NICT in 2009. He has been studying evaluation of human-system and human-human dialogue and mutual adjustment in communication. Ph.D. (Science)

Hideki Kashioka
Director, Spoken Language Communication Laboratory, Universal Communication Research Institute

After completing a master course, Dr. Kashioka joined ATR. He was temporarily transferred to NICT in 2006 and hired in 2010. He has been studying spoken language processing, speech translation, and spoken dialogue He also is a guest associate professor at Nara Institute of Science and Technology. Ph.D. (Engineering)

Hisashi Kawai
Executive Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute

After completing a doctoral course, Dr. Kawai joined KDD R&D Laboratories (currently, KDDI R&D Laboratories) in 1989 and researched speech synthesis and speech recognition. He was temporarily assigned to ATR in 2000 for four years and researched and developed speech synthesis systems. He has been temporarily assigned to NICT since 2009 and is studying speech translation technology. Ph.D. (Engineering)

Tamotsu Shirado
Research Manager, Planning Office, Universal Communication Research Institute

Dr. Shirado joined the Radio Research Laboratory, Ministry of Posts and Telecommunications (currently NICT) in 1986. Since then, he has worked in Kajima, Hiraiso, Kansai, and Keihanna, and at the Information and Communications Policy Bureau of the Ministry of Internal Affairs and Communications (then). He is currently working in the Planning Office of the Universal Communication Research Institute. Ph.D. (Engineering)

Introduction

The research goal in the Spoken Language Communication Laboratory of Universal Communication Research Institute is to develop an information system that anyone can use easily and naturally. We have been investigating an advanced dialogue processing technology that can accept user's spontaneous speech queries and understand, and even guess, the intention of the dialogue and present the requested information. To demonstrate the research result and collect data from real-world usage, we released AssisTra, an application for smartphones that provides information for tourists, in Apple's App Store in June 2011. This article will briefly introduce the three functions of AssisTra and explain the spoken dialogue processing technology that mainly is used in Hanna's Guide - Kyoto.

Figure 1●Dialogue Examples from Hanna's Guide - Kyoto

Three Functions of AssisTra

• Sightseeing Guidance System with Spoken Dialogue Interface "Hanna's Guide - Kyoto"

This is a spoken dialogue system that accepts spontaneous speech input from a user and responds appropriately. A user can use the speech inputs shown in Figure 1 to retrieve various kinds of information helpful for sightseeing in Kyoto, such as tourist spots and restaurants.

•Tourist Information Application in Multiple Languages: "KyoTra"

The application provides text information useful for sightseeing in four languages (Japanese, English, Chinese, and Korean). The system can search and display popular tourist spots in Kyoto and also the nearest tourist spots (about 2,900 hits) from a user's current location, along with directions from the current location to the desired destination.

• Travel Record Application: "TraMemo"

The system allows you to record pictures and notes (voice or text) and link them to a position on an electronic map.

Spoken Dialogue Processing Technology

Generally, a spoken dialogue system has the structure shown in Figure 2. It comprises five main modules: speech recognition, spoken language understanding, dialogue management, spoken language generation, and speech synthesis. All of the modules in Hanna's Guide - Kyoto were developed in our laboratory.

Speech recognition and speech synthesis have employed a statistic method based on the Hidden Markov Model (HMM). By utilizing a huge amount of tourist dialogue data (described hereinafter) to construct a model specialized in providing tourist information, the system has achieved a high level of speech recognition performance and provides a natural synthesized speech, as if the machine is actually talking to a user. In addition, we have collected and sorted many output sentences from professional guides to describe various tourist spots, including descriptions of cherry blossoms, the autumn color of leaves, and so on, as text.

In this article, we will describe an outline of the spoken language understanding and dialogue management technologies employed in Hanna's Guide - Kyoto.

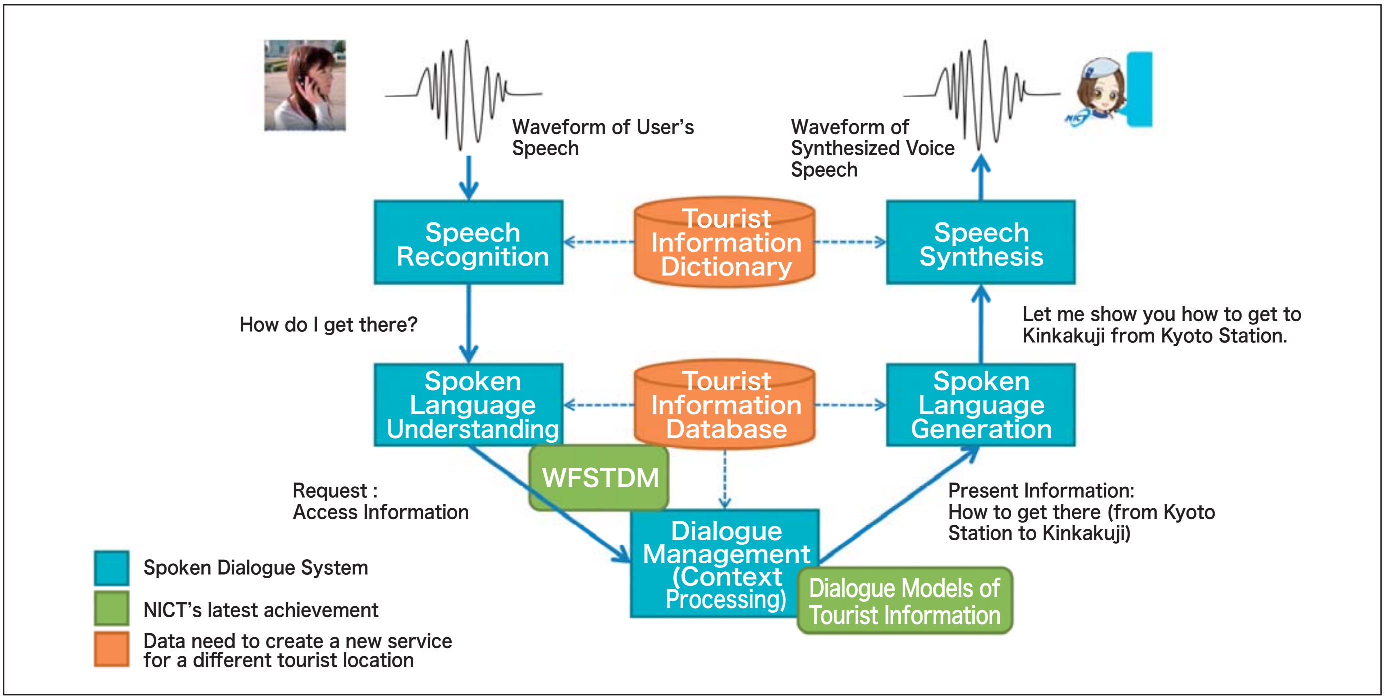


Figure 2●Structure Diagram of Spoken Dialogue System

• SpokenLanguage Understanding

The ways of expressing something vary with the person and the situation. For example, a user who wants to know how to get to a tourist spot by bus might express that intention using one of the examples in Figure 3. The same meaning, however, can be conveyed in a variety of ways. It is not so difficult for a human to understand a speaker's intention when expressed in various forms but for a computer to understand it, the various expressions must be converted into the same symbol. This is the function of spoken language understanding.

To realize this function, the various expressions that users actually use must be collected. At the same time, an algorithm for spoken language understanding must be developed. To collect the wording actually used in conversations, we recorded 300 dialogues from 150 hours of conversations between professional sightseeing guides and people posing as tourists. The collection is pretty large compared to the world standard for spoken dialogue data collected in a single situation. We also built a prototype of a spoken dialogue system and conducted an experiment with human subjects to collect spoken expressions in a real-world situation. Based on this data, we used the Weighted Finite-State Transducer-based Dialog Manager (WFSTDM), a framework for spoken language understanding and dialogue control developed by our laboratory, to create a model for spoken language understanding based on WFST expressions.

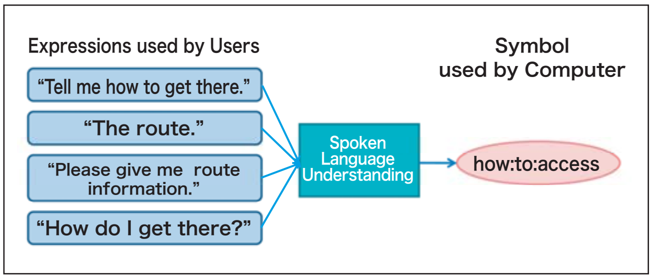


Figure 3●Example of Spoken Language Understanding

• Dialogue Management

Even when exactly the same speech is input, a user's intention may be different, depending on the situation or the dialogue history. For example, let's say the system gets the input, "Tell me how to get there." This information must be complemented with other information, such as "from where, to where, and by which transportation means," based on the user's dialogue right before the speech. Determining a response by complementing the hidden intention in these speeches is the function of dialogue processing.

Such dialogue history processing is highly dependent on the situation where a dialogue system is used and the purpose for a user to utilize the system. With that in mind, we created a model for history processing specialized in sightseeing dialogue based on the aforementioned large-scale dialogue data, which was collected from the situation close to the actual use by a user, so that the system can properly process a dialogue history.

Conclusion

Since the release of the application, we have been analyzing the collected log data and found that the response accuracy of the system needs improvement. We realized that the variety of human speech, intentions, and expressions are much wider and more complicated than we could cover using our 150 hours of training data. For a computer to accurately understand a person's intentions, we must continue collecting larger volumes of dialogue data and further improve the accuracy of spoken language understanding and dialogue history processing. Our future work will include reconstruction of the models for each module by adding the collected speech data from the experiments using the system, while proceeding with research on an algorithm that can more flexibly understand speech and control dialogue. To expand the use of the system, we are also planning to prepare Hanna's Guide - Kyoto in multiple languages so that it can be used to help foreign tourists who come to Japan for sightseeing. Furthermore, we intend to demonstrate the practicality of dialogue processing technology by constructing a spoken dialogue system that can handle various real-world tasks, such as ticket reservations and call-center operations.

Report on NICT's 2011 Facility Open House

Advanced ICT Research Institute (Kobe)

– Experience the future of information and communications!! –

Saturday, July 30　Number of visitors: 505

While playing quiz games, visitors looked around the eight sites in the four research buildings. In the exhibition booths, they enjoyed doing experiments and making things, including "measuring brain activity", "conducting ultralow temperature experiments", "polarization and color change experiments", "making a microscope", and "sampling DNA". The activities were designed by each laboratory. The visitors also enjoyed interacting with the researchers, listening to their talks about the kinds of research being done at the Advanced ICT Research Institute, and examining the facilities.

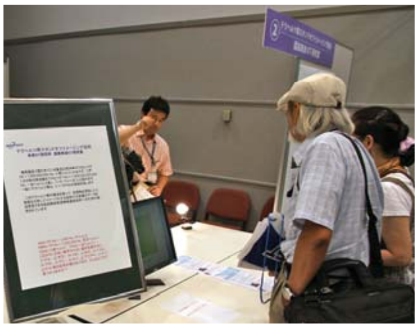
●Experienced the world of superconductivity and ultralow temperature with a demonstration of the Meissner effect of superconductivity and liquid nitrogen

●Sampled and observed the DNA of broccoli

●Made a Leeuwenhoek microscope and observed cells

●Created a rainbow-colored box using a polarizer

●Measured brain waves and learned about them



●Observed an electric bulb with a camera that can detect terahertz waves

Lecture Meeting by Researchers

●Snapshot of the Lecture Meeting

In the fourth research lecture meeting, three researchers gave separate talks about superconductive quantum devices, biomolecular motors, and the brain's memory. They introduced their research and explained the cutting-edge technology using familiar examples. The room was almost full for both the morning and afternoon lecture meetings. The audience eagerly listened to the lectures and asked sharp questions.

100th Anniversary of the Discovery of Superconductivity
– Future Information Communications Made Possible by Superconductivity –
Nano ICT Laboratory
Hirotaka Terai, Research Manager

Nanometer Measurement Using a Biomolecular Motor
– Observe, Manipulate and Measure the Movement of Molecules –
Bio ICT Laboratory
Hiroto Tanaka, Senior Researcher

"Bat" in "My" Brain
– Let's look at a knowledge map of the brain –
Brain ICT Laboratory
Takahiro Soshi, Expert Researcher

NICT held a Facility Open House again this year during the summer holidays for elementary and junior high school students to give them an opportunity to see what NICT is doing and let them directly experience how interesting science technology is (We cancelled the planned open house at Koganei headquarters due to the power shortages this summer).

Kashima Space Technology Center

– Radio Waves and Satellite Connect Earth and Space –

Saturday, July 30　Number of visitors: 865

With some of our office buildings damaged by the earthquake, open areas were limited and we had to scale back this year. We held the event, however, placing more emphasis on safety than ever before.

●Entrance of Open Facilities

●Refuge Area

It was cloudy on the day of the Open House, not too hot and not too cold, with no rain. It was actually perfect weather for the visitors and staff because this year we had many sites set up outdoors in tents to introduce research.

Despite the lower level of PR activity due to the decision to scale back the event this year, we welcomed many guests.

●Reception

●Presentation in tent – 1

●Presentation in tent – 2

The research presentation at the Open House focused on satellite communications that are resistant to disasters. We showed our support activities conducted in the disaster-stricken areas right after the earthquake by using the satellite communications, while letting children experience the satellite communications network in an easy-to-understand way. We also introduced crustal movement observations related to earthquakes as measured using radio waves (electromagnetic waves). It all went well, and the visitors showed us many pleasantly surprised faces and curious looks.

●Children experiencing the experimental satellite communications network

●Displayed on the floor were full-scale observational results of crustal movements caused by earthquakes.

Prize Winners

Prize Winner ● Teruhisa Misu / Expert Researcher, Spoken Language Communication Laboratory, Universal Communication Research Institute

◎Date: March 10, 2011

◎Name of Prize:
The Awaya Prize Young Researcher Award

◎Details of Prize:
In recognition of the excellent lecture on Optimization of Dialogue Strategies using Reinforcement Learning in Voice Interaction that Supports Decision-making (Authors: Teruhisa Misu, Koumei Sugiura, Kiyonori Ohtake, Chiori Hori, Hideaki Kashioka, Hisashi Kawai, and Satoshi Nakamura)

◎Name of Awarding Organization:
The Acoustical Society of Japan

◎Comments by the Winner:

I am greatly honored to receive the Awaya Prize Young Researcher Award that recognizes our research results for creating a model of voice interaction and optimizing dialogue strategies. The results were achieved by utilizing the huge body of voice interaction data collected through the project. I would like to extend my sincere appreciation to all of the people who have given their kind support and cooperation for the research, especially those in the Spoken Language Communication Laboratory.

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

Joint Prize Winners:
Masato Akagi
(Japan Advanced Institute of Science and Technology)
Kaoru Hirota
(Tokyo Institute of Technology)

◎Date: March 10, 2011

◎Name of Prize:
The 51st Sato Prize Paper Award

◎Details of Prize:
A functional model of the auditory peripheral system: Modeling phase-locking properties and spike generation processes of the auditory nerves

◎Name of Awarding Organization:
The Acoustical Society of Japan

◎Comments by the Winner:

It is a great honor for me to have our research paper on an auditory model, published in Acoustical Science and Technology, selected for the Paper Award. I would like to express my sincere gratitude to everyone who supported my research. The proposed model can faithfully simulate the firing pattern of the auditory nerves—the periphery expression of the sound coming through the external ear. The model can be applied to scientific research into the aural sense and to engineering research for evaluating sound models. The recognition gives me huge encouragement and I will continue to pursue the research.

Prize Winner ● Toshiaki Kuri / Director, Planning Office, Photonic Network Research Institute

◎Date: March 15, 2011

◎Name of Prize:
Recognition of Service in Electronics Society Activities

◎Details of Prize:
In recognition of dedicated service in operating projects for the Electronics Society

◎Name of Awarding Organization:
IEICE Electronics Society

◎Comments by the Winner:

It was a true honor for me to have interacted with many distinguished experts in the industrial and academic arenas while conducting projects for four years beginning in May 2005 as secretary-general of the Technical Committee on Microwave Photonics, IEICE (The Institute of Electronics, Information and Communication Engineers) Electronics Society. That was a really valuable experience for me. I would like to extend my deep appreciation to the executive group, the expert committee, and the advisors of the Technical Committee, who gave me warm guidance and cooperation, as well as to those concerned persons in NICT who supported me during the activities.

Prize Winner ● Yutaka Kidawara / Director General, Universal Communication Research Institute
Sadao Kurohashi / Expert Researcher, Information Analysis Laboratory, Universal Communication Research Institute

Joint Prize Winners:
Susumu Akamine
(Former NICT Research Expert / currently with NEC)

◎Date: April 28, 2011

◎Name of Prize:
Contribution Award in the 43rd Ichimura Academic Awards

◎Details of Prize:
In recognition of unique research into the WISDOM information analysis system that has opened up a new academic field and contributed to the development of the industry

◎Name of Awarding Organization:
The Acoustical Society of Japan

◎Comments by the Winner:

WISDOM has helped users to find reliable, valuable information from the web, which contains both good and bad information. The research did not end as just another project, but turned into something useful in real life that was widely recognized and led to our receiving the Ichimura Academic Awards. We would like to express our deep gratitude to the former Knowledge Clustered Group, as well as to all of the staff members of NICT. We would not have received the prize, especially after just having received the Maejima Award, without the kind cooperation given to us. We would like to ask for your further support and cooperation as we aim at even higher goals in the third medium-term plan for further development of information analysis technology.

Yutaka Kidawara

Prize Winner ● Zhen Wang / Distinguished Researcher, Advanced ICT Research Institute

Joint Prize Winners:

Yoshinori Uzawa
Yasunori Fujii
(National Astronomical Observatory of Japan, National Institutes of Natural Science)

◎Date: April 20, 2011

◎Name of Prize:

Prizes for Science and Technology of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (Research Category)

◎Details of Prize:

In recognition of pioneering research into terahertz detection technology utilizing niobium nitride-based superconductivity

◎Name of Awarding Organization:

Minister of Education, Culture, Sports, Science and Technology

◎Comments by the Winner:

I am truly honored to receive the Prizes for Science and Technology of The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, especially in this memorable year of the 100th anniversary of the discovery of superconductivity. The prize recognizes my twenty years of research into niobium nitride-based superconductivity thin-film, devices, and terahertz-band high-sensitivity SIS heterodyne receivers using this technology and its ALMA application. I am deeply grateful to the joint researchers and NICT staff members, for their long-term support of the research. I will continue to make every effort to advance superconductivity research.

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

◎Date: April 6, 2011

◎Name of Prize:

EGU G Division Outstanding Young Scientist Award

◎Details of Prize:

For outstanding contributions to the improvement of the accuracy of space geodetic techniques.

◎Name of Awarding Organization:

European Geosciences Union

◎Comments by the Winner:

It is indeed an honor for me to have my research about the "Development of Highly-accurate Correction and Innovative Technology for Space Geodetic Techniques" recognized and to receive the EGU G Division Outstanding Young Scientist Award in 2011. I believe the technique will contribute to precise international time comparisons. I will continue to proceed with such research that will be worth recognizing.

EGU G Division Outstanding Young Scientist Award

◎Date: May 23, 2011

◎Name of Prize:

The Tsuboi Prize of the Geodetic Society of Japan

◎Details of Prize:

Precise Modeling of Radio Propagation for Space Geodesy

◎Name of Awarding Organization:

The Geodetic Society of Japan

◎Comments by the Winner:

I have received the Individual Award of the Tsuboi Prize of the Geodetic Society of Japan in recognition of my research into "Precise Modeling of Radio Propagation for Space Geodesy." The research has resulted in a highly accurate model of delay errors, as well as a method for correcting them, in radio-wave transmissions due to a neutral atmosphere. Delay errors are a serious factor in space geodetic technologies that use space geodetic techniques and microwaves. The research has significantly contributed to improving the accuracy of observation data. I would like to express my deep gratitude to the many people who have supported me, and I will continue to work toward better research results.

The Tsuboi Prize of the Geodetic Society of Japan

Received Certificate of Appreciation from Tokyo Fire Department

—For the contribution of WINDS to emergency aid efforts after the Great East Japan Earthquake—

On July 28 at the government office of Tokyo Fire Department, NICT received a certificate of appreciation from the Fire Chief of the Tokyo Fire Department for our support and cooperation in the emergency aid efforts after the Great East Japan Earthquake.

As a part of research and development using the ultrafast internet satellite WINDS, NICT Wireless Network Research Institute has been investigating how to make good use of the communications satellite after large-scale disasters. Although WINDS is still in the experimental stage, NICT gave priority to doing everything we could to helping the people affected by the Great East Japan Earthquake.

In response to a request for assistance from the Tokyo Fire Department on March 13, two days after the earthquake, we carried all the necessary equipment, including a VSAT (portable, ultra-compact earth station), to Kesennuma City on March 14 and began using WINDS to provide broadband network connections between the Command Headquarters of the emergency firefighting aid groups (main office: Kesennuma City, Miyagi) and the Tokyo Fire Department (TFD, at its Headquarters' strategy room, Ote Town, Tokyo) on March 15. The temporary communications network allowed the two offices to easily share information by transmitting high-quality images and maps of damaged areas bi-directionally in real time.

We are honored to receive this certificate of appreciation, which recognizes our contributions to facilitating the activities of the emergency aid groups.

Again, we wish to extend our deepest sympathies to the people who have suffered from this unprecedented tragedy and wish them the earliest possible recovery.

●Receiving a certificate of appreciation from the Fire Chief of the Tokyo Fire Department
(Hiroshi Kumagai, Vice President, NICT (Left); Yoshio Kitamura, Fire Chief, Tokyo Fire Department (Right))

●Executives of the Tokyo Fire Department and the NICT Staff

【FYI】Information concerning our use of WINDS to aid emergency response efforts after Tohoku Region Pacific Coast Earthquake (March 16, 2011)
http://www.nict.go.jp/info/topics/announce110316.html

Information for Readers

The next issue will explore “NIRVANA”, which visualizes network traffic in real time, as well as data hiding, digital watermarking, and other topics.

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