

### **3.23.3 Research on the database containing the results of survey on the buildings damaged in The Niigataken Chuetsu-oki Earthquake in 2007 and The Noto Hanto Earthquake in 2007**

Expert Researcher Shibayama traveled to Niigata and Ishikawa Prefectures on Feb. 25 to 28 to investigate the site in Kashiwazaki City that was seriously affected by The Niigataken Chuetsu-oki Earthquake in 2007. He exchanged views with Associate Professor Masami Gotou of the Kanazawa Inst. of Tech., who is a coordinator at the Architectural Inst. of Japan engaged in summarizing the damage after The Noto Hanto Earthquake in 2007. The focus of this research is to identify a method for summarizing and providing a vast amount of disaster information collected after an earthquake. The data will be used in researching a method of investigation in disaster areas and for elucidating the factors leading to building damage.

### **3.23.4 Demonstration test of disaster information collection system**

The effective implementation of emergency measures after an earthquake requires quickly understanding the damage situation. The Disaster Management and Mitigation Group conducted a study on a method for effectively collecting damage information by using ICT and has been developing an information collection system using cell phones that could be used during a disaster. For this purpose, a demonstration test concerning information collection that involved simulating circumstances during a disaster, was held in Takamatsu City on Feb. 29 and 30 in front of the public who may use the system in the future (Fig. 57).

### **3.23.5 Exhibition**

- (1) In the Technical Show Yokohama 2008 held in Pacifico Yokohama on Feb. 13 to 15, a voice-reading system using wireless tag was exhibited at the booth of NICT Incubations (Fig. 58).
- (2) An open test by the technical committee studying government radio transmissions

into each home to prevent disaster, under the Kinki Bureau of Telecommunications, of which Group Leader Takizawa is a member, was held in Awaji City, Hyogo on Feb. 27. The test included exhibiting the rescue communicator (Fig. 59).

### **3.23.6 Job experience for junior high school students**

Six students in the 2nd year of Tokyo Denki University Junior High School were accepted for job experience on Feb. 4 (Fig. 60).

## **3.24 March 2008**

### **3.24.1 Patent granted**

The following patent for a method of



**Fig.57** Demonstration test of disaster information collection system



**Fig.58** Technical Show Yokohama 2008





**Fig.59** Committee studying government radio transmissions into each home to prevent disasters

restricting the duration only of general calls, created by Senior Researcher Kazunori Okada and others, was granted on March 5. The invention makes both important communication calls and general calls, for example, when members of the public want to confirm the safety of their loved ones, easier to connect during times of congestion in a disaster (application date: Dec. 21).

- Okada and Masahiro Kuroda (Medical ICT Group): “Method of restricting and controlling the duration of telephone calls made via a communication network,” Patent No. 4056013

### 3.24.2 Research presentation

(1) 1st Int’l Workshop on Disaster and Emergency Information Network Systems (IWDENS 2008)

A satellite workshop of the Int’l Conf. on Advanced Information Networking and Applications (AINA2008) held by the IEEE Computer Society, IWDENS 2008, was held in Okinawa on March 26. Group Leader Takizawa and Senior Researcher Koichi Gyoda each made the following presentations.



**Fig.60** Job experience for junior high school students

- Takizawa, Masafumi Hosokawa (NRIFD), Ken’ichi Takanashi (NRIFD), Hada, Akihiro Shibayama, and Jeong Byeong-pyo: Pinpointing the place an emergency cell phone call originates using an active RFID tag.
- Gyoda, Nam, Okada, and Takizawa: Analysis of Ad Hoc Network Performance in Emergency Communication Models.

(2) General journals

- Hada: Disaster mitigation research platform — rescue communicator, Telecom Frontiers, No. 58, pp. 23–32, Mar. 2008.

(3) Symposium in the general meeting of Inst. of Electronics, Information and Communication Engineers (March 18 to 21) “Ad hoc network that supports recovery from a disaster”

- Gyoda, Nam, Okada, and Takizawa: “Analysis of the performance of ad hoc network in the communication model during an urban disaster”

General session

- Semba, Okada, Gyoda, and Nam: “Evaluation of the characteristics of emergency multisystem access in microcell network when there are many non-operating base stations”

(4) Joint presentation (by researchers in external organizations)

- General meeting of the Inst. of Electronics, Information and Communication Engineers



- Masafumi Hosokawa, (NRIFD), Ken'ichi Takanashi (NRIFD), Takizawa, and Hada: "Positioning system using RFIDs for sending distress messages by cell phone"
- Hideo Sato (Tokyo Denki Univ.), Kuniaki Kawabata (RIKEN), Hayato Kaetsu (Tokyo Denki Univ.), Tsuyoshi Suzuki (Tokyo Denki Univ.), Yasunori Yakiyama (Tokyo Denki Univ.), Yasushi Hada, and Yoshito Tobe (Tokyo Denki Univ.): "Environmental information collection by sensor nodes with a passive pendulum mechanism" (poster session by students)
- Research presentation by students of the Tokyo branch of the Inst. of Electronics, Information and Communication Engineers (March 1)
  - Hitoshi Kono (Tokyo Denki Univ.), Kei Sawai (Tokyo Denki Univ.), Kuniaki Kawabata (RIKEN), Hada, and Tsuyoshi Suzuki (Tokyo Denki Univ.): "Development of shock-resistant sensor nodes for collection of information in disaster areas"
- 13th Robotics Symposia (March 16 to 17)
  - Ryuji Sugizaki (Tokyo Denki Univ.), Tsuyoshi Suzuki (Tokyo Denki Univ.), Kuniaki Kawabata (RIKEN), Yasushi Hada, and Yoshito Tobe (Tokyo Denki Univ.): "Gathering of environmental information with mobile robots and wireless sensor networks"

### **3.24.3 Demonstration test of disaster information collection system**

After the demonstration test on disaster information collection with cell phone terminals performed in Takamatsu City at the end of Feb., a second test was carried out using the same subjects (20 to 60 years of age) over two days, March 28 and 29. In this test, ease of operation of the information collection system (confirmation of the fact that the operation once experienced can be repeated even after a prolonged period) and reliability of the information were verified.

This test was reported in *The Shikoku Shimbun*, Setonaikai Broadcasting Co., Ltd., NHK local news, and others on March 29.

### **3.24.4 Koichi Gyoda, transferred to Shibaura Inst. of Tech.**

Senior Researcher Koichi Gyoda who was responsible for the research and development of the ad hoc network, was transferred to Dept. Electrical Communication, College of Engineering, Shibaura Inst. of Tech. as an associate professor on April 1.

## **3.25 April 2008**

### **3.25.1 Facilities' Open House of Nat'l Research Inst. of Fire and Disaster**

When the facilities of the Nat'l Research Inst. of Fire and Disaster, were opened to the public on April 18, Expert Researcher Jeong Byeong-pyo made a demonstration of the damage information collection system using cell phones (Fig. 61).

## **3.26 May 2008**

### **3.26.1 Contribution to "The research meeting concerning how to make important communication more sophisticated"**

The final meeting of the research committee for making important communication more sophisticated, under the Telecommunications Business Department of Ministry of Internal Affairs and Communications, was held on May 26. Studies on restricting the duration of



**Fig.61** Opening of the facilities of Nat'l Research Inst. of Fire and Disaster to the public



communications during a disaster, which was proposed as an important technology for ensuring communication, were described in an independent chapter of the report. The section of the report describing future directions also stated that it is desirable that technologies effective for communication time-restriction should be studied in collaboration between NICT and telecommunication carriers.

### 3.26.2 Expert Researcher Jeong Byeong-pyo estimated the soil amplification factor of the Sichuan Earthquake (China) from satellite data

In 2008, Expert Researcher Jeong Byeong-pyo started research on a method for estimating the soil amplification factors observed in large-scale earthquakes that occurred mainly in developing countries. He used a digital elevation model previously obtained, for example, from artificial satellites. He also roughly estimated the seismic intensity distribution from them, in collaboration with the Nat'l Research Inst. of Fire and Disaster. This research is focused more on speed than accuracy and strives to support determining a strategy on the place to which the international emergency rescue team is to be dispatched. As part of the research, Expert Researcher Jeong Byeong-pyo estimated the soil amplification factor of the Sichuan Earthquake that occurred on May 12. The results were reported urgently in the Remote Sensing Society of Japan on May 23. He was interviewed about the results by *The Asahi Shimbun* on May 26 and 27.

### 3.26.3 Invited lectures and presentations in academic meetings

(1) The second local disaster management information symposium, "Toward establishing a means of communicating information that is effective in disaster mitigation", was held on May 8 at Iwate Prefectural Univ. by the Inst. of Local Disaster Management Information, Iwate Prefectural Univ. Group Leader Takizawa gave a lecture entitled "Studies on ICT for Disaster Management in NICT". The lecture was presented, as Iwate Pref. Univ., Univ. of Shizuoka, and Kochi

Univ. of Tech. were connected to each other by JGN2plus (Fig. 62).

- (2) In the forum for supporting disaster management ICT at the Wireless Technology Park 2008, held in Pacifico Yokohama on May 13, Group Leader Takizawa gave a lecture entitled "Studies Conducted in NICT to Establish a Useful ICT for Disaster Management and Mitigation" (Fig. 63).
- (3) On May 16, Group Leader Takizawa gave a lecture entitled "Collecting Information on Disaster Areas with IC Tags". He gave the lecture to 34 students as part of telecommunication training in the professional course of the College of Land, Infrastructure, Transport and Tourism.
- (4) In the Int'l Symposium on Mobile Information Technology for Emergency Response (Mobile Response 2008) held in Germany on May 30, Expert Researcher Yasushi Hada



**Fig.62** Second Local Disaster Management Information Symposium



**Fig.63** Forum for supporting disaster management ICT in Wireless Technology Park 2008



gave a presentation entitled “Three-Way Pinpointing of Emergency Calls from a Cell Phone Equipped with an RFID Reader.” Yasushi Hada replaced the first author and Group Leader Takizawa in this event. This presentation gave the results of the development under contracted research of the Special Coordination Funds for Promoting Science and Technology. The Proceedings were published as LNCS from Springer.

(5) In the meeting of the Remote Sensing Society of Japan held in Tokyo Inst. of Tech. on May 23, Expert Researcher Jeong Byeong-pyo gave a presentation entitled “Topographic Classification Using ASTER-DEM for Estimation of Soil Amplification”. The results of the on-site investigation in the Philippines obtained by analysis using satellite data and also those obtained in emergency analysis of Sichuan Earthquake were included in the presentation.

(6) In the spring meeting of the Inst. of Social Safety Science held in Toyako Lake on May 30 to June 1, Expert Researcher Jeong Byeong-pyo gave a presentation entitled “Information Collection System Using Cell Phones for Use During a Disaster”. The presentation was related to the results obtained in the field test performed in Takamatsu City in February and March of the same year.

### 3.27 June 2008

#### 3.27.1 Tokyo Int'l Fire and Safety Exhibition (Fig. 64)

In an exhibition held by the Tokyo Fire Department approximately every 5 years, the Disaster Management and Mitigation Group presented an exhibition on June 5 to 8 and presented various research results of the group and collaborated organizations. The following two workshops were held on the first day of the exhibition.

(1) Workshop, “ICT, firefighting and disaster management” (morning of June 5)

Members of the research team engaged in “studies on a system to support firefighting activities before and after a large-scale disaster and to share information” performed



**Fig.64** Tokyo Int'l Fire and Safety Exhibition 2008

under the Grant-in-Aid for Scientific Research (basic research B), in which Group Leader Takizawa is the representative, presented their results. The Expert Researcher Masafumi Hosokawa of the Nat'l Research Inst. of Fire and Disaster urgently reported the results of the topographic classification and soil amplification factor estimation of Sichuan Earthquake obtained in collaboration with Expert Researcher Jeong Byeong-pyo. The presentation attracted considerable attention. A summary of what Expert Researcher Jeong Byeong-pyo stated in interviews on May 26 and 27 (see **3.26.2**) was reported in an article on “Accurately estimating the damage from earthquakes using data from space” in the morning edition of the *The Asahi Shimbun* on June 4. The program is shown below:

“Studies on a system for support for firefighting activities before and after large-scale disaster and for information sharing,” Osamu Takizawa (NICT)

“Research and development of sensing to support activities to manage disasters and ubiquitous space-time basic technology,”



Masafumi Hosokawa (Science and Technology Policy Office, FDMA)

“Studies on disaster mitigation through cooperation between commuters unable to get home and local residents and governments in large-scale urban disasters,” Yoshiaki Hisada and Masahiro Murakami/Akihiro Shibayama (Kogakuin Univ./NICT)

(2) Workshop, “Positioning of the use of RFID and assurances for safety and security” (afternoon of June 5)

A meeting to present the results obtained through contracted research under the Special Coordination Funds for Promoting Science and Technology, in which NICT is also involved, on “positioning of the use of RFID and assurances for safety and security” was held and the meeting was very successful. Many people engaged in firefighting participated. The program is shown below:

“Summary of entire project and improvement in precision of positional information and acquisition of environmental information using the P2P model,” Kaoru Sezaki (Center for Spatial Information Science, The Univ. of Tokyo)

“Seamless positioning using RFID and development of an efficient surveying system,” Izumi Kamiya (Geospatial Information Authority)

“Assurance of safety and security using positioning technology,” Osamu Takizawa (NICT)

“Positioning technology needed when responding to a distress call,” Masafumi Hosokawa (Science and Technology Policy office, FDMA)

“Technology for search and rescue,” Ken’ichi Takanashi (NRIFD)

“Ensuring the safety and security of children,” Tomonori Saito (NRIPS)

### **3.27.2 On-site investigation on The Iwate-Miyagi Nairiku Earthquake in 2008**

The Iwate-Miyagi Nairiku Earthquake in 2008 occurred at 8:43 on June 14, 2008.

Expert Researcher Akihiro Shibayama traveled to the site on the same day and made

an immediate investigation on the damage with Professor Masato Motosaka, Disaster Control Research Center, Tohoku Univ. (Fig. 65). The investigation results were reported through the disaster committee of the Architectural Inst. of Japan.

### **3.27.3 On-site test under the NEDO project for the development of component technologies for construction of a strategic advanced robot**

A test for a NEDO contracted research project, “high-speed search robots for confined spaces” was conducted in the underground complex of Sannomiya, Kobe, during the period from midnight on June 17 to the early morning of June 18. Expert Researcher Yasushi Hada and Group Leader Takizawa participated in the test (Fig. 66). A drill to simulate the operation of a robot was performed by the firefighters from the fire-defense headquarters of Odawara, Kawasaki, and Kobe, in front of the people from the Ministry of Economy, Trade and Industry and NEDO. Other professionals also attended the test for evaluation. A problem was observed concerning the communication, for which NICT and others were responsible. It was not possible to display a particular function due to radio interference, for example, from the surveillance cameras of shops in the underground complex. Further improvement was therefore needed.

### **3.27.4 Presentations at academic meetings**

(1) The following presentation was given at



**Fig.65** On-site investigation of the Iwate-Miyagi Nairiku Earthquake in 2008



the 27th meeting of the Japan Society for Simulation Technology held on June 20.

- Senior Researcher Okada, Suzuki, the trainee Semba, and Expert Researcher Nam: “Call quantity characteristics of emergency multisystem access in a microcell network when there are many non-operating base stations”
- (2) In the Robotics and Mechatronics Conference (ROBOMECH 2008) of the Robotics Society of Japan held on June 5 to 7, the following presentations were given.
- Hada et al. : “Outdoor demonstration test of an information collection network using intelligent sensor nodes and an autonomous airship,” “Test of long-distance remote control of a mobile robot using wireless LAN communication,” and three other collaborative presentations.

### 3.27.5 Patent granted

Okada and Masahiro Kuroda (Medical ICT Group): “Method and system of restricting and controlling the duration of telephone calls communicating via a network”(Patent No. 4130973, registered: June 6, 2008)

## 3.28 July 2008

### 3.28.1 Techno Transfer in Kawasaki

In the exhibition held in the Kanagawa Science Park on July 9 to 11, the RFID-based voice-reading terminal was exhibited at the booth of NICT Incubations (Fig. 67).



**Fig.66** On-site demonstration of NEDO project for Strategic Development of Advanced Robotics Elemental Technologies

### 3.28.2 General Government Fair 2008

In the exhibition held at Tokyo Big Sight on July 16 to 18, progress of the research and development project: “Protecting children from crime” was exhibited jointly with the Nat’l Research Inst. for Police Science of Nat’l Police Agency, Surugadai Univ. and the Center for Spatial Information Science, The Univ. of Tokyo (Fig. 68).

### 3.28.3 Spatial Information Symposium 2008

At the Symposium held in Tokyo Conference Center on July 17, Expert Researcher Akihiro Shibayama gave a presentation entitled “Sharing of Disaster Management Information between Local Residents and Government Using ICT”.

### 3.28.4 NICT’s Facilities’ Open House

The facilities of NICT were made open to public on July 25 and 26, when a rescue robot and other items were demonstrated. At the event, studies conducted in the Disaster Management and Mitigation Group were presented (Fig. 69).



**Fig.67** Technology Transfer in Kawasaki



**Fig.68** General Government Fair 2008





**Fig.69** Facilities' Open House

### 3.29 Aug. 2008

#### 3.29.1 Test for collection of damage information from above by an unmanned airship

On Aug. 12 to 15, Expert Researcher Yasushi Hada participated in a test flight of a 14 meter-class LTA held by JAXA in Taiki-cho, Hokkaido and conducted a damage information collection test between ground and sky using rescue communicator (Fig. 70). This is the third in a series of tests, continuing from those in Aug. and Dec. last year. In the earlier tests, the transmission of audio information collected every minute by the rescue communicator to an unmanned airship high above via an ad hoc network was tested. It was confirmed then that communication of the rescue communicator with the airship, with which it is not possible to communicate directly, can be achieved by multi-hop transfer, and that communication with the rescue communicator is also possible even when it is covered with a wooden plate 10 cm thick, which simulates a damaged building. The results obtained in these collaborative tests were disclosed in the



**Fig.70** Test on collecting damage information from above by an unmanned airship

international conference held in The Univ. of Electro-Communications on Aug. 20 to 22, SICE Annual Conference 2008.

#### 3.29.2 Participation in academic activities and drills

- (1) Expert Researcher Kotaro Sonoda attended the IEEE IHHMSP 2009 (Int'l Conf. on Intelligent Information Encoding and Multimedia Signal Processing) held in Harbin, China, on Aug. 15 to 17. He played the role of chairman for the session of Advanced Data Encoding and Coding Techniques for Audio signals. The current meeting, which was related to information encoding and mining of multimedia signals, was the fourth.
- (2) Expert Researcher Yasushi Hada gave a lecture entitled "research and development of robot sensor network for use in disaster management or mitigation" in the 51st mobile unit communication research meeting of Megurokai on Aug. 28.
- (3) In the joint disaster management drill of Tokyo Metropolitan Government and other cities held on Aug. 31 (In Harumi-futou Park, Chuo-ku), a corner of the exhibition space, to provide operational experience of the cell phone terminal with a damage information collection function. The function was developed in collaboration with Nat'l Research Inst. of Fire and Disaster, Fire Defense Agency, Ministry of Internal Affairs and Communications, was formed (Fig. 71). The cell phone terminal was reported to the media on Aug. 25 before the drill.



### 3.29.3 Status of NEDO contract research

The robot developed under the NEDO contracted research project participated again in the RoboCup 2008 World Championship held in Suzhou, China on July 14 to 20 under the team name, Pelican United, after participating in the previous year and won 3rd prize in the section, Autonomy (autonomous performance) of the Rescue Robot League (Fig. 72).

### 3.30 Sep. 2008

#### 3.30.1 Presentations at academic meetings and magazine coverage

(1) In the meeting of the Architectural Inst. of Japan 2008 held in Hiroshima Univ, on Sep. 18 to 20 the following presentations were given.

- Jeong Byeong-pyo, Shinsaku Zama



**Fig.71** Joint disaster management drill of Tokyo Metropolitan Government and other governments

(NRIFD), Shibayama, and Takizawa: “Demonstration test of disaster information collection system using cell phones”

- Nishigaya Norifumi (Kanto Gakuin Univ.), Norio Abeki (Kanto Gakuin Univ.), and Jeong Byeong-pyo: “Micro-tremor-based vibration characteristics of the ground in San Pedro, the Philippines”
- Shibayama, Masami Gotou (Kanazawa Inst. of Tech.), and Shinya Muranishi (Kanazawa Inst. of Tech.): “Studies on the period needed to investigate building damage”
- Takeshi Okubo (Kanazawa Inst. of Tech.), Shinya Muranishi (Kanazawa Inst. of Tech.), Shibayama, and Masami Gotou (Kanazawa Inst. of Tech.): “Investigation of buildings half a year after the Noto Hanto Earthquake in 2007”

(2) J. of Radio Engineering & Electronics Association, “FORN”, Sep. issue

Group Leader Takizawa wrote an article entitled “Information communication technology useful for disaster management and mitigation”.

#### 3.30.2 Committee

(1) Committee for investigation and management of the joint resident/government ubiquitous disaster mitigation information system



**Fig.72** left: Logo of Pelican United (Chiba Inst. Tech., Tohoku Univ., Tsukuba Univ., Okayama Univ., AIST and NICT)  
right: Certificate of commendation from the RoboCup 2008 World Championship



The first meeting of the committee for the investigation and management of the project for science and technology of safety and security of the Ministry of Education, Culture, Sports, Science and Technology, which started the same year, was held at Univ. of Yamanashi on Sep. 22. The project started with the purpose of constructing a system to improve disaster information sharing in collaboration between local residents and governments and for achieving disaster mitigation and also of constructing an information system to support the system. Univ. of Yamanashi was the representative organization. The Univ. of Tokyo (Graduate School of Information Science and Technology, Institute of Industrial Science) and the Nat'l Inst. of Advanced Industrial Science and Technology (AIST) were joint research organizations, and the Nat'l Research Inst. of Fire and Disaster and NICT were cooperative research organizations.

### 3.30.3 Tests

- (1) High-speed search robots for use in confined spaces (NEDO contracted research)

After the test in August, Expert Researcher Hada conducted a field test of the integrated wired/wireless ad hoc network in the underground complex in front of the Sannomiya Station, Kobe, after the railway service had stopped operating, twice on Sep. 7 to 8 and 12 to 14.

- (2) Workshop on "Protecting children from crime" (contracted research of JST/RISTEX)

A workshop for the contracted research, "Establishing a practical ground for monitoring damage to children and crime-prevention activities" (representative organization: Nat'l Research Inst. for Police Science) was held at the Tsukuba Int'l Congress Center on Sep. 22. Group Leader Takizawa attended the workshop. Four pairs, each consisting of a parent and a child, participated in the workshop, collecting data by performing regional risk analysis and walking in the town to conduct inspections. NICT was responsible for development of the application for the cell phones used during the

walking inspections (Fig. 73).

### 3.31 Oct. 2008

#### 3.31.1 Test on evacuation monitoring with a real-time evacuation-monitoring system using active RFID

In the disaster management drill held in the Shinjuku campus of Kogakuin Univ. on Oct. 22, Expert Researcher Shibayama conducted a test on monitoring the evacuation in a high-rise building with Kogakuin Univ. (Fig. 74). In the test, the evacuation status in the high-rise building was monitored in real time, with active RFIDs being carried by teachers and students. The test results are useful for predicting congestion in the evacuation routes and for decision-making when determining the evacuation routes. The test was performed under the cooperative research with Kogakuin Univ., "studies on disaster mitigation through the cooperation of commuters unable to get home with local residents and government agencies in a large-scale urban disaster".

#### 3.31.2 On-site investigation of Sichuan Earthquake

Expert Researcher Jeong Byeong-pyo conducted investigative research on topography of the area damaged in the Sichuan Earthquake, which occurred on May 12, and the surrounding areas in cooperation with Kyoto Univ. and Kanazawa Univ. in the period from Oct. 18 to



**Fig.73** Workshop for "Protecting children from crime"



27 (Fig. 75). The investigation was conducted as part of the research on international contribution concerning the estimation of damage and transmission during a disaster through the combination of remote sensing and technical test satellites. The validity of our method for estimating earthquake damage based on numerical altitude data (DEM) obtained from artificial satellites was verified. The results of the investigation showed that the method has accuracy sufficient for use in urgent reports issued immediately after a disaster.

### 3.31.3 Presentations at academic meetings and acceptance of trainees

(1) At the 14th World Conference on Earthquake Engineering held in Beijing on Oct. 13 to 17, the following presentations were given.

- Jeong Byeong-pyo, Shinsaku Zama, Masafumi Hosokawa, Osamu Takizawa, and Bartlome C. Bautista: "A study on the classification of landform based on SRTM-3 for estimating site amplification factors in metropolitan Manila," the Philippines, 14th World Conf. Earthq. Eng., DVD 2008
- Akihiro Shibayama, Yoshiaki Hisada,

Masahiro Murakami, Makoto Endo, Shinsaku Zama, Osamu Takizawa, Masafumi Hosokawa, and Tsuguyuki Ichii: "A study on the support system for disaster information collection using information and communication technology," 14th World Conf. Earth. Eng., DVD 2008

(2) At the international conference held Seoul, Korea on Oct. 14 to 17, the following presentation was given.

- Hideo Sato, Kuniaki Kawabata, Tsuyoshi Suzuki, Hayato Kaetsu, Yasushi Hada, and Yoshito Tobe: "Information gathering by wireless camera node with passive pendulum mechanism," Int'l Conference on Control, Automation and Systems 2008 (ICCAS 2008), pp. 137–140, Seoul, Korea, Oct. 14–17, 2008.

(3) At the research meeting on multi-dimensional mobile communication network of the Japan Society for Simulation Technology held in Niigata Univ. on Oct. 31, the following presentation was given.

- Tomotaka Suzuki (a trainee), Kazunori Okada, and Nguyen Hoang Nam: "Evaluation of characteristics of W-CDMA micro cell network when there are non-



**Fig.74** Disaster management drill held in Shinjuku campus of Kogakuin Univ.



**Fig.75** On-site investigation of Sichuan Earthquake



operating base stations”

- (4) At the meeting of the Japan Society for Disaster Information Studies held in the Center for Integrated Disaster Information Research, The Univ. of Tokyo on Oct. 25, the following presentation was given.

- Takizawa, Jeong Byeong-pyo, Masafumi Hosokawa,(NRIFD), and Masashi Matsuoka (AIST): “Research and development project on damage estimation during a disaster to support by International Rescue Team of Japan Fire-Service”

- (5) Sixteen members of the Firefighters’ Union and Firefighting Advisory Committee for East Iruma area were accepted for inspection and training on Oct. 31.

### 3.31.4 Exhibitions

- (1) CEATEC JAPAN 2008

The system for estimating earthquake damage was exhibited in the NICT Super Event, held in Makuhari Messe on Sep. 30 to Oct. 4 (Fig. 76).

- (2) Security & Safety Trade Expo 2008

The author participated in the exhibition held at Tokyo Big Sight on Oct. 8 to 10 (Fig. 77).

- (3) The International Industrial Fair 2008

An RFID-based voice-reading system was exhibited at the booth of NICT Incubations at the exhibition held at the Kobe Int’l Exhibition Kobe International Exhibition Hall on Oct. 8 and 9 (Fig. 78).

## 3.32 Nov. 2008

### 3.32.1 Demonstration evaluation of the high-speed search robot for use in confined spaces, developed under NEDO contracted research

Technical demonstration to evaluate the NEDO contracted research project, which was underway since 2006, was conducted in the underground complex of Sannomiya, Kobe on Nov. 6. To test the communication portion, for which NICT is mainly responsible, five robots were actuated simultaneously using the system developed. Two of the robots could be controlled remotely even from a long distance of



Fig.76 CEATEC JAPAN 2008



Fig.77 Security & Safety Trade Expo 2008



Fig.78 Int'l Frontier Industry Messe

683 meters, demonstrating to the reviewers that the system satisfied the initial target of actuating multiple search robots simultaneously in a confine space 700 meters in length (Fig. 79).

### 3.32.2 Local ICT Future Festa 2008 in Tokushima

Future information communication technology for use during a disaster was exhibited jointly with the Nat’l Research Inst. of Fire



and Disaster. Group Leader Takizawa gave a lecture entitled “Advanced ICT for disaster management and mitigation” in the Tonankai and Nankai Earthquakes Seminar held on Nov. 8 (Fig. 80).

### 3.32.3 u-Japan Festa in Fukuyama

In the forum for investigation the use of RFID in Chugoku, held at the event in Fukuyama, Hiroshima on Nov. 14, Group Leader Takizawa gave a lecture on mobile terminals and RFID used in a ubiquitous networked society (Fig. 81).

### 3.32.4 Open demonstration test of positioning using RFID and assurances for safety and security

On Nov. 26, a demonstration test of the research and development project under the Special Coordination Funds for Promoting Science and Technology, which was carried out in collaboration with The Univ. of Tokyo, Geospatial Information Authority, NRIFD and Nat’l Research Inst. for Police Science, was held in Nagareyama City, Chiba (Fig. 82). The test was reported to the media on Nov. 18.

### 3.32.5 Presentations at academic meetings

In the meeting of the Seismological Society of Japan held in Tsukuba Int’l Congress



**Fig.80** Exhibition and lecture in Local ICT Future Festa 2008 in Tokushima



**Fig.79** Demonstration for evaluation of NEDO project



**Fig.81** Lecture in u-Japan Festa in Fukuyama





**Fig.82** Open demonstration test of "Positioning using an RFID and assurances for safety and security"

Center on Nov. 24, the following presentation was given.

- Jeong Byeong-pyo, Shinsaku Zama (NRIFD), Makoto Endo (NRIFD), Masafumi Hosokawa, (NRIFD), and Takizawa: "Estimation of seismic intensity distribution in Sichuan Earthquake"

### **3.32.6 Expert Researcher, Akihiro Shibayama, transferred to Tohoku Univ.**

Expert Researcher Akihiro Shibayama was transferred as assistant professor to the laboratory of Professor Masato Motosaka in the Disaster Control Research Center, Tohoku Univ. on Dec. 1.

## **3.33 Dec. 2008**

### **3.33.1 Discussion group for the utilization of ICT in the field of firefighting and disaster management**

Under the current status and future prospects concerning advances in ICT, including ubiquitous network and broadband, for the purpose of establishing an environment of cooperative research and development by matching the seeds in research organizations with the needs in firefighting, the Nat'l Research Inst. of Fire and Disaster initiated a discussion group for the use of ICT in the field of firefighting and disaster management. The

objective was to allow ICT to be used more actively in the field of firefighting and disaster management, for example to support firefighting activities and to collect disaster information. The first meeting was held in the NICT Kojimachi meeting room on Dec. 19, where Group Leader Takizawa was selected as the chief examiner.

### **3.33.2 Participation of the engineer, Kim Taewoon**

To accelerate the research and development project into the international contribution concerning the estimation of damage and data transmission during a disaster through the combination of remote sensing and technical test satellites, Kim Taewoon of, Urban Safety and Security Research Institute, Univ. of Seoul, Korea, joined the team as a fixed-term engineer on Dec. 1. He is responsible for developing the topographic classification algorithm for estimating soil amplification factors.

## **3.34 Jan. 2009**

### **3.34.1 Continuation of the NEDO rescue robot project approved**

Among the three projects initially approved after the "stage gate evaluation" to determine whether the projects should be continued or terminated, under the NEDO contracted research in progress since 2006, entitled "RT System Moving in Damaged Buildings, Strategic Development of Advanced Robotics Elemental Technologies (in the field of robot for special environment)," the project in which NICT is participating, namely, "high-speed search robots for use in confined spaces" (representative organization: Int'l Rescue System Inst.) was approved for continuation. Two additional years were approved for it to achieve practical application. One of the reasons for the decision was that the selection of the wireless/wired hybrid communication system is practical and that the system is also practical, indicating that the method proposed by NICT, as its practical application is taken into consideration, is highly regarded.



### 3.34.2 Participation to the test of providing information to commuters unable to get home, held by the Kanto Bureau of Telecommunications of the Ministry of Internal Affairs and Communications

An on-site test aimed at providing information to commuters unable to get home was held through an investigation and discussion group concerning the establishment of a communication support system for local disaster management, initiated by the Kanto Bureau of Telecommunications of the Ministry of Internal Affairs and Communications. The test was held in the area in front of the east gate of Ikebukuro Station on Jan. 23 (Fig. 83). In the test, a wireless mesh network was constructed using a high-output wireless LAN with a 4.9GHz band and IEEE802.11s. Local disaster information was transmitted to and from portable terminals. Electronic papers and information display devices such as LEDs were deployed in “Machikado” disaster management information stations and various areas. In this way, the effectiveness of the system in evacuating and providing guidance to the commuters unable to get home was verified. Former Expert Researcher Akihiro Shibayama currently assistant professor in Tohoku Univ. (also a short-term researcher of NICT since Jan.), participated in the test as an application-related professional advisor. He provided technological advice concerning the mobile ad hoc network using portable terminals.



**Fig.83** Test for providing information to commuters unable to get home

### 3.34.3 Lectures and public relations

- (1) In the symposium, “Summary and future prospects of the five-year research into disaster management systems to prepare against a large-scale disaster,” held by the Disaster Management System Research Center of Ritsumeikan Univ. in Hotel Granvia Kyoto on Jan. 23, Group Leader Takizawa gave a keynote lecture entitled “Advanced ICT and disaster management and mitigation”. He also participated in the panel discussion (Fig. 84).
- (2) In the “Disaster Management Tokushima Podcast,” an Internet radio program provided by the Crisis Management Bureau of Tokushima Prefecture, interviews with Group Leader Takizawa entitled “Disaster management and mitigation with cell phones — communication technology in the near future” were broadcast from Jan. 12.
- (3) Comments on the means of communication during a disaster by Group Leader Takizawa appeared in an article dealing with the problems of hospitals at the heart of a disaster, which ran in *The Asahi Shimbun*, Osaka morning edition on Jan. 19, which was the anniversary of the Great Hanshin Earthquake.

### 3.35 Feb. 2009

#### 3.35.1 Cooperative research carried out with Dr. Vu, Hanoi Inst. of Tech.

Dr. Vu Van Yem, Director of Department



**Fig.84** Symposium, “Summary and future prospect of the disaster management system research for preparation against large-scale disaster conducted over five years”



of Telecommunication Systems, School of Electronics and Telecommunications Hanoi Inst. of Tech. was invited to the Disaster Management and Mitigation Group for the period of Feb. 23 to 26 to engage in cooperative research on the emergency wireless network. He gave a lecture entitled “Research into Advanced Emergency Communications System for Fishing Boats in Vietnam,” in the video conference room of the main building on Feb. 23 (Fig. 85).

### 3.35.2 Demonstration test of disaster information collection system using cell phone terminals

A simulation demonstration test on the collection of information during a disaster by the information collection system during disaster using cell phones was carried out in Takamatsu City on Feb. 27 and 28, with citizens aged 20 to 60 years participating, as was the case the previous year. The purpose of the test was to examine whether the same subject remembered the operation method after one year.

### 3.35.3 Exhibitions

#### (1) The 13th Technology Against Earthquake Expo

The damage estimation technology during a disaster and the disaster information collection system using cell phones were presented in the exhibition held in Pacifico Yokohama on Feb. 5 and 6 (Fig. 86).

#### (2) Technical Show Yokohama 2009

The RFID-based voice-reading system was exhibited by NICT Incubations in the exhibition held in Pacifico Yokohama on

Feb. 4 to 6 (Fig. 87).

#### (3) Tama Industrial Exchange Exhibition

In the exhibition held in the Showa Memorial park in Tachikawa City on Feb. 20–21, the RFID-based voice-reading system was exhibited by NICT Incubations (Fig. 88).

### 3.35.4 Guidance for trainees completed

#### (1) The trainee, Tomotaka Suzuki (The Univ. of Electro-Communications, M2), prepared



**Fig.86** Earthquake Management Technology Exhibition



**Fig.87** Technical Show Yokohama 2009



**Fig.85** Lecture by Dr. Vu Van Yem



**Fig.88** Tama Industrial Exchange Exhibition