nication model using an ad hoc network — when there is restriction on the route of terminal movement"

(3) The following four presentations were given at the Symposium on Cryptography and Information Security (SCIS 2007) of the Inst. of Electronics, Information and Communication Engineers held in Nagasaki Huis Ten Bosch on Jan. 23 to 26.

- Kenichiro Akai (Mitsubishi Res. Inst.), Ichiro Murase (Mitsubishi Res. Inst.), Kyoko Makino (Mitsubishi Res. Inst.), Daisuke Inoue (Network Security Incident Response Group), Katsunari Yoshioka (Network Security Incident Response Group), Kotaro Sonoda, Junji Nakazato (Network Security Incident Response Group), Hiroshi Nakagawa (The Univ. of Tokyo), Tsutomu Matsumoto (Yokohama Nat'l Univ.), Tsuyoshi Toyama (Yokohama Nat'l Univ.) and Takizawa: "Discussion on the security of Web 2.0"
- Sonoda, Noriaki Asemi (Nat'l Inst. of Advanced Industrial Science and Technology (AIST)), Junji Nakazato (Security Fundamentals Group), Katsunari Yoshioka (Network Security Incident Response Group), Daisuke Inoue (Network Security Incident Response Group) and Takizawa: "Studies on a validation system based on the individual difference in the sense of hearing"
- Masashi Eto (Network Security Incident Response Group), Sonoda, Katsunari Yoshioka (Network Security Incident Response Group), Daisuke Inoue (Network Security Incident Response Group), Junichi Takeuchi (Kyushu Univ.) and Koji Nakao (Network Security Incident Response Group): "Proposal for a method of examining the similarity of malware by spectral analysis"
- Takizawa: "Positioning using RFID and information security in assuring safety and security"

3.11 Feb. 2007

3.11.1 Disaster/Crisis Management ICT Symposium

Group Leader Takizawa participated in the symposium held in Pacifico Yokohama on Feb. 1 as a panelist in the panel discussion on the viewpoints of disaster management organizations (Fig. 26).

3.11.2 Exhibitions and demonstrations

(1) Technical Show Yokohama

An RFID-based oral reading system was exhibited at the booth of the NICT Incubations in the exhibition held in Pacifico Yokohama on Jan. 31 to Feb. 2.

(2) Earthquake Management Technology Exposition

A summary of the studies of the Disaster Management and Mitigation Group was presented at the exposition held in Pacifico Yokohama on Feb. 1 and 2.

(3) Second Nat'l Conference on Firefighting, Rescue and Emergency

In the research meeting for firefighters, emergency medical technicians and others held in the Tachikawa Training Ground of Tokyo Fire Department, 8th Fire District HQ on Feb. 4, Group Leader Takizawa exhibited the RFID system developed under the Special Project for Earthquake Disaster Mitigation in Urban Areas (Fig. 27).

3.11.3 Presentations at academic meetings

(1) Mobile Response 2007

Group Leader Takizawa and Senior

Fig.26 *Disaster/Crisis Management ICT Symposium*

Researcher Gyoda attended the Int'l Workshop on Mobile Information Technology for Emergency Response held in Rraunhofer Inst., St. Augustin, Germany on Feb, 22 and 23, where Group Leader Takizawa gave a presentation entitled "Hybrid Radio Frequency Identification System for Use in Disaster Relief" (Fig. 28). The adoption rate was 43% and Group Leader Takizawa was the only presenter from Asia. The workshop was the first conference specialized to mobile systems, wearable computers, data treatment technologies and the like for emergency, rescue, firefighting and disaster management organizations, where various achievements obtained in related projects in EU countries were presented. The proceedings of the workshop were published later from Springer as one of the lecture notes in computer science (LNCS).

Fig.27 *Group Leader Takizawa introducing the RFID system in the second Nat'l Conference on Firefighting, Rescue and Emergency*

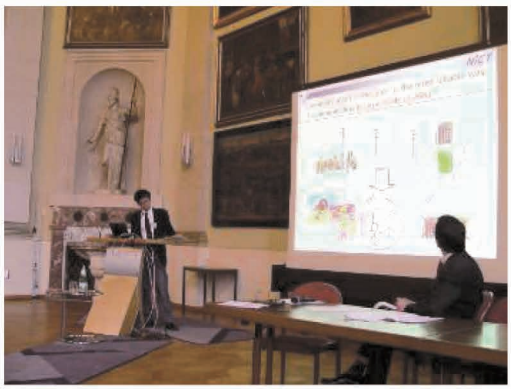

Fig.28 *Group Leader Takizawa lecturing in Mobile Response 2007*

3.12 March 2007

3.12.1 Results of ad hoc network simulation during a disaster

For the application of the ad hoc network technology during a disaster, a computer simulation directed to a practical target was examined, as described below:

(1) The behavior of an ad hoc network formed by terminals moving on a road, when the road is obstructed due to a large-scale disaster, was studied in an area 500 meters square at the center of downtown Sendai City, which may possibly be damaged if an earthquake off the coast of Miyagi occurs. The following findings were obtained (Fig. 29).

1. The data delivery rate declines as the speed at which the terminals travel increases, because the route change due to the termination of communication increases.
2. The change in the selection rate in the direction in which the terminals are traveling at intersections caused by road obstruction does not have a large influence on the data delivery rate.
3. When some areas are blocked, prohibiting the terminals from traveling into the areas, the data delivery rate declines under the influence of the blockage if the terminal is traveling at a speed of 4 m/s or less, but the influence is small if the speed is higher than that.

   Parts of the studies were conducted as contracted research under the Ministry of Internal Affairs and Communications (SCOPE), "Research and development of multimedia technology for collecting information using remote robots in a disaster".

(2) For data collection and transmission from high-speed search robots, a trunk cable with wireless LAN access points formed at intervals of 50 meters was installed in an underground complex with a total length of 700 meters, and a system in which a robot searched the area surrounding the respective

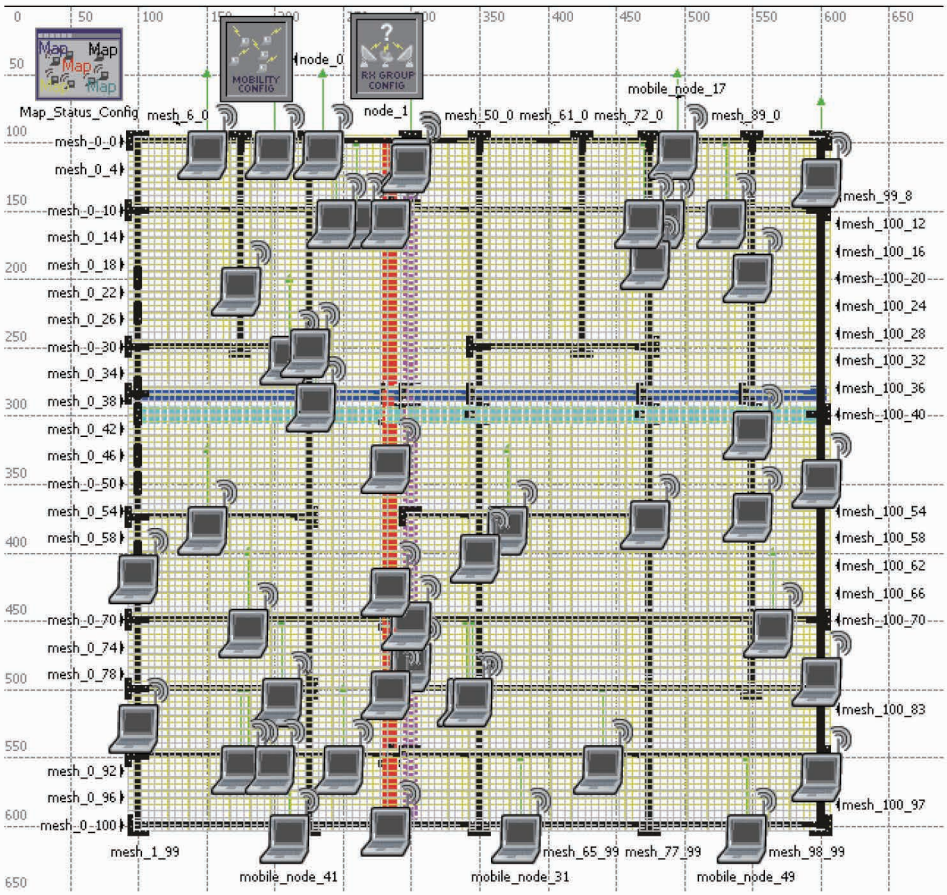

Fig.29 *Terminal traveling model in the area, simulating the central area of Sendai City*

access points was simulated. As a result, the following findings were obtained (Fig. 30).

1. The difference in data delivery rate caused by the difference in the shape of search area is small.
2. In the case of a system in which access points are installed and the search robots start searching simultaneously (simultaneous system), the data delivery rate declines significantly, for example, due to data collision, but in the case of a system in which each robot starts searching at a time difference (sequential system), the data delivery rate, especially of the image signal, is possibly improved significantly.

Part of this research was carried out under NEDO contracted research: "RT system movable in damaged buildings (in the field of robots for special environments)".

3.12.2 Presentations at academic meetings

(1) The following two presentations were given in the general meeting of the Inst. of Electronics, Information and Communication Engineers.

- Ling Zhong Wei (The Univ. of Electro-Communications), Gyoda and Nobuo Nakajima (The Univ. of Electro-Communications): "Test for demonstration and evaluation of an information exchange system using a wireless ad hoc network, Fleama.net"
- Gyoda, Nam, Okada, and Takizawa: "Analysis of the performance of an ad hoc network in the model of communication during a disaster"

(2) The following presentation was given at the 2007 spring research meeting of the

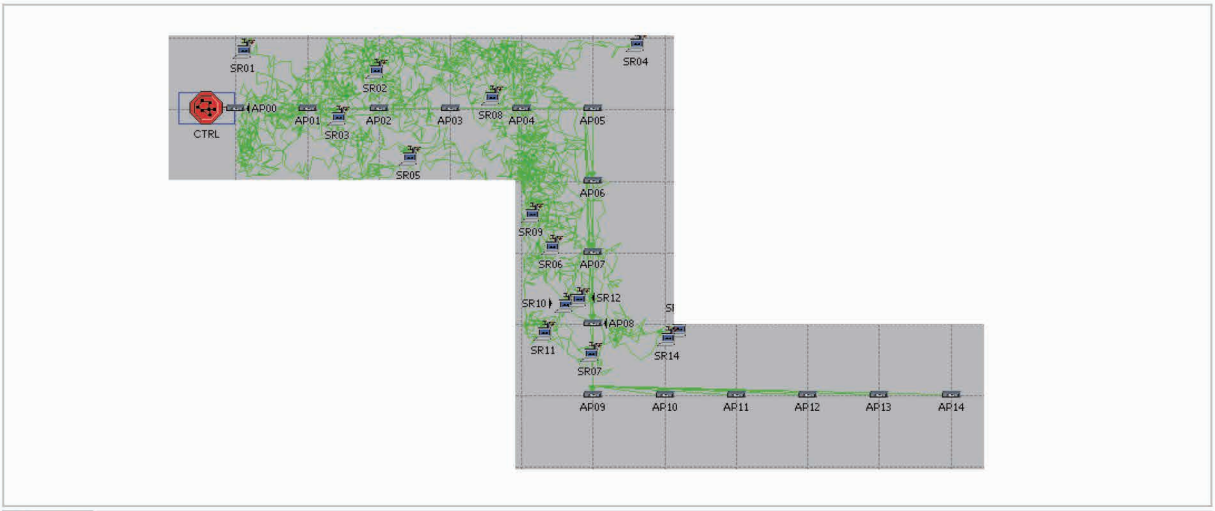

Fig.30 *Examples of the search area (crank-shaped) and the locus of robots used in computer simulation*

Acoustical Society of Japan.

- Expert Researcher Kotaro Sonoda, Ryouichi Nishimura (Tohoku Univ.), Suzuki, and Takizawa: "DWPT-QIM electronic watermarks"

3.13 April 2007

3.13.1 Arrival of two Expert Researchers

Akihiro Shibayama (formerly, Research Assistant, Disaster Control Research Center, Tohoku Univ.) and Yasushi Hada (formerly, Co-operative Research Fellow, RIKEN) arrived as Expert Researchers on April 1. Akihiro Shibayama specializes in building/urban disaster management and Yasushi Hada specializes in disaster information collection robots.

3.13.2 Collaborative graduate schools

Senior Researcher Okada is a visiting professor for the graduate school of Information Systems of The Univ. of Electro-Communications, and Senior Researcher Gyoda is a visiting associate professor of the graduate school of Electro-Communications. Last year, Senior Researcher Okada started providing continuous research guidance to a second-year master's student, a first-year student in the same course and Cui Lu Ming, a third-year exchange master's student from Beijing Univ. of Posts and Telecommunications. Senior Researcher Gyoda started providing research guidance to Wadhah Al-Mandhari, a first-year doctoral student.

3.13.3 Award for excellent presentation from the Society of Instrument and Control Engineers

The presentation entitled "Development of a Damage Information-Sharing System Using Hybrid Wireless Tags," given by Group Leader Takizawa together with Expert Researcher Akihiro Shibayama (then in Tohoku Univ.) and researchers at the Nat'l Research Inst. of Fire and Disaster and Kogakuin Univ. at the seminar of the System Integration Division (SI2006) of the Society of Instrument and Control Engineers (SICE) in Dec. 2006 received an award for excellent presentation (disclosed on Apr. 23) (Fig. 31). The presentation covered the results obtained under the Special Project for Earthquake Disaster Mitigation in Urban Areas and the Grant-in-Aid for Scientific Research (basic research B).

3.14 May 2007

3.14.1 Exhibition in u-Japan Festa in Hiroshima 2007

In the event held in Hiroshima on May 17 and 18, studies on RFID, Web GIS, ad hoc communication, regulation of cell phone communication period, damage information collection system and acoustic signal electronic watermark were disclosed by a panel presentation and by demonstration (Fig. 32).

3.14.2 Newspaper coverage

The activities of the Disaster Management and Mitigation Group were reported in an article related to safety and security that appears every Wednesday in *The Nikkan Kogyo Shimbun* (May 23).

3.14.3 Multimedia Information Hiding Research Working Group

The first meeting of the "Multimedia Information Hiding Research Working Group," a temporary research group of the Inst. of Electronics, Information and Communication Engineers established in April this year was held at the NICT headquarters (Fig. 33). Professor Hideki Noda, Kyushu Inst. of Tech., who was formerly at CRL, was the chairman, and Expert Researcher Kotaro Sonoda assumed the role of secretary. Keynote addresses were given by Professor Hiroshi Yasuda and a director of the Japanese Society for Rights of Authors, Composers and Publishers (JASRAC), and there were invited lectures, panel discussions and exhibitions by ten companies. With approximately 100 participants, the meeting was better attended than expected. The Disaster Management and Mitigation Group presented two studies, "Acoustic Electronic Watermarks" and "Hiding Information in Documents" (May 29).


表 彰 状

SI2006 優秀講演賞

情報通信研究機構　滝澤　修　殿
東北大学　笹山　明寛　殿
総務省消防庁消防研究センター
　知川　直文　殿
工学院大学　村上　正浩　殿
工学院大学　大田　嘉幸　殿

貴殿の講演「ハイブリッド無線タグを用いた被災情報共有システムの開発」は優秀であったと認めここに表彰します

平成18年12月16日

第7回（社）計測自動制御学会
システムインテグレーション部門講演会
実行委員長　和田　充雄
プログラム委員長　田中　孝之

Fig.31 *Award for excellent presentation provided by the Society of Instrument and Control Engineers*

3.15 June 2007

3.15.1 Arrival of an Expert Researcher

On June 1, Expert Researcher Jeong Byeong-pyo (formerly, Guest Researcher in the Nat'l Research Inst. of Fire and Disaster,

Fig.32 *u-Japan Festa in Hiroshima 2007*

Fig.33 *Multimedia Information Hiding research meeting*

Fire and Disaster Management Agency) arrived as an Expert Researcher. His specialty is urban disaster management and firefighting and disaster management.

3.15.2 Next-Generation Safety/Security ICT Forum

The Next-Generation Safety/Security ICT Forum was established, based on a report of the research group examining studies that should be conducted in information communication technology to provide a safe and secure society, which was conducted in 2006 by the Ministry of Internal Affairs and Communications.Its inaugural meeting and the inaugural symposium were held in Otemachi Sankei Plaza on June 26. The Disaster Management and Mitigation Group participated in the exhibition held concurrently, and Expert Researchers Shibayama and Hada and Group Leader Takizawa attended the exhibition (Fig. 34).

3.15.3 Presentations at academic meetings

Expert Researcher Hoang Nam attended the 3rd Int'l Conference on Networking and Services (ICNS2007) held in Athens, Greece, on June 19 to 25 and gave a presentation entitled "On the Performance of Hybrid Wireless Network of Emergency Communications in Disaster Areas". He received the Best Paper Award.

3.15.4 Committee and lecture

(1) Group Leader Takizawa attended the meeting to support the evacuation of victims needing to be rescued and information transmission during a disaster. The meeting was held by those in charge of disaster management at the Cabinet Office on June 19. Takizawa explained the progress of the research and development into disaster management and mitigation ICT as an activity concerning the transmission of information during a disaster that is taken by the Ministry of Internal Affairs and Communications. The committee was established after the heavy rain disaster in July 2004 and the meetings are held during the rainy season every year with the managers from relevant ministries participating.

(2) Group Leader Takizawa attended as a member the first meeting of the committee for utilization of the communication support system for local disaster management for use in major earthquakes, held by the Kanto Bureau of Telecommunications on June 27. The committee examines the measures to make the most of ICT in local disaster management with representatives from the automatic dispenser industry and convenience store industry. Discussions started for preparation of the final report in December.

(3) A new science/technology seminar, "Efficient utilization of RFIDs in the firefighting and disaster management fields" by Fire and Disaster Management Agency and the Science/Technology-Promoting Association for Firefighting and Disaster Management (secretariat: The Inst. for Fire Safety & Disaster Preparedness) was held in Tokyo on June 28. Group Leader Takizawa gave a presentation entitled "Front Line in the Studies on the Use of RFIDs during Disaster —Support for Firefighting and Disaster Management Activities and Measures in Large-Scale Disaster—". The aim was to introduce the technical field of a sensor network in combination with fire detection and RFIDs for people engaged in firefighting.

Fig.34 *Exhibition in Next-generation Safety/ Security ICT Forum*

3.16 July 2007

3.16.1 Award presented in Rescue Robot League, RoboCup 2007

In a world championship on robots, Robo-

Cup 2007, held in Atlanta, the United States, "Pelican United" (a joint team of five organizations; Int'l Rescue System Inst., Tohoku Univ., Chiba Inst. of Tech., Nat'l Inst. of Advanced Industrial Science and Technology (AIST) and NICT) had the following results: 2nd place overall in the Rescue Robot League and 1st place in the Mobility division (Fig. 35).

3.16.2 Presentations at academic meetings

(1) The following presentation was given at the communication quality research meeting of the Inst. of Electronics, Information and Communication Engineers, held on July 12.

- Gyoda, Okada, Nam, and Takizawa: "Evaluation of the performance of an emergency communication model using an ad hoc network"

(2) The following presentation was given at the IEEE Int'l Geoscience and Remote Sensing Symposium held in Barcelona on July 27.

- Masafumi Hosokawa (NRIFD), Jeong Byeong-pyo, and Takizawa: "Earthquake Damage Detection Using Remote Sensing Data"

3.16.3 Committees and lectures

(1) The first meeting on studies into the transmission of government radio announcements into each home to prevent disasters by the Ministry of Internal Affairs and Communications, Kinki Bureau of Telecommunications, was held in July 3, and Group Leader Takizawa attended the meeting as a member.


RoboCupRescue Robot League

SICE International Award

is presented to

Pelican United

Chiba Institute of Technology, Tohoku University, Okayama University, Tsukuba University, AIST, NICT, IRS

for outstanding performance on mobility at RoboCup 2007 Atlanta

July 8th, 2007

Shigeki Sugano

Chairman of SICE System Integration Division

Fig.35 Certificate of first place in Mobility division

(2) A new science/technology seminar, "Efficient utilization of RFIDs in the firefighting and disaster management fields" by the Nat'l Research Inst. of Fire and Disaster of Ministry of Internal Affairs and Communications and the Science/Technology Association for Firefighting and Disaster Management (secretariat: Inst. for Fire Safety & Disaster Preparedness) was held in Osaka in July 6. Group Leader Takizawa gave a lecture entitled "The Front Line of Studies on the Use of RFIDs During a Disaster —Support for Firefighting and Disaster Management Activities and Measures in Large-Scale Disasters—".

3.16.4 Events

(1) Technology Transfer in Kawasaki

In the exhibition held on July 11 to 13, a voice-reading terminal using RFID was displayed in the NICT Incubations' booth.

(2) NICT's Facilities' Open House

When the facility was opened to the public on July 27 to 28, the Disaster Management and Mitigation Group showed a 3D disaster management map (Google Earth map) of the area close to NICT. It was displayed on a large screen and attracted a lot of interest. In addition, a rescue robot, Kenaf, developed jointly under NEDO contracted research was revealed for the first time (Fig. 36). Kenaf had received an award in the world championships for rescue robots, RoboCup.

Fig.36 Disclosure of rescue robot, Kenaf, when the facility was opened to the public

3.16.5 Qualification acquired

Group Leader Takizawa was registered as a "Bousaishi(disaster manager)" by the Japan Bousaisi Organization on July 23 (Registration number: 018010).

3.17 Aug. 2007

3.17.1 Paper published in EI-registered journal

The trainee, Cui, summarized his half-year studies and gave a presentation entitled "Performance Estimation on IEEE 802.11e (EDCA) Considering Emergency Calls during Network Congestion" in IC-BNMT2007 held in Beijing on Sep. 18 to 20. He won the award for the best paper (adoption rate: 10%). It was published in the Journal of China Universities of Post and Telecommunications (EI-registered Journal).

3.17.2 Tests

Expert Researcher Hada joined a basic test on automatic control of a 14 meter-class unmanned LTA (lighter-than-air) airplane, conducted by the Japan Aerospace Exploration Agency (JAXA) in Taiki-cho, Hokkaido on Aug. 23 to 25. He conducted a test on the collection of damage information using a rescue communicator from above (Fig. 37). Although it was not possible to obtain the desired results in the test because of interference in the control transmission from the PC collecting the information, it was the first outdoor test of a robot moving in three-dimensions for the Disaster Management and Mitigation Group. The test yielded valuable results, such as operation and maintenance method and created a favorable cooperative relationship with JAXA.

3.17.3 Acceptance of summer trainees

Expert Researcher Shibayama accepted two summer trainees, juniors in Takushoku Univ., for training on RFID during the period from Aug. 1 to Sep. 7.

3.17.4 Summer science camp

High school students were accepted for summer training during the period of Aug. 8 to 10. Expert Researcher Akihiro Shibayama conducted most of the training, in which a 3D disaster management map was prepared by using Google Earth (Fig. 38).

Fig.37 *Test for collection of damage information using JAXA unmanned airship*

3.18 Sep. 2007

3.18.1 Lectures and presentations

(1) In the NICT-PTIT Joint Seminar for ICT R&D held in Hanoi, Vietnam, on Sep. 7, Expert Researcher Nam gave a presentation entitled "Research Activities into Emergency Communications and Services".

(2) In the Society meeting 2007 of the Inst. of Electronics, Information and Communication Engineers held in Tottori Univ. on Sep. 10 to 14, the following two presentations were given:

- Semba, Okada, Gyoda, Nam, and Takizawa: "Evaluation of the Performance of Microcell Networks when There Are Many Non-Operating Base Stations"
- Cui, Okada, and Chen Xingyi (Beijin Unig. Posts and Telecommunications): "A Performance Study on Wireless LAN Considering Emergency Calls in Congested Situations" (presentation given

also at the 2007 Int'l Conference on Broadband Network & Multimedia Technology)

(3) In the 25th seminar of the Robotics Society of Japan, held at the Chiba Inst. of Tech. on Sep. 13 to 15, the following presentation was given.
- Ryuji Sugizaki (Tokyo Denki Univ.), Tsuyoshi Suzuki (Tokyo Denki Univ.), Kuniaki Kawabata (RIKEN), Hada, and Yoshito Tobe (Tokyo Denki Univ.): "Construction and Control of a Wireless Sensor Network Using Mobile Robots For Collecting Information on Areas Affected by a Disaster"

(4) In the SICE Annual Conference 2007, held in Kagawa Univ. on Sep. 17 to 20, the following presentation was given.
- Gyoda, Hada, and Takizawa: "Performance Analysis of the Network and Scenarios for the Search Robot Rescue System"

(5) In the IEEE Int'l Workshop on Safety, Security, and Rescue Robotics (SSRR 2007) held in Rome, Italy, on Sep. 27 to 29, the following presentation was given.
- Gyoda, Hada, and Takizawa: "Performance Analysis of the Network Models for the Search Robot Rescue System in the Closed Spaces"

3.18.2 Demonstration and exhibition

(1) A joint disaster management drill by Tokyo Metropolitan Government, Akishima City, Fussa City, Musashi-murayama City, Hamura City, and Mizuho-cho was held in Akishima City, Tokyo, on Sep. 1, where the rescue robot, Kenaf, was demonstrated (Fig. 39).

(2) In the Int'l Frontier Industry Messe held in Kobe Int'l Exhibition Center on Sep. 13 and 14, Kenaf and an RFID voce-reading terminal were exhibited in the NICT Incubations' booth (Fig. 40).

3.18.3 Competitive research funds acquired

The following research and development project and project planning investigation applied by the Disaster Management and Mitigation Group as a research member in the research and development area of "Protecting children from crime" in the Research Inst. of Science and Technology for Society (RISTEX) of the Japan Science and Technology Agency (JST) were both accepted.

- Research and development project: "Establishment of practical grounds for determining the damage to children and crime prevention activities"
  Research representative: Yutaka Harada, Department of Criminology and Behavioral Sciences, Nat'l Police Agency Nat'l Research Inst. for Police Science
- Project-planning investigation: "Feasibility study on ensuring the safety of children using IT"
  Research representative: Tsutomu Matsumoto, Graduate School of Environment and Information Science, Yokohama Nat'l Univ.

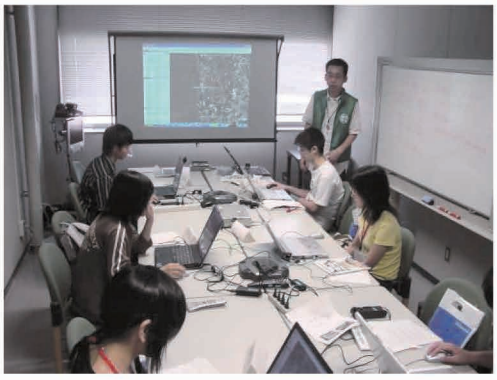

Fig.38 Summer science camp

Fig.39 Joint disaster management drill held by Tokyo Metropolitan Government, Akishima City, Fussa City, Musashi-murayama City, Hamura City and Mizuho-cho

Fig.40 Int'l Frontier Industry Messe

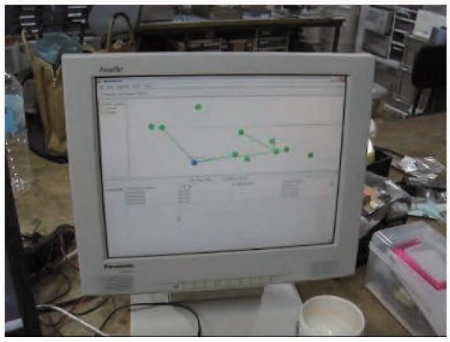

Fig.41 Screen of ad hoc network topology

Fig.42 Ad hoc wireless nodes

Fig.43 Remote operation of robot

3.19 Oct. 2007

3.19.1 Test

Expert Researcher Yasushi Hada conducted a demonstration and verification test on operation of a search robot using 13 ad hoc wireless nodes in Tohoku Univ. on Oct. 13. The test was conducted in collaboration with Professors Kazuya Yoshida and Keiji Nagatani, Tohoku Univ., as part of the "Research and development of multimedia technology for collecting information using remote robots in a disaster" which is conducted under the SCOPE contracted research of the Ministry of Internal Affairs and Communications (Figs. 41, 42 and 43). The test demonstrated that it was possible, by viewing a video image, to actuate the robot via ten hops of the ad hoc wireless nodes by remote wireless operation.

3.19.2 Guidance of diagram training

Expert Researcher Jeong Byeong-pyo who was appointed as an instructor in the model project to promote training in local disaster management using diagrams, of the Nat'l Research Inst. of Fire and Disaster of the Ministry of Internal Affairs and Communications, provided guidance in diagram training to the municipal officers in Saiki City, Oita, on Oct. 26 to 28.

3.19.3 Presentations at academic meetings

(1) The following presentation was given at the 16th research meeting of the GIS Association of Japan, held in Sapporo on Oct. 19 to 21.

- Expert Researchers Jeong Byeong-pyo and Masafumi Hosokawa(Nat'l Research Inst. of Fire and Disaster) and Takizawa: "Studies on spatial information communication system to support the activities of international firefighting and rescue teams – summary of the studies and preparation of the on-site activity support map"

(2) The following presentation was given at the 9th Int'l Cooperate Seminar between

KAGIS (Korean Association of Geographic Information Studies) and GISA (Geographic Information Systems Association, Japan), held in Daegu, Korea, on Oct. 22 and 23.

- Expert Researchers Jeong Byeong-pyo and Masafumi Hosokawa (Nat'l Research Inst. of Fire and Disaster), Shinsaku Zama (NRIFD) and Takizawa: "Development of a System for Estimating the Damage Caused by an Earthquake in Seoul, Korea"

(3) The following presentation was given at the research meeting on multi-dimensional mobile communication networks of the Japan Society for Simulation Technology held in YRP on Oct. 25.

- Semba, Okada, Gyoda, and Nam: "Evaluation of the Characteristics of Emergency Multisystem Access when There Are Many Non-Operating Base Stations"

3.19.4 Exhibition

Studies by this group were exhibited at the CEATEC Japan 2007, held in Makuhari Messe on Oct. 2 to 6 (Fig. 44), in the Local ICT Future Festa in Aomori, held in Shin-Aomori General Sport Park on Oct. 12 to 14 (Fig. 45), and at the Crisis Management Industry Exposition 2007, held in Tokyo Big Sight on Oct. 17 to 19 (Figs. 46 and 47).

3.20 Nov. 2007

3.20.1 Exhibition of the results obtained in the SCOPE project of the Ministry of Internal Affairs and Communications

A meeting to report the results obtained in the "Research and development of multimedia technology for collecting information using remote robots in a disaster" (research representative: Professor Kazuya Yoshida, Tohoku Univ.) conducted under SCOPE of the Ministry of Internal Affairs and Communications, and to conduct a demonstration, was convened in the science communication event held in Tokyo Academic Park on Nov. 24, "Science Agora" (held by JST) (Fig. 48). The Disaster Management and Mitigation Group reported

Fig.44 CEATEC JAPAN 2007

Fig.45 Local ICT Future Festa in Aomori

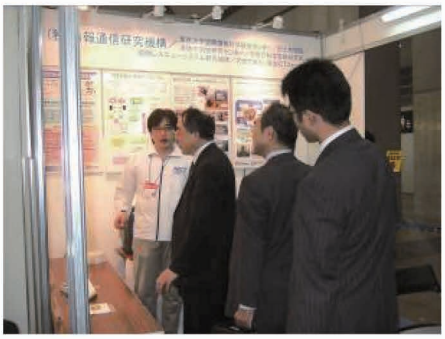

Fig.46 Security & Safety Trade Expo 2007

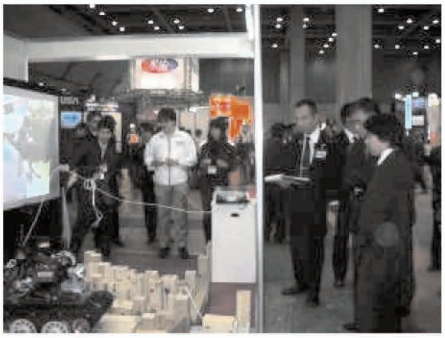

Fig.47 Security & Safety Trade Expo 2007

results concerning characterization of an ad hoc network for communication between robots (urban model) and also presented an exhibition of actual ad hoc network nodes used for the remote control of search robots. The demonstration of remote control of a robot for use in a disaster area was the first example of a test using the ETS-Ⅷ satellite, and a joint press release was issued by Tohoku Univ., Osaka Univ., and NICT on Nov. 14.

3.20.2 Cooperative research agreement with JAXA (Unmanned and Innovative Aircraft Team)

For the damage information collection experiment from above using a rescue communicator, a joint research agreement to research mission compatibility through a flight test on an LTA unmanned airplane was reached with JAXA on Dec. 3.

3.20.3 Survey of the Emergency Fire Response Team sent after the Noto Peninsula Earthquake

On Nov. 29 and 30, Expert Researcher Jeong Byeong-pyo and members of the Laboratory of Disaster (Earthquake) Study of the Nat'l Research Inst. of Fire and Disaster went to the fire-defense headquarters of Fukui City as well as Toyama City (which provided support) and Kanazawa City (which received support). They conducted a survey, by way of interview, on the support activities conducted by Emergency Fire Response Teams after the Noto Peninsula Earthquake that occurred on March 25, 2007. There is concern about deterioration in the efficiency of activities due to the problem of communication congestion after a large disaster, such as an earthquake, The survey, conducted by interviews, focused on the activities of the fire-defense headquarters sent as support from the neighboring prefectures, the means of communication used, the efficiency of communication (ease of connection), preservation and use of important communication (disaster-related communication), as well as the demands made of NICT.

3.20.4 Presentations at academic meetings

(1) In the 3rd Int'l Conference on Intelligent Information Encoding and Multimedia Signal Processing (IIHMSP 2007) held in Taiwan on Nov. 26 to 28, Expert Researcher Kotaro Sonoda gave the following presentation:
- Sonoda, Katsunari Yoshioka, and Takizawa: "Information Encoding for Public Address Audio Signal Using FH/FSK a Wide Spectrum"

(2) Expert Researcher Akihiro Shibayama made the following presentation:
- Akihiro Shibayama, Masaki Nagata (Oyo Corp.), Shinzaburo Hori (Disaster Prevension Technologies.), Tetsuro Okuno (Disaster Prevension Technologies.), Satoshi Masuda (Tohoku Univ.), Ken Sato (Tohoku Univ.), and Masato Motosaka (Tohoku Univ.): "Development of a disaster management information-sharing platform in the case of the earthquake off Miyagi", Abstract of the meeting of the Inst. of Social Safety Science No. 21, pp. 113–114, Nov., 2007.
- Shibayama, Yoshiaki Hisada (Kogakuin

Fig.48 *Meeting and demonstration for reporting final-year results obtained under the SCOPE project (Tokyo Academic Park)*

Univ.), Masahiro Murakami (Kogakuin Univ.), Kanji Sugii (NRIFD), Shinsaku Zama (NRIFD), and Takizawa: "Development and performance test of a mid- and long-distance damage information collection system for use in a disaster", Abstract of the Annual Meeting of Japan Association for Earthquake Engineering pp. 350–351, Nov., 2007, and three other presentations

(3) Expert Researcher Jeong Byeong-pyo made the following presentation:
- Jeong Byeong-pyo, Sinsaku Zama (NRIFD), Makoto Endo (NRIFD), and Takizawa: "Development of a prototype of the information collection system using cell phones for use during a disaster". Abstract of the Meeting of the Inst. of Social Safety Science, No. 21, pp. 15–16, Nov., 2007, and five other presentations

(4) The trainee, Shinya Semba, gave the following presentation:
- Semba, Okada, Gyoda, and Nam: "Evaluation of the characteristics of emergency multi-system access in a microcell network when there are many non-operating base stations," IEICE Technical Report, RCS 2007-109, pp. 71–76, Nov., 2007.

3.20.5 Various exhibitions

(1) Int'l Robot Exhibition 2007

In the exhibition held at Tokyo Big Sight on Nov. 28 to Dec. 1, results obtained in the research project of the Research Inst. for Science and Technology, Tokyo Denki Univ., SCOPE of the Ministry of Internal Affairs and Communications and the NEDO contracted research project were exhibited in the booth jointly operated by Tokyo Denki Univ., RIKEN, and NICT (Fig. 49).

(2) Patent Solution Fair

In the exhibition held at Tokyo Big Sight on Nov. 28 to 30, an RFID-based voice-reading terminal was exhibited at the booth of NICT Incubations (Fig. 50).

3.21 Dec. 2007

3.21.1 Test in the earthquake management drill conducted in the Shinjuku high-rise campus of Kogakuin Univ.

In a large-scale earthquake management drill conducted in a 25-story building in the center of Tokyo on Dec. 6, Expert Researcher Akihiro Shibayama conducted the following two tests (Fig. 51).

(1) Test on real-time assessment using an active RFID tag to determine whether victims remain in the houses or have been evacuated

(2) Test on the collection of local damage information by student and staff volunteers

Participation in this drill is based on the research contract agreement between NICT and Kogakuin Univ. concerning studies on disaster mitigation through the cooperation of commuters unable to get home with local residents and governments in a large-scale urban disaster.

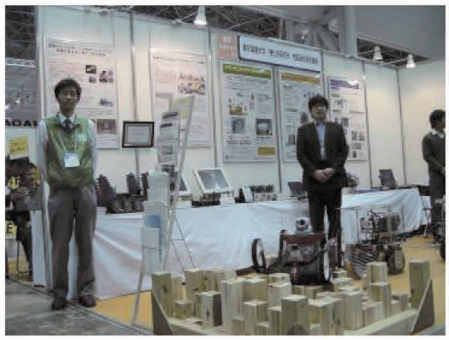

Fig.49 *Int'l Robot Exhibition 2007*

Fig.50 *Patent Solution Fair*

3.21.2 Robot demonstration test in the east/west free passage of Sendai City and Sendai Subway Station

A joint demonstration test of a search robot for use in a large-scale disaster was held on Dec. 16 with organizations participating in the NEDO contracted research, with cooperation of the Sendai City Transportation Bureau. A robot was controlled remotely, for example, on the concourse, platform and stairs of the station after operation of the subway. NICT was responsible for development and the demonstration test of the main communication part of the system to control the robot and transmission of the monitoring image. The demonstration revealed that it was possible to control the system remotely and to transmit the monitoring image over a distance of about 300 meters in an environment where there were both wired LAN and an ad hoc wireless LAN (Fig. 52).

3.21.3 Test on damage information collection by LTA aircraft

Expert Researcher Yasushi Hada participated in a flight test of an n 14 meter-class LTA conducted by JAXA in Kagoshima on Dec. 17 to 19 and held a damage information collection test between the ground and sky using a rescue communicator. The NICT Workshop helped to prepare the shield box (Fig. 53 right) to prevent interference with the control system for the LTA.

Fig.51 *Test in the earthquake disaster management drill conducted in the Shinjuku high-rise campus of Kogakuin Univ.*

3.21.4 Workshop on Communication and Navigation for the Development of Vietnam's Marine Economy

Due to Vietnam's long coastline, there is a significant problem in the responses to disasters involving small ships. There is therefore an urgent need for the development of an inexpensive means of communication along the coastline and a means of receiving distress signals. Against this background, a workshop was held by Hanoi Univ. of Science and Tech. in Hanoi, Vietnam, on Dec. 15 to 16. Expert Researcher Nguyen Hoang Nam presented the results of his studies on the OFDMA ad hoc cellular network and joined in the panel discussion with government officials, in which he explained the latest situation of marine communication technology in Japan.

3.21.5 Lecture in Ochanomizu Univ.

Expert Researcher Akihiro Shibayama

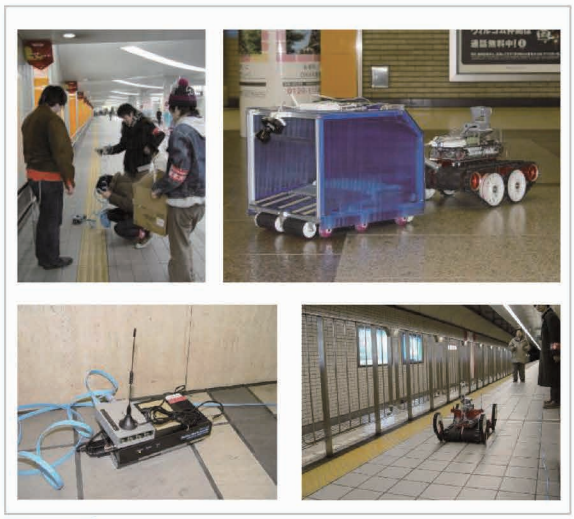

Fig.52 *Robot demonstration test conducted in the east/west free passage of Sendai City and the Sendai Subway Station (top right) cable-installing robot (under development by Chiba Inst. Tech., not used this time), (bottom left) wireless ad hoc nodes*

who was a part-time lecturer of a special lecture on natural environment "disaster risk and geographic information" in the Geography course, Faculty of Letters and Education of Ochanomizu Univ. in the latter half of 2007, gave a lecture entitled "Information Sharing and Improved Efficiency of Activities after an Earthquake through the Cooperation of Local Residents and Governments and through the Optimum Use of ICT" on Dec. 20.

3.21.6 Exhibit in the Special Science of Safety Exhibition (Centennial Memorial Hall of Nihon Univ., College of Humanities and Sciences, Dec. 8 to 24)

NICT's studies, conducted out under three contracted research projects (positioning of the use of RFIDs and assurances for safety and security, establishment of the practical grounds for monitoring the damage to children and crime-preventing activities, and research and development for assurance of children safety using IT) were presented in an exhibit entitled "Studies in the Prevention of Crime — Examples of Studies Abroad and in Japan" (Fig. 54).

3.21.7 Newspaper coverage

The comment of Group Leader Takizawa that the preservation of public telephones is important in ensuring a means of communication during a disaster was cited in a special article in the Osaka Edition of *The Yomiuri Simbun* (Dec. 5), under the headline, "Public telephones removed also from schools in disaster-prone areas, despite their effectiveness in an earthquake".

3.22 Jan. 2008

3.22.1 Symposium on Cryptography and Information Security (SCIS 2008) by the Inst. of Electronics, Information and Communication Engineers

In the meeting held in Miyazaki Seagaia on Jan. 22 to 25, Expert Researcher Kotaro Sonoda gave a presentation entitled "Studies on Individual Authentication System Based on the Sound of One's Voice" (Fig. 55) and Group Leader Takizawa gave a presentation entitled "Concept for Ensuring Child Safety Using IT". The presentation entitled "Proposal for a Means of Examining the Similarity of

Fig.53 *Test on collection of damage information by LTA aircraft*

Fig.54 *Special exhibition, "The Science of Safety"*

Fig.55 *Presentation by Expert Researcher Kotaro Sonoda in SCIS 2008*

Malware Using Spectral Analysis," which was given jointly by Expert Researcher Kotaro Sonoda and the Researcher Mr. Eto of the Network Security Incident Response Group at SCIS last year, received the Excellent Paper Award and the commendation ceremony was held during the meeting.

3.22.2 Tohoku area meeting of the Japan Society for Natural Disaster Science

In the meeting held at the Hachinohe Area Local Industry Promotion Center on Jan. 13, Expert Researcher Akihiro Shibayama gave several presentations. The first, entitled "Establishing a Platform for Sharing Disaster Management Information for Preparing for the Earthquake off Miyagi and the Method of Operation" was given individually, and two other presentations, entitled "Research on the Method of Evaluating the Local Disaster-Managing Potential Against the Earthquake off Miyagi" and "Studies on the Potential of the Disaster Management Organization in Sendai City for Earthquakes" were given with other researchers.

3.22.3 Coverage in Nikkan Kogyo

Group Leader Takizawa, Senior Researchers Kazunori Okada, and Koichi Gyoda wrote four consecutive articles on advanced ICT and disaster management and mitigation in the section, "Risk Control" in the Thursday Edition of *The Nikkan Kogyo Shimbun*.

- Jan. 10: Site-oriented research and development (Takizawa)
- Jan. 17: Cell phones during a disaster (Okada)
- Jan. 24: Rescue robots (Gyoda)
- Jan. 31: Ubiquity is essential (Takizawa)

3.23 Feb. 2008

3.23.1 Investigative research for international cooperation with support activities, based on spatial information systems

Expert Researcher Jeong Byeong-pyo made a trip to the Philippine Inst. of Volcanology and Seismology on Feb. 4 to 11 to improve the map of earthquake risks in the Philippines and to conduct investigative research on the construction of a research network (Fig. 56). The investigative research is a first step toward developing a system to support international contributions both in manpower and technology that facilitates rapid and efficient rescue activities. The research achieves this by promoting the exchange and sharing of spatial information that is beneficial to the rescue activities of the international emergency rescue team, such as basic maps and information on the damage situation. The research also strives to enable the operations headquarters to remain informed of the safety and activities of the team members by connecting the disaster area abroad where the international emergency rescue team performs its operation with the headquarters in Japan by satellite communication.

3.23.2 Demonstration of a disaster robot

A demonstration exhibition of a robot jointly developed under a NEDO contracted research project in 2007 was held for members of the police force, fire brigade and self-defense forces on Feb. 26. The exhibition was part of a project to support the technological development of equipment against a chemical disaster under the Ministry of Economy, Trade and Industry. In response to a request from the project administrators, Expert Researcher Yasushi Hada participated in a demonstration of the NICT's robot, Kenaf.

Fig.56 *Cooperative investigation in the Philippines*