

Voice of Foreign Researchers in Japan

Through a long academic life in Japan



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It is my great pleasure to have this opportunity to share my experience in Japan with you, thanks to a request from IEICE-TFIPP. From my limited perspective, I strongly believe that Japan is one of most advanced places for doing research on aspects of information and communication technology. It is very difficult for me to put into words the impact of the past twelve years in Japan. I suppose the best way to reminisce is by enumerating various bits and pieces of my stay in Japan.

When I was affiliated with the University of Science and Technology of China (1990 - 1997), I participated twice in a JSPS project carried out with China under the Core University Program (<http://www.jsps.go.jp/english/e-asia/core.htm>) in 1992 and 1996. During each three month stay in Japan, I had good experiences both technically and culturally. That was one of the main reasons that I wanted to continue my research in Japan. Thanks to the wonderful recommendation of Prof. Keikichi Hirose, I was luckily awarded Monbusho scholarship to study in Japan (October 1997 - March 2001). I pursued my Ph.D. (E) at the Department of Information and Communication Engineering, the School of Engineering, the University of Tokyo. Research at the Hirose lab (<http://www.gavo.t.u-tokyo.ac.jp/index.html.en>) covered various aspects of speech analysis, synthesis, recognition and applications to dialog and CALL systems. I devoted myself to studying Chinese speech prosody for speech synthesis in the light of the well-known Fujisaki model (one of the original works of the lab). Basically, the atmosphere on the campus is comparatively liberal, so everyone can study what she/he would like. On the other hand, it was up to “lazy” international students like me to fulfill their own responsibilities because there was no one pushing them. Many Japanese seem to have a strong sense of their own responsibilities.

After obtaining my Ph.D (E), I joined the Advanced Telecommunications Research Institute International (ATR) (http://www.ATR.jp/index_e.html) as a researcher (2001 - 2008). I got a lot of information about ATR before I arrived there, partly because the famous CHATR (a text-to-speech system) was developed by ATR. ATR’s research culture is “to do interesting research”, something that was especially true in the early days when ATR had sufficient research funds. The situation has unfortunately changed in recent years. Considering the research environment, I do not think you could find another place in the world as good as ATR, especially for foreign students and researchers (about one-fourth of the staff). Basically, it is essential that your group and SHIEN are behind of you, where SHIEN is a foreigner support system and the efforts of SHIEN staff make foreigners’ lives much easier. I highly appreciated their great

efforts to complete all the necessary admission formalities for my son to smoothly start his school education. They took us to the elementary school named Saganakadai and gave my son the basic survival tips for the initial days as well. We used to get a written notice in English (sometimes also in Chinese) nearly every day from his elementary school that was mostly the information about their scheduled activities. Such friendly thinking is very helpful for foreign parents. I attended their festivals several times as a guest teacher. It was so refreshing to be in an atmosphere of mutual learning. From the progressive thinking at the elementary school, you can see that the unique research and life environment I mentioned a bit above does not merely happen at ATR, but exists in all the well-managed systems in Japan.

For foreign travelers in Japan, the language may be the biggest challenge, especially for those from non-English speaking regions. But it may not be as much of a problem in the near future. Some of you may know that NICT (<http://www.nict.go.jp>) is promoting several national projects toward overcoming various communication boundaries, including the language barriers between people from around the world who speak different languages. Automatic speech translation technology for travelers has been developed under the MASTAR project (<http://mstar.jp/index-e.html>). Anyway, Japanese are very kind and friendly to a “gaijin” like you and me. I never get afraid if I am lost in a city, because there’s always somebody who will help me. That is a wonderful thing about the Japanese.

I am currently engaged in multilingual speech synthesis research and system development. IEICE transactions are indispensable for my research work, because the transactions published a lot of high-quality research papers leading the field of speech synthesis. Also, I have had several opportunities to present my research results at IEICE and IEEE conferences and symposiums. I strongly believe that IEICE is evolving as a global hub for students, faculties and engineers in the field of information and communication engineers from Japan and abroad.

Hot Topics

Research on Electronics and Information Technology in Singapore



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Singapore has an exciting and well-funded research environment. The Government has reserved nearly 3% of the GDP for the field of R&D every fiscal year. Three universities, the National University of Singapore (NUS), Nanyang Technological University (NTU) and Singapore Management University (SMU), as well as the Institute for Infocomm Research and Fusionopolis which belongs to a government agency, the Agency for Science, Technology and Research (A*STAR), have promoted their research activities in electronics and information technology. According to an article of ScienceWatch.com

(<http://sciencewatch.com/inter/ins/10/10febTOP20ENG/>), NTU and NUS are ranked 8th and 9th in the most-cited institutes in engineering from 1999 to 2009, respectively. In this article, I would like to introduce some representative research topics in electronics and information technology developed in Singapore.

(1) *Electric vehicle (eco-friendly car, KRUCE)*

In April 2009, a team of 10 students belonging to the Faculty of Engineering at NUS has launched an eco-friendly urban concept car with water as the only emission. The car is powered by a hydrogen fuel cell. It will have a zero carbon emission rating, and will be almost noiseless when driven. Using the name of the place where the NUS is located (Kent Ridge), the car is called KRUCE (Kent Ridge urban concept car).

KRUC is 2.70 meters long, 1.20 meters wide, and 1.18 meters high and weighs only 130 kilograms. The car features a clean and efficient powertrain, which consists of a hydrogen fuel cell paired with an electric direct drive wheel hub motor.

The customized hydrogen fuel cell can deliver up to 1.2 kilowatts of power and is at least twice more efficient than a comparative internal combustion engine. It is also a zero-carbon emission engine, generating only water and unused air at the exhaust. Moreover, they will be more durable than internal combustion engines. The wheel hub motor is a reliable and efficient motor that develops the one horsepower required to propel the eco-friendly urban concept car. Weighing in at only six kilograms, the motor works well with the fuel cell to create a near silent vehicle.

(2) *One of the world's greenest supercomputers*

In February 2010, NTU opened the High Performance Computing (HPC) Center to support the university's growing international research profile and capacity, especially in sustainability.

Unlike most data centers that require a lot of energy to cool the operating environment, the NTU's HPC system maximizes performance with unique water-cooled technology. This eliminates the need for computer-room air conditioners, allowing for room-temperature operation. The result is a reduction in electrical consumption by more than 30 percent compared with the standard precision cooling system found in most supercomputers. The NTU's supercomputer is ranked the 6th most energy-efficient in the world based on x86 architecture.

With one of the world's fastest supercomputers over 29 teraflops (trillion mathematical calculations per second), NTU is now exploring more possibilities in leading-edge research topics such as developing future energy sources, studying global climate change, and understanding biological systems and the physics of complex socio-economic systems, among others. More can also be achieved in research such as in the modeling of volcanic activities, understanding the earth's tectonic movements, as well as the simulation of flight dynamics.

(3) *Optimal assignment of users to servers for mobile phones*

Real world industry sectors provide School of Information Systems at SMU with a test-bed and laboratory for experimentation as well as a fertile breeding ground for new ideas. This is one of the research topics performed under such an experimental environment.

The cell for mobile phones is a service area defined by the maximum service radius reached by the corresponding signal, and the maximum number of users to be served within that radius. Here, they have the following two challenges: dealing with a large scale system, and user mobility. In other words, the maximum number of users would be served. In addition, the distance between users and their assigned mast would be minimized to achieve the best possible connectivity.

Existing approaches are not computationally feasible for millions of users since they model it as a search problem that is plotted on to a graph. To deal with such a large scale, the coordinate space is conceptually divided into partitions (e.g., square regions) what are termed "spatial indexing," which serve as location indexes. This approach allows the graph search to run on the set of partitions, enabling it to disqualify entire groups of users, instead of individual users, as candidates to be served from specific repeaters. Also, by narrowing down the possible options, searches are completed in a shorter time. However, it cannot address itself to the second challenge of frequent user movements. To deal with location updates without invoking a new search from scratch, an approach has been developed that would reuse previously computed assignments and amend them to produce the new optimal assignment. Thus, it can save processing time and enhance system responsiveness.

(4) *User-centric scholarly digital library*

Finally, in the informatics, I would like to briefly introduce research topics in the research group where I work now (<http://wing.comp.nus.edu.sg/>). Our group aims at developing a user-centric scholarly digital library by using information retrieval (IR) and natural language processing (NLP) techniques. For example, our research topics cover record matching in metadata, domain specific readability, photo organization, interface of a user-centric digital library, and scholarly paper recommendation in IR, discourse analysis, related work summarization and question answering in NLP.

Singapore's 4th autonomous university, Singapore University of Technology and Design, will open in 2012. It is expected that the research activities in electronics and information technology in Singapore will evolve further than ever before.

Annual Activity Report of IEICE Overseas Sections Report-5

Activity Report from IEICE Korea, Communication Section



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IEICE Korea, Communication Section organized a special workshop entitled "Sensor Network Technology and RFID Application" on February 4, 2010. Four experts of sensor network and RFID applications from Japan and Korea gave speeches. It was held in conjunction with the 20th HSN (High Speed Network) workshop at Daemyung Resort in Byeonsan, 4 hours away from Seoul by vehicle. This workshop covered positioning systems using RFID for safety and security, enhanced Wireless Sensor Network (WSN) for reliability and scalability, RFID-based supply chain management, and updated RFID/USN standards as well. About 60 people attended there, including around 40 engineers, 5 students and 15 professors from manufactures, Universities and R&D sectors. The invited presenters clearly announced their valuable knowledge and recent development in the field to the participants who had high interests on WSN technology and RFID applications. The lectures are summarized as following:

(1) Opening Address, "Introduction to Communication Society of IEICE" was given by Prof. Chimoon Han, Representative of IEICE Korea, Communication Section with introductory remarks on the current status of IEICE Communications Society and IEICE.

(2) The first speech entitled "RFID-based Positioning Systems for Enhancing Safety and Sense of Security" was given by Prof.

Kaoru Sezaki, University of Tokyo, Japan. Currently, they say the accuracy of GPS is not sufficient to respond to emergency calls yet. To realize a seamless and accurate positioning system, a team of experts from four governmental research institutes was formed into the national project. In the positioning systems, user's devices obtain ID numbers from the embedded RFID tags and the devices retrieve corresponding location information by querying a database. They proposed various techniques to decrease the cost since the national geographic survey planned to deploy RFID tags and a localization mechanism exploiting motion sensors and P2P-based technique. When the device approaches RFID tags, it estimates its position by dead-reckoning and collocated devices with exchanging their location estimation and performing localization to keep the accuracy. The various applications were implemented to enhance the sense of security in emergency, especially monitoring and analyzing the daily behavior of children. He briefly introduced the on-going real urban sensing project of University of Tokyo which deployed wireless sensor networks and mobile phones in Tatedayashi City.

(3) The next speech entitled “*Reliable Wireless Sensor Networks and Its Applications*” was given by Dr. Seong-Soon Joo, Head of Ubiquitous Sensor Network Research Team, Electronics and Telecommunications Research Institute (ETRI), Korea. More than 15 years have passed since the concept on Wireless Sensor Network (WSN) was introduced for ubiquitous sensing and collaborative computing. In spite of numerous research efforts on WSN, it seems hard to find deployed WSNs in commercial use. On the contrary to the promising expectation on WSN, where redundant data gathered with low cost wireless sensing nodes would be effective for extracting information from the data, the real world service requires exact data from sensors at a certain time. WSN is technically mature for commercial use, especially Zigbee over IEEE 802.15.4 PHY/MAC, simple application with point-to-point, and beacon-enabled network for saving energy. Low power consumption, reliability, and scalability are enhanced in IEEE 802.15.4-2006 MAC to meet the requirements for industrial applications. He referred to what ETRI has carried on research and business development for reliable WSN that would be introduced in the future to answer the real world requests. He also suggested the distributed channel hopping based on TDMA MAC system for reliable communication.

(4) The speech entitled “*Status of RFID Item-Level Tagging in Pharmaceutical RFID System*” was given by Dr. Kwang Nam-Gung, CEO, Hanmi IT Co., Ltd, Korea. Radio Frequency Identification (RFID) is emerging as the hottest information tracing technology in supply chain management with its inherent ability to reveal item-level product information. There are no companies yet, who have deployed RFID system entirely at the corporate level in pharmaceutical industry of Korea, because there are too many hurdles for drug manufacturers to successfully deploy ILT (Item-Level Tagging) system & solution. Unlike a majority of case study-based references, this presentation took a different perspective by modeling how to overcome obstacles of ILT in pharmaceutical industry by introducing Hanmi Pharmaceutical's case. In addition, he presented expected effects of ILT RFID system, which would be getting anti-counterfeiting, reducing product recall and return, reinforcing transparency of drug distribution, and achieving strong RFID ROI (Return on Investment). He also mentioned that this case would have important implications for developing RFID technologies and proliferating RFID systems in pharmaceutical industry.

(5) The last speech entitled “*Current Status of RFID-USN Standard in Korea*” was given by Dr. Byoung Moon Chin, Managing Director, Telecommunications Technology Association of Korea (TTA). He introduced the overview of Korean standard organizations, RFID/USN standards and the future plan for RFID/USN standardization. RFID/USN standardization activities were commenced in Korea in 2004 and then the relevant TTA standardization committee was established. Most of TTA's RFID standards were based on the international standards for RFID air-interface and code. Therefore, RFID standardization activities have been focused on mobile RFID standard development and new RFID application services connected with domestic telecommunication services. USN standards have been developed since 2004, focusing on USN basic technologies and application services. Thus, most of mobile RFID standards have been developed in Mobile RFID Forum in Korea, and their outputs have been reflected on both TTA standards and the international standards. He also mentioned that in the future, TTA would focus their activities on the standards of RFID function expansion technologies and USN application diffusion.



Fig.1 The presenters and members concerned of Sensor Network and RFID Workshop

Report-6

Activity Report from IEICE Korea, Electronics Section



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Electronics Section*

The academic activities of Korea, Electronics Section in 2009 are summarized as following.

In the year 2009, the IEICE Korea, Electronics Section organized a workshop. The first workshop was entitled “IT New Technology Workshop”. It was held at Kyungpook National University (KNU), Daegu Korea on October 30, 2009, and co-sponsored by IEICE Korea Section, School of Electronics Engineering in KNU and IEEE Taegu Section. The workshop invited one overseas speaker and two domestic speakers.

Prof. Tatsuhiro Nakajima from the University of Tokyo, Japan, was invited as the first guest speaker and he gave a lecture on “R&D Activities on Renewable Energy and Smart Grid in Japan”(Fig. 1).

Dr. Kee-Young Nam, Principal Researcher, Smart Grid Research Division, Korea Electrotechnology Research Institute (KERI) and Mr. Sung-Wan Byun, Vice President/CEO, Samsung Thales Co., gave lectures on “Green Growth and Smart Grid” and “Recent Trend on Defense Technology,” respectively(Fig. 2).

Most of more than 200 attendees at the workshop, were mainly graduate students in the special field. The overview and advantages of IEICE and the Section were introduced by Prof. Duk-Gyoo Kim, KNU, Representative of IEICE Korea, Electronics Section. His speech also covered the features of those organizations, academic activities and membership benefit, and it

encouraged the participants to visit IEICE homepage on the Web.

As one of the other events, Prof. Duk-Gyoo Kim was invited to give a 40 minutes talk on “Freshmen Design Course at School of Electronic Engineering and Computer Science in KNU” at the IEICE 2010 General Conference held at Tohoku University, Sendai on March 18, 2010. He referred to the milestone of higher education in Korea and introduced their unique “Freshman Design Course” for under-graduate curriculum through students’ self developed robot design work and competition of creativity.



Fig.2 Prof.Nakajima provides a lecture.



Fig.3 Dr.Nam (KERI) talks on Smart Grid Status in Korea



Fig.4 Audience and the proceedings of the workshop.



Report-7

**Activity Report from IEICE Korea, Information Section
“Toward Cloud Policy in Korea”**



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Representative of IEICE Korea, Information Section*

In the year 2009/2010, the IEICE Korea Information-Section as a part of Grid middleware research center at KAIST organized the 6th Korea-Japan Grid Symposium. This Section has six times organized the Grid Symposiums since 2004 and contributed a lot to the research works of Grid technology. Prof.Chan-Hyun Youn has maintained the academic cooperation with Dr. Satoshi Sekiguchi and Dr. Yoshio Tanaka, AIST, Japan.

The Venue for the Symposium has been circulated every year so far. In 2009, Korea-Japan e-Science Symposium was held in Sendai, Japan, where more than 20 Korean delegates attended it (Fig.5). Their affiliations were KAIST, Korea Univ., Kangwon National Univ., Daejeon Univ., Ajou Univ., GIST and KISTI, respectively. The Korean speakers presented updated topics in the area of Grid applications and middleware, for examples, “Parallel Computation of Cardiac Arrhythmia” by Prof. Eun Bo Shim, Kangwon National University, “Implementation of the Finite-difference Time Domain Method for Photonic Device Simulation in Parallel Computing Environment” by Prof.Youngjoo Chung, GIST, and “Service-oriented PACS-Grid” by Prof.Chan-Hyun Youn, KAIST, and the other four speeches in the area of Grid.

On the other hand, Japanese delegates also gave good presentations on e-Science applications and Grid middleware. Their talks were “Middleware Enabling More Resource Federation for e-Science” by Dr. Kento Aida, NII, “A Model-based Algorithm for Optimizing I/O Intensive Application in Clouds Using VM-based Migration” by Dr. Kento Sato, Tokyo Institute of Technology, “Domain Authorization-based Hierarchical

Distributed Resource Monitoring System in Cooperation with Resource Reservation” by Dr. Atsuko Takefusa, AIST and the other four speeches in the area of cloud and middleware.

Additionally, members of the Section attended Korea Information Processing Society (KIPS) Spring Conference in Chuncheon, Korea (Fig.6). The conference covered whole areas of information and communications technologies. The attendees were over 300 in total. The overview of the Section was introduced for young PhD and MS students who participated in the Conference.



Fig.5 Korea-Japan e-Science Symposium 2009 participants in front of AIST Sendai Branch Office



Fig.6 Spring Conference of Symposium KIPS, Chuncheon, Korea

Upcoming International Conferences

NOLTA 2010 - IEICE Engineering Sciences Soc.
2010 International Symposium on Non-linear Theory and Its Applications, at Krakow in Poland, on Sept. 5-8, <http://nolta10.is.tokushima-u.ac.jp/>.

SISA 2010 - IEICE Engineering Sciences Soc.
2010 International Workshop on Smart Info-Media Systems in Asia, at Manila in Philippines, on Sept. 8-9, <http://splab.cs.kitami-it.ac.jp/sisa2010/>.

GJS2010 - IEICE Communications Soc.
The 13th German Japanese Symposium, at Osaka in Japan, on Sept. 13-14, <http://www.ieice.org/cs/conf/calendar.html>.

ICCE 2010 - IEICE Electronics Soc. & Communications Soc.
The 3rd International Conference on Communications and Electronics, at Nha Trang in Vietnam, on Sept. 15-17, <http://www.hut-icce.org/2010/>.

AP-RASC'10 - IEICE
2010 Asia Pacific Radio Science Conference, at Toyama in Japan, on Sep. 22-25, <http://www.ap.ide.titech.ac.jp/ap-rasc10/>.

IWSEC 2010 - IEICE Engineering Sciences Soc.
2010 International Workshop on Security, at Kobe in Japan, on Nov. 22-24, <http://www.iwsec.org/2010/>

APARM 2010 - IEICE Engineering Sciences Soc.
The 4th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling, at Wellington in New Zealand, on Dec. 2-4, <http://msor.victoria.ac.nz/Events/APARM2010/>.

ISADS 2011 - IEICE Communications Soc. and Information Systems Soc. The 10th International Symposium on Autonomous Decentralized Systems (ISADS 2011), in Tokyo and Hiroshima, on March 23-27, 2011. Due dates for papers and panel proposals is Aug 31. <http://www.isads2011.info.hiroshima-cu.ac.jp/>.

Message from TFIPP Secretariat

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