

Report on NTT Communication Science Laboratories Open House 2012

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Abstract

Open House 2012 was held at NTT Communication Science Laboratories in Keihanna Science City, Kyoto. Over 1000 people visited the facility on June 7 and 8 to enjoy six lectures and twenty-six exhibits of the labs' latest research efforts.

1. Overview

At NTT Communication Science Laboratories (NTT CS Labs), we are studying aspects of both human science and information science in order to devise communication technologies based on a deeper understanding of humans and information. In studies relating to future communication environments, intelligent computing, and the quality of human life, all of our researchers are continuously promoting the creation of innovative technologies that will revolutionize telecommunications. The labs are located in Kansai Science City (Seika-cho, Kyoto) and Atsugi City, Kanagawa.

NTT Communication Science Laboratories Open House has been held annually with the aim of introducing the results of the labs' basic research and innovative leading-edge research to not only NTT Group employees but also visitors from companies, universities, and research facilities engaged in research and development, business, and education. This year, the event was held at NTT Keihanna Building (**Photo 1**) in Kansai on the afternoon of June 7 and all day on June 8, 2012; there were 1070 visitors. This article reports on the event's research talks and exhibits.

2. Keynote speech

The open house started with a speech by the Direc-



Photo 1. Event site (NTT Keihanna Building).

tor of NTT CS Labs, Naonori Ueda, entitled, “Communication science for big data era” (**Photo 2**).

In recent years, social media have been widely used, and information terminals have become highly compact and more advanced. These developments have accelerated the *information explosion* on the Internet more than ever. We are approaching the *big data era*, when telecommunication systems and services will deeply analyze a wide variety of data and provide the analysis results to systems in the real world, which will in turn lead to highly efficient



Photo 2. Naonori Ueda, Director of CS Labs, giving the keynote speech.



Photo 3. Research talk by Dr. Naoyuki Hironaka.

social systems.

To create such systems and services, telecommunication technologies should be not only highly sophisticated but also safe and secure for their users, which will lead to an enriched and relaxed information and communications technology (ICT) society. Therefore, it is necessary to study communication science, which includes not only telecommunications but also human science and social science. Accordingly, Dr. Ueda introduced the social trends of big data, involving machine-learning technologies that are expected to analyze data powerfully, and the related research conducted at NTT CS Labs.

3. Research talks

Four research talks were given, highlighting recent significant research results and high-profile research themes.

- “Neuroscience of liking and wanting—Exploring biological foundations of human emotion in animal behavior—” Naoyuki Hironaka, Human and Information Science Laboratory
- “Preservation of digital contents—Standardization activities and best practices for digital content preservation being discussed at ISO/IEC and other organizations—” Noboru Harada, Moriya Research Laboratory
- “Random number generation from light—Fast physical random number generation using chaos in semiconductor lasers—” Kazuyuki Yoshimura, Media Information Science Laboratory

- “Real world revealed through sensor networks—Technologies for collecting, interpreting, and presenting information from massive and heterogeneous sensor nodes—” Yoshiyuki Suyama, Innovative Communication Laboratory

Each presentation introduced some of the latest research results, including some background and an overview of the research. All of the talks were very well received by the many participants.

In “Neuroscience of liking and wanting,” state-of-the-art studies on the emotion of liking and wanting, based on the development of neuroscience in recent years, were introduced (**Photo 3**). In “Real world revealed through sensor networks,” the latest research developments derived from activities of the s-room Project were introduced from the viewpoint of collecting, interpreting, and presenting data from sensors (**Photo 4**).

4. Research exhibits

The open house featured 26 exhibits displaying the latest research results. These were classified into three categories—information science, interface science, and life science—from the viewpoint of how the results will influence our society of the future. Each exhibit had a booth and used techniques such as slides on a large-screen monitor or hands-on demonstrations, with researchers explaining the latest results directly to visitors (**Photo 5**). The research exhibits are summarized below.



Photo 4. Research talk by Dr. Yoshiyuki Suyama.

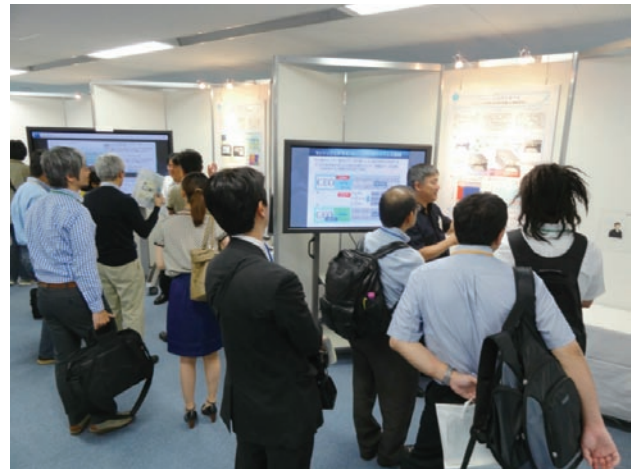


Photo 5. Research exhibits.

Information science

- Unmeasurable light produces common secrets
—Secret key distribution using correlated randomness in lasers—
- Computer guarantees ultimate security of cryptosystems
—Security proof using formal methods—
- Does the law protect your privacy?
—Mathematical formulation of privacy and its applications to law—
- Adaptive learning from similar examples
—Robust semi-supervised learning and its application to NLP—
- This is the essence of your data, isn't it?
—Extracting hidden structure of data for deeper data mining—
- Quickly finding similar objects to a query
—Fast similarity search based on a neighborhood-graph index—
- Live TV search
—Realtime media search using incremental feature database—
- Observing the noisy world
—Collective sensing, coding, and large deviation properties—
- Stereoscopic camera system for accurate color and shape reproduction
—Stereoscopic 6-band video system—

Interface science

- Massive sensor networks collect data you want to know
—Dynamic configuration of sensor networks—

- Word order is critical for translation quality
—English <-> Japanese translation by Japanized English—
- Dynamic displays provide more information about conversations
—Conversation space by physical representation of head motions—
- Toward media spaces that reminisce
—Reflecting on past activities on t-Room and its applications—
- Analyzing your singing style
—Singing style extraction based on singing voice F0 model—
- Who spoke when and what?
—Progress in scene analysis for multi-speaker conversation—
- Clearly distinguishing your voice from ambient noise
—Speech enhancement using temporal, spatial, and spectral cues—
- Listening and understanding conversations
—Advanced techniques for spontaneous speech recognition—
- When sound alters vision
—Distortion of visual space and time by audio-visual integration—
- Reaching now, looking later
—Implicit eye-hand coordination—
- Seeing materials from image cues
—Adaptive strategy of human visual system—

Life science

- Why do children suddenly begin to learn words?



Photo 6. Visitor experiencing a video conference with dynamically moving displays.



Photo 7. Visitors watching research presentation on infant's vocabulary spurt onset.

—Unveiling the myth of vocabulary spurt by analyzing longitudinal data—

- Appropriate words for children at particular ages
 - Searching for appropriate contents for toddlers—
- Speaking plays tricks on hearing
 - Close link between articulation and speech perception—
- Rats can better themselves by observing others
 - Neural basis of adaptive social behaviors—
- Exploring brain mechanisms for selective listening
 - Psychophysics, modeling, and functional brain measurements—
- Tactile sensation categories based on mimetic words
 - Tactile textures and their phonetic representations—

The exhibit “Dynamic displays provide more information about conversations” demonstrated a remote video conference where the head movement of each member at the remote location was reconstructed as the movement of a display located at the person’s corresponding seat in the main location; the projected video of the remote person’s head and shoulders gave many visitors the vivid feel of a real communication environment, as if all the conference participants were in the main location (**Photo 6**). The exhibit entitled “Why do children suddenly begin to learn words?” showed the underlying mechanism of an infant’s vocabulary spurt onset, the phenomenon in



Photo 8. Associate Professor Akihiro Kitada of the University of Tokyo giving an invited talk.

which the child’s vocabulary-learning speed suddenly become faster at an age of 1.5 years; the study was based on an analysis of personal longitudinal data, and many visitors showed great interest in this mechanism (**Photo 7**).

5. Invited talk

This year’s event also featured an invited talk by Akihiro Kitada, Associate Professor of the University of Tokyo. He spoke on the topic of “Connection, the social, and the political: The mode of communication

and the sociality of the youth” (**Photo 8**). From the viewpoint of social science, he gave an explanation of analyzing the mode of young people’s communication while introducing movies about youth. Although it was a sophisticated presentation, the audience laughed and enjoyed the talk in a friendly mood.

6. Concluding remarks

Just as last year, many visitors came to the NTT CS Labs open house and engaged in lively discussions on

the research talks and exhibits and provided many valuable opinions about the presented results. In closing, we would like to offer our sincere thanks to all of the visitors and participants who attended this event.

References

- [1] Open House website (in Japanese).
<http://www.kecl.ntt.co.jp/openhouse/2012/>
- [2] Open House poster.
http://www.kecl.ntt.co.jp/openhouse/2012/oh2012_poster_en.pdf



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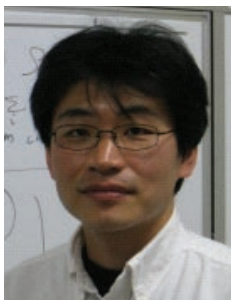
He received the B.S. degree in chemistry from Keio University in 1989, the M.S. degree in physics from Tokyo Institute of Technology in 1991, and the Ph.D. degree in media and governance from Keio University in 2004. He joined NTT in 1991, studying word meaning in artificial intelligence and natural language processing. He was also a visiting researcher at the Center for the Study of Language and Information, Stanford University, USA, from 1998 to 1999.



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She received the B.A. degree in education in 1999, the M.A. degree in health science in 2001, and the Ph.D. degree in arts and sciences in 2004 from the University of Tokyo. She joined NTT CS Labs in 2004. She is currently engaged in research on speech perception/production development in infants and children.



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He received the B.E. degree in information science from Kyoto University in 1993 and the M.S. and Ph.D. degrees in computer science from the University of Tokyo in 1995 and 2006, respectively. He joined NTT in 1995. He was a researcher at the Quantum Computation and Information Project, ERATO/SORST, Japan Science and Technology Agency (JST) from 2004 to 2009, and a visiting researcher at the Institute for Quantum Computing, University of Waterloo, Canada, from 2010 to 2011. His current research interests include distributed computing and complexity theory in the classical as well as quantum settings.



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He received the B.E. degree in mechanical engineering and the M.S. degree in informatics from Kyoto University in 2002 and 2004, respectively. He joined NTT CS Labs in 2004. He is currently interested in fast approximate similarity search for large-scale and various media.



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He received the M.E. and Ph.D. degrees from Sophia University, Tokyo, in 2003 and 2010, respectively. He is currently engaged in research on speech and audio signal processing. He received the 2006 IEICE Paper Award, the 2009 ASJ Outstanding Technical Development Prize, and the 2011 ASJ Awaya Prize. He is a member of IEEE, the Acoustical Society of Japan (ASJ), and the Institute of Electronics, Information and Communication Engineers (IEICE).
