

Graduate School of Information Science

The Graduate School of Information Science undertakes high-level basic research in information science. We also systematically train researchers and engineers who will become pioneers in the area of information, communication and life science technologies. The Departments of Information Processing, Information Systems, and Bioinformatics & Genomics, and the Information Technology Center provide educational programs that cover the majority of areas related to information science.

The School is a center of research and education in the fields of 'Information Sciences, Electrical and Electronic Engineering' of the 21st Century COE Program (selected in 2002) and a 'Core Program to Promote Talented Students for the Future in Information Science' of the Initiatives for Attractive Education in Graduate Schools (selected in 2005). We are moving forward to be internationally competitive and reaching for the world's top level in research and education. Many industry-government-academia collaborative projects are currently underway.

Special systems designed to accept and encourage excellent students, such as admission examination by interview, excellent student program, accelerated admission and early course completion are implemented. Through our acknowledged curriculum and research base, we educate students who will lead the highly advanced information society.



NAIST[®] Topics

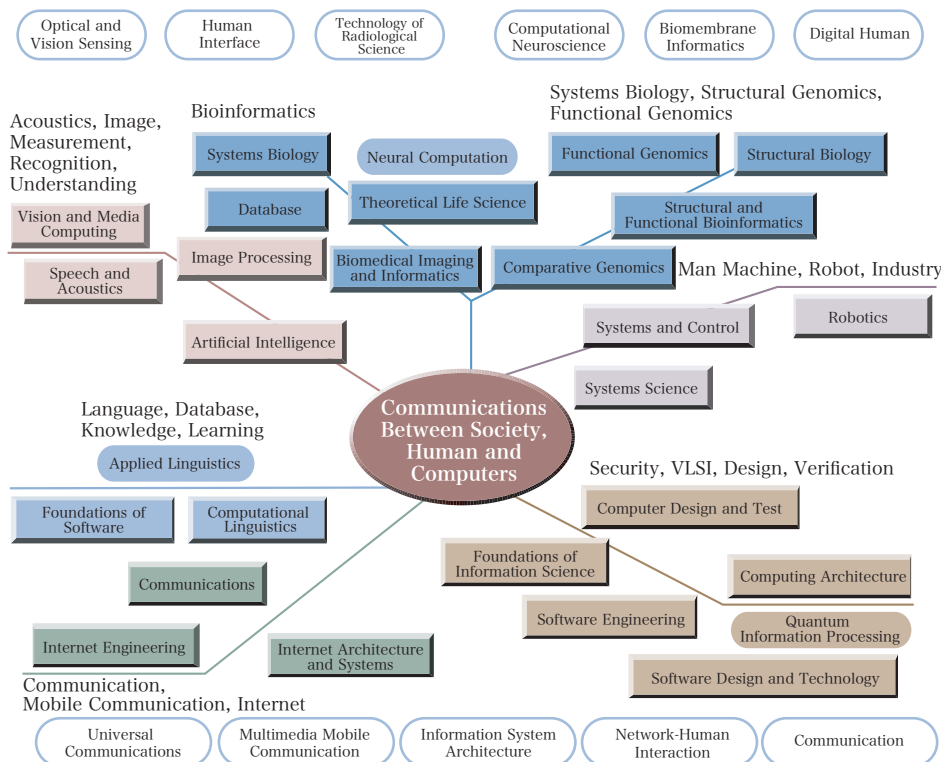
Developing a State-of-the-Art Satellite Communication System

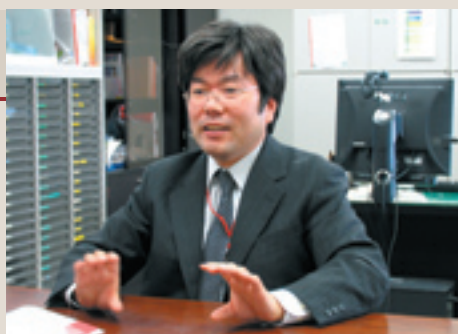
Minoru OKADA, Professor
Communications
Graduate School of Information Science

Our current focus is on satellite communications, specifically a new method for making frequencies available to more operators. Available frequency resources are strictly limited, but with our new method, being developed jointly with the communications company JSAT, it will become possible for more users to make efficient and economical use of the same bandwidth.

Conventionally, a hub station and its terminal stations use different frequencies for transmission and reception. In our method, however, both hub and terminal stations use the same frequency. In this case, the hub station receives signals by summing its own signals and those transmitted by terminal stations. It recovers the transmission signals by subtracting its own signals, which is good for security because this operation cannot be done by third parties.

However, a satellite used for this purpose moves around 100 km per day at a distance of 36,000 km from the earth. Given that the number of patterns in the signals





that must be searched by the hub station amounts to 2 to the power of 64, if the margin of error in the distance between the hub station and the satellite is to be limited to a few centimeters, as desired, a super-powerful mainframe computer would be required. Therefore, we have established a simpler equation to calculate this distance that focuses only on similar frequencies so that standard systems can handle the calculation.

Such ideas often emerge rather spontaneously from casual conversation. So I always keep the door of my research lab open, so that anybody can come in when they come up with an idea.

Even a specialized project like ours can demand a wider range of expertise, such as computer programming. We make sure everybody acquires such necessary backgrounds for applying their knowledge in the real world. The emphasis on collaboration with other institutions, including those overseas, is a unique characteristic of our laboratory.

- **Admission system that places high value on individuality**
Interview-based admission / Cross-disciplinary admission and recruitment / Fast-track admission for outstanding students
- **Forming an internationally competitive school of the world's highest standards**
Ubiquitous Network Media Computing under the 21st century COE program / Core Program to Promote Talented Students for the Future in Information Science under the Initiatives for Attractive Education in Graduate Schools / E-Society Project / IT Spiral Project for training leading IT specialists
- **Open-minded, active faculty members and diverse course structure**
Seminars coordinated by Department of Information Processing, Information Systems, Bioinformatics and Genomics, and Information Technology Center / Collaborative Laboratories in external institutions
- **Flexible research and education system**
Choice of research laboratory based on student's preference / 4-term-a-year system with intensive training / Fast-track system for graduation / The highest grade in appraisal methods by Ministry of Finance
- **Support for outstanding students**
Excellent student program / Teaching assistant and Research assistant program / Support for international exchange activities
- **Advanced research environment**
"Mandara", integrated information processing system / Electronic library and archives / Wide range of advanced large-scale research facilities

Department of Information Processing

- Foundations of Information Science
- Foundations of Software
- Computer Design and Test
- Internet Engineering
- Computational Linguistics
- Artificial Intelligence
- Image Processing
- Speech and Acoustics
- Interactive Media Design
- Applied Linguistics (Visiting Course)
- Quantum Information Processing (Visiting Course)

Department of Information Systems

- Computing Architecture
- Software Engineering
- Communications
- Vision and Media Computing
- Systems Science
- Systems and Control
- Robotics
- Software Design and Technology
- Internet Architecture and Systems

Department of Bioinformatics and Genomics

- Database
- Theoretical Life Science
- Biomedical Imaging and Informatics
- Systems Biology
- Structural Biology
- Functional Genomics
- Comparative Genomics
- Structural and Functional Bioinformatics
- Neural Computation (Visiting Course)

Collaborative Laboratories

- Communication (NTT Communication Science Laboratories)
- Computational Neuroscience (Advanced Telecommunication Research Institute International)
- Network-Human Interaction (Matsushita Electric Industrial Co., Ltd., Advanced Technology Research Laboratories)
- Information System Architecture (NEC Corporation, Kansai Research Laboratories)
- Human Interface (Fujitsu Laboratories Ltd.)
- Multimedia Mobile Communication (NTT DoCoMo, Inc.)
- Optical and Vision Sensing (OMRON Corporation, Research and Development HQ Sensing & Control Technology Laboratory)
- Biomembrane Informatics (National Institute of Advanced Industrial Science and Technology)
- Digital Human (National Institute of Advanced Industrial Science and Technology)
- Technology of Radiological Science (Research Institute of National Cardiovascular Center)
- Universal Communications (Keihanna Cooperation University System)