ATTACHMENT 1: Profile and Detailed Achievements of the Group A Recipient of the 2015 C&C Prize

Prof. Masaru Kitsuregawa

Current positions
        Professor, Institute of Industrial Science, the University of Tokyo
        Director General, National Institute of Informatics

Personal History (born in 1955)
 1978： Graduated from Department of Electrical and Electronic Engineering, the University of Tokyo
 1983： Earned Doctor of Engineering, the University of Tokyo
 1983： Lecturer, Institute of Industrial Science, the University of Tokyo
 1984： Associate Professor, Institute of Industrial Science, the University of Tokyo
 1997： Professor, Institute of Industrial Science, the University of Tokyo
 1998： Director, The Center of Conceptual Processing of Multimedia Information, IIS, the University of Tokyo
 2003： Director,   Center for Information Fusion, IIS, the University of Tokyo
 2008： Science Adviser, Ministry of Education, Culture, Sports, Science and Technology, Japan
 2010： Director General, The Earth Observation Data Integration & Fusion Research Initiative, the University of Tokyo
 2013： Director General, National Institute of Informatics
 2013： President, Information Processing Society of Japan
 2014：Chairman of Committee for Informatics, Science Council of Japan

Major awards:
 1986： The Moto-Oka Award
 1992： Japan IBM Science Prize
 1992： Best Paper Award、IEICE
 2002： FIT Best Paper Award・FIT Funai Best Paper Award
 2003： Fellow,   IPSJ
 2003,2004,2010： Best Paper Award, Database Society of Japan (DBSJ)
 2005： Fellow,   IEICE
 2009： ACM SIGMOD Edgar F. Codd Innovations Award
 2009： Contribution Award, Ministry of Land, Infrastructure, Transport and Tourism, Japan
 2010： Achievement Award, IEICE
 2010： PAKDD Distinguished Contributions Award
 2011： Contribution Award、IPSJ
 2012： Fellow, ACM
 2012： Fellow, IEEE
 2013： Medal of Honor with Purple Ribbon

2015：21st Century Invention Award, National Commendation for Invention, Japan
Institute Invention and Innovation

–Achievements–

Today, a wide variety of information is rapidly increasing through the spread of social media and video content distribution over the Internet. It is believed that if more of this information could be collected, accumulated, and learned from (a process known as big data analytics), the results could be used to effectively resolve many issues facing society in recent years. In addition to such conventional media, the Internet of Things (IoT) and machine-to-machine (M2M) communications are expected to expand, leading to the emergence of a society that creates new value through sophisticated processing of massive amounts of data, including vast amounts of sensor information that will continue to grow exponentially. To achieve these advances, there is a strong need for research and development that covers not only technologies for the data collection, accumulation, and analysis, but also technologies for the use of data obtained for industry and services.

Prof. Masaru Kitsuregawa has long been involved in researching sophisticated database systems. In particular, he has achieved various pioneering and significant breakthroughs in research areas such as parallel database processing methods, high-speed database engines, computing hardware, and high-performance storage systems.

Focusing on the importance of data (information) and data management from the beginning of his research career, Prof. Kitsuregawa advocated the GRACE relational-database machine in the early 1980s and created numerous computational algorithms for database systems based on hash functions. Those hash-based technologies are now indispensable to today's database systems. He also led the research at the international level, and demonstrated actual system performance and effectiveness through various significant achievements.

The functional disk system is a relational database architecture characterized by hash-based dynamic clustering developed by Prof. Kitsuregawa and his colleagues. That system achieved outstanding performance based on the Wisconsin Benchmark, the most widely used database benchmark in the 1980s. Those results demonstrated efficient parallelization of hash-based query processing. Prof. Kitsuregawa has also made significant contributions to the development of large-scale parallel databases, for example, implementing, evaluating, and demonstrating the effectiveness of hash-based computational algorithms for large-scale PC clusters and distributed shared memory systems. Due to the results described above, he was awarded the Edgar F. Codd Innovations Award at the 2009 ACM SIGMOD Conference, one of the top conferences in the field of data engineering. Today, these query processing methods are implemented in the vast majority of commercial database management systems. They are also used for the parallel distributed processing of massive data, such as the MapReduce framework famous as a parallel computing system for search engines. These achievements attest to his significant contributions to industry.

Japan's Cabinet Office began a funding program for World-Leading Innovative R&D on

Science and Technology in 2010 to create new social systems that make sophisticated use of very large databases. As part of that program and in collaboration with industry, Prof. Kitsuregawa also developed a high-speed database engine. That ingenious achievement was based on the invention of a revolutionary data processing principle called the "out-of-order execution principle." Through this project, pioneering advances such as data search speeds 1,000 times faster than those of conventional search engine technologies were achieved. Such speeds enable the targeting of massive data processing, including the huge amounts of sensor data that is being produced in the era of big data.

Broadly anticipating technological and institutional issues in the massive digital information age, Prof. Kitsuregawa has also been a pioneer in launching collaborative industry-government-academia projects to find solutions. As a very prominent leader in Japan, he has made various research efforts, including service- and legislation-related initiatives. Those have led to innovative and comprehensive contributions to the growth of R&D to resolve the issues.

Prof. Kitsuregawa has long been referring to and focusing on the rapid growth in the amount of information that has been produced by human activities since the beginning of the 21st century. He named this the "information explosion." In addition, before the big data movement that originated in the U.S. in the 2010s, he started research in the specific area of the information explosion in 2005 in a project for Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT). Along with identifying issues from the information explosion, he worked on the creation of an advanced ICT infrastructure, demonstrating the effectiveness of services that make use of the explosion. That project led to the launch of various initiatives and studies in this area. They included the establishment of a research project by Japan's Ministry of Economy, Trade and Industry (METI) towards the creation of advanced services in this field in 2007. In that project, he conducted many demonstrations in various service fields. He even studied institutional issues (such as the use of personal information and copyrights) that might be obstacles to the spread of future advanced services. The result was the establishment of a more favorable environment. His achievements through that project, in turn, boosted interest in R&D on ultra-large-scale data and information processing technology in Japan. It has contributed to today's growth of R&D in that field and to spreading industrial applications in various fields such as medicine and health.

Moreover, in recent years, Prof. Kitsuregawa has been conducting various social analysis studies, building the largest Japanese language Internet archive in Asia. He is also building and providing a giant-scale global environment database system as a platform for researchers in diverse fields such as water resources and global warming. Through these activities, he is broadly contributing to the development of new applications and the expanded use of large-scale digital information processing across various application fields.

As detailed above, today's ICT is serving as a conventional information processing platform. However, more importantly, it is evolving into an engine for the generation of new technologies and services by converting a large amount of data into useful information.

Therefore, in the near future, ICT is expected to expand into artificial intelligence supported by large-scale digital information centered on ultra-large databases. This will change society in major ways. During the process of conducting research to make large-scale parallel database systems more efficient, Prof. Kitsuregawa anticipated the emergence of big data (the information explosion) and cloud computing. The pioneering activities of Prof. Kitsuregawa, who helped usher in this era through his R&D and projects, have significantly contributed to the development not only of information and communications technology but also Japan's economy and industry. In honor of his outstanding contributions, the NEC C&C Foundation is proud to present the C&C Prize to Prof. Kitsuregawa.