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Systems Software Technology to Maneuver Gigantic Data

The world is becoming able to digitally record each and every event happening every second to form large-scale data, which (recently called big data) has the potential to be exploited to make our life more convenient and to create new business. Yet, the increasing amount of data has continued to be generated in the world. It is one of the critical challenges to explore how mankind manages and utilizes the data without being misled or deluded by it. Our research group has been studying and exploring data-intensive platform technologies to enable higher speed, efficiency and manageability than ever before. These are expected to be applied to systems software for managing and processing large-scale data in data centers and clouds. Major on-going research projects are summarized below. As they indicate, we are now mainly working on database systems and storage systems, but prospective students' projects are not limited to them. We welcome students who want to explore and invent new systems software technology that nobody sees ever in the world.

Super-fast database system

We are developing a new database system based on the unique software execution method (Fig. 1). This brand-new technology has the significant potential to speed up query execution; for example, a business decision-support query taking one hour could finish in less than ten seconds. The research group is studying and exploring software design and implementation to prove the potential power for a variety of data, hardware and application software. In addition, we are working to apply the technology into cloud infrastructure and open source software and to explore new social applications to be enabled by the technology (Fig. 2).

Super-energy-efficient database system

Energy consumption has continued to increase at data centers and clouds. It is estimated that they will face difficulties to secure the necessary energy in the near future. In anticipation of such an energy competition era, we are exploring fundamental technologies to significantly improve the energy efficiency of database systems.

Super-intelligent storage system

Magnetic disks were the mainstream device for data storage systems more than half a century. Today, thanks to the evolution of semiconductor technology, flash memory and storage class memory are being incorporated into the system. The storage system is becoming a complex made of heterogeneous devices plus a powerful controller. Our research group is studying fundamental technology for realizing the automatic management of the system by fully utilizing the technical characteristics of the cutting-edge storage devices.

- We provide the laboratory tour and consultation for prospective students upon request. Please feel free to contact Dr. Kazuo Goda.
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Fig 1. A prototype of super-fast database software.

Fig 2. An example of a real big data analytics system.