

Title	Aiming to create an advanced society that can make effective use of digital contents : the common property of all humankind From computer network to digital content network
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Aiming to create an advanced society that can make effective use of digital contents – the common property of all humankind

From computer network to digital content network

Potential value of Big Data and other digital contents is now a focus of worldwide attention. For digital content to convey its value to potential users, it is essential to make known existing usages of such content. This requires a wide variety of technical developments. Dr. Kaneko regards the life cycle of digital content – from its creation until its death– as something like that of humans. He studies digital infrastructures to support the life cycle with network technologies through practical applications development (Fig. 1).

Stage 1 Viewing 4K broadcasts at home

Visit an electric store in town and you can see 4K ultra high-definition images, which will impress you with their utter beauty and overwhelming impact. It is said that Japanese people will be able to enjoy such wonderful TV broadcasts at home by 2020 Tokyo Olympics/ Paralympics. But a number of technical problems must be solved before this becomes a reality.

After completing his doctoral program at the University of Tokyo, Dr. Kaneko joined Keio University's Research Institute for Digital Media and Content (DMC) in 2006, when he began studying network technologies capable of delivering large-capacity digital content in anticipation of an era of 4K broadcasts over networks.

Dr. Kaneko remarks in retrospect, "Computers in those days lacked the computation power that modern PCs have. This made it relatively easy for me to clearly identify the problems involved in handling large-capacity digital content. Through experiencing many troubles, I found a number of problems." He undertook the study without taking it too seriously. In fact, at the beginning he assumed that there would be no significant difference between small- and large-volume data in the way we handle them. But contrary to his initial expectation, he came to realize that they were totally different.

The system known as Media Operations on Networks (MOON) was inspired by the hard-earned results of this early study. MOON enables large-volume data sharing over networks using dozens of inexpensive computers. Even

in households without a high-quality, highly expensive large-capacity network, MOON can offer large-capacity content delivering performance comparable in quality and price to currently available networks. What's more, it can respond flexibly to increase or decrease its capacity according to the viewer population.

The proposal of a method for large-capacity communications using inexpensive computers and networks and proving it feasible was a breakthrough achievement especially when the majority of researchers were beginning to handle large-volume digital content using powerful servers and quality controlled networks.

From Stage 1 to Stage 2 Creating service-conscious digital technologies

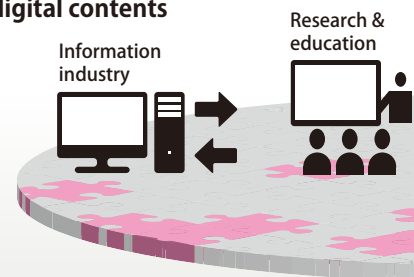
Dr. Kaneko's research endeavors are not confined to the development of network technologies. He says, "A network that functions properly means that all users use the network under the same rules. And the usefulness of a network increases dramatically as the network scale grows larger. As we focus on network technologies, therefore, we naturally consider the expected services and content, which leads us to create rules so that they maximize the network

scale." No matter what purposes they may be used for, it is often the case that digital technologies share essential functions. That said, random combination of functions would not work. In designing network, we should take various content and services into account and find the very requirements that could serve as their common minimum denominators.

Dr. Kaneko continues, "In my student days when I was engaged in network studies, I pursued studies to find and

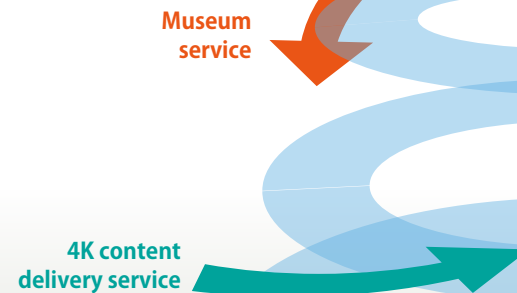
Stage 3

World of rich digital contents



Stage 2

Structuring of digital content service infrastructure



Stage 1 Digital technology

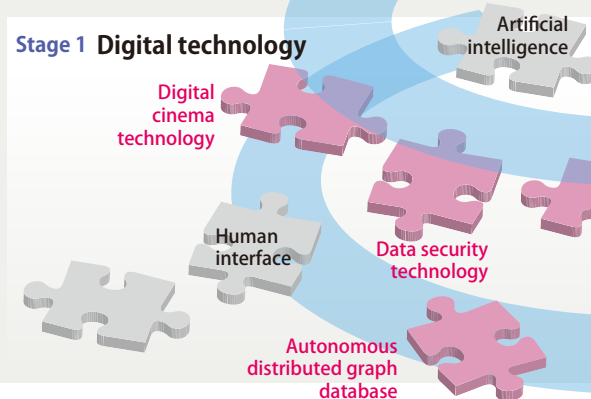


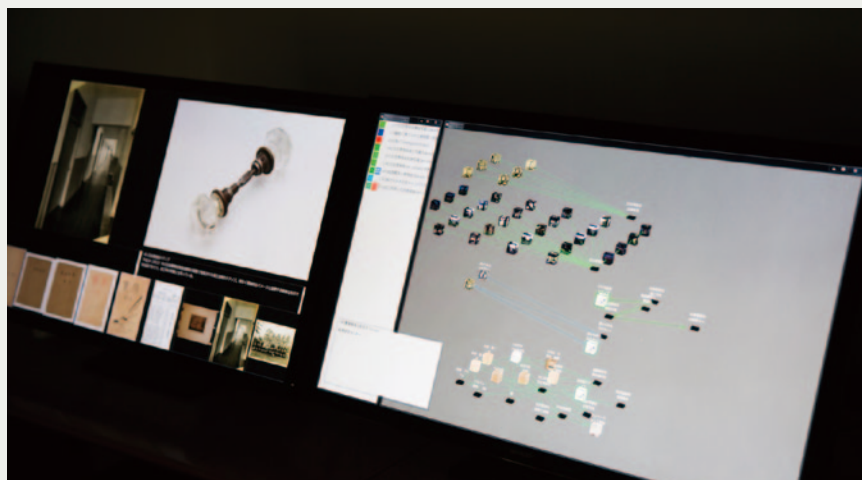
Fig.1 Dr. Kaneko's approach to research

Dr. Kaneko's research targets (red pieces) shifted from network of computers to that of content (data). And now he focuses on designing a computer network for the network of content.

Fig. 2 Virtual museum based on MoSaIC

With the help of MoSaIC functions, it is possible to create “Your own museum space” by arranging and displaying exhibits according to your personal knowledge, feelings, and tastes. Combination of these museum spaces enables the creation of virtual museums that can be realized only by digital technologies.

solve network problems from the viewpoints of pure network technologies. When I completed my doctoral program, Prof. Tomonori Aoyama, my adviser, encouraged me to approach network technologies from the perspective of ‘How users wish to use it.’ Inspired by this advice, who was well aware of the limitations of merely studying network technologies, Dr. Kaneko decided to change the direction of his study to network architecture design, much

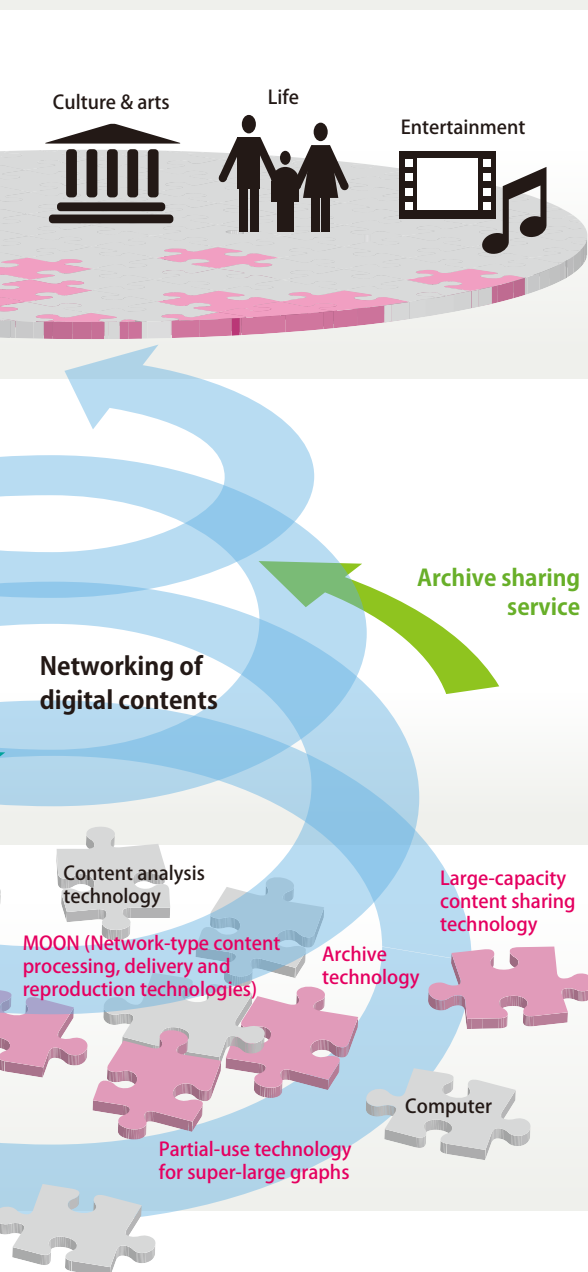


needed by new generations of network services.

After taking up a post at DMC, Dr. Kaneko changed his approach in addressing network technologies by considering the perspective of application services worthy of networking. The development of network technologies for 4K broadcasts nurtured a perspective of application services, which led to an awareness of a new problem as to what really drives effective utilization of 4K content.

line-linking system. If any one of such new discoveries catches your attention, then you can examine it separately to identify the relationship between the contents concerned. Indication of relationship thus helps to expand the world of content users.

The work of linking content with lines is still being done manually today, but once it is automated thanks to advances in research, digital content all over the world will be linked together like a network. It will thus trigger an explosive increase in the number of new discoveries.



**Stage 2
Networking of digital content**

Upon assuming a post as an assistant professor at the Department of Information and Computer Science at Keio, Dr. Kaneko launched a project to develop a digital museum. Keio has a wealth of historically valuable materials. Although efforts have been made to digitalize these materials, little has been utilized to date.

To deal with this situation, Dr. Kaneko initiated the Museum of Shared and Interactive Cataloguing (MoSaIC) project. The foremost feature of this project lies in the technology developed by him that can “retrieve, from a certain content, other related contents without the use of keywords” (Fig. 2).

When one searches for a content, it is usually the case that language such as keywords intervenes, as in searches on Google. Dr. Kaneko, however, decided to use simple line-linking between the related contents instead of language-based text keying. By doing so we may not be able to see why these contents are related, but with the absence of ambiguity inherent in language we can be sure that certain relations do exist between them.

Once a certain content is chosen, line-linked contents are presented one after another, which can lead to new discoveries. This is the strength of the

**Stage 3
Enriching the world of digital content**

Besides the foregoing research activities, the range of Dr. Kaneko’s involvements with digital content infrastructures is remarkably wide, including a contract with Hollywood to verify functions and performances of digital cinema equipment, and drafting the standard of digital archives. This is because, in order to pursue projects and studies relating to effective use of digital content in a comprehensive manner, he thinks it necessary to grasp each and every problem of digital content that we are now facing. He also believes that we won’t be able to enhance and enrich our digital society without creating technologies capable of freely using enormous amount of digital content –both already existing and to be amassed in the future.

Dr. Kaneko’s world of research is one of a kind in the world. Using it as the core, DMC at Keio University plans to create a digital museum. A point where arts and sciences meet, DMC is blessed with a superb research environment that allows participants to engage in a wide range of pursuits, from networks to content. We look forward to seeing new, exciting values coming from DMC.

(Reporter & text writer : Akiko Ikeda)