Review of NTT-MIT Research Collaboration

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Abstract

This paper outlines the recently completed five-year collaboration between NTT and the Massachusetts Institute of Technology (MIT) that started in July 1998. Its objectives are described from the viewpoint of R&D in NTT, and the joint research projects and project management system are explained.

1. Introduction

In June 1998, NTT and the Massachusetts Institute of Technology (MIT) signed a five-year collaborative research agreement. Research began in July 1998 and was completed in June 2003. The two principal aims were to study the new world order of communications and computers and to build a foundation for growth in the global field of information and communications. This paper introduces the other five selected papers in this issue that describe in greater detail the specific results of the collaborative research. It outlines the overall collaborative research project and the activities conducted over the past five years under the terms of the agreement.

2. NTT's role and activities

NTT's predecessor, NTT Public Corporation, placed special emphasis on R&D. Consequently, it achieved exceptional research results and developed outstanding human resources in the fields of information and communications. That same spirit has continued in all of NTT's activities since the company was privatized in 1985, and NTT has promoted R&D by making it the driving force of its business. The aim of R&D at NTT has been to develop practical technology to directly support the company's telecommunications business, with emphasis on research that will be useful in developing future technology. As time passed, however, the R&D fields became greatly diversified, making it increasingly difficult for the R&D division of a single organization to cover all relevant research domains. Strategic research alliances with other organizations came to play an important role, and collaborative research with universities now accounts for a high percentage of such research. With this background, NTT selected two research laboratories at MIT as partners for collaborative research: the Laboratory for Computer Science (LCS) and the Artificial Intelligence Laboratory (AI Lab), which are the world's foremost research laboratories in the fields of information technology and computer science. NTT researchers began working in collaboration with researchers from these two laboratories from July 1998 [1]. LCS is well known for its pioneering research in communications and computers in such areas as mathematics and computation, MULTICS (a multilingual conversational system), the RSA security system, Ethernet, spreadsheets, and the World Wide Web. The AI Lab, meanwhile, established in 1959 by two giants in the artificial intelligence field—Marvin Minsky and John McCarthy—has formulated many of the basic concepts underlying the field of artificial intelligence. One of the guiding principles at LCS and the AI Lab has always been not to stop merely at academic results but also to develop products and provide actual services based on their research. For NTT, which for many years has aimed at research that can be applied in practical use, LCS and the AI Lab were ideal research partners.

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Collaboration between NTT and MIT

3. Outline of the collaborative research

The collaborative research between NTT and MIT extended over the five-year period from July 1998 to June 2003, with the upper limit on research expenditures for the agreement's duration set at $18 million. The overall aim was to find unique, advanced research results in the areas of information/communications, computers, and artificial intelligence that would have worldwide significance and make a major contribution to society and business. Three specific research themes were established: 1) architectures, protocols, and application technologies for next-generation high-speed networks, 2) technologies for human-computer interfaces in a networked world, and 3) software technologies for large-scale networks and human interface systems. Prior to this arrangement, NTT had already established a record of introducing pioneering concepts in such key areas as INS (1978), VI&P (1990), basic multimedia (1994), and information distribution (1998). After conducting numerous experiments, NTT formed its vision of what the information society should be in the 21st century. In the environment of rapid advances made in information/communications equipment and the communications infrastructure, such as the trend toward broadband networks and the miniaturization

and higher performance of personal computers, NTT announced its "Vision for a New Optical Generation" in November 2002 [2]. The three main research aims of the collaborative research between NTT and MIT involved technologies that are essential for the next generation of information/communications services that NTT is working to provide. NTT's decision five years ago to move ahead with this type of collaborative research shows how farsighted and meaningful the company believes this research must be. As part of the original agreement, NTT and the member companies of the NTT Group obtained free use of the intellectual property rights related to the collaborative research.

A Joint Steering Committee (JSC) was established to manage the collaborative project to make the research as effective as possible and to evaluate the results (Fig. 1). It consisted of three members each from NTT and MIT. They discussed and selected the research themes and, at the end of each fiscal year, evaluated the progress of the research projects within each theme. The committee decided whether to continue ongoing projects and also chose the themes for new projects. The members of the JSC changed over the duration of the collaborative research agreement, as shown in Fig. 2.

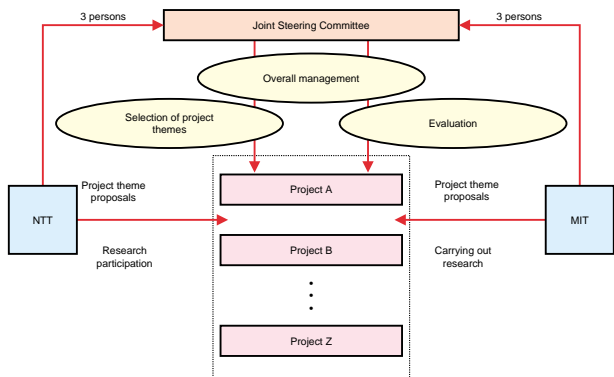At the start of collaborative research, seven project

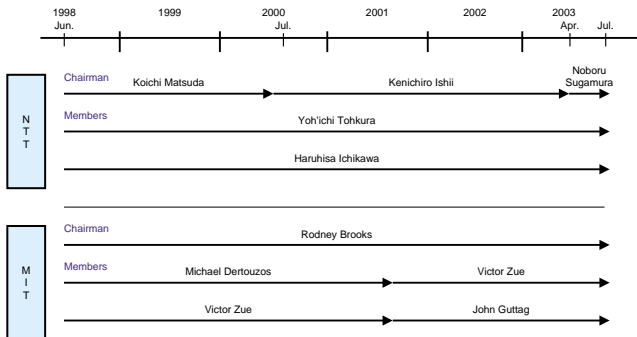Fig. 1.   Form of management for NTT-MIT collaborative project.

Fig. 2. Members of Joint Steering Committee.

themes were selected for study (Table 1). As seen in Fig. 3, that number increased to the level where about 17 to 21 themes were usually being studied at one time. Research results were announced four times during the five-year period. Efforts were made each time to communicate the results to the member companies of the NTT Group (Fig. 4). Figure 5 shows the number of projects studied each year by category as

Table 1. List of projects selected in fiscal 1998.

1. WIND: Wireless networks of devices
2. Multilingual conversational system
3. Self-updating software
4. Cryptography, info security and algorithms
5. Virtual viewpoint reality
6. Interactive sculpting of 3D computer graphics models
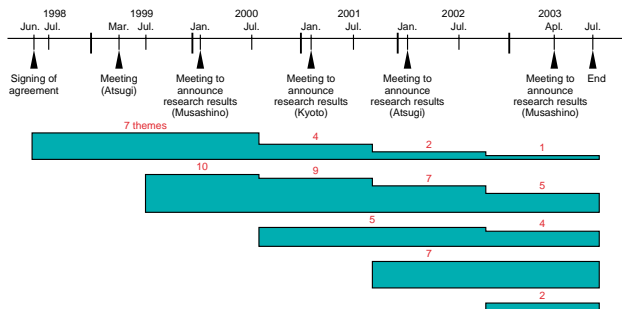7. Image and video retrieval using a visual encyclopedia

Fig. 3. Progress of research activities (numbers of projects and meetings to announce research results).

Lecture by Dr. Rodney A. Brooks,
Director, AI Lab.

Lecture by Dr. Kenichiro Ishii,
Director, C.S. Lab.

NTT Group employees listen keenly to presentations

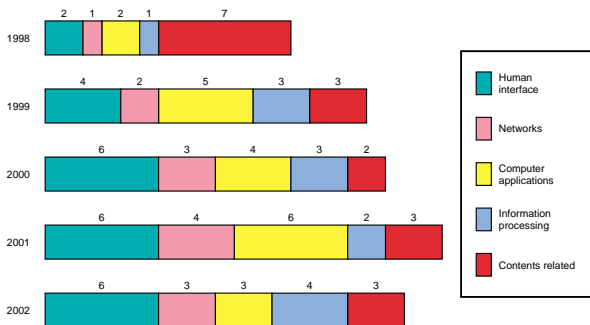Fig. 4.   Scenes from meeting to announce research results (January 25, 2001, Kyoto).

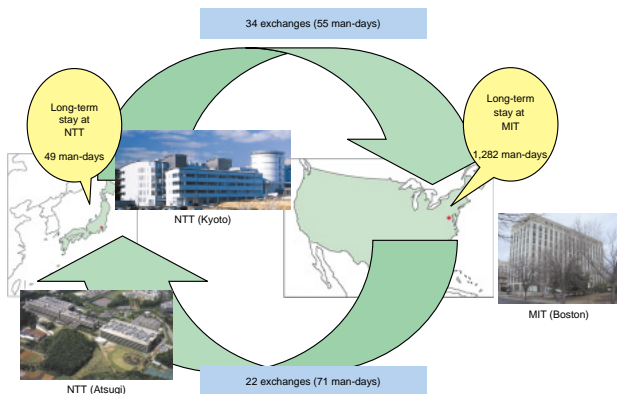Fig. 5.   Number of projects by research field.

Fig. 6.   Exchange of human resources.

well as the overall balance of the number of projects in each of the five general theme areas.

During the five-year period, many researchers from both NTT and MIT visited each other's sites, with some researchers staying for extended periods (Fig. 6). The network of human ties that was built up will prove invaluable to both parties in the future and are certain to contribute to the further development of both organizations.

4.   Conclusion

The five-year collaborative research project between NTT and MIT was concluded at the end of June 2003 after achieving valuable research results and an energetic exchange of human resources. The benefits gained from the project will be put to good use directly and indirectly in the future in both NTT's research and business activities. One of the members of the JSC from the beginning, Dr. Michael Dertouzos, a foremost communications researcher, passed away during the project in August 2001. While expressing our sincere gratitude once again for Dr. Dertouzos's inspiration and guidance during the course of the collaborative research, we trust that his soul rests in peace.

References

[1]   K. Matsuda, "NTT R&D and NTT-MIT Collaboration," NTT R&D, Vol. 49, No. 7, pp. 352-358, 2000 (in Japanese).
[2]   N. Wada, "Vision for a New Optical Generation," NTT Technical Review, Vol. 1, No. 1, pp. 6-17, 2003.

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