US-Korea Joint Workshop on Digital Libraries: Removing Barriers to International Collaboration on Research and Education through Digital Libraries

Supercomputer Center, San Diego, CA, USA
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A. Project Summary

There are many barriers to the worldwide development of digital libraries, and the involvement of the US in such activities. These are of particular concern in the context of digital library support of collaboration on research and education between pairs of nations with very different languages and cultures, such as the US and Korea. We propose a workshop involving digital library researchers from the US and Korea who wish to work to remove such barriers.

This small workshop, to be held August 10-11, 2000 at the San Diego Supercomputer Center, has three main goals. First, it will work to identify key barriers and to determine ways to remove these barriers. Second, it will document what advances in research on digital libraries are needed in this context, especially to facilitate US-Korea collaboration related to research and education. Third, it will document consensus on priorities and feasible activities for such research as a guide to the digital library community.

C. Project Description

This proposal requests support for a two-day workshop to define and document 1-3 challenge problems and possible solution approaches involving research on digital libraries (DLs) – with the aim of enhancing US-Korea collaboration on research and education. This planning workshop proposal for DL international activities focuses on three inter-related goals:

1. removing a number of current key barriers to international collaboration on research and education, especially involving US and South Korea, by
2. advancing research on digital libraries that is especially needed in the case of US-Korea collaboration, starting by
3. articulating the priorities and feasible activities for such research as a guide to investigators and as helpful information for such sponsors as NSF, DARPA, and NCA.

C.1 Proposal Topic

There is a great deal of cooperation between the US and South Korea. Both have strong commitments to education, and there are many Korean scholars who have at one time studied in the US, or visited for a long period of time. In both countries there is interest in research on digital libraries.

Fortunately, digital libraries provide a basis for collaboration around shared artifacts, independent of space and time. As is clear from NSF interest in developing the National Science Digital Library (NSDL, where Science represents Science, Mathematics, and Technology Education) [1, 2], digital libraries show promise to support education. They also show promise to support research, as is evident from the worldwide interest in scholarly documents available from digital libraries. For example, South Korea has been ranked consistently as 5th or 6th among nations in terms of accesses to the electronic thesis and dissertation collection at Virginia Tech.

Yet, there are serious barriers that limit collaboration on research and education between the US and South Korea. First, few Americans understand the Korean language. Discussions are difficult. Timely research results from Korea, that frequently appear first in reports, theses, and dissertations, often are written in the Korean language and are not "discovered" by most Americans carrying out literature reviews. Many Korean scholars lack the time or the proficiency in English to write papers, or even prepare metadata, in English, so that they will be clearly understood. Even multimedia educational resources, that might be more easily shared to support learners in both countries, cannot easily be developed to allow ready "international" use. Second, there is a serious gap in terms of understanding of the history and culture of these two nations. Working together and sharing is particularly difficult when miscommunication is frequent. Third, and very important in the current context, there is little financial support for collaboration.

However, we believe these barriers can be surmounted. We argue that once the situation and opportunities are clearly articulated, it will be obvious that such support would have high impact, both in the field of digital libraries, and more broadly in terms of promoting collaboration on research and education.

The proposed planning workshop for DL international activities will focus on ways to understand and surmount these barriers so that digital library researchers in US and Korea can work together. In particular we hope to identify 1-3 "challenge problems", for example:

- to significantly enhance the NSDL, with important content and usage from both countries, by 2003.

C.2 Discussion

Workshop discussions will identify, discuss, and develop 1-3 such challenge problems of mutual interest from a number of directions. For example, consider the challenge problem identified above. Participants could pinpoint what can be shared between the two nations to promote science-related education and research. They also could suggest how current barriers to that sharing can be removed.

In almost any DL R&D effort, there are three elements. Thus, there is a natural split into three main categories of discussion, that will be reflected directly in the workshop structure:

1. Users
2. Content & Collections
3. Research & Technology

We briefly consider each of these in turn. However, the scope and depth of the discussion at the workshop will be much broader. The initial agenda will reflect the combined understanding of the Organizing Committee, which will lay out the preliminary plan for sessions. However, the attendees also will present their experiences and views, and further sharpen workshop conclusions through vigorous debate and discussion.

C.2.1 Users

Digital libraries are designed for, and serve, users. We should understand this in the broadest sense, namely, that groups of users with common aims, and who often collaborate in a variety of activities, are the real target for DL design. Saying this in another fashion: digital libraries are defined in part by the societies they serve.

Our challenge, therefore is to understand both the to-be-served Korean and US societies, see what their similarities and differences are, and either build on commonalities, or personalize to support different needs. Rather than face the broad problem of dealing with the full population of both nations, we will focus on one or a few areas where common goals and experiences make the job easier. For example, we may emphasize undergraduate and/or graduate students, as well as researchers (so those who carry out the research will actually use their own tools and systems).

The content we select for joint projects may in its own right help us understand our users, such as if some content is about Korean history and culture.

C.2.2 Content & Collections

Thus, there are ready-made starting points for collaboration on content and collections, as well as a number of other important avenues that will need to be explored. First, there are works related to the Korean Cultural Heritage. These will help increase understanding between the countries, as well as pose serious problems related to capture, character coding, language processing, and preservation. Second, there is the NCSTRL (see www.ncstrl.org [3-5]) collection of CS technical reports. Some of these are of direct concern to workshop attendees, and so represent one type of content that could be more widely shared. Third, there is the growing collection of electronic theses and dissertations (ETDs, as collected through the Networked Digital Library of Theses and Dissertations, NDLTD, see www.ndltd.org [6-10]) that are being produced around the world by graduate students. Since they are book-length objects, often with multimedia components, that are accompanied by metadata (in XML, according to a newly developed DTD that resulted from international discussion connected with Dublin Core [11] and other meetings), they allow study of the issues related to books, without requiring complicated and expensive arrangements with publishers. While ETDs covering the science-related areas are a natural focus, works in other areas also bear promise to support collaboration. Fourth, there is the emerging genre of courseware, teachware, and other educational resources, like that being handled through the new

ACM Journal of Educational Resources in Computing (JERIC, see http://purl.org/net/JERIC/)), and the Computer Science Teaching Center (CSTC, see www.cstc.org [12]). These works include applets, animations, videos, and a variety of dynamic documents. They have rich metadata, which may be easier to work with in terms of multilingual access due to the context available. All of these types of collections of content provide the context for interesting and important cooperative research.

C.2.3 Research & Technology

Cooperative DL work between researchers in the US and South Korea considered in the proposed workshop should be carried out in testbed environments that are characterized by the users, content, and collections discussed above. There are many possible topics that may emerge as suitable for effectively collaborating US-Korea teams. While the workshop will aim to identify the best candidates, the three comments below may help lead toward those topics.

First, since digital libraries typically deal with metadata and full-text, there are all the challenging problems that relate to handling both Korean and English. At present, there are no bilateral DL efforts involving the US that consider the range of problems faced by dealing with these two languages. Character sets, coding, machine translation (MT), and cross language information retrieval (CLIR) are all of interest. In addition, there are opportunities to explore:

- having metadata in both languages while the full-text is in one language;
- improving CLIR for ETDs by using the extensive bibliographies;
- finding documents in another language, using image/video content in concert with text;
- seeing if MT is sufficiently effective to work in each of a number of DL tasks and activities, applied to basic metadata, abstracts, and/or full-text;
- using markup and other semi-structured content to enhance MT and CLIR;
- applying the large volumes of text available in ETDs, including technical terminology that may be easy to manage across languages, to expand lexicons so as to further improve MT; and
- making use of the context of education, along with the particular structure involved in educational resources, to help with cross-language manipulations.

Second, there is the problem of handling the distributed collections that are inevitable when working with diverse groups in two countries. There are opportunities to explore:

- applying the work of the Open Archives (see www.openarchives.org [13, 14]) initiative, and its support of harvesting;
- adapting work on federated searching, such as has occurred with NCSTRL and NDLTD,
- integrating harvesting and federated searching, along with mirroring, to optimize response time, completeness of coverage, currency of information, and quality of content;
- adapting such methods to a situation in which content covers two very different languages; and
- employing special characteristics of each nation and each nation's collections to improve performance when searching large numbers of distributed archives.

Third, with regard to users, there are many issues to consider, such as:

- collaboration among groups using 2 languages around digital objects in both languages;
- user interface design and usability testing with 2 languages and cultures;
- tailoring to learners and to teachers, working with educational resources in DLs; and
- cooperation enhancement through exposure to digital library content regarding Korean Cultural Heritage.

We hope to consider these three types of research, and others that emerge as the workshop planning proceeds.

C.3 Participants

There are many interested in this workshop topic. However, to be effective, we will need a small group that is focused on our objectives and represents both countries. We expect roughly 10 from each country, plus government representatives. We require researchers interested in international collaboration as well as possible sponsors. Below is a preliminary list of relatively senior individuals reflecting these requirements. Lines ending with a "+" indicate willingness to attend, pending support for travel and expenses. Others listed characterize the pool from which the Organizing Committee will draw upon to fill available slots.

From US:

(Organizing Committee)

- Edward A. Fox (Virginia Tech, fox@vt.edu) +
- Ronald L. Larsen (University of Maryland, rlarsen@deans.umd.edu) +
- Reagan Moore (San Diego Supercomputer Center, moore@sdsc.edu) +

(Possible Other Attendees, Alphabetical by Name)

- Daniel Atkins, Elliott Soloway (University of Michigan)
- Jaime Carbonell, R. Frederking, Yang, M. Shamos, R. Brown, E. Nyberg (Carnegie Mellon University)
- Shih-Fu Chang (Columbia University)
- Gregory Crane (Tufts University) +
- Raya Fidel (University of Washington)
- Hector Garcia-Molina (Stanford University)
- Michael Gertz (University of California, Davis)
- C. Lee Giles (NEC Research Institute)
- Paul Gorman, David Maier, Lois Delcambre (Oregon Graduate Institute)
- Stephen Helmreich (New Mexico State University, shelmrei@crl.nmsu.edu) +
- Ed Hovy and NLP Group (University of Southern California, ISI)
- Doug Oard alternate (University of Maryland)
- Yannis Papakonstantinou, Leigh Starr (University of California, San Diego)
- Howard D. Wactlar (Carnegie Mellon University)
- Cliff Weinstein, Young-Suk Lee (MIT, Lincoln Lab)
- Daniel S. Weld (University of Washington)
- Jennifer Widom (Stanford University)

(Government Agency Representatives)

- Stephen M. Griffin (NSF, sgriffin@nsf.gov)
- Lee Zia (NSF, lzia@nsf.gov) +
- Gary Strong, DARPA

From South Korea:

(Organizing Committee)

- Sung Hyon Myaeng (Chungnam National University, shmyaeng@cs.chungnam.ac.kr) +
- Sung Hyuk Kim(Sookmyung W. University, ksh@sookmyung.ac.kr)

(Possible Other Attendees)

- Soon J. Hyun (Information and Communication University, shyun@icu.ac.kr)
- Hae-Chang Rim (Korea University, rim@nlp.korea.ac.kr)
- Doo-Kwon Baik (Korea University, baik@swsys2.korea.ac.kr)

- Jonghoon Chun (Myongji University, jchun@wh.myongji.ac.kr)
- Sang Ho Lee (Soongsil University, shlee@computing.soongsil.ac.kr)
- Sang Goo Lee (Seoul National University, sglee@mars.snu.ac.kr)
- Jong Pil Yoon (Sookmyung W. University, jyoon@sookmyung.ac.kr)
- Sam Kyung Oh (Sungkyunkwan University)

(Government Agency Representatives (up to 10 as observers))

- Kwang Soo Chang (Ministry of Information and Communication)
- Yong Chae Kim (Ministry of Information and Communication)

C.4 Workshop Structure

By early July, all attendees will be invited and requested to prepare 1-2 page position statements. These will be edited into a preliminary draft of the proceedings, which will be distributed electronically to participants about a week before the meeting at SDSC. Attendees will be expected to have studied the document, so the meeting can proceed efficiently.

Due to travel constraints, the formal program will run two days. It is expected that participants will arrive on or before Wednesday, August 9. The meeting will take place on August 10 and 11. Some participants are likely to stay through August 12, allowing informal discussions to round out the deliberations. Further details regarding the workshop are given in the subsections following.

C.4.1 Draft Schedule

Following is a preliminary time schedule, subject to revision as the Organizing Committee continues its deliberations. Note that with 20 attendees, and a maximum reasonable allocation of about 5 hours of presentations on Day 1, we will opt for pairs of presenters (e.g., one from Korea and one from US) to work together on a 30-minute block (e.g., two 10 minute coordinated talks plus 10 minutes of related discussion). It is important that Day 2 focus on discussion, using breakout groups (e.g., discussing the issues laid out in C.2 above) and plenary review, so that consensus will result and reports can be prepared.

Day	Session	Time	Description
Aug. 10	1	8:30	Introduction, welcome, and charge to participants
	2	9	Presentations – Part 1
		10:30	Break
	3	11	Presentations – Part 2
		12:30	Lunch
	4	2	Presentations – Part 3
		3:30	Break
	5	4	Presentations – Part 4
	6	5	Recap of Day 1, Charge for Day 2
		7	Reception/Dinner
		Night	Informal Discussions
Aug. 11	7	8:30	Breakout Discussions 1
		10	Break
	8	10:30	Breakout Discussions 2
		12	Drafting Reports from Breakout Discussions, Lunch
	9	2	Reports from Breakout Sessions, Discussion
		3:30	Break
	10	4	Plenary Review of Directions and Recommendations
	11	5	Closing Remarks & Adjournment

C.4.2 Sessions

This meeting has ambitious goals and so must be well managed. Since there are frequent and ample breaks, it will be feasible to have strict adherence to the schedule. Time limits will be enforced. Presentations must be supported by an electronic representation, e.g., HTML pages or Powerpoint files, preferably submitted in advance. These will be collected and distributed both electronically and on paper at the end of Day 1.

It is likely that the presentations on Day 1 will be organized according to the headings and examples of sections C.2.1 through C.2.3, in roughly that order. Most of the presentations will be on research, but it will help to have that situated by having all attendees gain some common understanding about users, content, and collections. Members of the Organizing Committee will each chair a session on Day 1, and each breakout group on Day 2 will have at least one Organizing Committee member as participant. However, the breakout groups will have others serving as Chair and Reporter.

C.5 Results

We will sketch a general plan for DL international collaboration involving teams of researchers in US and Korea. As is explained in more detail below, we will produce two types of results:

- written documentation: a summary of the issues discussed in the workshop including the challenge problems identified; and
- a set of draft proposals for concrete pilot projects aimed to solve the challenge problems.

C.5.1 Dissemination of Workshop Results

Before the workshop begins, we will create a Web site with an overview and outline of the workshop, including a mechanism to allow commentary on the documents there. This site will be open to the public, allowing participation even by those unable to attend in person. Our initial plan calls for brief position papers, but other materials will be added as they become available.

During the workshop, a designated reporter will be assigned to each session. The reporter will be responsible for taking detailed minutes. These will be used for a variety of purposes. First, there will be a brief verbal report at the end of the workshop (one or two slides) on each breakout, as well as some slides summarizing the presentations themselves. This will occur during the workshop itself. Just after the workshop, there will be a report prepared that summarizes in more detail the workshop itself, including abstracts of all papers and discussions.

After the workshop, we will upload summaries to the Web site, and will write an article for D-Lib Magazine, covering the workshop and its conclusions. In addition, the organizers will contribute to the *CACM* April 2001 special issue on digital libraries, edited by Fox and Marchionini.

C.5.2 Pilot Project Designs for Challenge Problems

Pilot project designs will serve as the basis for joint research, and can provide common focus for collaborative prototyping. Projects should address the challenge problems and the issues mentioned in C.2.1-C.2.3, as well as others that arise during the workshop.

Detailed properties of projects are that they be technically practical and of clear benefit. Collaborative projects are essential, especially those with strong evaluation components and that facilitate international interoperation. We will emphasize those involving open standards.

C.6 Location, Organizing Committee, Budget

This workshop will be hosted by the San Diego Supercomputer Center. Reagan Moore is handling local arrangements.

C.6.1 Organizing Committee

The Organizing Committee is made up of two individuals from each country. The co-chairs from the US side are Fox and Larsen, who are co-PIs of this proposal.

Edward A. Fox is Professor, Department of Computer Science, Virginia Tech and Director of the Digital Library Research Laboratory (see www.dlib.vt.edu). He has been involved in workshops related to digital libraries since 1991. He has attended conferences and workshops related to digital libraries in many parts of the US, as well as visiting in this regard: Austria, Canada, Costa Rica, Croatia, England, Finland, Germany, Hong Kong, Japan, Mexico, Portugal, Russia, Singapore, Spain, Switzerland, and Taiwan (with other visits scheduled to Argentina, South Korea, and South Africa). His research has covered many areas related to the workshop themes, including information retrieval, computational linguistics, distributed information systems, educational technologies, multimedia education, and aspects of human-computer interaction. He directs the Networked Digital Library of Theses and Dissertations (NDLTD, www.ndltd.org), is founding co-editor-in-chief of the ACM Journal of Educational Resources in Computing, and hosts the Computer Science Teaching Center, which he hopes will have many contributions from Korea. He recently has hosted one visiting professor from South Korea for a year long stay, and will soon have another visiting for a similar period – also to collaborate about digital libraries.

Ronald L. Larsen is Executive Director of the Maryland Applied Information Technology Initiative (MAITI), a consortium of 8 universities in Maryland committed to doubling their graduates in Information Technology core disciplines (e.g., CS, CE, EE) by 2004. He has been an affiliate associate professor in the UMCP Computer Science department since 1985 and active in digital library research and development for nearly ten years. From 1996-1999, he was Assistant Director of the Information Technology Office (ITO) at DARPA, where he was responsible for the office's work in information management, digital libraries and machine translation, and coordinated the office's work in software engineering, human computer interaction, speech recognition, information visualization, and distributed collaboration. Prior to that, he was Associate Director of the University of Maryland Libraries, where he managed the development of the University's State-wide library automation and information system, and was a principal in the development and design of Sailor, Maryland's public information network.

Reagan W. Moore is Associate Director for Data Intensive Computing at the San Diego Supercomputer Center and an Adjunct Professor in the UCSD CSE department. He coordinates research efforts in development of massive data analysis systems, scientific data publication systems, and persistent archives [15]. An ongoing research interest is support for information based data-intensive computing [16]. Moore is an active participant in NSF workshops on digital libraries and Knowledge Networks. Recent publications include a chapter on data-intensive computing in the book "The Grid: Blueprint for a New Computing Infrastructure" [17]. One effort deals with The SDSC Storage Resource Broker [18]. Moore has been at SDSC since its inception, initially being responsible for operating system development. Prior to that he worked as a computational plasma physicist at General Atomics on equilibrium and stability of toroidal fusion devices. He has a Ph.D. in plasma physics from the University of California, San Diego, (1978) and a B.S. in physics from the California Institute of Technology (1967).

Sung Hyon Myaeng is currently a professor at Chungnam National University, Korea. Prior to returning to Korea in 1994, he taught in the School of Information Studies, Syracuse University, for six years, where his tenure was granted. He was a co-PI for the DR-LINK work in the TIPSTER program project sponsored by DARPA. His research has centered around information

retrieval since his graduate studies. He has served on program committees for ACM SIGIR for many years as well as other conferences on information retrieval, natural language processing, and digital libraries. He is on editorial boards for several journals including Information Processing and Management. While active in research in the area of information retrieval including CLIR, categorization, and distributed IR, he has led several digital library projects in Korea, from a large-scale design at the national level to an implementation project. The MIRAGE system developed by his digital library research group in 1995 is considered the first digital library prototype developed in Korea, which has been partly commercialized. This prototype has evolved into an architecture that extends the traditional notion of digital libraries into a "dynamic knowledge space" where users can compose, efficiently store, and retrieve new multimedia digital objects from existing distributed resources. The major application of this digital library architecture is likely to be in education and knowledge management in corporate settings.

Professor Sung-Hyuk Kim has been involved in digital library research and activities since 1993. He has attended NSF DLI PI meetings and conferences related to digital libraries around the world, mainly in the US, as well as teaching digital libraries at the Sookmyung Women's University. He also has been involved in the organizing committee of many domestic and international digital libraries conference such as the Asian Digital Libraries Conference 2000 to be held in December, and The International Conference on Digital Libraries and Information Services for the 21st Century that was the first digital libraries conference held in Korea. His research has covered text encoding, XML and SGML, computational linguistics, CLIR, and application of digital libraries technology such as to electronic commerce. Kim has initiated this workshop since 1998 to share digital libraries technologies and experience with the US, and is co-chair from the Korean side with Myaeng.

C.6.2 Budget

This workshop will have at least 10 people invited from the US. The bulk of the funds will cover participant costs of travel, lodging, and accommodation. Additional charges such as for AV and room rental at the conference site will be handled as contractual services. Small amounts are requested for travel (e.g., for other meetings of the Organizing Committee) and materials and supplies. Wages for secretarial/clerical support, that we request to have funded as an approved line item in the budget, will support: conference planning, registration, arranging travel, handling reimbursements, as well as preparing reports, handouts and working documents before/during/after the meeting.

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