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## **Russian Digital Libraries Journal**

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Russian Digital Libraries Journal (RDLJ) is the first Russian electronic journal to present up-to-date reflection of research on and use of digital libraries - distributed information systems for creation, storage, analysis, distribution, search and retrieval in various collections of digital documents (text, image, audio, video etc.) via the global networks.

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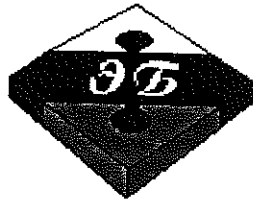
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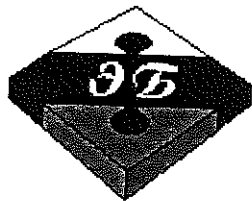
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## The ERCIM Digital Library Initiative

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### Abstract

The ERCIM Digital Library Initiative began in 1996 with the setting up of the DELOS Digital Library Working Group. The aim was to promote European research into the further development of digital library technologies, to stimulate the efficient and cost-effective implementation of digital library systems, to encourage collaboration between research teams working in the field, and to promote the transfer of knowhow and technology to the relevant application areas. We illustrate the main activities of the ERCIM DLI over the last three years, and discuss the intention to establish a forum for Digital Library activities in the future through the creation of a Network of Excellence. The areas in which this Network should be active are described.

### 1. Introduction

Digital libraries represent a new infrastructure and environment that has been created by the integration and use of computing, communications, and digital content on a global scale [1]. However, to explore the full benefits of the digital library (DL), the problem for research and development is not merely how to connect everyone and everything together in the network but rather to achieve an economically feasible capability to digitize massive corpora of information from heterogeneous and distributed sources; then to store, search, process and retrieve relevant information from them in a user friendly way. Several driving technologies are now rendering the creation of such digital libraries practicable, i.e. multimedia information storage, retrieval, filtering, networked database systems, distributed computing, hypermedia, etc. The digital library domain is thus an essentially multidisciplinary area covering a range of research topics including interoperability, metadata, information access, multilinguality, intellectual property rights, economic charging mechanisms, preservation and security issues.

The importance of digital libraries was recognised in the United States when, in late 1993, the National Science Foundation (NSF)/Defense Advanced Research Projects Agency (DARPA)/National Aeronautics and Space Administration (NASA) Research in Digital Libraries Initiative announced their decision to fund six big DL projects to lead the

development of technology in this area. Each project focused on a different type of collection and on different research issues [2]. At a meeting in spring 1995, the G7 leaders emphasized the need for activities focused on digital library initiatives in order to facilitate the world-wide access to information and knowledge.

For these reasons, the European Research Consortium for Informatics and Mathematics (ERCIM) identified the digital library sector as being an area of particular interest to its member institutions and decided to sponsor its own Digital Library Initiative. The aim was to promote European research into the further development of digital library technologies, in particular to stimulate research activities in areas which are relevant for the efficient and cost-effective development of digital library systems, to encourage collaboration between research teams working in the field of digital libraries, and to establish links with on-going DL projects and activities in industry and other public and private institutions.

In order to support these activities, in spring 1996, the DELOS Working Group was launched. DELOS has been a 3 year activity funded by ESPRIT Long Term Research (LTR No. 21057) within the Fourth Framework Programme of the Commission of the European Union. In this paper, we describe the main activities and achievements of the ERCIM DLI within the framework of the DELOS WG, and our intentions to continue this initiative in the future through the creation of a Network of Excellence for the digital library domain.

## **2. Main Activities of DELOS**

During its three year lifetime, DELOS has undertaken an intense programme aimed at stimulating R&D in the DL area. The main efforts have concentrated on the organization of a series of thematic workshops, the formulation of a collaboration with the US National Research Foundation (NSF), the sponsoring of European Conferences for Research and Advanced Technologies in Digital Libraries, and the creation of an ERCIM technical reference digital library service and development of a test-bed collection for the experimentation of new DL technologies by ERCIM scientists. A publicly accessible Web site has also been maintained providing information not only on the DELOS activities but also on DL initiatives and projects throughout the world (<http://iei.pi.cnr.it/DELOS/>).

### **2.1 Thematic Workshop Series**

Since March 1996, the DELOS Working Group has held nine workshops on research issues recognized as being of paramount importance to the DL community. Close ties with scientists of recognized value and with representatives of industry and user communities (from both European and non-European countries) have been established and their contribution has helped to make the workshops a success and has provided a springboard for the exchange of ideas. The following topics have been addressed: metadata and interoperability, multilingual information retrieval, image indexing and

retrieval, collaborative filtering, preservation of digital information, electronic commerce, user interfaces, digital libraries and distance learning. A particularly important feature of the workshops has been the relaxed atmosphere and ample time allowed for discussion; this has helped to encourage a free and lively exchange of ideas and expertise between the participants.

The tenth workshop will be held in Santorini, Greece and will focus on Audio-Visual Digital Libraries. This topic has been chosen as the DL of the future will increasingly be multimedial and multilingual. The collaborative interaction of image, sound, speech and natural language understanding technology is needed in order to successfully populate, segment, index, and search digital audio-visual collections (such as film, music, or photo archives) with satisfactory recall and precision. Invited speakers and ERCIM scientists will provide a panorama of activities in the area. Talks will cover issues such as storage standards for audio and video data, multilingual access, video abstracting, copyright and security issues, and will also include presentations of existing audio-visual DL systems and contributions from content providers (e.g. film and TV archives) describing their requirements from the new technologies.

The Proceedings of the Workshop are published in the DELOS Workshop series [3-10]; they are also available on the Web at both the ERCIM ([http://www.ercim.org/publication/workshop\\_reports.html](http://www.ercim.org/publication/workshop_reports.html)) and DELOS Web sites (<http://www.iei.pi.cnr.it/DELOS/WORKSHOP/workshop.htm>).

## 2.2 NSF-EU Collaborative Working Groups

A digital library is the integration of multiple components which do not initially fit together in a seamless fashion for a number of reasons. Firstly, the necessary components come from a background of different communities and, secondly, they should enable new functions which were not considered when the individual single components were first designed and implemented. This means that the realisation of large-scale globally distributed digital libraries depends as much on collaborative effort as it does on the development of new technologies in order to develop systems which truly integrate their components. A high level of collaboration is required both across disciplines and across geographical boundaries.

For this reason, DELOS, in collaboration with the US National Research Foundation, decided to set up a group of EU-US working groups with the mandate to jointly explore technical, social and economic issues and plan common research agendas with respect to a set of key DL research areas in which international cooperation was considered to be of particular importance. The Working Groups addressed the following DL-related research areas:

- interoperability between digital library systems
- metadata

- intellectual property rights and economic issues
- resource indexing and discovery in a globally distributed digital library
- multilingual information access.

The groups studied the state-of-the-art and current trends in their area and produced a set of recommendations and priorities for future R&D activities. Each group met twice over a two-year period. These meetings served as a basis for the researchers to define critical research questions through which it is hoped that joint research proposals will emerge within the framework of the expected agreement for collaboration on DL issues to be signed by the EC and the NSF.

The first results of these studies [1] were presented at a Workshop, held in Brussels on 12 October, 1998, to an invited audience composed mainly of European research coordinators, funding officials and heads of national research programmes, plus some representatives from leading industries interested in aspects of Digital Library research and applications. The final reports of the Working Groups have now been released and are posted on the DELOS Web site (<http://www.iei.pi.cnr.it/DELOS/NSF/nsf.htm>). A volume containing these reports, together with an introduction by the coordinators, will be published shortly by Springer in their Lecture Notes for Computer Science series.

### **2.3 European Conferences on Digital Libraries (ECDL)**

These conferences provide an important opportunity for European scientists interested in and/or now working on DL-related research issues to come together, compare and discuss their activities and results with colleagues from outside Europe. Major aims of the conference are to stimulate young scientists to explore new areas of interest in digital library development (through fellowships offered to young researchers) and to establish a forum for discussion of issues particularly relevant for Europe. In addition to the presentation of research papers, the conferences include invited talks, tutorials, demos and poster sessions.

So far two very successful conferences have been organised. The first was held in Pisa, Italy on 1-3 September 1997. The conference was attended by over 100 delegates. At the second conference held in Heraklion, Crete, Greece, 21-23 September 1998, the number of delegates more than tripled. The Proceedings of these Conferences were published by Springer [11,12].

This year, the ECDL conference will take place in Paris on 22-24 September 1999. An interesting trend is that, while at the first conference papers submitted mainly focused on research topics of relevance to DL applications, many of the papers submitted for the Paris conference discuss actual on-going DL experiences. This shows how real-world activities in this area have increased over this short time span.



## 2.4 ERCIM Technical Reference Digital Library (ETRDL)

Towards the end of 1997, the decision was taken by the ERCIM DLI to create a digital collection of the technical documentation produced by ERCIM scientists and to provide on-line distributed public access to this collection. This service will offer a similar service to that provided in the United States by NCSTRL, the Networked Computer Science Technical Reference Library [13,14]. The aim is to assist the ERCIM scientists to make their research results immediately available world-wide and provide them with appropriate on-line facilities to access the technical documentation of others working in the same field. The intention is also to make the ERCIM digital collections available as testbeds for the validation of research in the DL domain.

The service runs on an infrastructure based on the DIENST system [15,16] developed by NCSTRL Consortium, which has been extended by the addition of new functionalities to meet the needs of the European IT scientific community. These include the adoption of a common metadata description standard, the introduction of common classification schemes and methods to manage them, and the implementation of interfaces for languages other than English. An author interface has been included to facilitate the insertion of new documents by the users themselves.

ETRDL is a distributed collection, consisting of the set of the local collections. These are maintained on the local servers of each partner institution. This has led to the implementation of two levels of Home Pages. A centralised access point has been provided to the system through the DELOS Web site, whereas a local home page is installed on each local server. The user who accesses the system through the centralised Home page is directed to select one of the local servers in order to search the ERCIM DL collection. Depending on the local server selected, he/she is also given a choice of language as most local servers will maintain interfaces in English and in the local language.

The Local Home Page interface caters simultaneously for two user classes - information seekers and information providers - by offering two main options: search/browse any collection; submit/withdraw a document to/from a local collection. From the local home pages, the search and browse functions can be activated over the entire NCSTRL collection, over the ERCIM collection, or over the collection(s) of the local institution. In each case, the user is not only accessing a different collection (or sub-collection), but is provided with a different perspective on the information, depending on the functions that have been implemented at that particular level. When searching on the ERCIM or the local collections, the user can switch between user interfaces in English or his/her own language. On-line helps in both languages are available.

Adapting an existing system to meet new requirements is rarely easy. We had to address a number of problems when implementing the ETRDL. These included the implementation of a powerful search mechanism which allows the user to perform a simple or a fielded

search throughout the entire library or on selected collections. Queries can include terms from controlled vocabularies (ACM and MSC classification schemes) and free keywords. Constraints can be imposed on the type, date or language of the documents to be searched.

ETRDL is now active. The next step will be to build up the local collections. All new technical documentation produced by the eight ERCIM institutions mentioned above (but hopefully others will join the activity soon) should be inserted in the library. In the mean-time, we are working on the development of the next version of the system (which will include modules to handle multilingual issues such as mechanisms for the correct search and visualization of all character sets, the maintenance of separate and linked indexes to permit the definition of the search language, semi-automatic procedures to assist authors in document classification, etc.).

For more information on the ETRDL project and documentation on the system, see <http://www.iei.pi.cnr.it/DELOS/EDL/edl.htm> and also [17, 18].

### 3. Results

The ERCIM DLI within the framework of the DELOS DL Working Group has played an important role over the last three years in promoting the creation of a European Digital Library research community. It has provided a forum where a number of communities, i.e., libraries, cultural heritage, electronic publishing, electronic commerce, information infrastructure, software industry, etc. have had the possibility of collaborating intensively with the DL research world, exchanging new ideas, experiences, and research results. It has succeeded in establishing strong collaborative links with the US DL research community, through the National Scientific Foundation (NSF), as well as with other research teams from countries outside the European Union (Russia, Czech Republic, Japan). It has also succeeded in arousing awareness within the European funding agencies of the priority DL research issues and has encouraged the creation and funding of DL projects.

### 4. Future Directions

As reported, the efforts of the ERCIM DLI have helped to change the DL scenario in Europe over the last few years. The research community has grown in an impressive way and in many areas (electronic publishing, libraries, health care, cultural heritage, entertainment, protection of the environment, education, etc.) there is an increasing awareness that the building of very large heterogeneous digital information repositories, interconnected and accessible through global information infrastructures, requires R&D in the digital library domain. We have, thus, an application and industrial context that favours scientific and technological developments in this area. We feel that it is very important to maintain this momentum. It is thus our intention to continue and extend the activities conducted by DELOS through the creation of a Network of Excellence for Digital Libraries.

This Network should play a key role in the evolving DL scenario. It can promote an international agenda for future research activities in the DL domain which takes into account the most recent developments in the field. It can constitute a point of reference for all the DL projects funded by the 5th Framework programme of the European Commission by facilitating the exchange of experiences, the testing of technologies, and the evaluation of models, techniques and approaches. It will involve the application community in the technological advances, and study and test appropriate models to facilitate industrial exploitation. It will also create a dense network of relations with other international DL communities.

In order to achieve these objectives, the Network intends to:

- *Create a Digital Library Research Forum*, to stimulate and coordinate actions aiming at the advancement of research in the digital library domain as well as the improvement of scientific collaboration between European research teams working in this area; to create a forum where a number of communities, i.e., electronic publishing, cultural heritage, libraries, electronic commerce, national archives, health care, entertainment, etc, have the opportunity of collaborating intensively with the DL research world, by exchanging new ideas, experiences, and research results. The mechanisms which will be used to achieve these objectives are a thematic workshop series, European conferences, and an international research exchange programme.
- *Stimulate the Development of Large-Scale Testbeds*, as experience has shown that progress on new digital library technologies depends on the availability of such testbeds. Currently, several excellent collections (of images, video segments, maps, journal articles, scientific technical reports, etc.) are under creation in conjunction with CEU/national funded research projects. The Network of Excellence will undertake the task of making some of these collections available over the Internet for research purposes. The aim is to accelerate and enhance research in digital libraries and related areas.
- *Organize Specific Advanced Education and Technology Transfer Actions*. The deployment of digital library technologies is becoming essential for the successful realization of large-scale globally distributed repositories in many different application domains. The Network will, therefore, undertake continued education actions (summer schools, curriculum revision, etc.) in DL technologies. Equally important is the promotion of specific technology transfer actions in selected application domains.
- *Create a Standardization Forum*. A number of emerging Web standards will provide much of the basic architecture for digital libraries (RDF, Dublin Core, INDECS, DIENST protocols, UNICODE, XML, Z39.50, etc.). Many of the emerging standards have just begun to move from research to deployment. Implementors will need to follow the progress of research, while researchers will need to monitor the experience of early adopters. The refinement of a stable architecture for digital libraries will

require several iterations as these standards are adapted for various applications. The Network of Excellence will promote the constitution of working groups on broad topics of digital library technology. Such WGs will have the responsibility of (i) examining a specific cluster of relevant standards; (ii) effecting the transfer of research results into implementation while providing researchers with feedback on practical problems of deployment; and (iii) disseminating the results of Working Group activities in the form of workshop proceedings and reports, Web-based observatories, etc.

- *Create a Multilingual and Cross-Language System Evaluation Forum.* Until very recently, the international information networks were dominated by the English language. The situation is now in rapid evolution and the volumes of information available over the global networks in languages other than English is increasing much faster than for English. The user community of such knowledge sources is thus creating enormous pressure for the development of systems that provide access to information without language or cultural barriers. For these reasons, Multilingual Information Access (MLIA) is a key topic for the Digital Library domain. However, the implementation of multilingual interfaces and Cross-Language Information Retrieval (CLIR) systems implies the need for suitable methodologies and tools for the evaluation of multilingual system performance. In collaboration with NIST (US National Institute for Standards), the Network of Excellence will establish a forum for the study and discussion of multiple language information access technologies and for cross-language system evaluation.
- *Coordinate International Cooperation and Collaboration in the DL Domain.* DLs are inherently distributed, which is part of their appeal, and it is crucial to share aspects such as standards to ensure that the functions a digital library provides are useful in a global, multi-lingual, and multi-cultural environment. The Network of Excellence will seek to establish collaborative actions with other research communities. In particular, the profitable cooperation with the US established by the DELOS WG will be extended under the NSF International DL programme and the expected cooperation agreement on DLs between the NSF and the IST programme of the European Commission; a cooperation agreement with the Digital Library Programme of the Russian Foundation for Basic Research will be established. Cooperations with the Eastern European countries, South America and Japan will be stipulated in the context of specific agreements for cooperation between the EU and these countries.

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