EULER - a DC-based integrated access to library catalogues and other mathematics information in the web

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Abstract. Literature databases, scientific journals and com munication between researchers on the electronic level are rapidly developing tools in mathematics having high impact on the daily work of mathematicians. They improve the availability of information on all important achievements in mathematics, speed up the publication and communication procedures and lead to enhanced facilities for the preparation and presentation of research in mathematics. The aim of this article is to give a more detailed report on one of these projects, the so-called EULER -project, d eveloping a search engine for distributed mathematical sources in the web. Main features of the EULER deliveries are uniform access of different sources, high precision of information, de - duplication facilities, user -friendliness and an open approach enabling participation of additional resources. The partner of the projects represent different types of libraries and moreover different types of information in the web. The functionalities of the EULER -engine will be described and a report will be given on th e transition from the prototype developed in the project to a consortium based service in the internet.

1. Synopsis

The aim of the EULER -project is to provide strictly user -oriented, integrated network based access to mathematical publications. The EULER -service intends to offer a "one -stop shopping site" for users interested in Mathematics. Therefore, an integration of all types of relevant resources has to be a goal of such a project: bibliographic databases, library online public access catalogues, e lectronic journals from academic publishers, online archives of preprints and grey literature, indexes of mathematical Internet resources. They have to be made interoperable, using common Dublin Core based Metadata descriptions for example. A common user interface - which will be called the EULER -engine - has to assist the user in searching for relevant topics in different sources in a single effort. As a principle, the EULER system should be and has been designed as an open, scaleable and extensible information system. Library users and librarians from mathematics in research, education, and industry are the main participants of such an enterprise.

EULER is an initiative of the European Mathematical Society, and especially focuses on real user needs. Standard, widely used and non -proprietary technologies

such as HTTP, SR/Z39.50, and Dublin Core are used. Common resource descriptions of document -like objects enable interoperability of heterogeneous resources. The EULER-project develops a prototype of new el ectronic information services. Hence most relevant information of one subject area (mathematics) is integrated in this project (one -stop-shopping). The EULER -results have been designed in such a way that they are easily portable to other subject domains.

Users are enabled to make effective use of the mathematical library -related information resources offered with a single user interface. Time -consuming tasks associated with the use of non -integrated services have been eliminated. The user has been enabled to search for and localise relevant documents. In many cases he can retrieve the full text of an article electronically.

The Project is funded by the EU within the programme Telematics for Libraries.

2. Objectives and Structure of the EULER-project.

As mentioned above the aim of the project is to provide strictly user -oriented, integrated network based access to mathematical publications, offering a "one -stop shopping site" for users interested in Mathematics. Therefore, an integration of all types o f resources mentioned above is necessary. Since EULER combines descriptions of resources (bibliographical databases) with the complete text of documents, free resources with commercial ones and databases with very different structures, retrieval systems and user interfaces, this integration had to built upon common resource descriptions. This glue or intermediate level is accomplished by using descriptions of all resources following the Dublin
Core (DC) metadata standard, recently developed and published as an Internet draft.

Technically, the integration of the different resources has been accomplished by producing DC metadata for all resources (by means of conversion, automatic generation or metadata creator software), and collecting it into front -end databases for every individual EULER -service. A retrieval and search software, the EULER -engine, uses these metadata databases as sources for a distributed search service. The integration approach is based on the Z39.50 standard or on HTML -form based data interchange.

At distributed servers, multilingual EULER -service interfaces are provided as entry points to the EULER -engine, offering browsing, searching, some document delivery and user support (help texts, tutorial etc.). The interface is based on common user friendly and widely used web browsers (public domain or commercial) such as for example Netscape. The (multi -lingual) user interface has the common features of every good Internet service and a self -explaining structure. The user has one single entry point to start of his information search. The searching contains

– a subject oriented browsing

– a search for authors, titles and other relevant bibliographic information
– a subject oriented search in different information resources.

Full access to the implementations of the project results is available at all participating libraries (SUB, UNIFI, NetLab, CWI), and in a regional network of French research libraries (co -ordinated by MathDoc), tailored to specific institutional needs. Restricted demo acc ess is available for the general public. The European Mathematical Society encourages European mathematicians from research, education and industry to use and evaluate the new services. Overall scientific quality of the services are secured by the appropriate Committees of the European Mathematical Society.

Practically the main objectives of the project correspond to a set of work -packages. An initial Requirements Analysis work -package covered user requirements, final discussion and definition; revision o f methodologies, test and evaluate alternative concepts for the EULER system; the integration of new relevant developments in the EULER system; standard developments monitoring, observing the developments of new important relevant standards, participation in relevant standard definition discussions.

The Resource Adaptation work -package builds the basic set of EULER Metadata Databases that are finally accessible from the EULER -engine like scientific bibliographic databases, library OPACs, preprint servers, peer-reviewed electronic journals, mathematical Internet resources. Bibliographic databases and OPACs cover the broader scenario of automatic metadata to metadata conversion. Peer -reviewed electronic journals, preprint servers, and mathematical Internet resources cover the broader scenario of resources harvesting, metadata creation (automatically or manually), and access to networked resources.

The EULER -engine Implementation work -package - carried out in parallel to the Resource Adaptation work -package - has designed and implemented the EULER - engine. The EULER Engine acts as an "intelligent" gateway between users and the metadata databases produced in WP-2 by providing:

- user oriented interfaces and help tools,
- the capability to re-map searches and browsing to the metadata databases,
- the capability to collect answers (i.e. hits) and to present them by ranking, filtering, ordering etc.

This includes both the user interfaces and the interfaces to the partners metadata databases and other selected Internet resources.

During the Evaluation and Demonstration work -package - to be carried out after the release of the EULER Engine (beta version) in July 2000 - selected groups of users will start system evaluation. The work intends to measure the system suitability and scalability and the satisfaction level of users with the service.

The last work -package is Information Dissemination and Exploitation Preparations. Information dissemination took place and will take place via

professional journal articles, prese ntations at conferences, and similar events. Relevant reports of the project are made publically available on the World Wide Web. The final exploitation plan for EULER services and other project results is under discussion. Commercial exploitation for future operation of EULER services and transfer of EULER results to other subject domains is under consideration.

3. The EULER partners

The currently accessible contents for the EULER -engine are provided by the partners of the project. The group includes l ibraries spread out all over Europe, who represent also different types of libraries.

The State Library of Lower Saxony and University Library of Göttingen (SUB Göttingen) represents a library with national responsibility to collect all publications in the field of pure mathematics. It is one of the five largest libraries in Germany. Göttingen is in charge of more than 20 specialist collections supported by the German Research Association. The CWI library (http://www.cwi.nl/cwi/departments/BIBL.html) is th e typical candidate for a research library of a national research center, - CWI in this case. It has a large and extensive collection of literature in the fields of mathematics and (theoretical) computer science. The University of Florence as a project partner represents the typical university library with its distributed department libraries. The libraries automated management of the University of Florence started in 1986 with the participation to the Sistema Bibliotecario Nazionale (SBN), promoted by the Italian Ministero per i Beni Culturali ed Ambientali. Currently, 50 libraries are, spread over Florence, including those of faculties, departments and institutes.

A partner specialised in digital libraries and net -based information is represented by NetLab. The name stands for the Research and Development Department at Lund University Library, Sweden. It is running or participating in a number of projects in collaborative efforts with other institutions and organisations from the Nordic Countries, Europe and USA. DESIRE (http://www.ub2.lu.se/desire/), the Development of a European Service for Information on Research and Education, is one of the largest projects in the European Union Telematics For Research Sector of the Fourth Framework Program. In addition, MDC as a national center for co - ordination and resource -sharing of mathematics research libraries and mathematics departments is representing libraries and library users in EULER. MDC stands for "Cellule de Coordination Documentaire Nationale pour les Mathématiques" (MDC).

Together with the European Mathematical Society and the Heidelberg Academy of Sciences FIZ Kralsruhe provides the longest -running international abstracting and reviewing service for mathematics, Zentralblatt MATH. Zentralblatt MATH (http://www.emis.de/ZMATH) covers the entire spectrum of mathematics and computer science with special emphasis on areas of applications with about 70.000 items per year. Development efforts have been undertaken in co -operation with MDC

to offer enhanced se arch functions in the MATH database via the World Wide Web. Special links to electronic articles and library based document delivery services are offered with the database searches. The project is an initiative of the European Mathematical Society (EMS), which represents the community of library users interested in mathematics from the whole of Europe. The EMS will bring in its Electronic Library of Mathematics, distributed through EMS's system of Internet servers, EMIS, http://www.emis.de/. This Electronic Library is today the most comprehensive archive of freely available mathematical electronic journals and conference proceedings.

Experiences from prior and on -going work of these institutions, sketched above, form the baseline of the EULER -project. They cover more or less all aspects of knowledge which will guarantee that the project will lead to an excellent product. Some of them already agreed to be part of the consortium which should take care of the permanent EULER-service, once the EULER project will have been terminated.

4. Current Achievements of the EULER-project

The evaluation of the user needs had been finalised in the first period of the project. On this basis the first draft of the EULER -engine, the adaptation of resources and the user interface had been developed. In the middle of 1999 the whole system had been offered for the alpha -test to a broader community of experts and users in order to get comments for improvements and extensions. The response from the community was positive in gener al. A lot of specific proposals have been obtained to improve the usability of the system. The EULER -engine and the metadata -maker are working in a reliable way. The unique identification of sources and the de -duplication check lead to quite homogeneous search results offering comprehensive information within the hit list.

These recommendations and additional results from internal discussions between the EULER-partners were taken into account for the development of the beta -version of the system. In partic ular special efforts will be spend for improving and extending the user interface. Special selection facilities between resources and more options for prescribing general ranges for the search will enable the user to get quicker and more precise results with the EULER -engine. The test of the beta -version will be carried out in the middle of 2000.

The adaptation of resources has been finalised in parallel to the work on the beta -version. As an additional test a restricted set of resources has been invited t o adapt their content to the requirements for being searchable within the EULER -system. They have offered some support from the EULER -group to get the adaptation work done. This lead to an improvement of the preprint information available within the EULER-system. Some other modest extensions of the accessible content are in preparation.

The detailed functionalities provided by the EULER -system through its current user interface can be checked directly under the URL

http://www.emis.de/projects/EULER/

Comments for improvements and additions always are welcome. The project will terminate in September 2000. Then the change from a prototype to a permanent service is projected for the EULER -system. This will be supported by a consortium where some of the current partners may take part, additional partners may enter and the set of resources hopefully will be augmented.