

SYSTEM OF INTELLIGENCE RETRIEVAL FOR CORPORATE ACADEMICAL INFORMATION NETWORK

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Abstract

The article devoted to intellectualization of data retrieval in corporate academic information and library network of Uzbekistan universities and colleges. It includes results of innovation researches to develop information system, digital libraries, intellectual methods and retrieval software.

Keywords: Information Environment, Fuzzy Logic, Library, Information Retrieval, Stochastic Criteria, Determined Criteria, Information System, Corporate Network

1. INTRODUCTION

There are more than 12000 libraries in Uzbekistan and 67 from them are academic libraries. They include around 30% of all information scientific and educational resources of the republic. At present time scientists, researchers, teachers and students are in great need of new sources for their research works, teaching and learning. Tashkent University of Information Technologies has developed corporate information and library network for academic libraries and is distributing the experience for other library unions such as library network of institutions under the Academy of Science, library network of more than 1500 colleges and others. The corporate network is not the only system for information provision of universities and other educational organizations but it is good experimental environment to exam some math models, algorithms, methods and software on information retrieval and databases development.

Obviously, to search any information resources in library network we have to have some system (software) to store and find different literature, multimedia resources and others, to provide information services for users.

2. CORPORATE INFORMATION LIBRARY SYSTEM

The software of the corporate network is based on ARMAT system. ARMAT is information system to develop digital libraries, work in corporate conditions of libraries interaction to information exchange, also to provide users with electronic information resources in local or corporate networks.

The system allows to create the corporate information infrastructure to have access to databases of different sources, also have information exchange between libraries of different departments and agencies such as Ministry of HE, Academy of Science and others (Fig. 1).

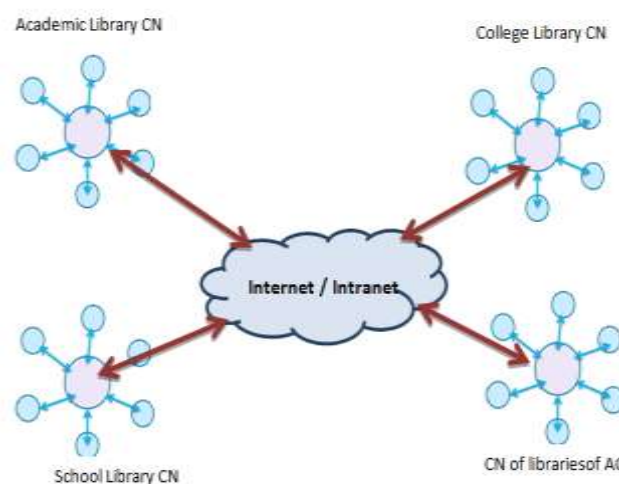


Fig. 1 Corporate information network

The system makes the following functions:

- Allows to create and process electronic catalogues and full text databases of electronic textbooks, books, periodicals, the reference literature, etc.;
- It is focused to work as on one computer, in local computer networks without restriction of users quantity, and in corporate information networks of online access to the information at creation and to work with the union electronic catalogue. Use Cloud Computing in information-library networks can essentially raise efficiency as of user service, and of network administration;
- Language of the user interface is in Uzbek, Russian and also it is quickly localized to any other languages;
- Allows to process and describe any kinds of editions, as traditional (books, textbooks, magazines, articles etc.), and nonconventional (audio- and video data, computer files and programs, maps and notes etc.);
- It is completely compatible with international standard DUBLIN Core for description of the bibliographic data

and supports electronic catalogues on communicative formats such as MARC21, UNIMARC, RUSMARC or UZMARC;

- Allows to enter the data into the electronic catalogue in the simplified form on structure DUBLIN Core and then to convert in structure UNIMARC, MARC21 or UZMARC;
- Support of national fonts is provided;
- There is online access to electronic library resources through the Internet and allows to borrow bibliographic records of other libraries;
- Allows to create a personal electronic places (cabinets) for readers, to keep account their orders (statistics), to serve in online, submit orders as through electronic catalogue of library, as literatures which in it is absent;
- Statistical information to various criterions are created;
- Quickly adaptation to any types of libraries (public, academic, school, etc.).
- Provides protection of information resources in corporate network and the Internet (information security).

3. CONDITIONS TO MAKE DECISIONS IN CORPORATE NETWORKS

In order to make decision in corporate network we have separated three kinds of information environments where information resources are created and information retrieval is conducted: Deterministic information environment, Stochastic information environment, Fuzzy information environment.

There are a lot of library information systems (LIS) which work indeterministic information environment, where the initial information for information retrieval is strictly defined (is determined), all information resources are ordered, catalogued by the established rules. There is strictly deterministic source for each inquiry and reader accurately knows the information source, such as the author, keywords, source name and etc. Also the required information is given precisely.

However, in practice we face with situations when we don't know the author of the source, even its name exactly but we can describe our requests with vague or fuzzy prepositions. Then we need some tools to process our requests to find necessary information. The fuzzy request is request when user can't accurately formulate his inquiry, he doesn't know precisely the author, the source name, but he can formulate subjects, the list of keywords, to exclude some less important themes in request/1/. He can specify most and less significant themes. This is obvious in the case of vague (imprecise) propositions like "this resource is more interesting" (or "includes most information about atomic reactor", "less information about atomic nucleus", etc.). In the analogy to various definitions of operations on fuzzy sets (intersection, union, complement, ...) one may ask how propositions can be combined by *connectives* (conjunction, disjunction, negation, ...) and if the truth degree of a composed proposition is determined by the truth degrees of

its components, i.e. if the connectives have their corresponding *truth functions* (like truth tables of classical logic)/2/.

Table 1: Model of fuzzy relevance

Inquiries			Electroni ccatalog	Resources		
Z_1	Z_2	Z_n		S_1	S_2	S_m
μ_{11}	μ_{12}	μ_{1n}	a_1	μ_{11}	μ_{12}	μ_{1n}
μ_{21}	μ_{22}	μ_{2n}	a_2	μ_{21}	μ_{22}	μ_{2n}
μ_{31}	μ_{32}	μ_{3n}	a_3	μ_{31}	μ_{32}	μ_{3n}
μ_{41}	μ_{42}	μ_{4n}	a_4	μ_{41}	μ_{42}	μ_{4n}
μ_{51}	μ_{52}	μ_{5n}	a_5	μ_{51}	μ_{52}	μ_{5n}
μ_{61}	μ_{62}	μ_{6n}	a_6	μ_{61}	μ_{62}	μ_{6n}
μ_{k1}	μ_{k2}	μ_{kn}	a_k	μ_{k1}	μ_{k2}	μ_{kn}

Where

$Z = \{ z_1, z_2, z_3, \dots, z_m \}$ - inquiries

$A = \{ a_1, a_2, a_3, \dots, a_n \}$ - bibliographic records.

$S = \{ s_1, s_2, s_3, \dots, s_n \}$ - resources (full text).

μ_{ij} - relevance z_i to a_j and a_j to s_i

For deterministic IE

$$\mu_{ij} = 0 \vee 1$$

For stochastic IE

$$\mu_{ij} = M_{ij}$$

the factor characterising probability of conformity (relevance) of request z_i to result r_i . It is defined on the basis of the statistical information.

For fuzzy IE

$$\mu_{ij} = \mu_A \text{ (from 0 to 1)}$$

is membership function. The membership function, which represents a fuzzy set $\tilde{A}$ is usually denoted by μ_A .

Let look at the functional structure of the system ARMAT for corporate information network (Fig.2). The system includes following subsystems: Electronic catalog creation (electronic catalog and digital library creation), Information retrieval (retrieval of information from digital library and other databases), Statistic information collection and creation (about resources using, users statistics and etc.), Fuzzy data processing (fuzzy database creation, collection of experts knowledge, fuzzy make decision and etc.), Corporate interaction (creation of union catalog and database of corporate network members, providing users with union (pooled) resources and etc.).

4. CONCLUSION

The indicators of corporate network efficiency are:

- Supply of free access of users to information resources. Implementation of principle of general information access regardless of its location. Database of Union Electronic Catalogue is opened for all members of

network collaboration and any member has right to use them regardless of its location.

- Through UEC of Information Resourceful Centers of Universities and corporate networks of Information Library Centers one can define which information resources are available in libraries and the their conditions of access.
- Decrease of duplication on work of libraries in electronic cataloguing. Electronic bibliographic records can be adopted and not be recreated.
- Representation of wide variety of information and library services. It includes distant access to information resources as well, including databases, document delivery, conduct of static database etc.
- Increase of operability and quality of represented bibliographic information on all educational fields. Quality of bibliographic information significantly increase as there is centralized conduction of records database holding by high-qualified specialists and with repeated checking.
- Protection of storage and from illegal access to information resources. There is centralized database administration conducted by high-qualified network and database administrators. According to this level of security and protection from records disappear and illegal access to them.

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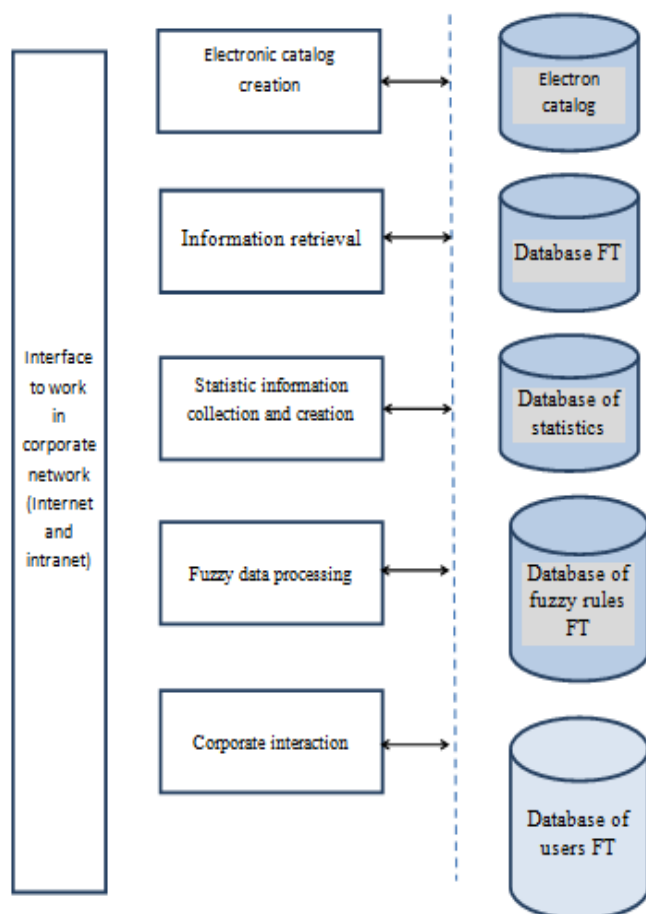


Fig. 2. Functional structure of LIS.