Informational Retrieval Thesaurus of Yaroslav Mudryi National Library of Ukraine: Content, Structure, and Use

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Abstract

The paper deals with terminological and species content of the Yaroslav Mudryi National Library of Ukraine information retrieval thesaurus; its structure is characterized; examples of dictionary entries are given. For clarity, the dynamics of thesaurus filling is shown. A historical digression on the origin of term "thesaurus" is implemented.

Keywords 1

Informational retrieval thesaurus (IRT), Automated information library systems (AILS), Descriptor, Non-descriptor, Document content, Yaroslav Mudryi National Library of Ukraine.

1. Introduction

In Ukraine, as well as all over the world, information is one of critical and importance strategic resource and a driving factor for the further state development. Library is one of the main institutions that provide collection, organization and public use of information. A priority of the Yaroslav Mudryi National Library of Ukraine (Yaroslav Mudryi NLU) is to help users navigate the large information space, and quickly search for and access the necessary information resources, and ensure guarantee the constitutional rights of individuals, such as the right to information. In order to successfully solve this problem, library subject specialists who are experts in finding the best information created the first Ukrainian-language universal information retrieval thesaurus (IRT), designed to display the content of documents and user requests for further search in automated information library systems (AILS).

2. Formulation of the problem

The problem of creating searchable images of documents using IRT is important in the context of organizing effective information retrieval in large arrays of information. Of particular importance in this context is IRT content and structure.

3. Analysis of last research and publications

The form of thesaurus has confidently taken its place in modern lexicography. Among such attempts there are «Le Thésaurus Larousse» (1992), created by direction of Daniel Péchoin, «Collins Thesaurus Dictionary. The Ultimate Wordfinder from A to Z» (2002), and its sequel «Collins English Dictionary & Thesaurus» (2002), which combined two forms of presentation of lexemes – explanatory and conceptual dictionary (thesaurus), «Information retrieval thesaurus of the Yaroslav Mudryi National Library of Ukraine», etc. The relevance of the issue of vocabulary thesaurus modelling is observed in

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the research scientists' works of the second half of 20th – beginning of 21th century: V. Morkovkin (1970), Yu. Karaulov (1976), O. Karpova (1996), T. Vylehzhanina (2004), O. Zbanatska (2004), O. Tur (2014), N. Kunanets (2019), H. Matsiuk (2020), and others. Their research brings together ways to classify thesauri on the basis of following criteria: types of semantic connections between dictionary elements; its volume; ways to explain lexeme meaning; number of represented languages; grammatical and stylistic qualification of lexemes; semiotic means used to explain semantics of words.

The problem of constructing thesaurus-type dictionaries was considered in studies of foreign scientists (C. Fenton [1], G. Grefenstette [2], M.M. Martínez-González and M.-L. Alvite-Díez [3], M.L. Nielsen [4], Y.C. Park and K.-S. Choi [5], C. Yallop and A. Kilgarriff [6], Yu. Karaulov [7], G. Kostyushkina and S. Korshunova [8], P. Braslavsky and E. Sokolov [9], I. Bolshakov [10]), and Ukrainian researchers (I. Getman [11], V. Shulgina [12], T. Vylehzhanina [13], O. Zbanatska [14] and O. Tur [15, 16]). Among the latest studies are works of H. Matsiuk, who considered the thesaurus as a tool for information support of interdisciplinary research [17–19], and N. Kunanets [20–24].

Thesauri are represented in normative sources as well. The ISO 25964–1: 2011 «Information and documentation – Thesauri and interoperability with other vocabularies – Part 1: Thesauri for information retrieval» [25] was published on Aug 08, 2011. The standard contains recommendations for development and maintenance of thesauri intended for information retrieval.

On Mar 04, 2013 the International Organization for Standardization (ISO) website announced the publication of 99-page standard ISO 25964–2: 2013 «Information and documentation – Thesauri and interoperability with other vocabularies (Thesauri and interoperability with other vocabularies)» [26]. It is an extension of ISO 25964–1: 2011, which was published in 2011.

4. Formulating the purpose of the article

The purpose of the paper is a comprehensive analysis of the Information retrieval thesaurus of the Yaroslav Mudryi National Library of Ukraine, in particular, its content, structure, use.

5. Main material

The history of human attempts to build thesaurus-like dictionaries dates back to antiquity. At the dawn of civilization, according to V. Morkovkin, when people could express their thoughts in writing with the help of ideograms and symbols, only possible dictionary was probably one in which words were arranged by thematic groups [27, p. 12]. Among oldest known attempts at ideographic classification is called «Attikai Lexeis» by the Greek grammarian, Aristophanes of Byzantium, director of the Alexandria Library. In 2nd century AD, there is another work on the material of Greek language, written by lexicographer and sophist Julius Pollux, the dictionary «Onomasticon» (in modern times the dictionary was first published in 1502 in Venice) [27].

The dictionary consists of 10 books, each of which is a separate treatise, combines thematically with words, and gives their interpretation. Thus, first book was about gods and kings, second – about people, etc. In 2nd–3d centuries AD, the Sanskrit dictionary «Amarakosha» (3 books, 10 thousand words) of ancient Indian poet, grammarian and lexicographer Amara Cina (according to other sources Amara Deva) was published. The dictionary was compiled in accordance with the level of science development and contemporary ideas. These dictionaries are first attempts at a systematic presentation of vocabulary based on peculiarities of the time worldview.

The first appearance of the term *thesaurus* is due to the Florentine scholar Brunetto Latini, who used it in the title of a systematic encyclopedia, calling his work «Les trésors» («Book of Treasure») (1863), which corresponded to the semantics of the term *thesaurus* – «treasure».

A new stage in the history of ideographic dictionaries is associated with works of already mentioned I. Kopievsky and F. Polikarpov, as well as the significant achievements of Peter Mark Roget (1852) and P. Boissieres (1862). It is worth noting that these works were not intended to meet the needs of information activities, they were only related to the problems of cognition, reflecting the views of time about universe. According to M. Chursin, for many centuries the thesaurus concept was limited to content of the "ideographic dictionary" concept, which facilitated search for words by their meaning

[28]. By the second half of the twentieth century, the «thesaurus» concept was identified with the «ideographic dictionary» concept and, in fact, remained a concept of linguistics.

The emergence of the idea to form a thesaurus linguistic concept is associated with the development of scientific thought during XX–XXI centuries. There are currently several scientific approaches to interpreting this concept. First, a thesaurus is a dictionary in which all the words of a language are fully represented and the semantic relations between them are shown (in other words, an ideographic dictionary). Second, a thesaurus is a semantic system of formalized language for automated control systems. This idea motivated the creation of information retrieval thesaurus.

In Ukraine, IRT of the Yaroslav Mudryi NLU has become widespread. The idea of its creation arose from the specialists of the cataloguing department with the beginning of the electronic catalogue (1995) [29]. When creating a search image of document (SID) librarians began to put on the books subject headings, which were entered into the electronic catalogue. Subject headings were built from keywords identified from the text of the original document [30]. As the selected keywords were subjective, there was a need for a unified linguistic support. Different variants of subject linguistic support of the electronic catalogue (alphabetical list of unified keywords, dictionary of subject headings) were considered, but the choice was based on IRT as the most promising practical guide for analytical and synthetic processing of documents [31]. The developers of the linguistic part were T.I. Vylehzhanina and O.M. Zbanatska, the program part was Yu. Zborovskyi. The initial stage of selection of terms for IRT was accompanied by consultation with scientists from various fields of knowledge. Their names, with words of gratitude, are placed in the Information retrieval thesaurus [14, p. 12].

The development of IRT was also facilitated by the properties of natural language, which didn't allow it to act as an effective information retrieval language (IRL) that is: phenomena of synonymy, homonymy and polysemy; presence of abbreviated phrases; abbreviations and informal connections between words [29]. These properties of natural language prompted the development of IRT [32].

Work on the development of dictionary entries for basic terms of IRT continued during 1997–2003 [29]. In February 2004, IRT was published in printed and electronic form (Figure 1). Universal in content, it contained more than 15.5 thousand terms (without inversion).



Figure 1: Printed and electronic edition of IRT

In the following years, work continued on its filling. The development of new dictionary articles for terms depended on the document flow of the library. The number of terms increased every year (Table 1).

Table 1Dynamics of increasing terms number

Date	Number of terms
as of 01.01.2005	20 163
as of 01.01.2006	24 709
as of 01.01.2007	25 951
as of 01.01.2008	25 951
as of 01.01.2009	26 457
as of 01.01.2010	26 774
as of 01.01.2011	27 398
as of 01.01.2012	27 702
as of 01.01.2013	28 122
as of 01.01.2014	28 755
as of 01.01.2015	29 734
as of 01.01.2016	30 034
as of 01.01.2017	31 885
as of 01.01.2018	32 501
as of 01.01.2019	34 766
as of 01.01.2020	36 346
as of 01.01.2021	37 132

The dynamics of IRT volume changes is shown in Figure 2.



Figure 2: Dynamics of IRT volume changes

IRT contains dictionary articles on:

- **lexical and semantic collection of terms** (material things, socio-political phenomena, branches of science and practice, processes, etc.);
- **geographical names** (names of continents, regions and other places, countries, their administrative-territorial units, ethnic lands, oceans, seas, rivers, mountains, etc.);
- **personalities** (proper nouns, or the special names of celebrities, gods, mythical and well-known literary characters, etc.);
- **institutions and organizations** (proper nouns, or the official names of institutions, organizations, societies, associations, etc.).

organizations							
Name	01.01.15	01.01.16	01.01.17	01.01.18	01.01.19	01.01.20	01.01.21
Geographical	3 738	3 841	4 013	4 300	4 483	4 659	4 765
names							
Personalities	1 851	1 897	3 233	3 350	4 171	4 740	4 978
Institutions	705	1 145	1861	1 905	2 136	2 292	2 411
Organizations	165	358	411	415	436	512	534

Dynamics of increasing number of terms (geographical names, personalities, institutions, and organizations)

Since the creation of the IRT, the task has been to unify the keywords selected from the text of the documents, i.e. to create a SID in the form of descriptors and non-descriptors. A *descriptor* is a term for indexing a thesaurus that is preferred over an alternative and equivalent separate record term. The Ukrainian Archival Encyclopedia states that a *descriptor* is a keyword called a class of synonymous or similar in meaning other keywords, and is used as a lexical unit of IRT to coordinate indexing of documents and create a searchable image of the document. A *Non-descriptor* is a term that can't be used for coordinate indexing and needs to be replaced by one or more descriptors to be used instead. An appropriate IRT dictionary entry is developed for each descriptor and non-descriptor.

In January 2019, a new information retrieval service «Thesaurus» (Figure 3) was posted on the «Library Specialist» page of the Yaroslav Mudryi NLU website at: <u>http://catalogue.nplu.org/ipt/</u>. This resource is an electronic version of IRT created by library staff during 1997–2020.

Термін:	Пошук	ПТ
Національна бібліотека України імені Ярослава Муд ІНФОРМАЦІЙНО-ПОШУКОВИЙ ТЕЗАУРУС	010	
 Загальна довідка 		
• Правила складання хронологічних підрубрик		
 Перелік формальних підрубрик 		

Кількість термінів: **37228** Останні зміни: **2021-02-08**

Правила пошуку

Table 2

- наберіть термін або його частину (одне чи кілька слів, перші літери слів, як-от екол аудит) і натисніть клавішу Enter або кнопку Пошук
- шукається термін з усіма словами запиту, у разі його відсутності перше слово запиту
- знаки пунктуації ігноруються, регістр літер не має значення

© Національна бібліотека України імені Ярослава Мудрого, 1997–2021 Figure 3: IRT Home Page

On IRT home page of the Yaroslav Mudryi NLU website the general information is placed, which provides purpose and content of IRT; examples of dictionary articles on descriptor and non-descriptor are given; conditional marks, which are put before terms, are described.

Because documents may display information about a particular year (e.g., 2020), or a range of years (e.g., 2000–2005), or beginning (end) of a particular century (e.g., 20th century, early), the rules of writing chronological subheadings in the subject headings are given, and additional methodical instructions are represented. There is also a list of terms that can be used as chronological subheadings (e.g., Renaissance, Iron Age, ancient world).

When constructing subject headings, formal subheadings are used, which don't relate to the document content, but reveal the form of presented material (e.g., reference publications, collections, educational publications). Their use is limited to a specific list on the main page of IRT («List of formal subheadings»).

Users of the information retrieval service «Thesaurus» have the opportunity to be acquainted with the number of terms and the date of last changes.

Search rules provide instructions on search features in this service. For example, when searching for the term «cars», a fragment of the inverted lexical-semantic collection of terms appears (Figure 4).



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In the fragment of the inverted lexical-semantic collection of terms there is a certain color designation. Descriptors are marked in blue (e.g., **automotive industry**; light blue – inverted descriptors (e.g., *cars*; *racing*); gray – non-descriptors (e.g., *cars*), inverted non-descriptors (e.g., *cars*; *sport*). Therefore, users can immediately visually determine the term status.

In this list, the term «cars» is chosen, and the corresponding dictionary article opens (Figure 5). Thus, term «cars» contains:

- note (we will consider their types below);
- working notes: ND means that this term cannot have an ethnic division; GD means that the term may have a geographical division (e.g., Cars Germany);
- date of creation;
- date of last edit;
- term translated into Russian;
- unused, synonymous term;
- a broader term meaning «road transport»;
- narrower, lower, specific terms in meaning (e.g., «trucks», «electric cars»);
- associative terms (e.g., «automotive», «car service»).
- information source.

Термін: (вытомобілі	Пошук	пт
автомобілі		
Під терміном автомобілі збираються документи про самохідні машини з двигуном внутрішнього згоряння для перевезення паса деталі збираються під конкретною назвою деталі, наприклад: автомобільні гальма	ажирів і вантажів безрейковими дорогами. Документи про окремі автомобільн	łi
тема / предмет –НП (не може мати етнічного поділу). Дата створення 2000-05-10 +ГП (може мати географічний поділ). Дата ост. ред. 2019-05-30		
рос. автомобили		
НВ автомашини		
Ш автомобільний транспорт		
Н вантажні автомобілі		
Н гібридні автомобілі		
Н спектромобілі		
Н конструкція автомобіля		
Н пасажирські автомобілі		
Н сонцемобілі		
Н спеціальні автомобілі		
А автомобілебудування		
А автомобільні дороги		
А автомобільні палива		
А автомобільні причепи		
Аавтомоделізм		
А автосервіс		

Figure 5: Dictionary article for «cars»

By following the hyperactive link of any terms, you can read the relevant dictionary article and view its content.

Thus, the information posted in the IRT, experts can use to unify the subject headings and subheadings (or sub-rubrics). Of great importance in the search is the factor that the terms presented in IRT are inverted.

There is a Latin translation for biological terminology and some medical terms. An example of such a dictionary article is given at Figure 6.



Figure 6: Dictionary article for descriptor «buttercup»

Термін: (жовтцеві	Пошук	ПТ
жовтцеві		
аскриптор Дата створення 2000-10-09 Дата ост. ред. 2003-09-27		
рос. лютиковые		
В жовтецеві		

© Національна бібліотека України імені Ярослава Мудрого, 1997–2021

Figure 7: Dictionary article for non-descriptor «buttercup»

Symbols are used to indicate the relationships between thesaurus terms. Each label reflects the type of terminological connection:

лат. – translation of the term into Latin and English;

poc. – translation of the term into Russian;

HB – a term that is not used (synonymous);

III - a term broader in meaning;

H – term, narrower in meaning, species term;

A – associative term;

B – term used (in dictionary articles for non-descriptor).

In Figures 6, 7 the descriptors are in blue and the non-descriptors in gray.

Vocabulary articles reflect the subject in a concise form and some of them have notes.

Table 3

Types	of	notes
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Types of notes	Examples
encyclopedic type (explains meaning of descriptor)	winter gardens Premises for the arrangement of an artificial park from ornamental plants which are usually combined with cultural and small architectural forms
clarifying type (distinguishes associative terms)	sound Under the term "sound" are collected documents about the auditory sensation caused by mechanical vibrations of the air (acoustic waves). Documents on mechanical oscillations propagating in elastic bodies (solid, liquid and gaseous) are collected under the term under the term sound oscillations
note as a complex	Terms or phrases from the following are used
note as a template	A template heading to display documents about the relationship of libraries with various aspects of life, activities, development, etc., for example: religion and people

Chronological subheadings (sub-rubrics) can be used when objectifying documents. The relevant rules, which are posted at the address, apply to their writing: http://ipt.nlu.org.ua/help.chron.subd.html

If necessary, formal subheadings (sub-rubrics) may be used, which are limited to a specific list (http://ipt.nlu.org.ua/help.form.subd.html).

The Yaroslav Mudryi NLU uses IRT for the objectification of documents. Document processing is carried out in an automated information and library system (AILS) MARC-SQL. For the subject disclosure of documents content, it is planned to fill in the sixth block (block of determining subject of the communicative format UNIMARC). Depending on the nature of significant concepts, subject headings are entered in the appropriate fields AILS MARC-SQL.

6 – Topic definition block (content analysis block):

600 – name of the person as the subject (*e.g.*, *Bilokur Kateryna Vasylivna* (1900–1961); *Volya Oles* (*b.* 1952); *Danylo Romanovych Halytsky*) (approximately 120–1264));

601 – name of the organization as a subject (*e.g.*, *Askania Nova Biosphere Reserve named after Friedrich Falz-Fein; Dynamo, football team; Poltava State Agrarian Academy);*

602 – generic name as a subject (e.g., Alchevsky, family; Volovichi, family);

605 – name as an object (e.g., Bible; "Domostroy"; New Testament);

606 – name of the topic as a subject (e.g., *national liberation movements; Ukrainian-Belarusian terminological dictionaries; Japanese literature);*

607 – name of the geographical place as a subject (*e.g., Kremenchug district; Kremnica, city* (*Slovakia; Banská Bystrica region*); *Podlasie*)

All values of fields 600, 601, 602, 605, 606, 607 and their subfields are selected exclusively from IRT of the Yaroslav Mudryi NLU. In the absence of an appropriate term for the formation of subject heading, IRT selects a broader term for compiling a generalized subject heading, and the required term for objectification is selected from other authoritative sources of relevant direction, and entered in field **610** as a **keyword**. Such terms are submitted for consideration by specialists of the department of linguistic support of information retrieval systems of the Yaroslav Mudryi NLU as proposals for inclusion in IRT (provided that this term is described in more than three documents).

A new solution in terms of content of IRT was the integration in its composition of geographical names, personalities, names of organizations and institutions, which is not typical for this type of information products. During the development of IRT, the idea of using encyclopedic notes arose, which greatly facilitated the creation of paradigmatic relationships between terms.

IRT is served as a terminological guide in various fields of knowledge, and IRT reflects the system of concepts in form of a structured set of terms, and is the result of serious and time-consuming work of highly qualified specialists.

IRT is also served as a means of improving the completeness of information retrieval, providing excessive indexing of information queries with the use of lexical items synonymous, as well as those that are in the generic and other associative relations to the descriptor. IRT helps to make compliance between:

• author's terminology (concepts or words of natural language used by the author to designate these concepts);

• system terminology (concepts and terms used to express these concepts when entering documents in the information retrieval system);

• consumer terminology (concepts and terms used by him to represent these concepts in formulating the request).

6. Conclusions

An information retrieval thesaurus are becoming important now, especially in the context of unifying search images of documents and search images of queries. On the one hand, they simplify the work of specialists, and on the other hand, their development requires significant intellectual effort, knowledge of a particular field to make most balanced and objective decisions on the inclusion of a certain term.

The information retrieval thesaurus of the Yaroslav Mudryi National Library of Ukraine has come a long way, starting with the development of its structure, scientific methods of filling, and later testing in the middle of library's AILS. The completeness of thesaurus terminological content allows users search for the required documents effectively.

The terminological content of the information retrieval thesaurus continues. He promptly responds to changes in society. Its further development is associated with the creation of authoritative files of subject headings as access points to documents in electronic catalogues. In the context of digitalization, these products will be a powerful linguistic support for any AILS.

We hope that the information retrieval service «Thesaurus» will be useful for librarians-practitioners who create searchable images of documents, and public libraries of Ukraine will be able to use it in the formation of electronic catalogues and in the formation of bibliographic databases. Due to encyclopedic and reference functions, the information retrieval thesaurus can be also served as a source of systematic knowledge from various fields of knowledge.

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