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# ONTOLOGICAL SYSTEM PROCESSING OF DATABASES OF SCIENTIFIC PUBLICATIONS

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Розроблення теорій, методів й алгоритмів виявлення та формування нових знань завжди займало одне з центральних місць у будь-якого наукового співробітника, тим паче якщо він активно працює над створенням нових наукових публікацій. Відомо, що універсальної мови формального опису концептів (знань) та системології трансдисциплінарних наукових досліджень не існує. А тому перед науковцями стоїть ряд першочергових проблем, в тому числі проблема значного пришвидшення отримання науковим співробітником необхідної йому когнітивно-структурованої інформації із своїх джерел. Онтологічна система оброблення баз даних наукових публікацій саме так орієнтована на наукового співробітника, у якого в наявності опубліковано від декількох десятків до сотень наукових праць. Нам невідомі пошукові системи, які змогли б у максимально стислий термін надати науковому співробітнику таку інформацію. Онтологічна система реалізує технології Information Retrieval і Knowledge Discovery in Databases з акцентом на технології й інструментарій Semantic Web та когнітивної графіки. Розроблення такої онтологічної системи припускає три стадії: на першій стадії створюються інструментальні засоби реалізації системи, методики й алгоритми взаємодії системи «Користувач — Інженер зі знань — Віддалена прикінцева точка» та наповнення її даними; на другій стадії вирішуються задачі мультимедійного подання образно-понятійних структур, що описані в наукових документах; і на третій стадії – вирішення проблеми добування нових знань.

Ключові слова: Трансдисциплінарні наукові дослідження, Технології Semantic Web, Онтологічний інжиніринг, База даних наукових публікацій.

Development of theories, methods and algorithms for the discovery and formation of new knowledge always was one of the most important tasks for any researcher, especially if they actively working on creation of new scientific publications. There is no universal language to describe formally concepts (knowledge) and systemology of transdisciplinary scientific research. Because of this, researchers have a set of urgent problems, and one of them is the way of speeding up the process of finding information (in the form of cognitive-structure) in their own sources. Ontological system for processing of databases of scientific publications created to solve this problem for a researcher, who have from tens to hundreds of scientific papers published. We are unaware of search systems, which would provide the same information for a researcher in such a short time. Ontological system implements technologies of Information Retrieval and Knowledge Discovery in Databases with accent on technologies and instruments such as Semantic Web and cognitive graphics. Development of such ontological system have three stages. On the first stage instruments for system development created, methods and algorithms of interaction between system components “User — Knowledge engineer — Remote endpoint”, also data added to the system at this stage. On the second stage task of multimedia presentation for conceptual and figurative structures, described in scientific documents, solved. Gaining new knowledge problem solved on the third stage.

Keywords: Transdisciplinary scientific research, Semantic Web technology, ontological engineering, scientific publications database.

## Introduction

There is multiple applications, for searching information in different databases (DB), including specialized applications. Most of these applications do not take into account a cognitive aspect of data processing, needed for creative approach, in particular for a researcher (RSR).

As a separate problem stands multimedia (conceptual and figurative) presentation of the search results, and their comparison with conceptual structure of subject area (SA, Knowledge Domain), this interests us for purposes of gaining new knowledge. For scientific research, it is relevant to process scientific publications of one author, authors of scientific unit or institute by using Semantic Web technology.

Ontological system (OS) for processing of databases of scientific publications (DBSP) uses technologies of Information Retrieval and Knowledge Discovery in Databases with accent on technologies and instruments of Semantic Web and cognitive graphics [1–3]. This technology and corresponding instruments allow creating multimedia presentation of conceptual and figurative structures, which described in scientific papers. Semantic Web technologies allow creation and processing for RDF repository of scientific publications, development of local and/or remote endpoints, assembling and execution of SPARQL-queries. Of the entire Semantic Web technologies multitude we need to highlight SPARQL-technology, which allows for a researcher (RSR) to create queries of arbitrary complexity, and to receive response, including all kinds of information.

Generalized diagram for development of OS DBSP shown at Figure 1. It includes preparation stage block and blocks of main stage with variations A, B and C. Preparation stage described in details at [1]. At the same place ontology graphs of SA is given and one of SP, which serve as data for implementation of main stage, variation B, phase 2.

We know about personified knowledge database of researcher, in which a sum of functional capabilities declared, this capabilities support processes of scientific and creative activity [2]. Such personified knowledge database is:

– a tool that supports scientific research, and one of the central directions of practical informatics development [4, 5];

– a development of knowledge system for RSR, for purposes of new knowledge gain (or arrangement of existing knowledge, error checking and checking for contradictions etc.) [6–9];

– one of the main subsystems for the modern system of research design [10], automated workplace for RSR [4];

– one of the main elements for creation of permanent canonical knowledge [11] and support for knowledge oriented information system functioning [12].

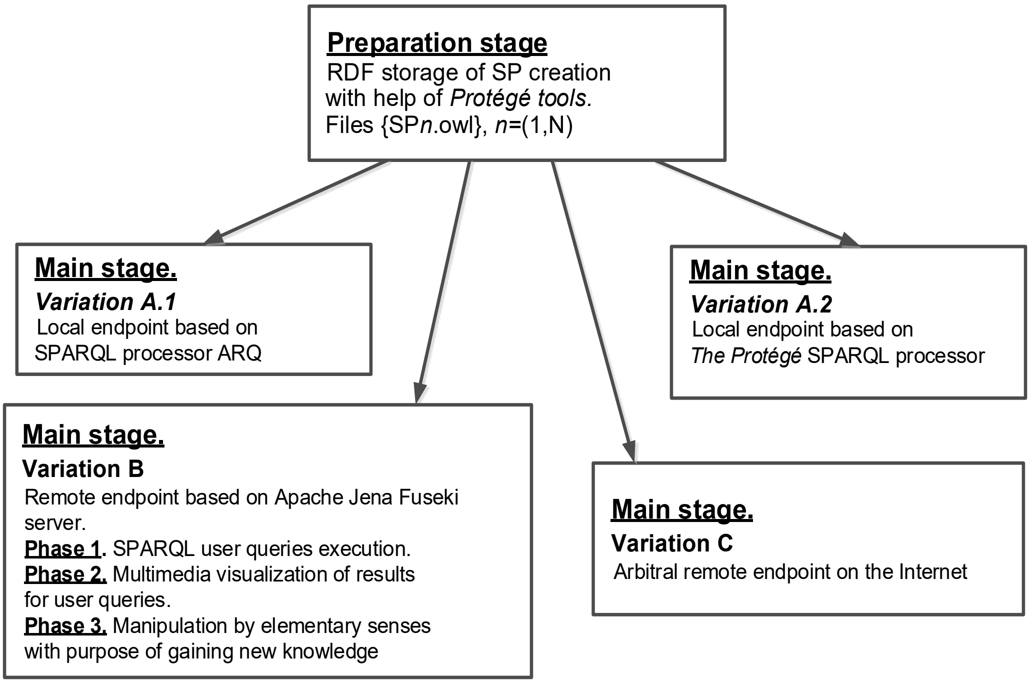


Figure 1. Generalized diagram of OS DBSP development

It is a common knowledge, that there is a tight connection between Semantic Web and UML technologies. In particular, it is a connection between OWL syntax and visual modeling of UML-diagrams. UML language presented as a general purpose language of visual modeling, which developed for specification, visualization, designing and documenting of software components, business processes and other systems. UML language is easy and powerful tool for modeling, which can be used effectively for creation of conceptual, logical and graphical models of complex systems that is built for different purposes. This language absorbed all the best software engineering methods and qualities, successfully used during many years, for modeling of large and complex systems [13].

Visual modeling in UML is possible to present as a process of gradual descent from most general and abstract conceptual model of source system to logical, and later to physical model of respective software system. For this purposes model in a form of so-called use case diagram built first. This diagram describes functional purpose of the system, what this system will perform in a process of its functioning. Use case diagram is a source conceptual presentation, or conceptual model of the system in the process of its designing and development [14, 15].

OS "Database of scientific publications" made for an author, who actively occupied by preparation and production of new SP. Of course, searching through your own SP can be done manually (which in most cases exactly how it's done), but with the help of OS this search can be accelerated significantly. In addition, it is possible to automatically structure received data into appropriate templates for future SP.

Now we will discuss development of architectural, structural components and UML-diagrams. Diagrams that show OS functioning on the base of remote Apache Jena Fuseki endpoint. In addition, we will discuss examples of the formal description of scientific paper usage by performing a set of queries.

*The goal of an article* – OS development. System allows significant acceleration of information retrieval by an author (from his own DB of SP), gives visual presentation of SP concepts and respective subject area, and implements famous Brooks formula for acquiring new knowledge [7, 8]:

$$K\left(S\right)+dI=K\left(S+dS\right)$$

where $K\left(S\right)$ – source knowledge structure, which is modified by results of information portion $dI$ processing, creating new structure $K(S + dS)$ and new knowledge portion $dS$. It is assumed, that components $dI$ and $dS$ closely tied with elementary senses, introduced at [1].

Main stage of user tasks performance split into three OS architecture variations – A, B and C. These variations have different functional power. A – Least powerful (organized as a local endpoint on users PC). B – Average power (organized as a remote endpoint based on Apache Jena Fuseki server). C – most powerful (organized as a remote endpoint, which implemented with the help of original software). We can see that variations of OS realizations fit for different purposes. A – For one user in local network with knowledge engineer (KE), in this scenario user can form queries, and receive answers only working with one science publication at a time. B – for a few users of the same scientific unit. C – for users from the whole institute. For B variation it is already possible to form one query for retrieval of structured information from multiple articles simultaneously, which is impossible to do with popular search systems.

In this material main attention will be on the description of processes with UML-diagrams usage for variation B, phase 1 (B1).

## Architectural and structural organization of OS DBSP (variation B, phase 1)

For this variation, OS functions as remote endpoint based on Apache Jena Fuseki, and consists of three phases: phase 1 – SPARQL user queries processing; phase 2 – multimedia visualization of user query results, or creation and usage of conceptual and figurative structures for subject area; phase 3 – manipulation by elementary senses with purpose of gaining new knowledge.

At Figure 2 diagram for OS variation B1 presented.

Initially knowledge engineer downloads respective files and deploys Apache Jena Fuseki as remote endpoint [16, 17]. Than he uploads scientific publications in a form of RDF graphs to the server, this data generated on preparation stage.

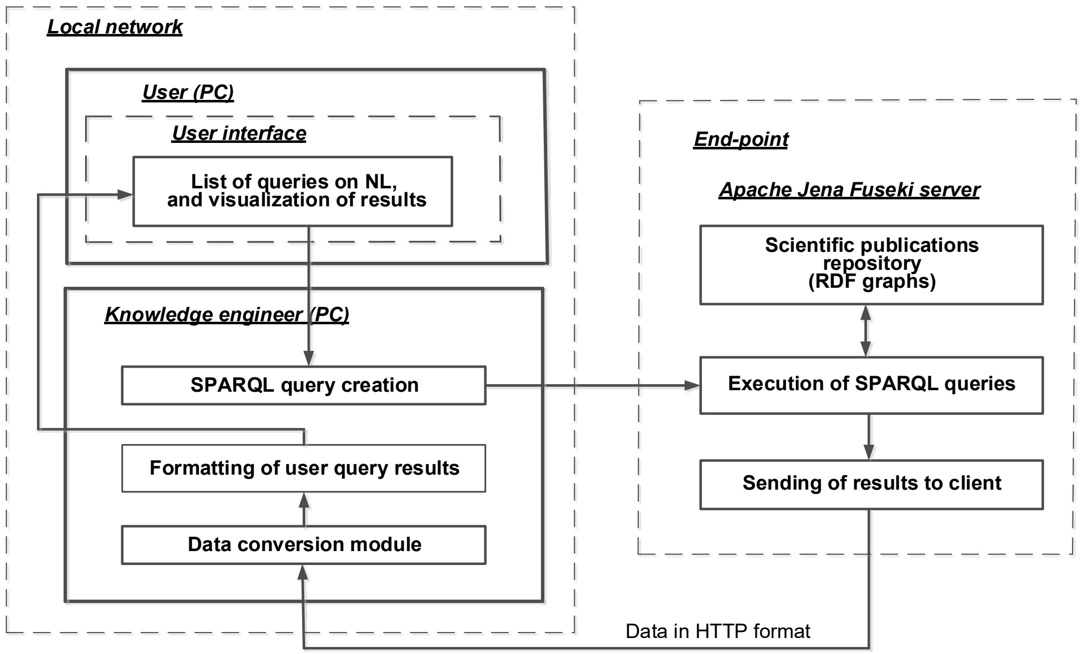


Figure 2. Generalized diagram of OS DBSP

User in his interface can see the list of possible queries on natural language. He can choose any query from this list one by one, chosen query transferred via network to knowledge engineer module, systematically user clarifies information that he is working with. It is possible to choose a subset of articles, which used for a search, this feature is useful if you do not need to search in all database.

Below you can see examples of queries on natural language (NL).

## Basic user queries

Researcher database contains N scientific papers published in popular scientific journals. Serial numbers N of scientific publications can be describes as follows:

**N** = 1, 2, …, $m_1$, …, $m_2$, …, $m_k$, …, N-1, N

Serial numbers of scientific publications (in this case we deal with articles) serve as arguments for queries. Data organized in such a way that author of SP is the first co-author in publication, or in other case, the one who owns the database is an author.

**1** *Show titles of articles on the topic of "transdisciplinarity"*.
**2** *Show titles of articles on the topic of "ontological"*.
**3** *Show annotations of articles* $m_1$, …, $m_2$, …, $m_k$, …
**4** *Show keywords of articles* $m_1$, …, $m_2$, …, $m_k$, …
**5** *Show titles of all* **N** *articles*:
5.1 in the order of publication date;
5.2 without co-authors.

…

**13** *Show titles of articles* $m_1$, …, $m_2$, …, $m_k$, …, where $m_1$, $m_2$, $m_k$ – query arguments set by a user.
**14** *Show full names of co-authors for articles* $m_1$, …, $m_2$, …, $m_k$, …

…

## UML-diagrams of the OS functioning for variation B1.

Now let us discuss UML-diagrams, which reveal the core of OS functions for variation B1.

On Figure 3 use case diagram presented, on Figure. 4 – class diagram, on Figure 5 – components diagram, on Figure 6 – sequence diagram.

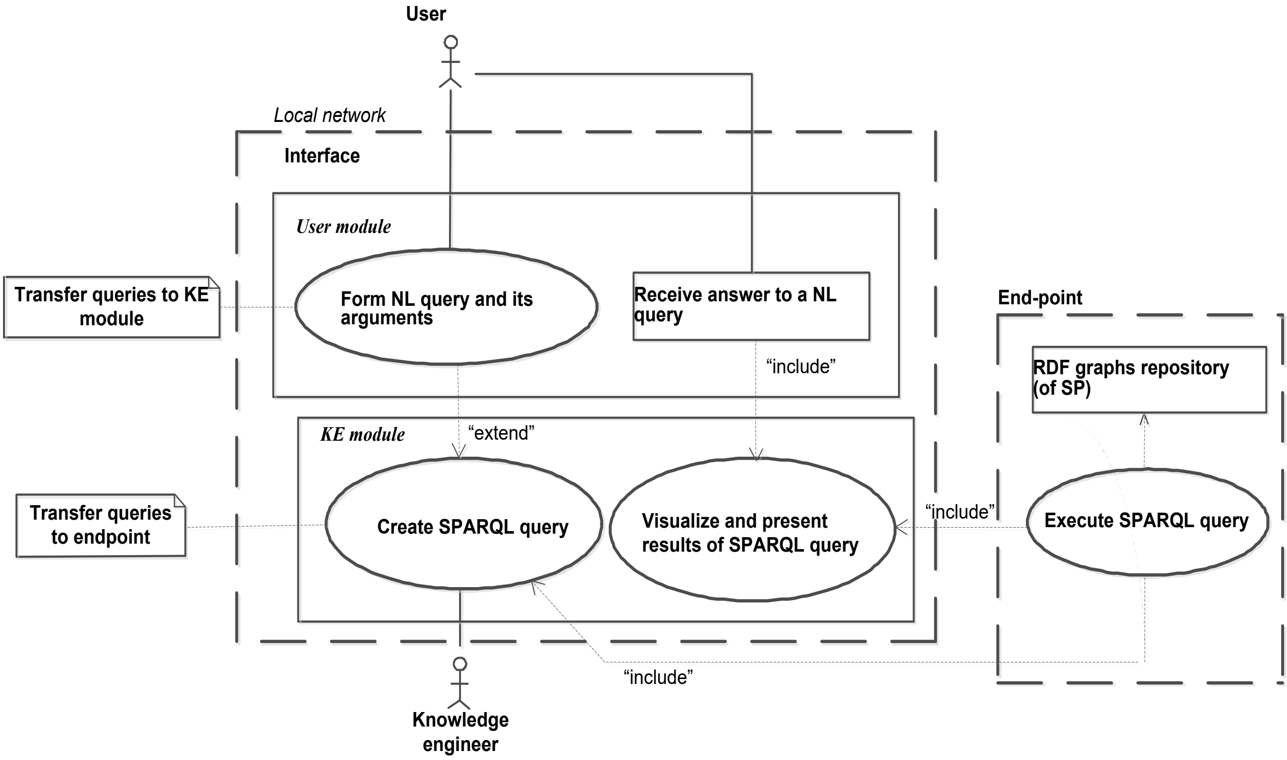


Figure 3. Use cases diagram of OS DBSP

To local network (LAN), which administrated by knowledge engineer, certain number of researchers connected. We will discuss network operation for one user, for other users process organized in a same way.

On researchers personal computer (PC) functions module of general interface. In the interface all the queries on NL displayed, from which researcher can choose one with desired arguments, another element of the interface shows results of a query execution.

Other part of system contains knowledge engineer module. In this module, SPARQL-query formed out of NL-query, and transferred over HTTP protocol to end-point. On the Apache Jena Fuseki server, SPARQL-query executed and response sent via HTTP protocol to knowledge engineer module and respective interface.

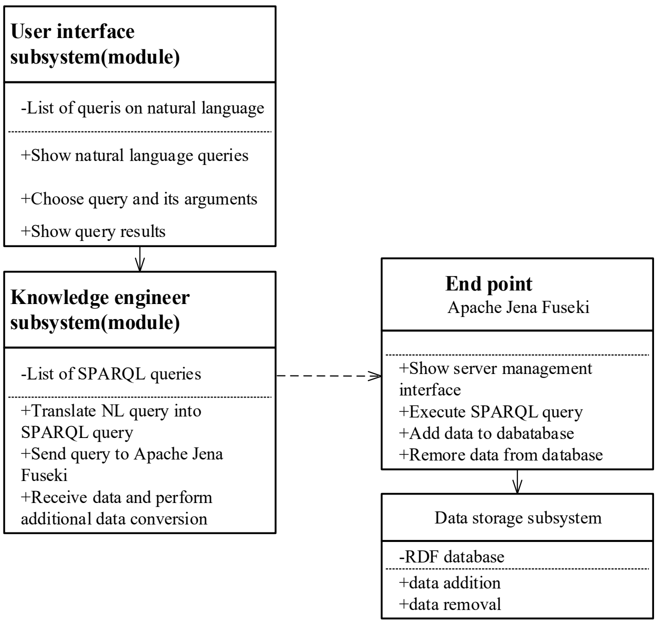


Figure 4. Class diagram OS DBSP

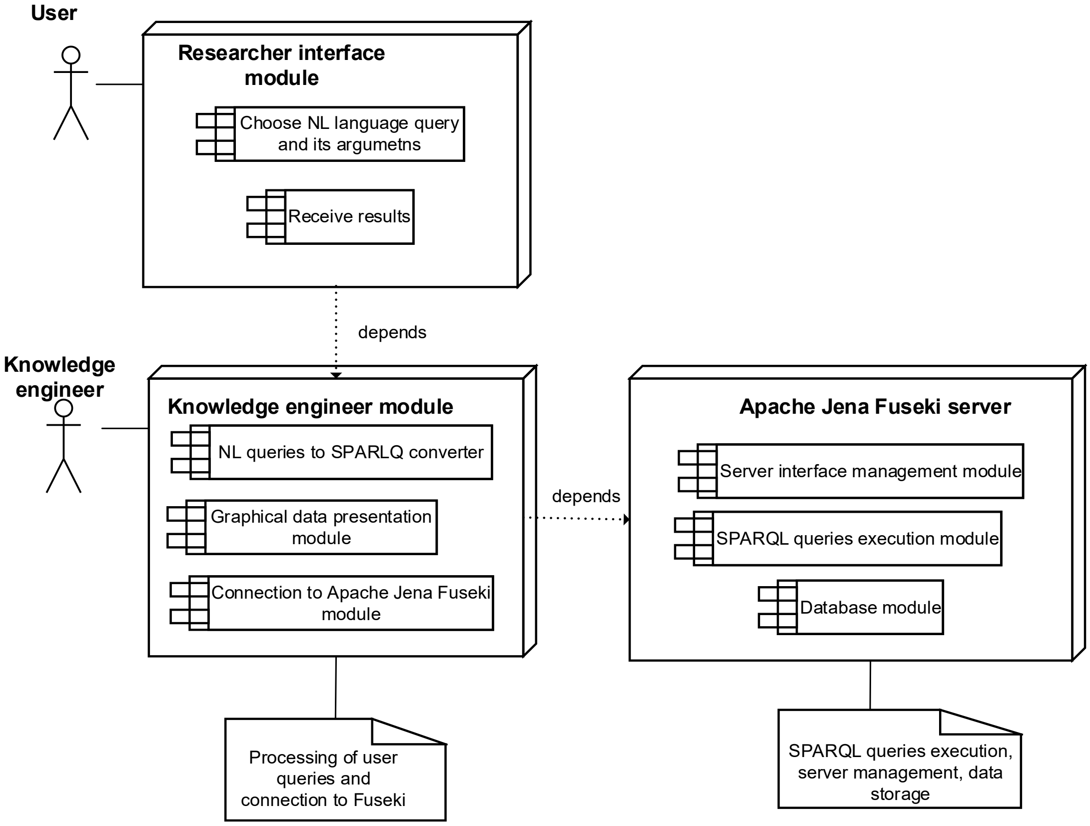


Figure 5. Components diagram OS DBSP

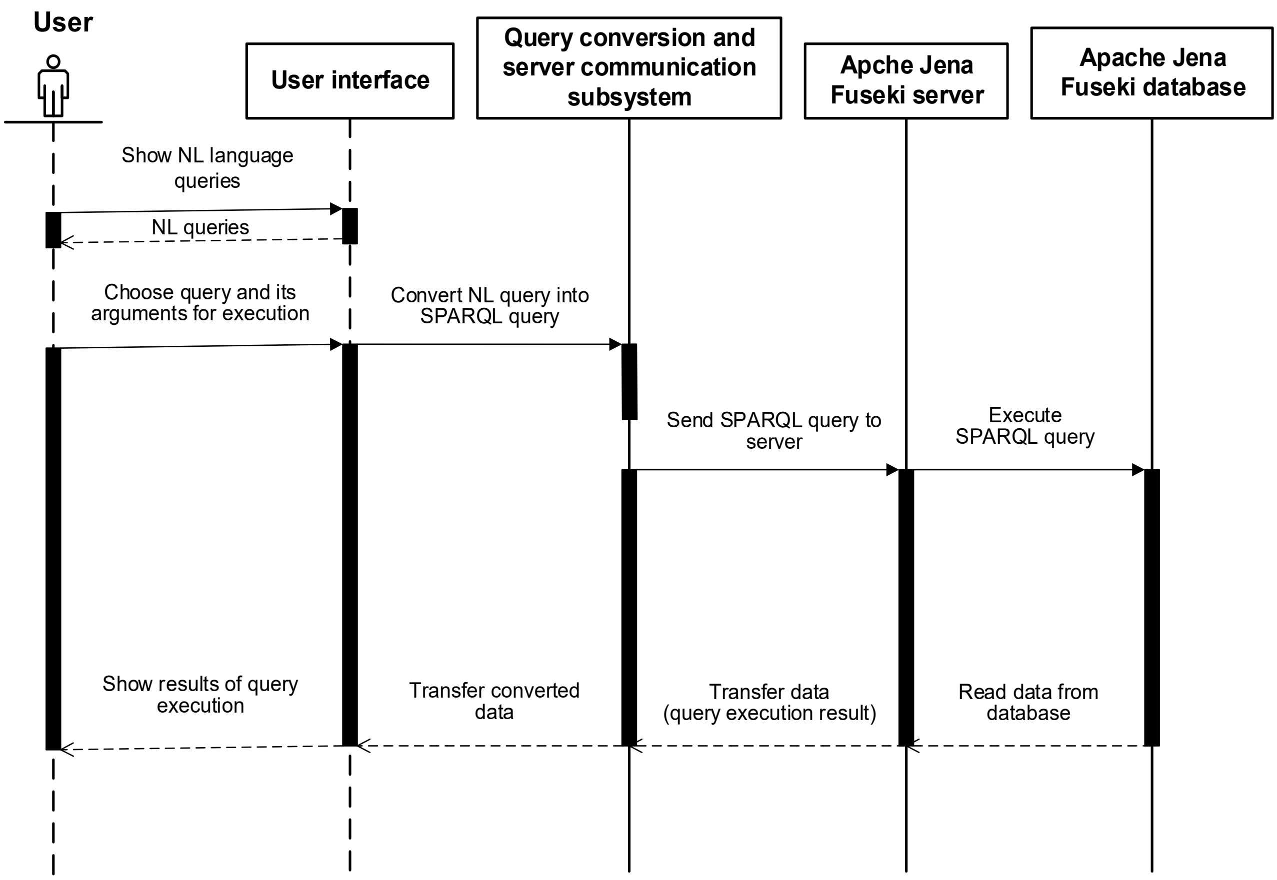


Figure 6. Sequence diagram OS DBSP

Operation of forming and processing for user queries, and receiving replies shown in details on main UML-diagrams at fig.3–fig6.

**Examples of SPARQL-queries execution and their results.**

It is important to note that diagrams do not show process of argument selection and their transformation into article numbers in database.

**NL-query.**

*Show titles of articles on the topic of "transdisciplinarity".*

**SPARQL-query.**

```
PREFIX : <http://www.semanticweb.org/николай/ontologies/2020/5/19/untitled-ontology-36#>

SELECT ?номер_статті ?назва_статті
{
  GRAPH ?номер_статті {?s1 :Название_статьи ?назва_статті.
    FILTER REGEX(?назва_статті, «трансдисципл», «i»)}
}
```

**Query results.**

| | **Номер_статті** | **Назва_статті** |
|---|---|---|
| 1 | <http://test.ulif.org.ua:51089/articles/data/article1> | «Методологические основы развития, становления и IT-поддержки трансдисциплинарных исследований» |
| 2 | <http://test.ulif.org.ua:51089/articles/data/article2> | «Трансдисциплинарность, информатика и развитие современной цивилизации» |
| 3 | <http://test.ulif.org.ua:51089/articles/data/article6> | «Проблемы трансдисциплинарности и роль информатики» |
| 4 | <http://test.ulif.org.ua:51089/articles/data/article7> | «Введение в класс трансдисциплинарных онтолого-управляемых систем исследовательского проектирования» |

**NL-query.**

*Show titles of articles on the topic of "ontological".*

**SPARQL-query.**

```
PREFIX : <http://www.semanticweb.org/николай/ontologies/2020/5/19/untitled-ontology-36#>

SELECT DISTINCT ?номер_статті ?назва_статті
{
  GRAPH ?номер_статті {?s1 :Название_статьи ?назва_статті.
    FILTER REGEX(?назва_статті, «онтолог», «i»)}
}
```

**Query results.**

| | **Номер_статті** | **Назва_статті** |
|---|---|---|
| 1 | <http://test.ulif.org.ua:51089/articles/data/article5> | «Про деякі особливості побудови онтологічних моделей предметних областей» |
| 2 | <http://test.ulif.org.ua:51089/articles/data/article7> | «Введение в класс трансдисциплинарных онтолого-управляемых систем исследовательского проектирования» |
| 3 | <http://test.ulif.org.ua:51089/articles/data/article8> | «Онтологическая концепция информатизации научных исследований» |
| 4 | <http://test.ulif.org.ua:51089/articles/data/article10> | «Архитектура онтолого-управляемых компьютерных систем» |
| 5 | <http://test.ulif.org.ua:51089/articles/data/article16> | «К вопросу системно-онтологической интеграции знаний предметной области» |
| 6 | <http://test.ulif.org.ua:51089/articles/data/article19> | «Знание-ориентированные информационные системы с обработкой естественно-языковых объектов: онтологиче-ский подход» |
| 7 | <http://test.ulif.org.ua:51089/articles/data/article21> | «Системно-онтологический анализ предметной области» |

**NL-query.**

*Show annotations of articles* 1, 2, 7.

**SPARQL-query.**

```
PREFIX : <http://www.semanticweb.org/николай/ontologies/2020/5/19/untitled-ontology-36#>
SELECT ?номер_статті ?назва_статті (group_concat(?анотація) as ?анотація_повна)
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article1>
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article2>
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article7>
{
```

```
 GRAPH ?номер_статті {?s1 :Название_статьи ?назва_статті.
        {:Аннотация :Иметь_Предложение  ?речення}
        {?речення :Иметь_Текст ?анотація}
        }
}
group by ?номер_статті ?назва_статті
```

**Query results.**

| | Номер_статті | Назва_статті | Анотація_повна |
|---|---|---|---|
| 1 | <http://test.ulif.org.ua:51089/articles/data/article1> | «Методологические основы развития, становления и IT-поддержки трансдисциплинарных исследований» | «Разработаны основы методологии трансдисциплинарного системного подхода к постановке и выполнению научных исследований и сложных прикладных проектов с акцентом на их IT-поддержку с использованием методов и средств искусственного интеллекта, в частности онтологического инжиниринга. … |
| 2 | <http://test.ulif.org.ua:51089/articles/data/article2> | «Трансдисциплинарность, информатика и развитие современной цивилизации» | «Перспективы и проблемы развития человеческой цивилизации всегда волновали общество. … |
| 3 | <http://test.ulif.org.ua:51089/articles/data/article7> | «Введение в класс трансдисциплинарных онтолого-управляемых систем исследовательского проектирования» | «Рассмотрен класс систем исследовательского проектирования, основанных на использовании парадигм трансдисциплинарности, онтологического управления и целенаправленного развития. … |

**NL-query.**

*Show keywords of articles* 1, 2, 7.

**SPARQL-query.**

```
PREFIX : <http://www.semanticweb.org/николай/ontologies/2020/5/19/untitled-ontology-36#>

SELECT ?номер_статті ?назва_статті ?ключові_слова
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article1>
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article2>
FROM NAMED <http://test.ulif.org.ua:51089/articles/data/article7>
{
 GRAPH ?номер_статті { ?s1  :Название_КС ?ключові_слова OPTIONAL
   {?s2 :Название_статьи ?назва_статті}}
}
```

**Query results.**

| | Номер_статті | Назва_статті | Ключові_слова |
|---|---|---|---|
| 1 | <http://test.ulif.org.ua:51089/articles/data/article7> | «Введение в класс трансдисциплинарных онтолого-управляемых систем исследовательского проектирования» | «трансдисциплинарность, онтологическое управление, виртуальные структуры (парадигма), развивающиеся системы, ноосферогенез, ноосфера, научная картина мира, трансдисциплинарный подход (знания), кластеры конвергенции, онтологический подход, онтологическая концепция, формальная онтология, формула Брукса, интеллектуальные ИС, трансдисциплинарные онтолого-управляемые ИС, исследовательское проектирование, персональные базы знаний, предметная область, GRID-сети» |

| | | | |
|---|---|---|---|
| 2 | <http://test.ulif.org.ua:51089/articles/data/article2> | «Трансдисциплинар-ность, информатика и развитие современной цивилизации» | «трансдисциплинарность, информатика, мониторинг, кластер конвергенции, компьютерная онтология, knowledge engineering, Единая национальная сеть информатизации, глобальная сеть трансдисциплинарных знаний. |
| 3 | <http://test.ulif.org.ua:51089/articles/data/article1> | «Методологические основы развития, становления и IT-поддержки трансдисциплинарных исследований» | «научная картина мира, информационная технология, развивающаяся информационная система, трансдисциплинарность, трансдисциплинарные исследования, трансдисциплинарные знания, кластер конвергенции, онтология, онтологическая концепция, онтолого-ориентиро-ванная поддержка.» |

## Conclusion

The goal of our research was to develop an ontological system for processing of databases of scientific publications, which will allow a researcher to increase significantly retrieval speed of required information (in from of cognitive structures) from his own sources.

In this article was introduced and described architectural and structural organization of OS, which includes local network with PCs of user and administrator/knowledge engineer, and remote endpoint based on Apache Jena Fuseki server, was shown main UML-diagrams of OS functioning, and examples of user queries execution.

## Further research

This research is far from its end goal. As we explained, it is necessary to implement phases 2 and 3, for that we need to develop algorithms of creation for conceptual and figurative structures, algorithms of their comparison and analysis with further intention of building subject area knowledge, and algorithms for discovery of a new knowledge in accordance with Brooks formula.

In the future research, our team will develop original instruments and tools with purpose of optimization for user queries, and optimization of usability for ontology system.

## References

1. PALAGIN, A.V., PETRENKO, N.G., Knowledge-oriented tool complex processing databases of scientific publications. *Control systems and computers.* 2020. №5. p. 17–33. URL: https://doi.org/10.15407/usim.2020.05.003 [Accessed: 22 June 2022].
2. PALAGIN, A.V., PETRENKO, N.G., VELYCHKO, V.YU., MALAKHOV, K.S. (2014) *Development of formal models, algorithms, procedures, engineering and functioning of the software system "Instrumental complex for ontological engineering purpose".* In: Proceedings of the 9th International Conference of Programming UkrPROG. CEUR Workshop Proceedings 1843. Kyiv, Ukraine, May 20-22, 2014. [Online] Available from: http://ceur-ws.org/Vol-1843/221-232.pdf [Accessed: 23 June 2022].
3. PALAGIN, A.V., KRYVYY, S. L. & PETRENKO, N. G. (2012). Ontological methods and means of processing subject knowledge. Lugansk: V.I. Dal East Ukr. Nac. University. DOI: https://doi.org/10.15407/usim.2020.05.003 [Accessed: 20 June 2022].
4. PALAGIN, O.V., MALAKHOV, K.S., VELYCHKO, V.YU., SHCHUROV, O.S. (2017). Design and software implementation of the subsystem of creation and use of the ontological knowledge base of the scientific researcher's publications. Problems in programming. 2017. №2. p. 72–81. URL: http://dspace.nbuv.gov.ua/browse?value=%D0%92%D0%B5%D0%BB%D0%B8%D1%87%D0%BA%D0%BE,%20%D0%92%D0%AE.&type=author [Accessed: 22 June 2022].
5. PALAGIN, O.V., VELYCHKO, V.YU., MALAKHOV, K.S., SHCHUROV, O.S. (2020). Distributional semantic modeling: a revised technique to train term/word vector space models applying the ontology-related approach. In: Proceedings of the 12th International Scientific and Practical Conference of Programming UkrPROG 2020. CEUR Workshop Proceedings 2866. Kyiv, Ukraine, September 15-16, 2020. [Online] Available from: http://ceur-ws.org/Vol-2866/ceur_342-352palagin34.pdf [Accessed: 20 June 2022].
6. PALAGIN, A., PETRENKO, N. (2018) Methodological Foundations for Development, Formation and IT-support of Transdisciplinary Research. *Journal of Automation and Information Sciences.* 50(10). p. 1-17. DOI: https://doi.org/10.1615/JAutomatInfScien.v50.i10.10.
7. KOTLYK, S. (Ed.) (2022). *Transdisciplinary intelligent information and analytical system for the rehabilitation processes support in a pandemic.* Iowa State University Digital Press. DOI: https://doi.org/10.31274/isudp.2022.121.
8. PALAGIN, A. Transdisciplinarity problems and the role of informatics. (2013). Cybernetics and Systems Analysis/ International Theoretical Science Journal. 2013, № 5 – p.3–13. [Online] Available from: http://www.kibernetika.org/volumes/2013/numbers/ 05/articles/01/ArticleDetailsEU.html [Accessed 20 June 2022].
9. PALAGIN, A. Architecture of ontology-driven computer systems. (2006). Cybernetics and Systems Analysis/ International Theoretical Science Journal. 2006, № 2 – p.111–124.
10. PALAGIN, A. An Introduction to the Class of the Transdisciplinary Ontology-controled Research Design Systems. (2016). *Control systems and computers*. 2016. № 6. p. 3–11. [Online] Available from: http://usim.org.ua/?page_id=3025&lang=uk. [Accessed 24 June 2022].

11. PALAGIN, O.V., KURGAEV, O. P. Interdisciplinary scientific research: optimization of system and information support. (2009). Bulletin of the National Academy of Sciences of Ukraine. 2009, № 3, p.14–25 . [Online] Available from: ftp://ftp.nas.gov.ua/akademperiodyka/Downloads/Visnyk_NANU/downloads/2009/3/st3.pdf [Accessed: 23 June 2022].
12. PALAGIN, A.V., PETRENKO, N. G. & KRYVYY, S. L. (2015). On the construction of knowledge-oriented computer systems for scientific research. *Control systems and computers.* 2015. №2. p. 64–73. [Online] Available from: http://usim.org.ua/arch/2015/2/7.pdf [Accessed 22 June 2022].
13. BOOCH G., RUMBAUGH J., JACOBSON I. The Unified Modeling Language User Guide. (2005). Reading, MA, 2005. 475 p.
14. SCHMULLER D. Sams Teach Yourself UML in 24 Hours, Complete Starter Kit. M.: Williams, 2005. 416 c. ISBN 0-672-32640-X.
15. Leonenkov, A. V. Tutorial UML 2. St. Petersburg: BHV-Petersburg, 2007. 576 p. ISBN 978-5-94157-878-8.
16. https://jena.apache.org/documentation/fuseki2/(date of access: 23 June 2022).
17. BOB DUCHARME. Learning SPARQL. Querying and Updating with SPARQL 1.1 (Second edition). (2013) O'Reilly Media, All rights reserved, August 2013. 367p.


## Література


1. Палагін О.В., Петренко М.Г. Знання-орієнтований інструментальний комплекс обробки баз даних наукових публікацій. *Control systems and computers.* 2020. №5. С. 17–33. URL: https://doi.org/10.15407/usim.2020.05.003 (дата звернення: 23.06.2022).
2. Palagin A.V., Petrenko N.G., Velychko V.Yu., Malakhov K.S., 2014. Development of formal models, algorithms, procedures, engineering and functioning of the software system "Instrumental complex for ontological engineering purpose". In: *Proceedings of the 9th International Conference of Programming UkrPROG*. CEUR Workshop Proceedings 1843. Kyiv, Ukraine, May 20-22, 2014. URL: http://ceur-ws.org/Vol-1843/221-232.pdf (дата звернення: 23.06.2022).
3. Палагин А.В., Крывый С.Л., Петренко Н.Г. Онтологические методы и средства обработки предметных знаний. Луганск: изд-во ВНУ им. В. Даля. 2012. 323 с. URL: https://doi.org/10.15407/usim.2020.05.003 (дата звернення: 20.06.2022).
4. Палагін О.В., Малахов К.С., Величко В.Ю., Щуров О.С. Проектування та програмна реалізація підсистеми створення та використання онтологічної бази знань публікацій наукового дослідника. – Проблеми програмування. – 2017. – №2. – С. 72–81. URL: http://dspace.nbuv.gov.ua/browse?value=%D0%92%D0%B5%D0%BB%D0%B8%D1%87%D0%BA%D0% BE%20%D0%92%D0%AE&type=author [дата звернення: 22 June 2022].
5. Palagin O.V., Velychko V.Yu., Malakhov K.S., Shchurov O.S., 2020. Distributional semantic modeling: a revised technique to train term/word vector space models applying the ontology-related approach. In: Proceedings of the 12th International Scientific and Practical Conference of Programming UkrPROG 2020. CEUR Workshop Proceedings 2866. Kyiv, Ukraine, September 15-16, 2020. URL: http://ceur-ws.org/Vol-2866/ceur_342-352palagin34.pdf (дата звернення: 23.06.2022).
6. Palagin A. V., Petrenko N. G. Methodological foundations for development, formation and it-support of transdisciplinary research. *Journal of automation and information sciences*. 2018. Vol. 50, no. 10. P. 1–17. URL: https://doi.org/10.1615/jautomatinfscien.v50.i10.10 (дата звернення: 23.06.2022).
7. Нові інформаційні технології, моделювання та автоматизація: монографія / ред. С. Котлик. Одеса: Екологія, 2022. 724 с. URL: https://doi.org/10.31274/isudp.2022.121 (дата звернення: 15.07.2022).
8. Палагин А.В. Проблемы трансдисциплинарности и роль информатики. Кибернетика и системный анализ. 2013. № 5. С.3–13. URL: http://www.kibernetika.org/volumes/2013/numbers/ 05/articles/01/ArticleDetailsEU.html (дата звернення: 23.06.2022).
9. Палагин А.В. Архитектура онтолого-управляемых компьютерных систем. Кибернетика и системный анализ. 2006. № 2. С.111–124.
10. Палагин А.В. Введение в класс трансдисциплинарных онтолого-управляемых систем исследовательского проектирования. Управляющие системы и машины. 2016. № 6. С. 3–11. URL: http://usim.org.ua/?page_id=3025&lang=uk. (дата звернення: 23.06.2022).
11. О. Палагін, О. Кургаєв. Міждисциплінарні наукові дослідження: оптимізація системно-інформаційної підтримки. Вісн. НАН України. 2009. № 3. С.14–25 . URL: https://doi.org/10.15407/usim.2020.05.003 (дата звернення: 23.06.2022).
12. Палагин А.В., Петренко Н.Г., Крывый С.Л. О построении знание-ориентированных компьютерных систем для научных исследований. УСиМ. 2015. № 2. С. 64–73. URL: https://doi.org/10.15407/usim.2020.05.003 (дата звернення: 23.06.2022).
13. Booch G., Rumbaugh J., Jacobson I. The Unified Modeling Language User Guide. Addison-Wesley. Reading. MA. 2005. 475 p.
14. Шмуллер Д . Освой самостоятельно UML 2 за 24 часа. Практическое руководство. Sams Teach Yourself UML in 24 Hours, Complete Starter Kit. М.: Вильямс, 2005. 416 с. ISBN 0-672-32640-X.
15. Леоненков А. В. Самоучитель UML 2. СПб.: БХВ-Петербург, 2007. 576 с.: ил.ISBN 978-5-94157-878-8.
16. https://jena.apache.org/documentation/fuseki2/(date of access: 23.06.2022).
17. Bob DuCharme. Learning SPARQL. Querying and Updating with SPARQL 1.1 (Second edition), O'Reilly Media, All rights reserved, August 2013. 367p.


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