Ontology Model and Ontological Graph for Development of Decision Support System of Personal Socialization by Common Relevant Interests

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Abstract

Today, due to the extended worldwide pandemic, socialization of persons with same interests is an enormously crucial step in isolating people. Moreover, most individuals are always attempting to simplify and automate all of the essential everyday routines that use a significant amount of free time. The same may be said about the individual's socialization process. In the situation of decision support system (DSS) development and large data analysis, machine learning and SEO technologies are presently increasingly significant. Almost any DSS that has a substantial user base employs proper socializing method. In this example, a unique algorithm based on Levenstein's algorithm, sample extension, N-grams, and the Noisy Channel model was developed. Based on current Levenstein algorithms, sample expansion, N-grams, and the Noisy Channel model, the researchers developed a new algorithm for assessing user information and determining the most apposite IP users based on the inspected text of profile messages. A active socialization DSS was created using an asynchronous programming framework. The convolutional neural network was upgraded, allowing for more effective searching for human faces in photos and checking for existent persons in the DSS database. The DSS will enable efficient and quick text data selection, analysis, processing, and final result generation. For systematic and high-quality intelligent search and processing of applicable information for the needs of a specific user, the DSS employs SEO technologies. By using a neural network, you may accurately identify a user based on his photo. The methods employed in general allow you to develop a convenient DSS socialization employing the relevant techniques. It is worth mentioning the importance of optimizing the current DSS; first and foremost, it is total asynchrony of system, which will eliminate any long waits and difficulties in processing and analyzing requests; second, the system allows efficient and active work with various volumes of large data. DSS users require more data. We also use the cloud platform, which allows for data dispersion. For example, all of the most challenging data may be stored in the cloud environment, and all of the necessary data can be downloaded using a simple basic DSS interface with data queries. As a result, it can be claimed that the development of this DSS is critical both in terms of societal impact and in terms of executing all of the algorithms that the DSS requires.

Keywords

Ontology, Levenshtein distance, Convolutional neural network, Social network, Noisy Channel model, Siamese neural network, Fuzzy search.

1. Introduction

Developing an intelligent personal socialization system is a critical task since, in today's society, individuals are attempting to optimize all life activities in order to save time and, as a result, spend that time more effectively. Users, rather than other people, prioritize programs that save user's time,

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optimize work, and are automated enough to conduct most activities while searching for certain applications. The information system combines two fundamental tasks: user socialization and socialization process improvement and automation. Because no such system exists today, developing an intelligent system that allows for fast analysis and user selection is a critical challenge. On the Internet, social systems will improve the process of locating and meeting individuals. To put this system together, you'll need to search for human faces in photographs using a convolutional neural network. To assess user data and build a list of relevant users, a fuzzy search algorithm and a noisy channel model are also necessary. The most significant issue in effectively creating an intelligent social system of persons with mutual interests is to properly comprehend and conduct the process of user socialization.

2. Related Works

Today, due to the extended worldwide pandemic, socialization of persons with same interests is an enormously crucial step in isolating people. Moreover, most individuals are always attempting to simplify and automate all of the essential everyday routines that use a significant amount of free time. There are several articles on this theme, for example, [1-2], in which the author suggests a new social network client ranking system and a flexible network model to support user interaction, and in which the author suggests a system to improve information aggregation and classification in social networks. The authors of publications [3] and [4] recommend that social networks be improved in their capacity to analyse user data and develop user characteristics, as well as in recognizing commonalities between users and then identifying correlations. Following searches for information on social networks all happen at the same time. When comparing the benefits of intelligent systems to comparable systems, it's worth noting that there are just a handful [6-10], including Tinder and Badoo. The system is related to them in that it employs a convolutional neural network to find comparable users and to identify system users [7]. Tinder and Badoo have the most restricted social features, enabling you to filter persons by gender, age, and area without optimizing or saving more time for socializing [11-17].

3. Materials and Methods

Individual socialization systems with similar interests based on SEO technology and machine learning methods have an exterior nature, which includes users and their four fundamental internal organisms: browsers, system controllers, databases, and system services, according to system analysis.

The external entity and the internal entity are always interacting during the operation of the system, so when the system initializes the external entity, the user accesses the system via the internal entity, the browser. If the user is already registered or otherwise registered, the browser entity authorizes current user in the midst of the system, and authorisation and registration are completed using the internal instance system controller. During the session, the system controller instance transmits a session token to the browser object and saves the current token in the browser. The User then uses the Browser object to submit a photo to authenticate it, which is subsequently added to the System Controller object. The essence of the System Controller checks for the presence of a face in the User's photo and searches the system for comparable images [18-32], after which the essence of the System Controller saves all received user data and transmits the created data to another internal object. After that, the Database entity saves all of the information using the System Service's internal essence, and the System Service processes it and generates a list of the system's unique users. The fuzzy search algorithms utilize the System Service entity to produce a list of users based on present user data, and the fuzzy search algorithms to use System Service entity to examine the data of users now operating within the system and other registered users.

It's made by decreasing the amount of overlap between users' interests. The System Service's subject then performs a last check of the incoming data for the existence of damaged or erroneous data before saving it with the Database entity. The data created by the Database entity is subsequently sent to the User object via the user's query. Using the basis of the Service system, the user evaluates the offered information and picks the user profile that he likes most.

Next, the core of the User is to exploit another user's advantage so that another system user may see that the present user has picked him. Once the configuration procedure is complete, the system service

entity starts communicating with the other user, forming a dialog box that is recorded as stored knowledge with the system controller and repository entities and exists as a stream of stored messages within the system. A session that runs on the system to automatically display all user messages and information, as well as a session which starts at a set time to display data. Because one of the most essential components of the system is the protection of users and the security of needed information, the System Service entity makes a request to the core of the Database to validate the availability of data. In the event of specific data processing issues, it is also required to enable entirely asynchronous analysis and information transfer for the program's fastest functioning, allowing users to use the system as rapidly as possible. It's also worth paying much more attention to the database's essence, because dealing with data is a critical component of the system, and how this object should operate and what components it should have, in this instance, internal, should be properly studied. The database's essence is made up of seven primary components that will allow you to handle user data safely and fast, namely: Check for backup files and validate the data; Data saving dialog box for the user; Make a data packet with the information you've gathered so far; Verify if the request is valid; On request, send data. The System Controller entity then proposes a system provider and an asynchronous data entity. The system service entity employs dynamic events to continually monitor the status of the system in which it lives and responds to any system changes at any given moment, and the essence of the System Service periodically examines the system for faults in exceptions that have not been recorded in the system log and attempts to repair them or sends logs to the System Controller for further processing in a separate thread. It's also required to go through the functions of the System Controller in further depth, which include: Data processing for users; Data processing for systems; Data verification; Checking the session's availability; Identifiers must be verified; Show the error message; Checking for updates; Saving system links; Checking user tokens. It is also required to discuss the essence of the Service system in further depth, which includes the following functions: Generating a user list; Using algorithms to analyse a list; Calculating a percentage; Processing user interaction; Create a message flow; Process the message flow; Create individual markers. It's also required to go over the substance of the browser, which isn't fundamental but does have the following features: Authorization; Registration; Token storage; Session monitoring; User messages are shown; Custom messages are read; A photo of the user is added; Send requests to the server from users; Client Error Display. After generating a message flow request, the current system service object sends a system controller entity request to the system service object, which asks a new dialog token, and the system service object sends a current token with information about the current session. Following that, the System Controller's Essence, via the Browser essence, presents the User essence's created dialog, after which the User can either continue working or log out. We describe classes, subclasses, property-relations, and property-data based on ontology approach [33-41].

4. Experiment

Figures 1-18 show the screenshots of the program screens one with a description of the class, properties-relationships and data-properties, OWLViz and OntoGraf ontology graphs, showing the execution and saving of the program using Turtle Syntax. Figure 1 shows the main program window and all open tabs needed to create the ontology: active ontology, entities, classes, objects, relationship properties, data properties, OWLViz and OntoGraf and SPARQL query ontology graphs, and Figure 2 shows the format selection save ontology - RDF / XML Syntax. Figure 3 shows the ontology URI and the basic types of information needed to create an ontology. Figure 4a shows the main classes of ontology, all of which inherit the class Thing, the ontology consists of the following classes: User, Album, Photo, Comment, MainComment, SubComment, Tag, Dialog, Message, Relation, Type, Friend, Best, Common, Post, Picture, Rate, Text, MainText, SubText, TextTag, Role, Admin, CommonUser, Moderator, UpUser, PremiumUser, VipUser. Figure 4b shows the add-property property, its Domains, and Ranges, which can be thought of as one-to-many, such as User add Photo or User add Friend. Figure 5a shows the property-relationship has, its Domains and Ranges, conditionally it can be represented as a relationship one to many, for example Post has Picture - The publication has a picture. Figure 5b shows the property-relationship is, its Domains, and Ranges, which can be thought of as one-to-many, such as Comment is SubComment.

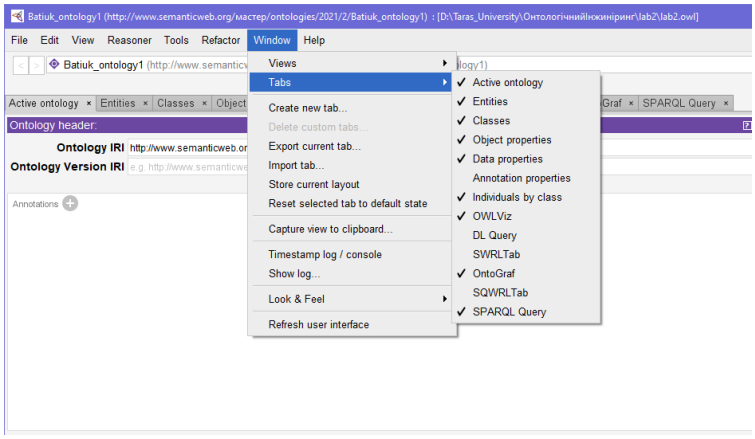


Figure 1: The main program window

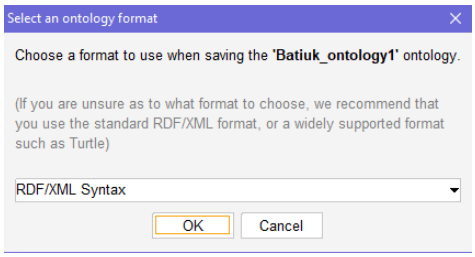


Figure 2: Choice of ontology format

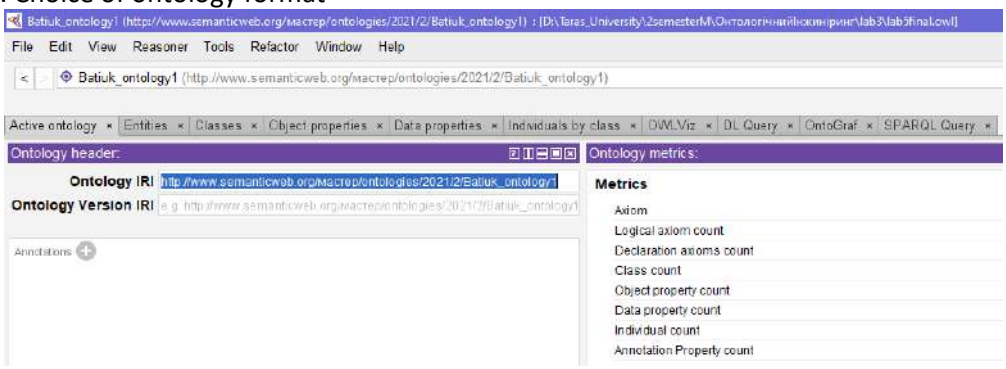
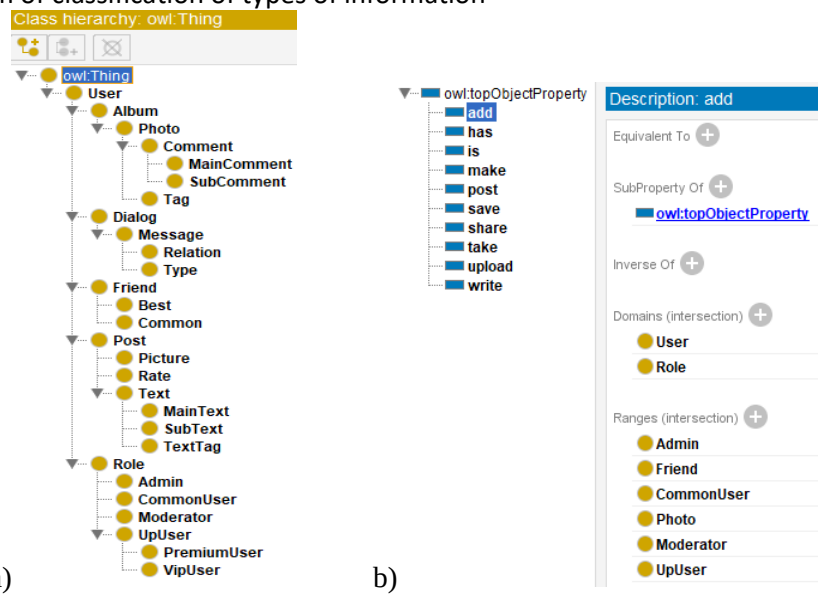


Figure 3: Diagram of classification of types of information



a) b)

Figure 4: a) Hierarchy of ontology classes and b) Property-relationship «add»

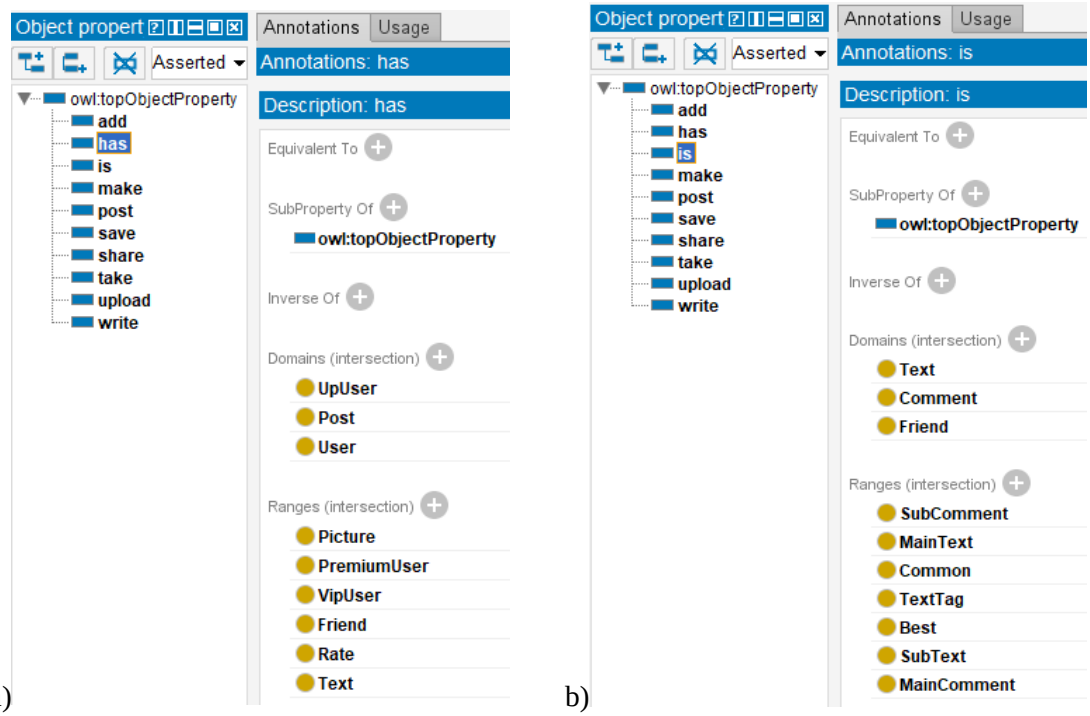


Figure 5: a) Property-relationship «has» and b) Property-relationship «is»

Figure 6a shows the property-relationship make, its Domains and Ranges, conditionally it can be represented as a relationship one to many, for example Admin make Message - The administrator creates a message. Figure 6b shows the property-relationship of the post, its Domains and Ranges, conditionally it can be represented as a relationship one to many, for example Moderator post Album - Moderator publishes Album.

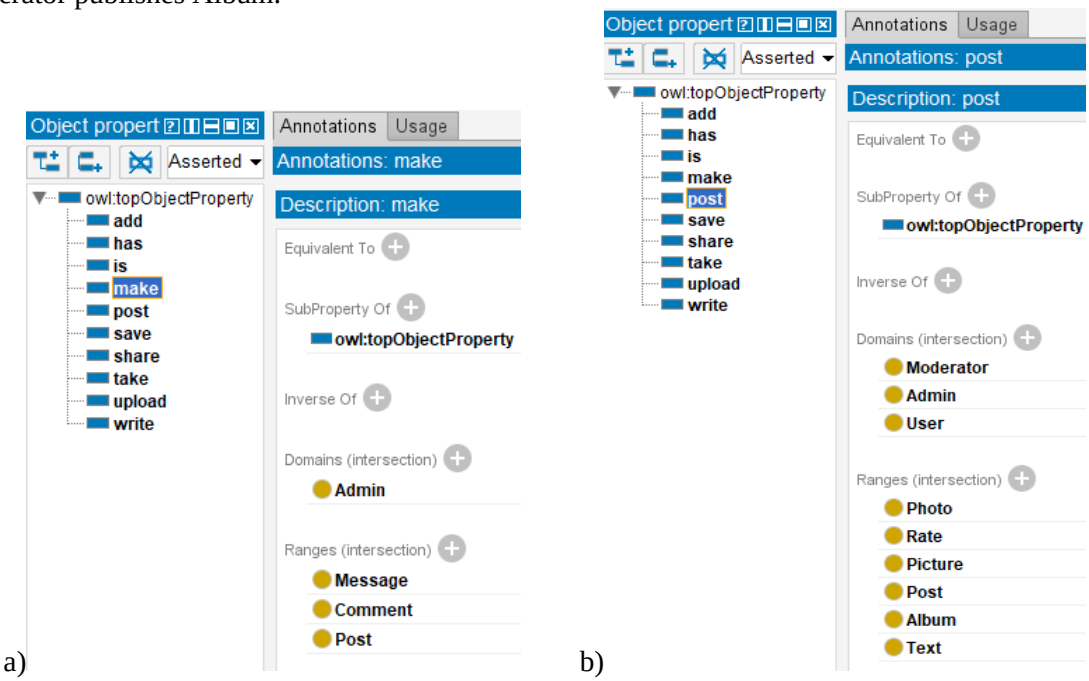


Figure 6: a) Property-relationship «make» and b) Property-relationship «post»

Figure 7a shows the property-relationship save, its Domains and Ranges, conditionally it can be represented as a relationship one to many, such as Friend save Message - Friend saves the Message.

Figure 7b shows the property-relationship share, its Domains and Ranges, conditionally it can be represented as a relationship one to many, for example User share Comment - User shares Comment.

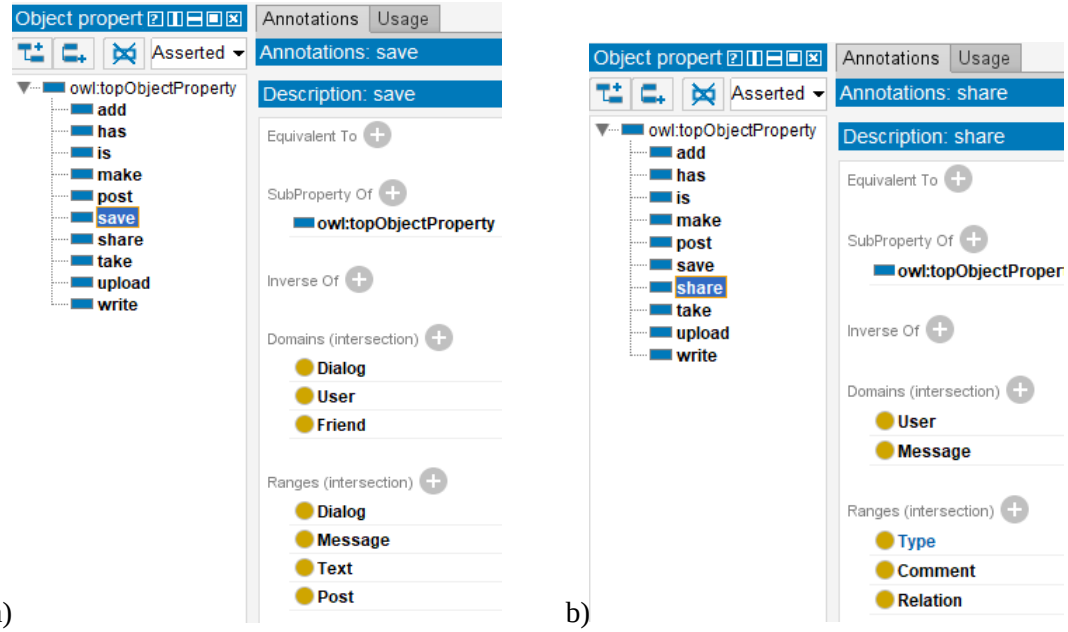


Figure 7: a) Property-relationship «save» and b) Property-relationship «share»

Figure 8a shows the take-property property, its Domains, and Ranges, which can be thought of as one-to-many, such as Friend take Photo. Figure 8b shows the property-relationship upload, its Domains and Ranges, conditionally it can be represented as a relationship one to many, such as Admin upload Tag - Admin uploads Tag.

Figure 9a shows the property-relationship write, its Domains and Ranges, conditionally this can be represented as a relationship one to many, for example User write MainText - User writes Main Text.

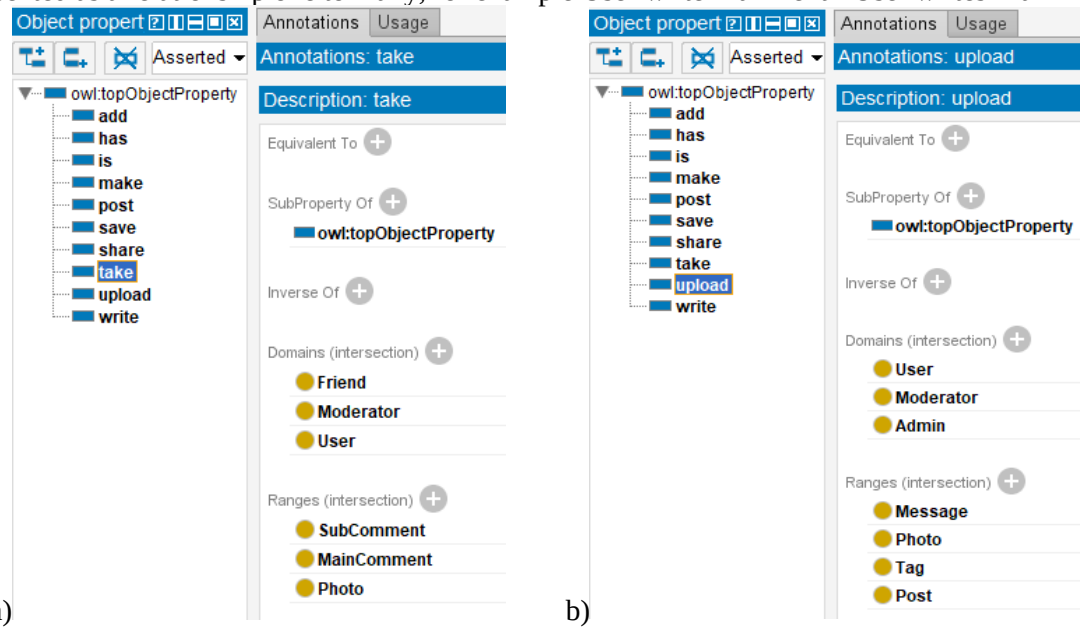
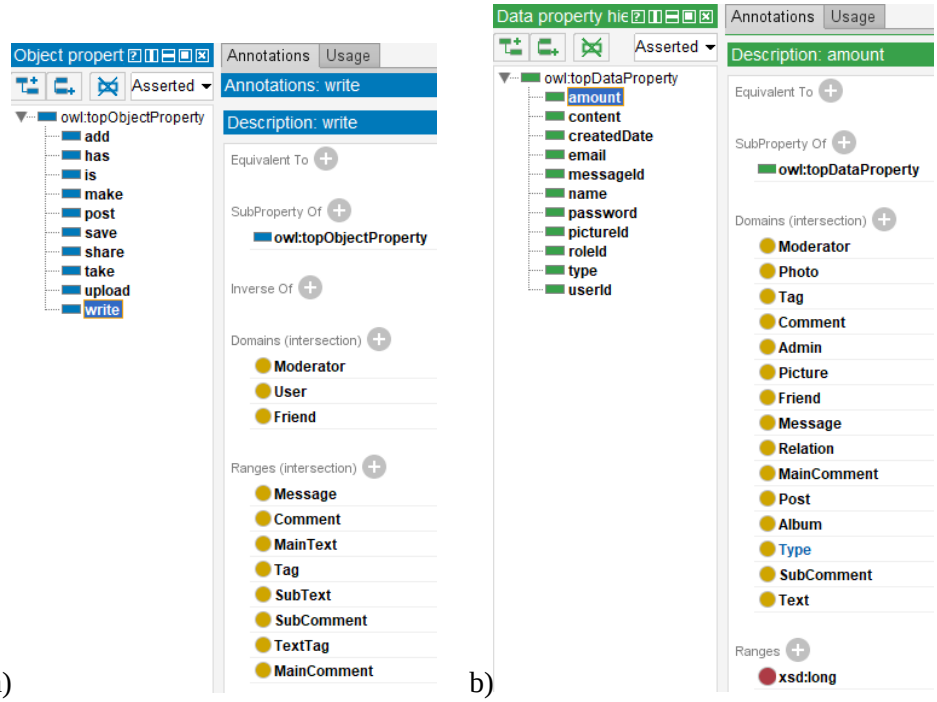


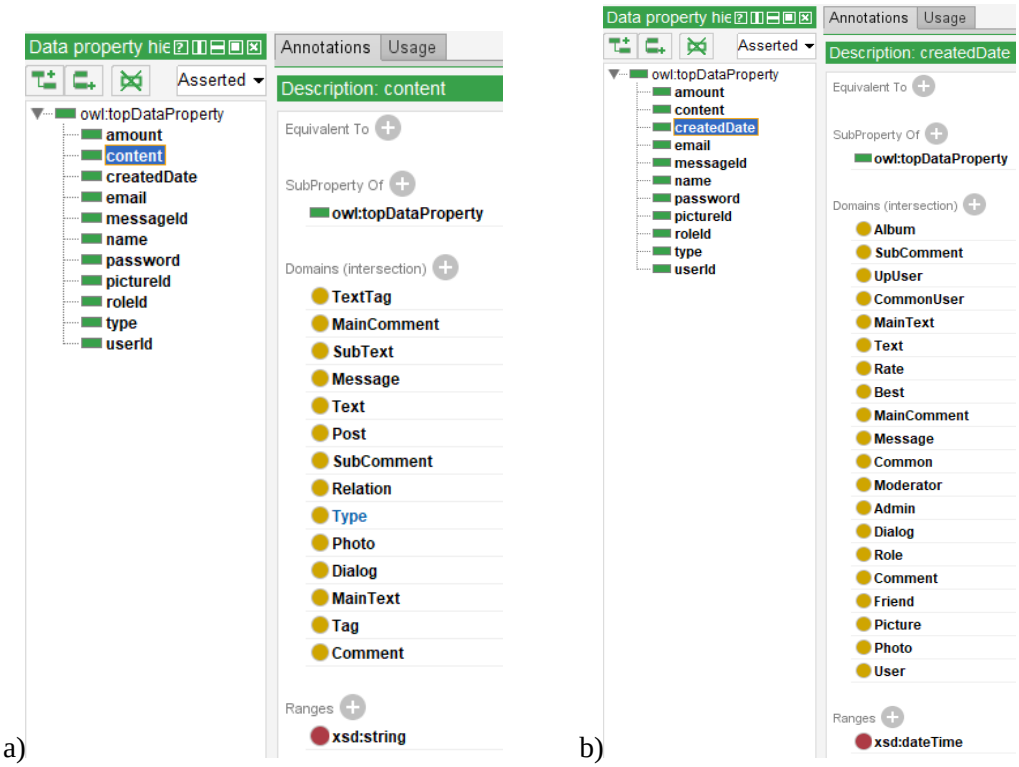
Figure 8: a) Property-relationship «take» and b) Property-relationship «upload»

Figure 9b shows the amount property-data, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, amount - Quantity has data type long. Figure 10a shows the data property property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, content - Content has a data type string. Figure 10b shows the data property createdDate, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, createdDate - Date created has data type dateTime.



a) b)

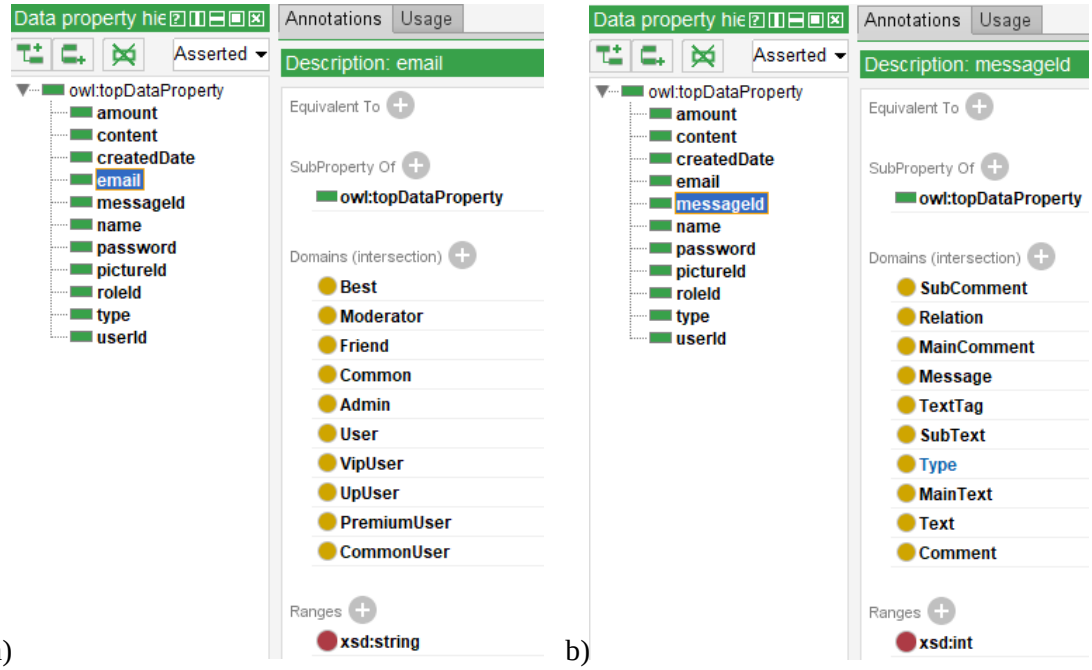
Figure 9: a) Property-relationship «write» and b) Property-data «amount»



a) b)

Figure 10: a) Property-data «content» and b) Property-data «createdDate»

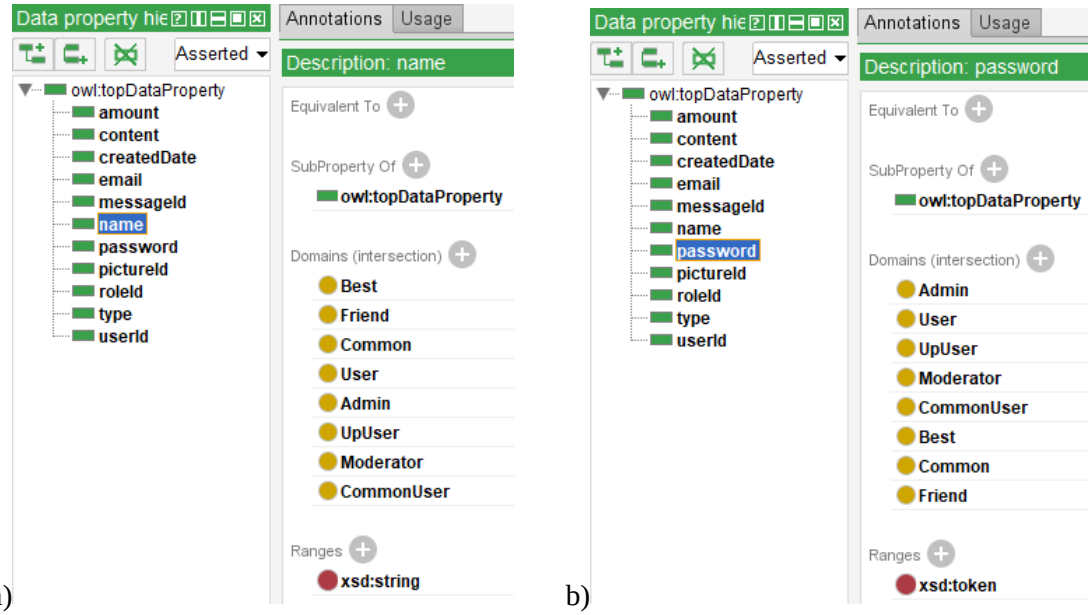
Figure 11a shows the email data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, email - Email has the data type string. Figure 11b shows the messageId data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, messageId - The message ID has the data type int.



a) b)

Figure 11: a) Property-data «email» and b) Property-data «messageId»

Figure 12a shows the data property name, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, name - The name has a data type string. Figure 12b shows the password data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, password - The password has a token data type.



a) b)

Figure 12: a) Property-data «name» and b) Property-data «password»

Figure 13a shows the pictureId data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, pictureId - Image ID has data type int. Figure 13b shows the roleId data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, roleId - Role ID has data type int.

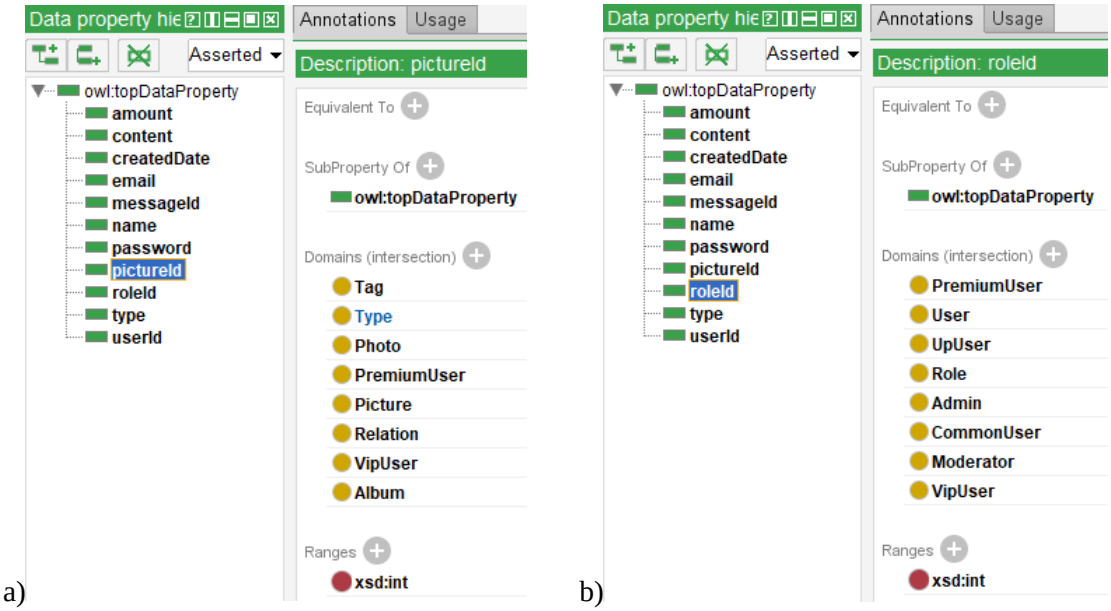


Figure 13: a) Property-data «pictureId» and b) Property-data «roleId»

Figure 14a shows the data property type, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, type - Type has a string data type. Figure 14b shows the userId data property, its Domains and Ranges, Domains the classes that contain the data property, and Ranges the type of data that will be stored in the data property. For example, userId - User ID has data type int.

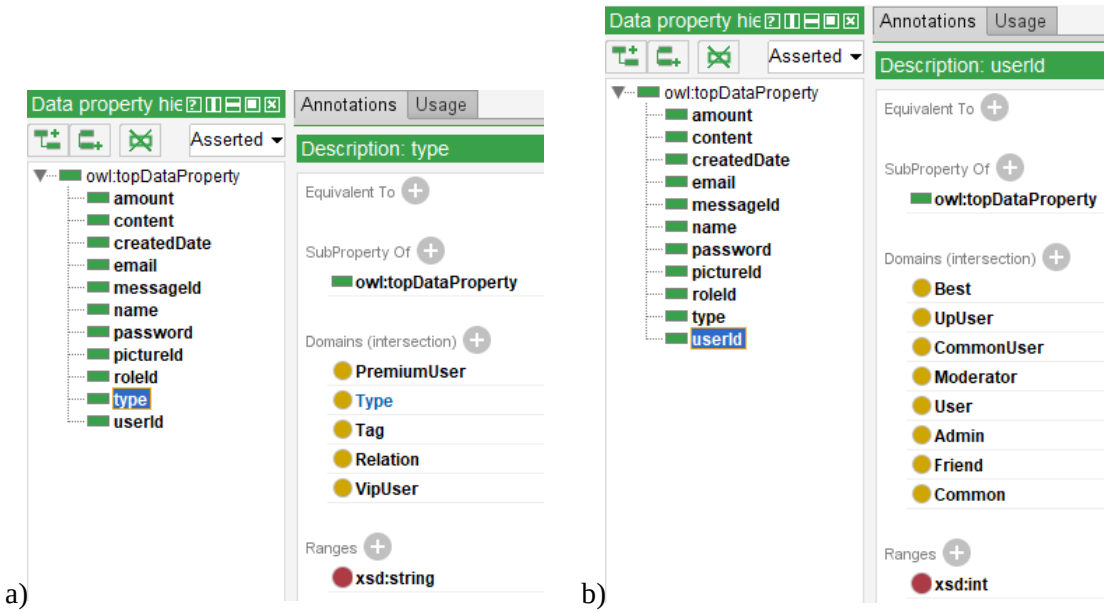


Figure 14: a) Property-data «type» and b) Property-data «userId»

Figure 15 shows the OntoGraf ontology graph, which shows all available ontology relationships and also shows the dependence of classes and their instances (objects), and Figure 16 shows the OWLViz ontology graph showing the general view of ontology classes. Figure 17 shows the operation of the Reasoner mechanism, which is responsible for running the existing ontology and checking for errors, Figure 18 shows the preservation of the ontology in another format, namely Turtle syntax.

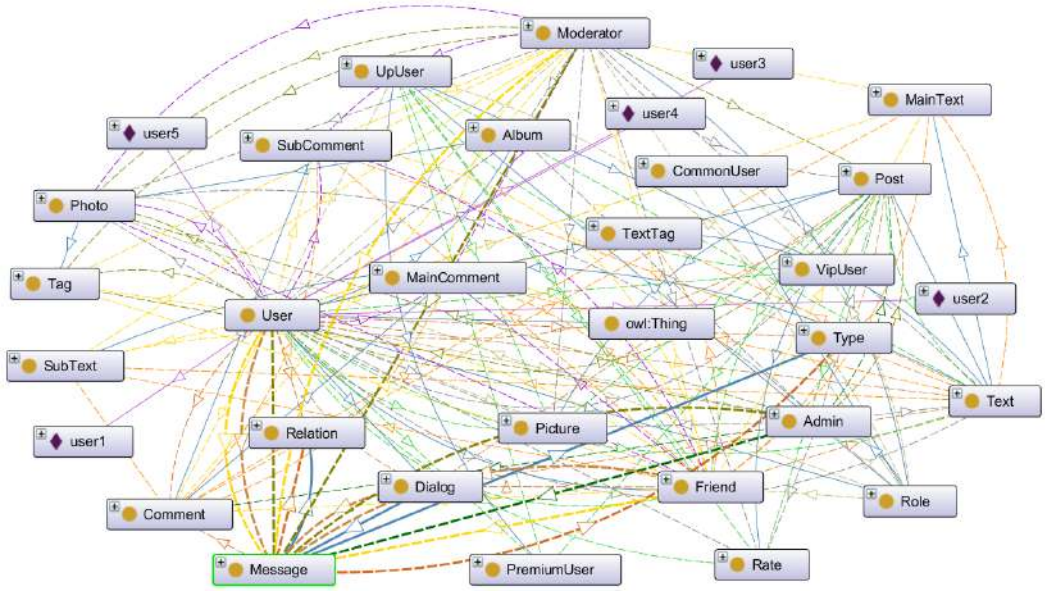


Figure 15: OntoGraf ontology graph

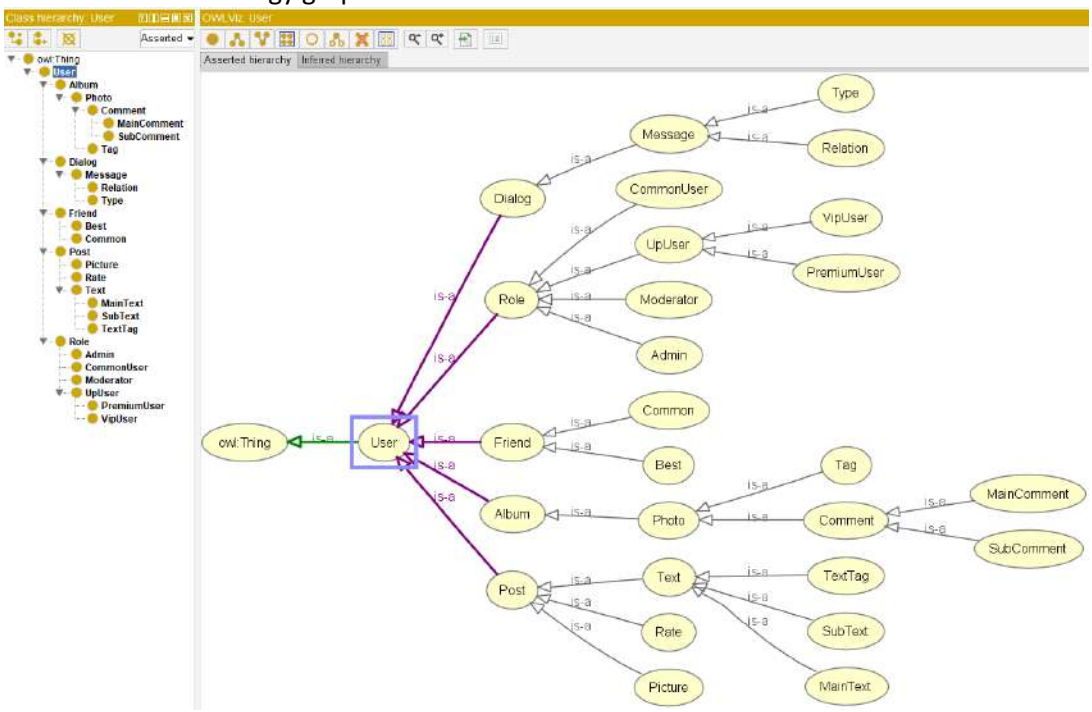


Figure 16: OWLViz ontology graph

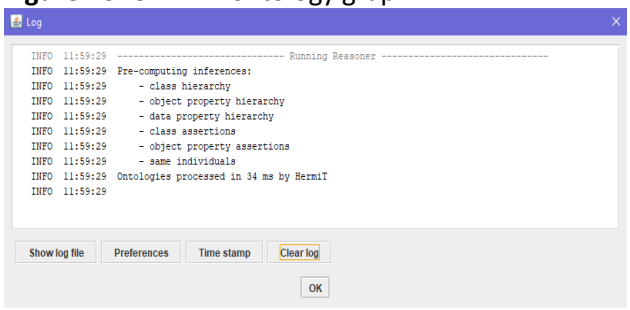


Figure 17: «Reasoner» Work

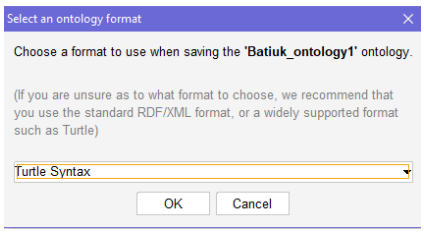


Figure 18: Preservation of ontology in "Turtle syntax" format

The listing presents the text of the ontology saved in "RDF / XML" format:

```
<?xml version="1.0"?>
<rdf:RDF xmlns="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1"
xml:base="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1"
     xmlns:owl="http://www.w3.org/2002/07/owl#"
     xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
     xmlns:xml="http://www.w3.org/XML/1998/namespace"
     xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
     xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
     xmlns:Batiuk_ontology1="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#">
    <owl:Ontology rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1"/>
        <owl:ObjectProperty rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#add">
        <rdfs:subPropertyOf rdf:resource="http://www.w3.org/2002/07/owl#topObjectProperty"/>
        <rdfs:domain rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Role"/>
        <rdfs:domain rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Admin"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#CommonUser"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Friend"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Moderator"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Photo"/>
        <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#UpUser"/>
        <rdfs:comment>Add content</rdfs:comment>
    </owl:ObjectProperty>
    <owl:ObjectProperty rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#has">
      <rdfs:range rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#VipUser"/>
        <rdfs:comment>Content</rdfs:comment>
    </owl:ObjectProperty>
     <rdfs:domain rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Comment"/>
        <rdfs:domain rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Friend"/>
       <rdfs:domain rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Text"/>
```

5. Results

Fig. 19-32 show screens of instances of ontological model classes (indicating class, relationship properties, data properties). Fig. 19a shows instance of the User class - user1, its properties-relationships and properties-data, for example user1 post post1 - user1 published post1, user1 password 12345 - user1 has password 12345.

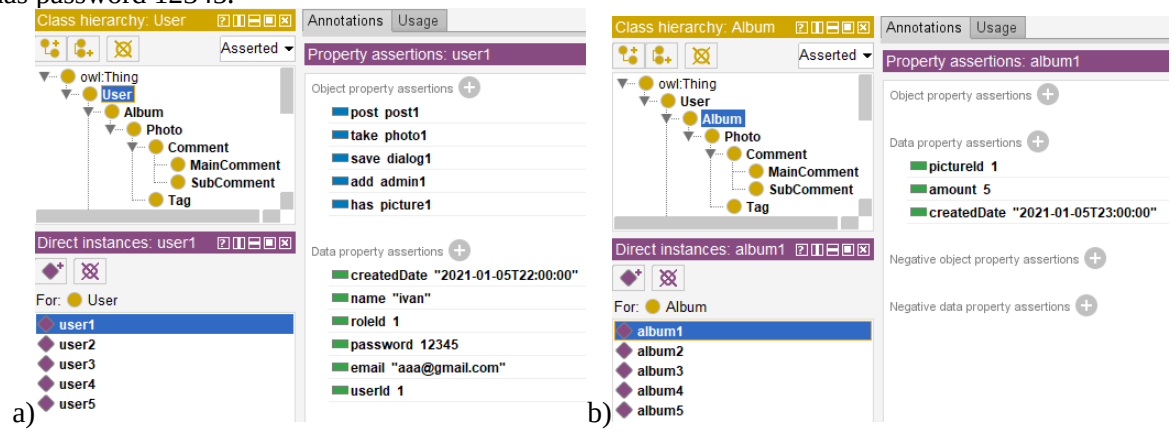


Figure 19: a) An instance of the class «user1» and b) An instance of the class «album1»

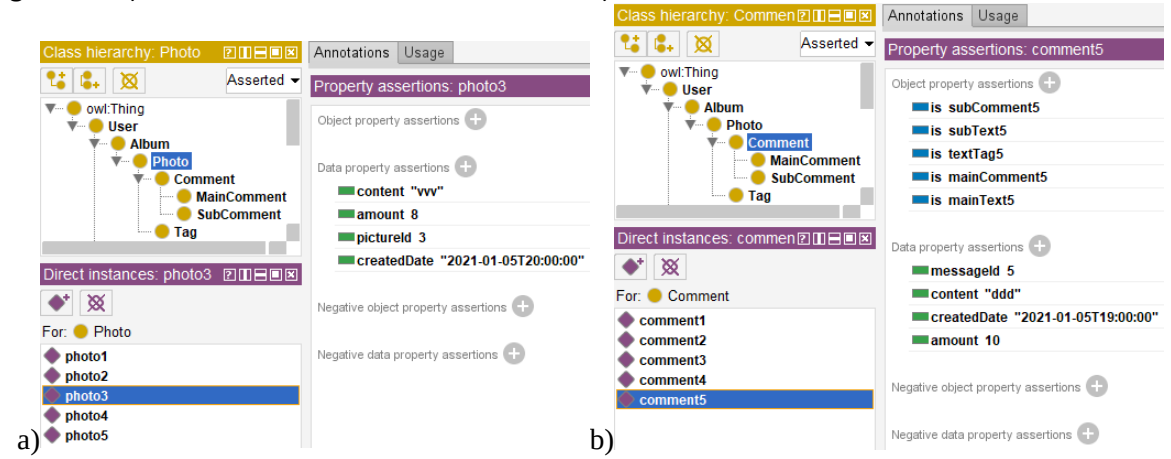


Figure 20: a) An instance of the class «photo3» and b) An instance of the class «comment5»

Fig. 19b shows an instance of the Album class - album1, showing its relationship-properties and data-properties, for example album1 pictureId 1 - album1 has Picture ID 1. Fig. 20a shows an instance of the Photo class - photo3, showing its relationship properties and data properties, for example photo3 content - photo3 has a photo caption. Fig. 20b shows an instance of the Comment-comment5 class, its relationship-properties and data-properties, for example comment5 is subText5, comment5 content "ddd". Fig. 21a shows an instance of the MainComment class - mainComment2, showing its relationship properties and data properties, such as mainComment2 amount 2. Fig. 21b shows an instance of the SubComment class - subComment3, its relationship properties and data properties, such as subComment3 amount 3.

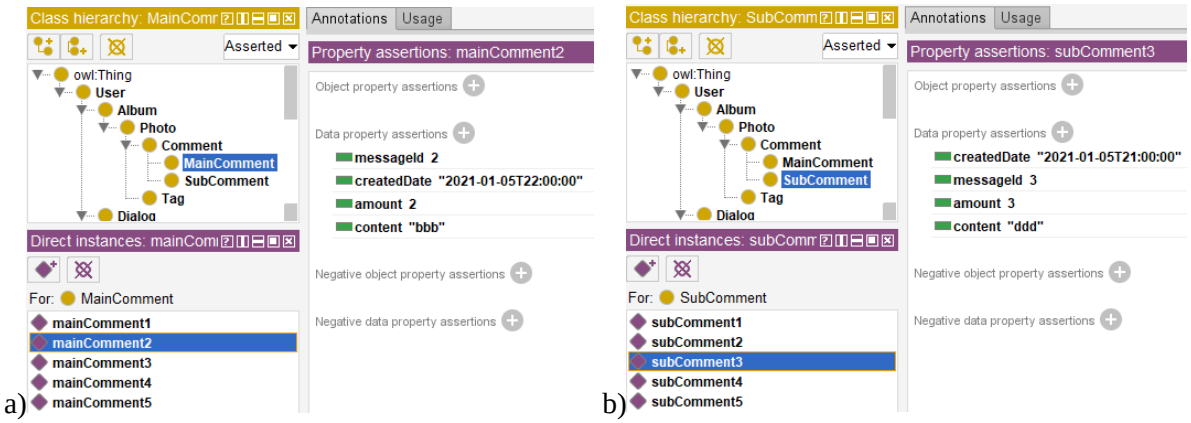


Figure 21: An instance of the class a) «mainComment2» and b) «subComment3»

Fig. 22a shows an instance of the Tag class - tag1, shows its properties-relationships and properties-data, such as tag1 pictureId 1. Fig. 22b shows an instance of the Dialog class - dialog1, its relationship properties and data properties, such as dialog1 save text1, dialog1 createdDate "2021-01-05".

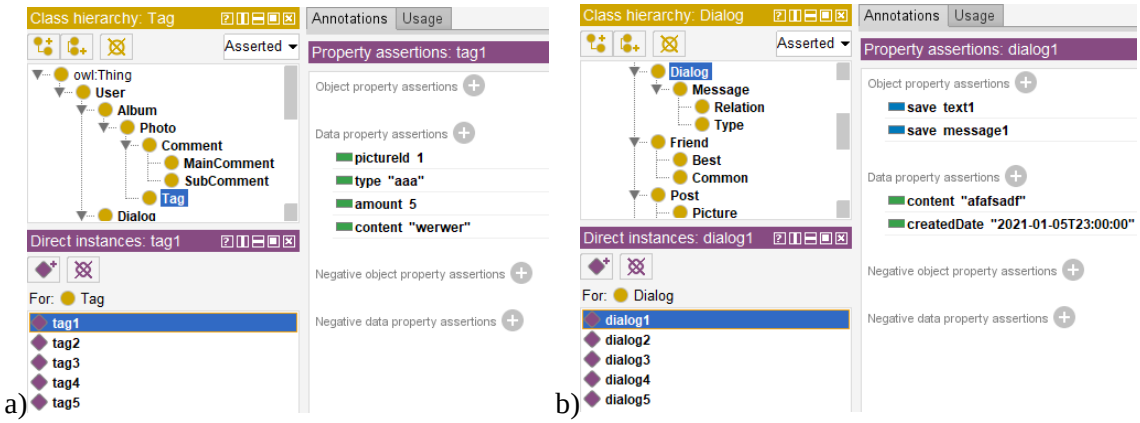


Figure 22: An instance of the class a) «tag1» and b) «dialog1»

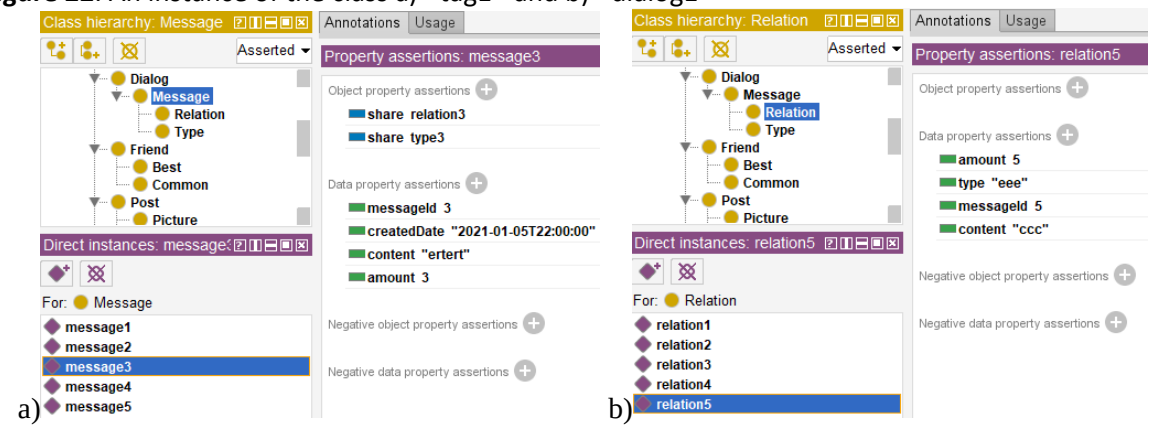


Figure 23: An instance of the class a) «message3» and b) «relation5»

Fig. 23a shows an instance of the Message-message3 class, showing its relationship properties and data properties, such as message3 share relation3, message3 messageId 3. Fig. 23b shows an instance of the Relation class - relation5, its relationship-properties and data-properties, such as relation5 type “eee”. Fig. 24a shows an instance of the Type class - type1, its property-relationship and property-data, such as type1 pictureId 1. Fig. 24b shows an instance of the Friend class - friend1, showing its relationship properties and data properties, such as friend1 is common1, friend1 name “david”.

Figure 25a shows an instance of the Best class - best1, its relationship properties and data properties, such as best1 email “a@gmail.com”. Figure 25b shows an instance of the Common class - common1, its property-relationship and property-data, such as common1 createdDate “2021-01-05”.

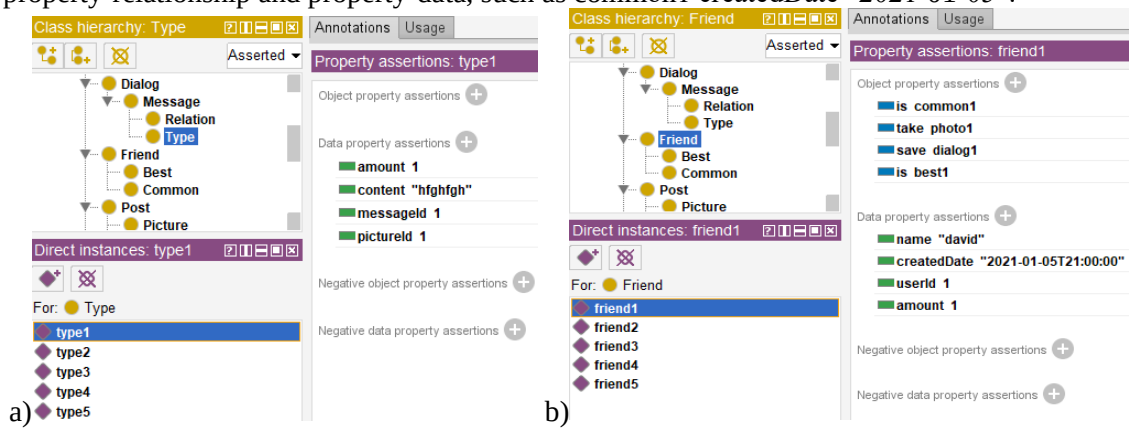


Figure 24: An instance of the class a) «type1» and b) «friend1»

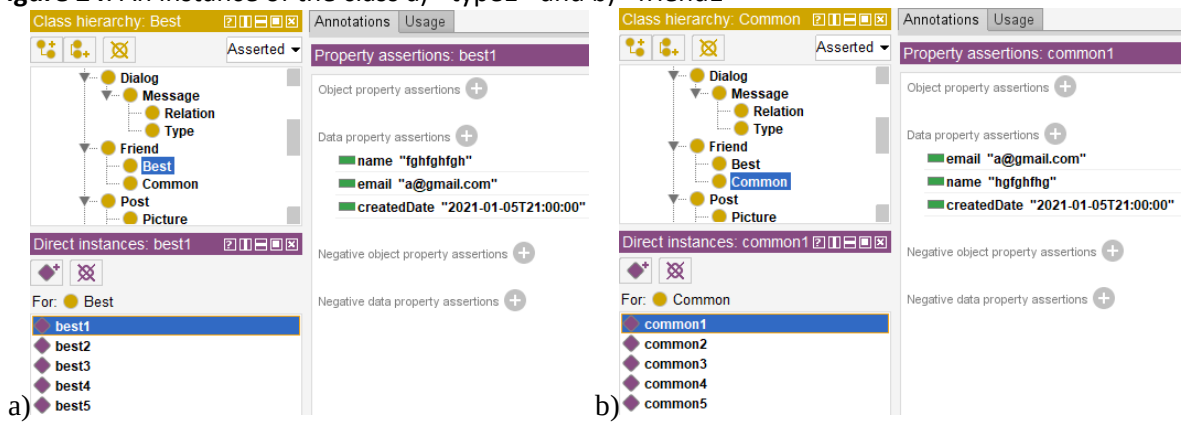


Figure 25: An instance of the class a) «best1» and b) «common1»

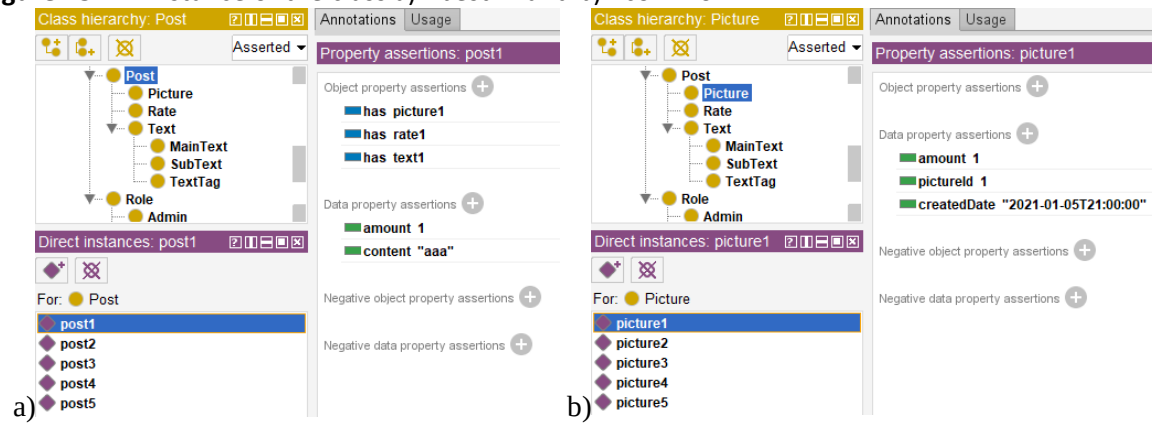


Figure 26: An instance of the class a) «post1» and b) «picture1»

Figure 26a shows an instance of the Post class - post1, its relationship-properties and data-properties, for example post1 has picture1, post1 amount 1. Figure 26b shows an instance of the Picture class - picture1, its relationship-properties and data-properties, such as picture1 amount 1. Figure 27a shows an instance of the Rate class - rate4, its relationship-properties and data-properties, such as rate4

createdDate “2021-01-05”. Figure 27b shows an instance of the Text-text2 class, its relationship-properties, and data-properties, such as text2 is subText2, text2 messageId 2.

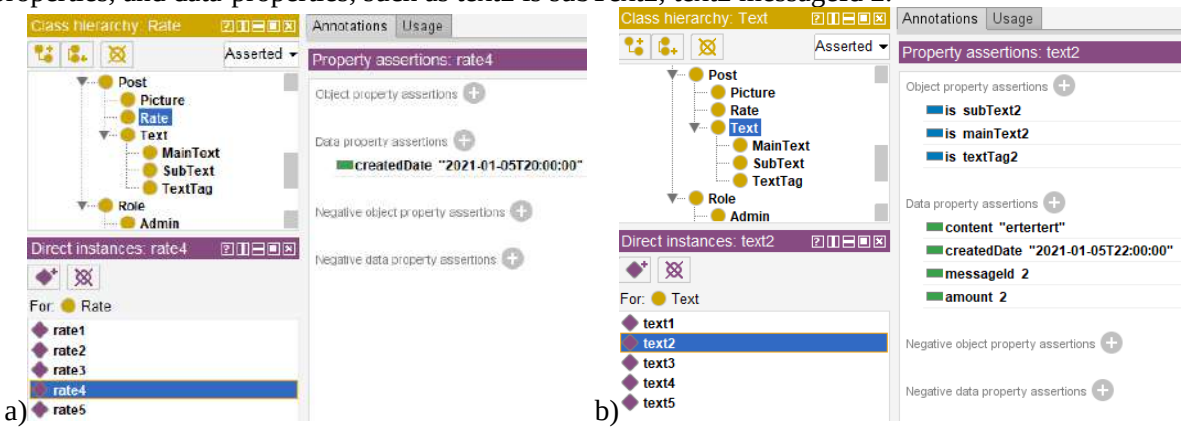


Figure 27: An instance of the class a) «rate4» and b) «text2»

Figure 28a shows an instance of the MainText class - mainText3, its relationship-properties and data-properties, such as mainText3 createdDate “2021-01-05”. Figure 28b shows an instance of the SubText class, subText5, and its relationship properties and data properties, such as subText5 messageId 5. Figure 29a shows an instance of the TextTag class - texTag1, its relationship-properties and data-properties, such as texTag1messageId 1. Figure 29b shows an instance of the Role class - role1, its property-relationship and property-data, such as role1 add admin1, role1 roleId 1.

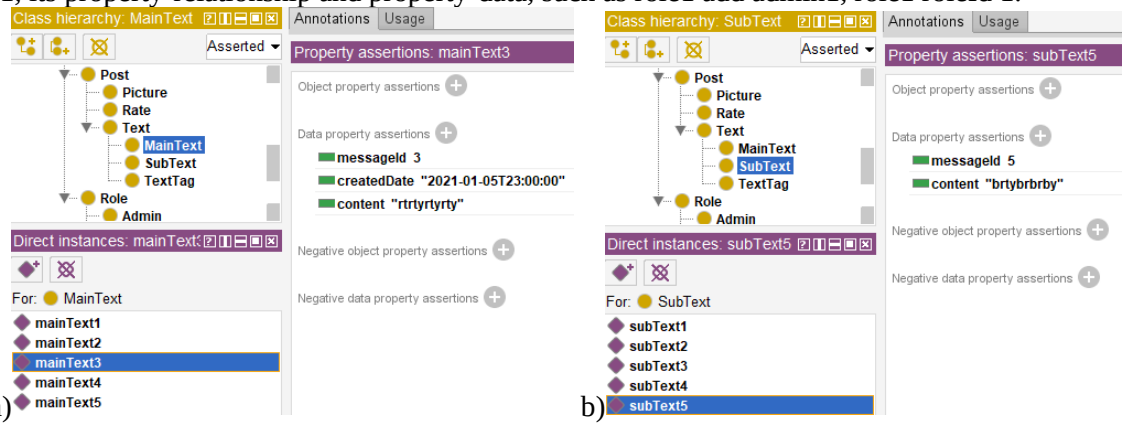


Figure 28: An instance of the class a) «mainText3» and b) «subText5»

Figure 30a shows an instance of the Admin class - admin3, its properties-relationships and properties-data, such as admin3 post rate3, admin3 password 2222. Figure 30b shows an instance of the CommonUser class - commonUser2, its relationship-properties and data-properties, such as commonUser2 createdDate “2021-01-05”.

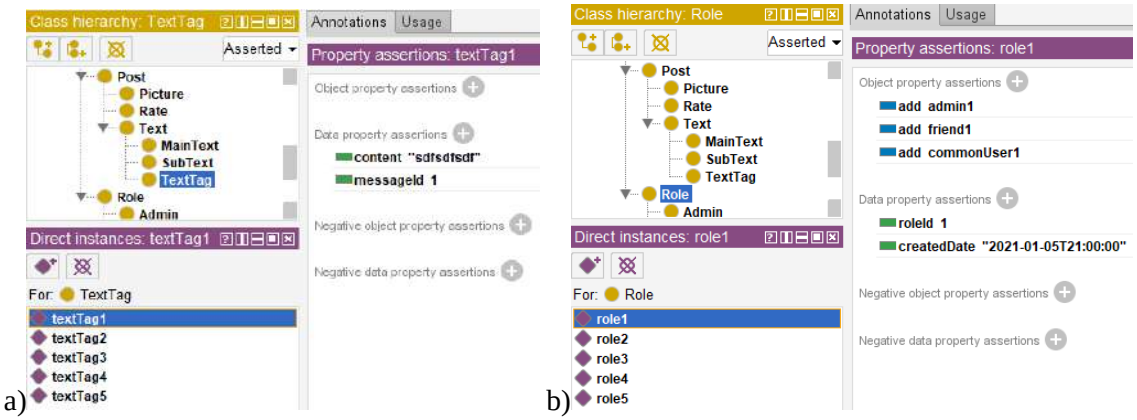


Figure 29: An instance of the class a) «tagText1» and b) «role1»

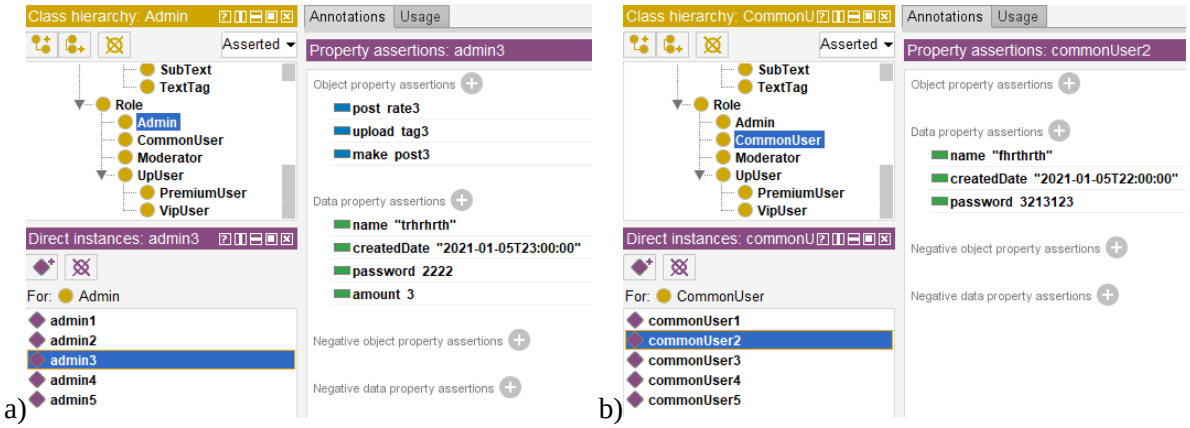


Figure 30: An instance of the class a) «admin3» and b) «commonUser2»

Figure 31a shows an instance of the Moderator class - moderator3, its properties-relationships and properties-data, such as moderator3 write tag3, moderator3 password 3221. Figure 31b shows an instance of the UpUser class - upUser2, its relationship-properties and data-properties, for example upUser2 has picture2, upUser2 email “b@gmail.com”.

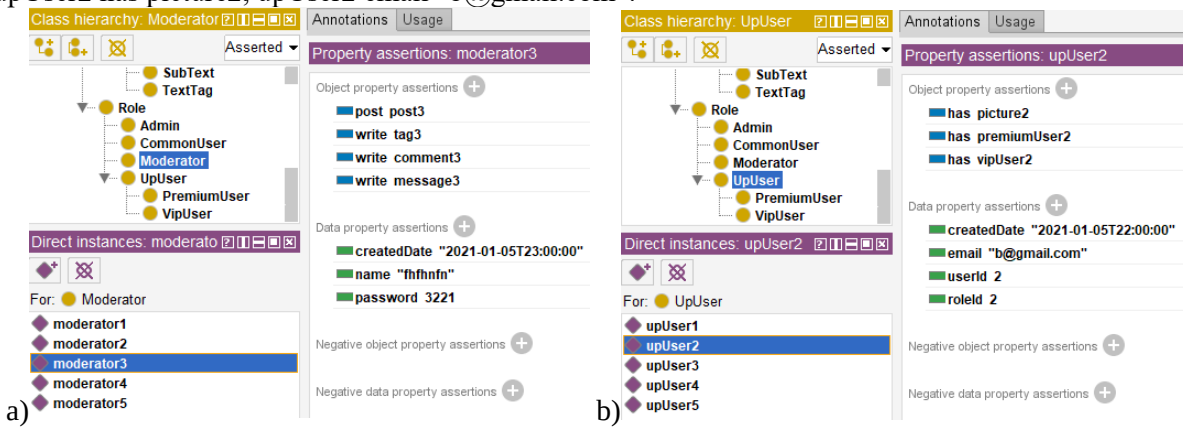


Figure 31: An instance of the class a) «moderator3» and b) «upUser2»

Figure 32a shows an instance of the PremiumUser class - premiumUser1, its relationship-properties and data-properties, such as premiumUser1 roleId 1. Figure 32b shows an instance of the VipUser class - vipUser3, its relationship-properties and data-properties, such as vipUser3 type 3.

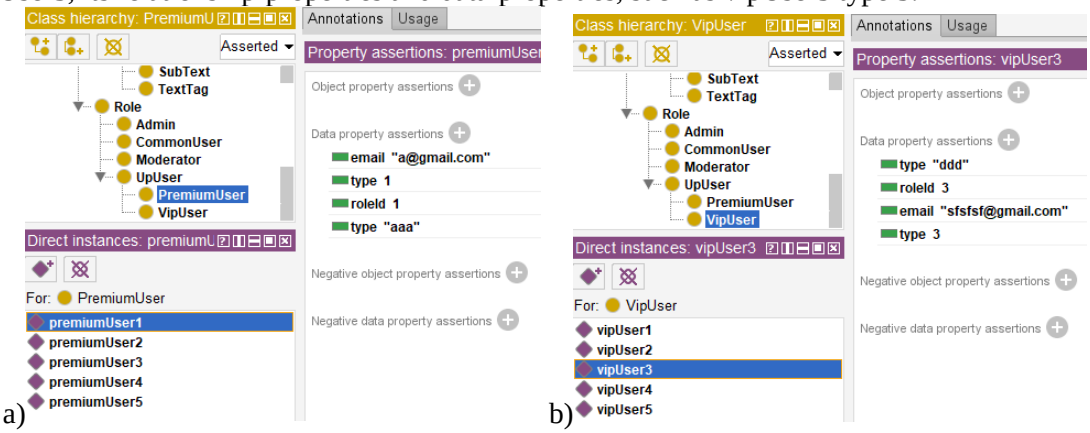


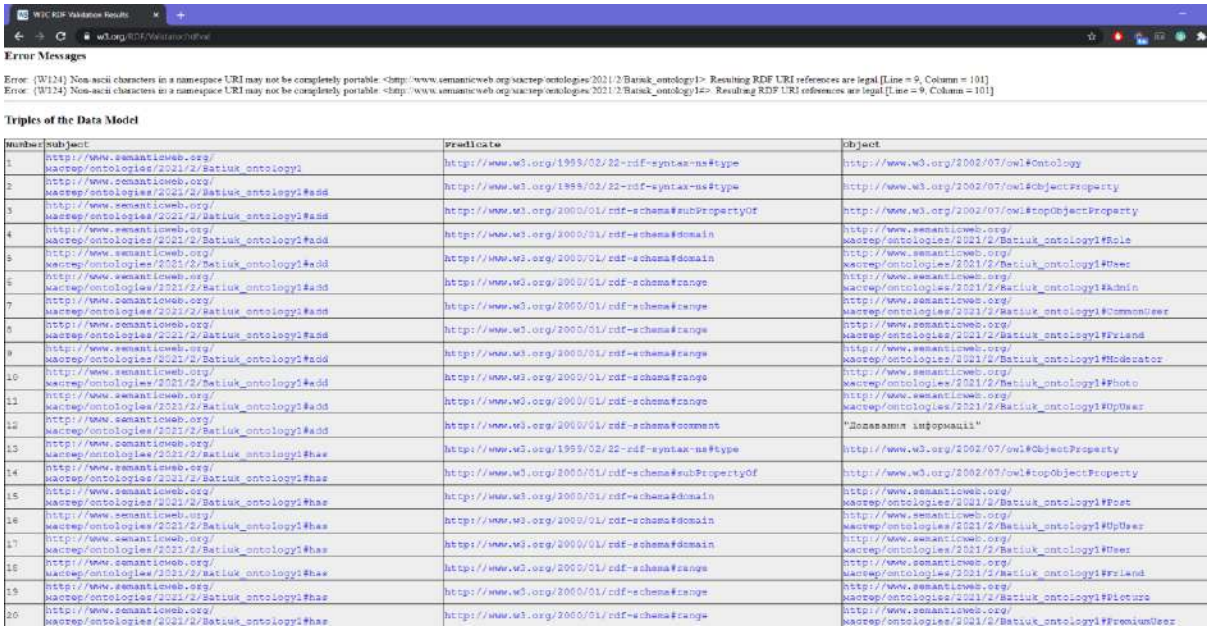
Figure 32: An instance of the class a) «premiumUser1» and b) «vipUser3»

The listing presents the text of the information system ontology saved in RDFS format.

```
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Admin">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Role"/>
    <rdfs:comment> Administrator </rdfs:comment> </owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Album">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
    <rdfs:comment> Album saved by user </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Best">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Friend"/>
    <rdfs:comment> Best friends category </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Comment">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Photo"/>
    <rdfs:comment> Comment to the photo </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Common">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Friend"/>
    <rdfs:comment> An ordinary friend </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#CommonUser">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Role"/>
    <rdfs:comment> Ordinary user </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Dialog">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
    <rdfs:comment> Preserved dialogue </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Friend">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
    <rdfs:comment> A friend of the main user </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#MainComment">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Comment"/>
    <rdfs:comment> The main comment </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#MainText">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Text"/>
    <rdfs:comment> The main text </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Mesage">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Dialog"/>
    <rdfs:comment> Messages in dialogue </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Moderator">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Role"/>
    <rdfs:comment> Moderator </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Photo">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Album"/>
    <rdfs:comment> Uploaded photo </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Picture">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Post"/>
    <rdfs:comment> Picture under the post </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Post">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
    <rdfs:comment> Post with information about the post </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#PremiumUser">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#UpUser"/>
    <rdfs:comment> Premium system user </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Rate">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Post"/>
    <rdfs:comment> User post rating </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Relation">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Mesage"/>
    <rdfs:comment> Message Relation </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Role">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#User"/>
    <rdfs:comment> System user roles </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#SubComment">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Comment"/>
    <rdfs:comment> Reply to comment </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#SubText">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Text"/>
    <rdfs:comment> Supporting text </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Tag">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Photo"/>
    <rdfs:comment> Tag under the photo </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Text">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Post"/>
    <rdfs:comment> The text of the post </rdfs:comment></owl:Class>
<owl:Class rdf:about="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#TextTag">
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/ontologies/2022/Batiuk_ontology1#Text"/>
    <rdfs:comment> Text tags </rdfs:comment></owl:Class>
```

6. Discussions

Figures 33-34 show the submitted RDF documents in Xml and Turtle syntax, the validity of documents on two different sites was checked, the document from Turtle syntax was converted to Xml, the documents are valid according to the verification on two different sites and have the same structure.



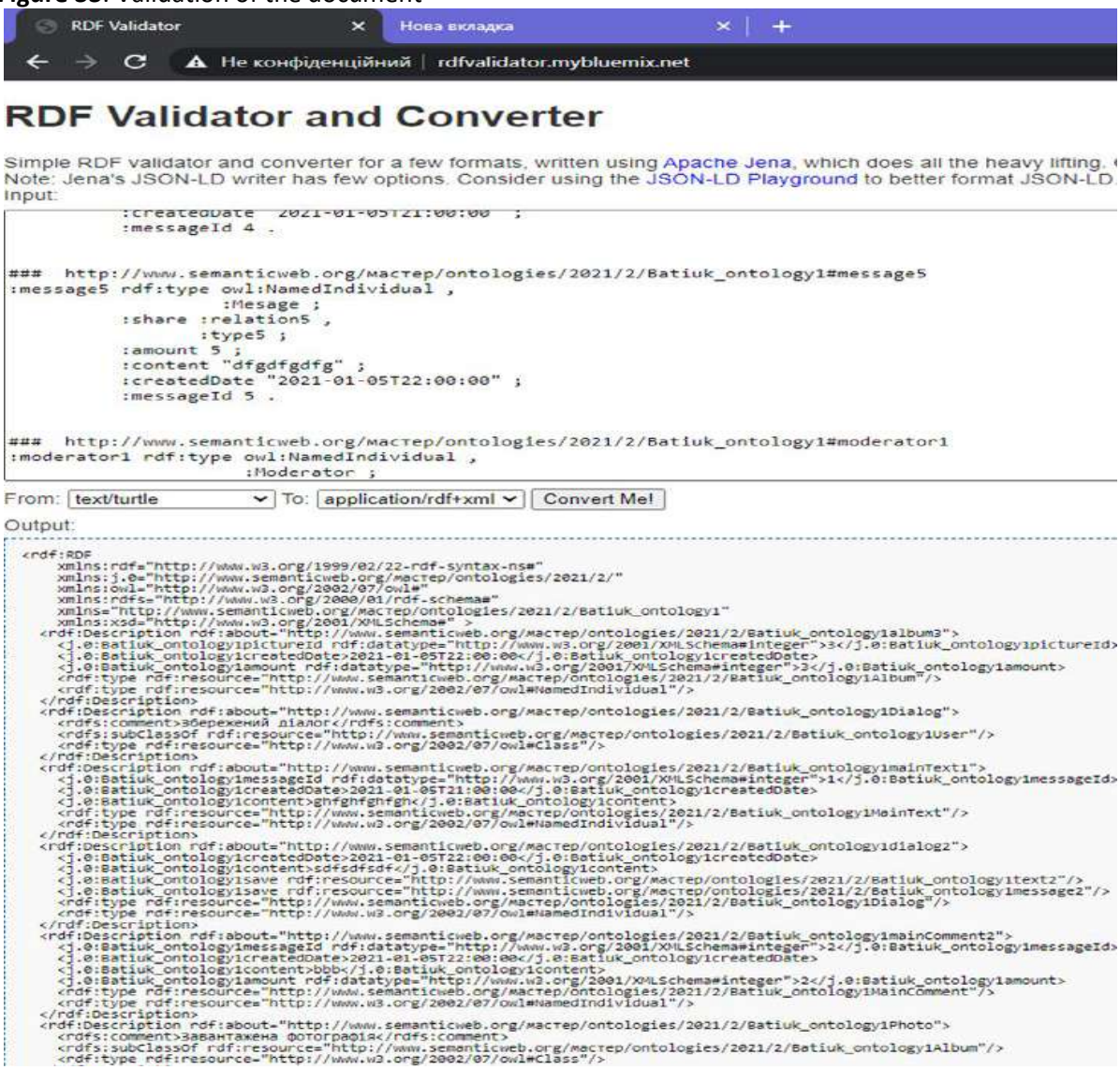
Error Messages

Error: [W124] Non-ascii characters in a namespace URI may not be completely portable. <http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1> Resulting RDF URI references are legal [Line = 9, Column = 101]
Error: [W124] Non-ascii characters in a namespace URI may not be completely portable. <http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#> Resulting RDF URI references are legal [Line = 9, Column = 101]

Triples of the Data Model

Number	Subject	Predicate	Object
1	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#Ontology
2	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#ObjectProperty
3	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#subPropertyOf	http://www.w3.org/2002/07/owl#topObjectProperty
4	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#domain	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Role
5	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#domain	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#User
6	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Admin
7	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#CommonUser
8	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Friend
9	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Moderator
10	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Photo
11	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#UpUser
12	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#add	http://www.w3.org/2000/01/rdf-schema#comment	"Додавання інформації"
13	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#ObjectProperty
14	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#subPropertyOf	http://www.w3.org/2002/07/owl#topObjectProperty
15	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#domain	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Post
16	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#domain	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#UpUser
17	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#domain	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#User
18	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Friend
19	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#Picture
20	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#has	http://www.w3.org/2000/01/rdf-schema#range	http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#PremiumUser

Figure 33: Validation of the document



RDF Validator | Нова вкладка

Не конфіденційний | rdfvalidator.mybluemix.net

RDF Validator and Converter

Simple RDF validator and converter for a few formats, written using Apache Jena, which does all the heavy lifting.
Note: Jena's JSON-LD writer has few options. Consider using the JSON-LD Playground to better format JSON-LD.
Input:

```
            :createdDate "2021-01-05T21:00:00" ;
            :messageId 4 .


###  http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#message5
:message5 rdf:type owl:NamedIndividual ,
                   :Mesage ;
            :share :relation5 ,
                   :type5 ;
            :amount 5 ;
            :content "dfgdfgdfg" ;
            :createdDate "2021-01-05T22:00:00" ;
            :messageId 5 .


###  http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#moderator1
:moderator1 rdf:type owl:NamedIndividual ,
                     :Moderator ;
```

From: text/turtle To: application/rdf+xml Convert Me!

Output:

```
<rdf:RDF
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:j.0="http://www.semanticweb.org/мастер/ontologies/2021/2/"
    xmlns:owl="http://www.w3.org/2002/07/owl#"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema#" >
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1album3">
    <j.0:Batiuk_ontology1pictureId rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">3</j.0:Batiuk_ontology1pictureId>
    <j.0:Batiuk_ontology1createdDate>2021-01-05T22:00:00</j.0:Batiuk_ontology1createdDate>
    <j.0:Batiuk_ontology1amount rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">3</j.0:Batiuk_ontology1amount>
    <rdf:type rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1Album"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1Dialog">
    <rdfs:comment>збережений діалог</rdfs:comment>
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1User"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Class"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1mainText1">
    <j.0:Batiuk_ontology1messageId rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">1</j.0:Batiuk_ontology1messageId>
    <j.0:Batiuk_ontology1createdDate>2021-01-05T21:00:00</j.0:Batiuk_ontology1createdDate>
    <j.0:Batiuk_ontology1content>ghfghfghfgh</j.0:Batiuk_ontology1content>
    <rdf:type rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1MainText"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1dialog2">
    <j.0:Batiuk_ontology1createdDate>2021-01-05T22:00:00</j.0:Batiuk_ontology1createdDate>
    <j.0:Batiuk_ontology1content>sdfsdfsdf</j.0:Batiuk_ontology1content>
    <j.0:Batiuk_ontology1save rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1text2"/>
    <j.0:Batiuk_ontology1save rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1message2"/>
    <rdf:type rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1Dialog"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1mainComment2">
    <j.0:Batiuk_ontology1messageId rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">2</j.0:Batiuk_ontology1messageId>
    <j.0:Batiuk_ontology1createdDate>2021-01-05T22:00:00</j.0:Batiuk_ontology1createdDate>
    <j.0:Batiuk_ontology1content>bbb</j.0:Batiuk_ontology1content>
    <j.0:Batiuk_ontology1amount rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">2</j.0:Batiuk_ontology1amount>
    <rdf:type rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1MainComment"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1Photo">
    <rdfs:comment>завантажена фотографія</rdfs:comment>
    <rdfs:subClassOf rdf:resource="http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1Album"/>
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Class"/>
```

Figure 34: Validation and conversion of the document

Fig. 35 shows an RDF graph in the form of a trio "resource-property-value" ("subject-predicate-object").

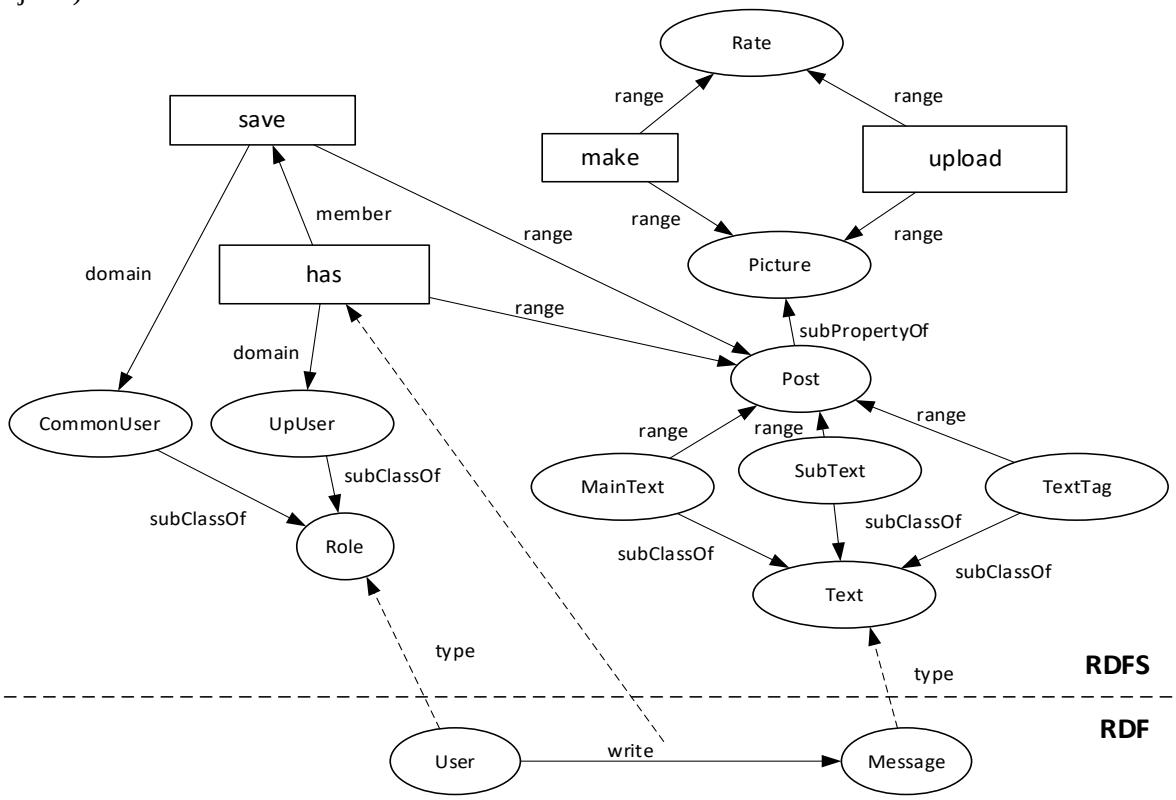


Figure 35: RDF graph in the form of a triple "resource-property-value"

The ontological model of the information system was tested in Protégé with the help of SPARQL-queries, Figures 36-47 show the screens of execution of SPARQL-queries and the obtained results. SPARQL-query has the following structure: PREFIX - reference to the data schemas needed to execute queries and reference to the ontology to which queries are made, SELECT - data sampling, specify the class and its properties for which the query occurs, WHERE - specify which properties- relations and data properties must be obtained, FILTER is an additional condition to the query.

a)

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT ?subject ?object
        WHERE { ?subject rdfs:subClassOf ?object }
```

b)

subject	object
Common	Friend
Friend	User
Comment	Photo
Tag	Photo
Picture	Post
Dialog	User
MainComment	Comment
Text	Post
Relation	Message
PremiumUser	UpUser
Album	User
Message	Dialog
Admin	Role
TextTag	Text
SubText	Text
Post	User
MainText	Text
Role	User
SubComment	Comment
Best	Friend

Figure 36: a) Basic SPARQL query and b) result of the base SPARQL query

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?user ?name ?createdDate ?amount
WHERE {
?user data:name ?name.
?user data:createdDate ?createdDate.
?user data:amount ?amount.
}
```

a)

user	name	createdDate	amount
admin1	"rhrhrhrhrh"	"2021-01-05T21:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
admin3	"trhrhrth"	"2021-01-05T23:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
admin4	"erterteter"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
friend4	"rthrthrth"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
friend3	"rthrhrth"	"2021-01-05T23:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
admin2	"rthrthrth"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
admin5	"vnvbnvn"	"2021-01-05T19:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
friend5	"rtyrtyrty"	"2021-01-05T22:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
friend2	"ffghfghfgh"	"2021-01-05T21:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
friend1	"david"	"2021-01-05T21:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>

b)

Figure 37: a) SPARQL-request to receive all users and b) result of SPARQL query to receive all users

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?user ?name ?createdDate ?amount
WHERE {
?user data:name ?name.
?user data:createdDate ?createdDate.
?user data:amount ?amount. FILTER (?amount > 2)
}
```

a)

user	name	createdDate	amount
admin3	"rhrhrhrth"	"2021-01-05T23:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
admin4	"erterteter"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
friend4	"rthrthrth"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
friend3	"rthrhrth"	"2021-01-05T23:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
admin5	"vnvbnvn"	"2021-01-05T19:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
friend5	"rtyrtyrty"	"2021-01-05T22:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>

b)

Figure 38: a) SPARQL query of more than 2 users and b) result of a SPARQL query of more than 2 users

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?comment ?content ?createdDate ?amount ?messageId
WHERE {
?comment rdf:type data:Comment.
?comment data:content ?content.
?comment data:createdDate ?createdDate.
?comment data:amount ?amount.
?comment data:messageId ?messageId.
}
```

a)

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?comment ?content ?createdDate ?amount ?messageId
WHERE {
?comment rdf:type data:Comment.
?comment data:content ?content.
?comment data:createdDate ?createdDate.
?comment data:amount ?amount.
?comment data:messageId ?messageId. FILTER(?messageId < 4)
}
```

b)

Figure 39: SPARQL-request for a) all comments and b) comments with ID less than 4

comment	content	createdDate	amount	messageId
comment4	"ccc"	"2021-01-05T20:00:00"	"8"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
comment2	"bbb"	"2021-01-05T22:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
comment5	"ddd"	"2021-01-05T19:00:00"	"10"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
comment1	"aaa"	"2021-01-05T23:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
comment3	"vv"	"2021-01-05T21:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>

Figure 40: The result of the SPARQL comment query

comment	content	createdDate	amount	messageId
comment2	"bbb"	"2021-01-05T22:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
comment1	"aaa"	"2021-01-05T23:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
comment3	"vv"	"2021-01-05T21:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>

Figure 41: The result of a SPARQL query for comments with an ID of less than 4

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?text ?content ?createdDate ?amount ?messageId
WHERE {
?text rdf:type data:Text.
?text data:content ?content.
?text data:createdDate ?createdDate.
?text data:amount ?amount.
?text data:messageId ?messageId.
}
```

a)

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/macrep/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?text ?content ?createdDate ?amount ?messageId
WHERE {
?text data:content ?content.
?text data:createdDate ?createdDate.
?text data:amount ?amount.
?text data:messageId ?messageId.
}
```

b)

Figure 42: SPARQL-query of a) the main type of messages and b) the main type messages

text	content	createdDate	amount	messageId
text1	"dgdfgdfg"	"2021-01-05T21:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
text3	"dfgdgdg"	"2021-01-05T20:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
text5	"dgdfgdfg"	"2021-01-05T21:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
text2	"ertertert"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
text4	"ertertert"	"2021-01-05T22:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>

Figure 43: SPARQL-query of all messages

text	content	createdDate	amount	messageId
mainComment2	"bbb"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message2	"dfgdfg"	"2021-01-05T21:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
comment2	"bbb"	"2021-01-05T22:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment3	"ddd"	"2021-01-05T21:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment4	"ddd"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
text2	"ertertert"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
text5	"dgdfgdfg"	"2021-01-05T21:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
comment5	"ddd"	"2021-01-05T19:00:00"	"10"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
comment3	"vv"	"2021-01-05T21:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
message4	"cbcvb"	"2021-01-05T21:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment5	"kkk"	"2021-01-05T20:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
message3	"ertert"	"2021-01-05T22:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
comment1	"aaa"	"2021-01-05T23:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment2	"sss"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message1	"sgg"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
message5	"dfgdfgdfg"	"2021-01-05T22:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment3	"ccc"	"2021-01-05T21:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment5	"eee"	"2021-01-05T19:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>

Figure 44: The result of the SPARQL query of all messages

a)

```
SPARQL query:

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?text ?content ?createdDate ?amount ?messageId
WHERE {
?text data:content ?content.
?text data:createdDate ?createdDate.
?text data:amount ?amount.
?text data:messageId ?messageId.
FILTER (?createdDate > "2021-01-05T21:00:00")
}
```

b)

```
SPARQL query:

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX data: <http://www.semanticweb.org/мастер/ontologies/2021/2/Batiuk_ontology1#>
SELECT ?text ?content ?createdDate ?amount ?messageId
WHERE {
?text data:content ?content.
?text data:createdDate ?createdDate.
?text data:amount ?amount.
?text data:messageId ?messageId.
FILTER (?amount < 5)
}
```

Figure 45: All messages for a) the creation time as more than 21:00 and b) the number as less than 5

text	content	createdDate	amount	messageId
mainComment2	"bbb"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
comment2	"bbb"	"2021-01-05T22:00:00"	"7"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
text2	"ertertert"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
message3	"ertert"	"2021-01-05T22:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
comment1	"aaa"	"2021-01-05T23:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment2	"sss"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message1	"sgg"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
message5	"dfgdfgdfg"	"2021-01-05T22:00:00"	"5"^^<http://www.w3.org/2001/XMLSchema#integer>	"5"^^<http://www.w3.org/2001/XMLSchema#integer>
text4	"ertertert"	"2021-01-05T22:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>

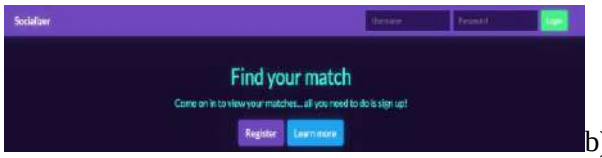
Figure 46: The result of the SPARQL-query of all messages, where the creation time is more than 21:00

text	content	createdDate	amount	messageId
mainComment2	"bbb"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message2	"dfgdfg"	"2021-01-05T21:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment3	"ddd"	"2021-01-05T21:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment4	"ddd"	"2021-01-05T20:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
text2	"ertertert"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message4	"cbcvb"	"2021-01-05T21:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment1	"aaa"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
message3	"ertert"	"2021-01-05T22:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment2	"sss"	"2021-01-05T22:00:00"	"2"^^<http://www.w3.org/2001/XMLSchema#integer>	"2"^^<http://www.w3.org/2001/XMLSchema#integer>
message1	"sgg"	"2021-01-05T23:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
mainComment3	"ccc"	"2021-01-05T21:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
text3	"dfgdgdg"	"2021-01-05T20:00:00"	"3"^^<http://www.w3.org/2001/XMLSchema#integer>	"3"^^<http://www.w3.org/2001/XMLSchema#integer>
text4	"ertertert"	"2021-01-05T22:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>
text1	"dgdfgdfg"	"2021-01-05T21:00:00"	"1"^^<http://www.w3.org/2001/XMLSchema#integer>	"1"^^<http://www.w3.org/2001/XMLSchema#integer>
subComment4	"ccc"	"2021-01-05T21:00:00"	"4"^^<http://www.w3.org/2001/XMLSchema#integer>	"4"^^<http://www.w3.org/2001/XMLSchema#integer>

Figure 47: The result of the SPARQL query of all messages where the number is less than 5

The control example shows the main functions and operation of the created information system, Figure 48a shows the main window of the program. Figure 48b shows the buttons on the main program window.

a)



b)

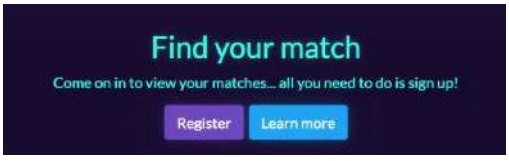
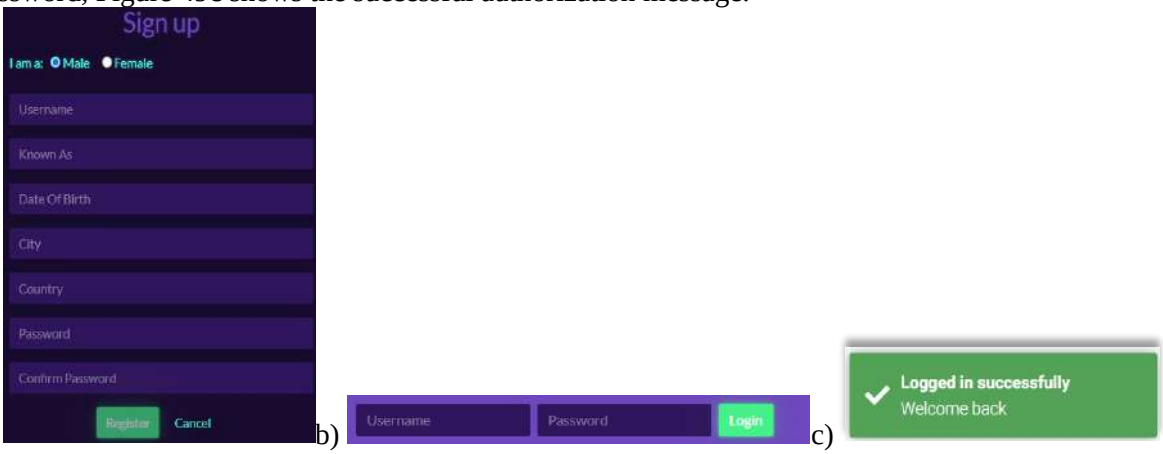


Figure 48: a) The main program window and b) buttons of the main program window

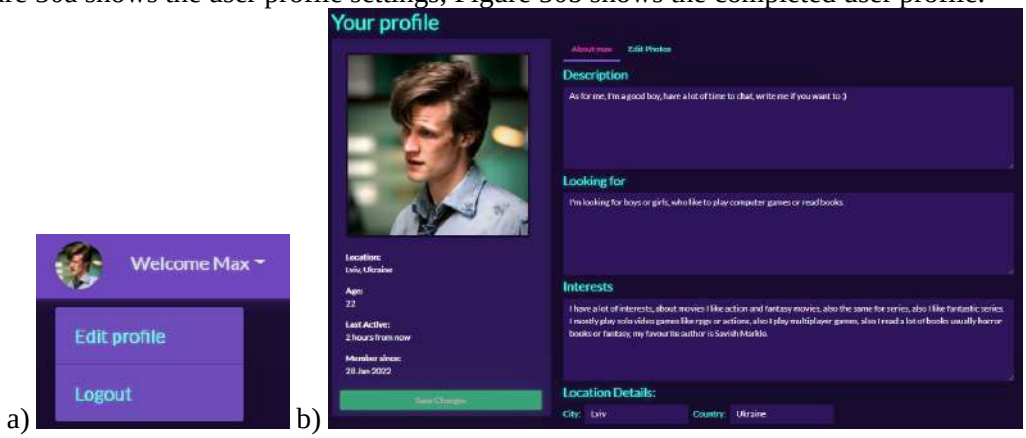
Figure 49a shows the user registration form. Figure 49b shows the user's authorization, login and password, Figure 49c shows the successful authorization message.



a) b) c)

Figure 49: a) User registration form, b) User authorization and c) Successful authorization message

Figure 50a shows the user profile settings, Figure 50b shows the completed user profile.

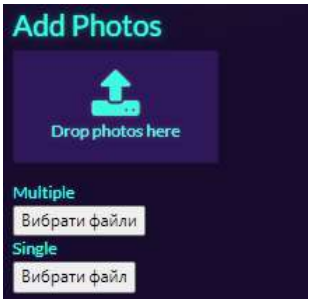


a) b)

Figure 50: a) User profile settings and b) completed user profile

Almost any DSS that has a substantial user base employs proper socializing method. In this example, a unique algorithm based on Levenstein's algorithm, sample extension, N-grams, and the Noisy Channel model was developed [42-49]. Based on current Levenstein algorithms, sample expansion, N-grams, and the Noisy Channel model, the researchers developed a new algorithm for assessing user information and determining the most apposite IP users based on the inspected text of profile messages for web page/content/resource management [50-64]. An active socialization DSS was created using an asynchronous programming framework. The convolutional neural network was upgraded, allowing for more effective searching for human faces in photos and checking for existent persons in the DSS database. The DSS will enable efficient and quick text data selection, analysis, processing, and final result generation. For systematic and high-quality intelligent search and processing of applicable information for the needs of a specific user, the DSS employs SEO technologies. By using a neural network, you may accurately identify a user based on his photo. The methods employed in general allow you to develop a convenient DSS socialization employing the relevant techniques. It is worth mentioning the importance of optimizing the current DSS; first and foremost, it is total asynchrony of system, which will eliminate any long waits and difficulties in processing and analysing requests; second, the system allows efficient and active work with various volumes of large data. DSS users require more data. We also use the cloud platform, which allows for data dispersion. For example, all of the most challenging data may be stored in the cloud environment, and all of the necessary data can be downloaded using a simple basic DSS interface with data queries. As a result, it can be claimed that the development of this DSS is critical both in terms of societal impact and in terms of executing all of the algorithms that the DSS requires. Figure 51a shows the process of uploading photos to the system, you can upload 1 or more photos at a time by dragging them manually or using Explorer. Figure 51b

shows uploaded photos of the user, you can delete all photos except the current main photo and the neural networks processed all the photos, and those where no faces were found are not available for display by the main photos of the user.

a) 

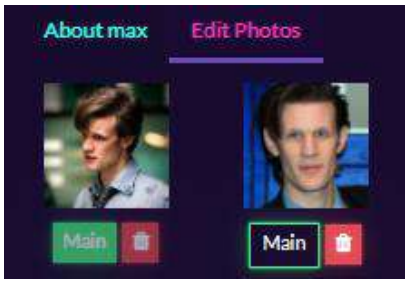
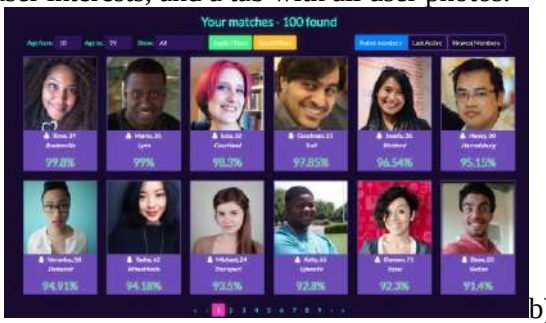
b) 

Figure 51: a) Upload photos and b) Uploaded user photos

Figure 52a shows the generated list of users using word processing algorithms and sorted by descending percentage of user similarity. Figure 52b shows the use of search filters in an existing list. Figure 53a shows the user profile selection, the ability to view the user's profile, like and write a private message. Figures 53b-53c show a tab of information about the preferences of users who have chosen us and whom we have chosen. Figures 54-55 show basic profile information of the selected user, a tab with user interests, and a tab with all user photos.

a) 

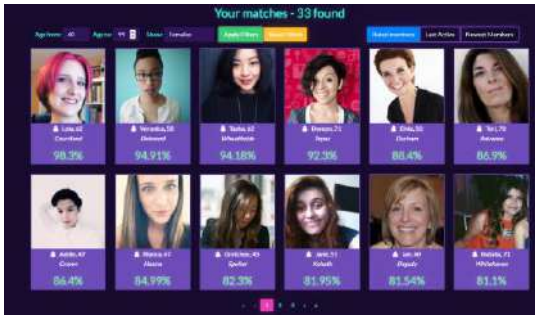
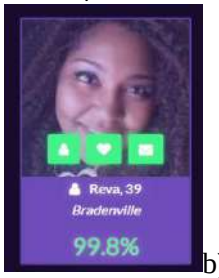
b) 

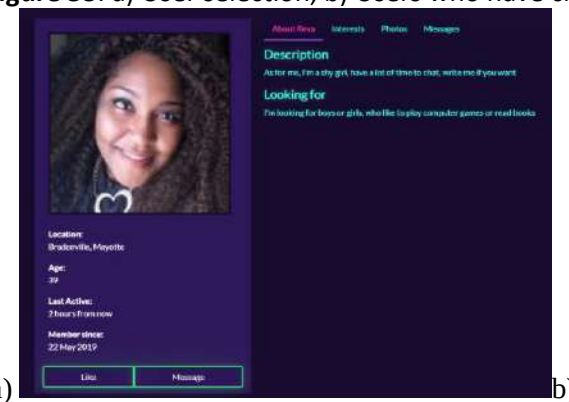
Figure 52: a) The list of users is formed and b) List filtering

a) 

b) 

c) 

Figure 53: a) User selection, b) Users who have chosen us and c) Users we have selected

a) 

b) 

Figure 54: a) Basic user information and b) The interests of the user

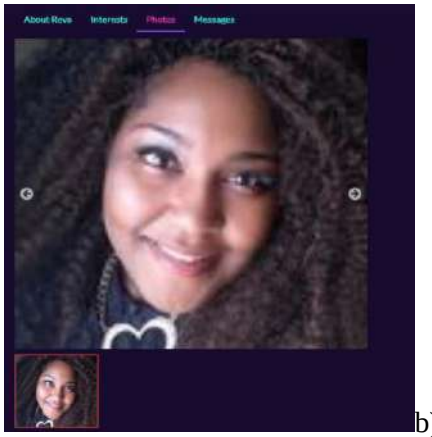
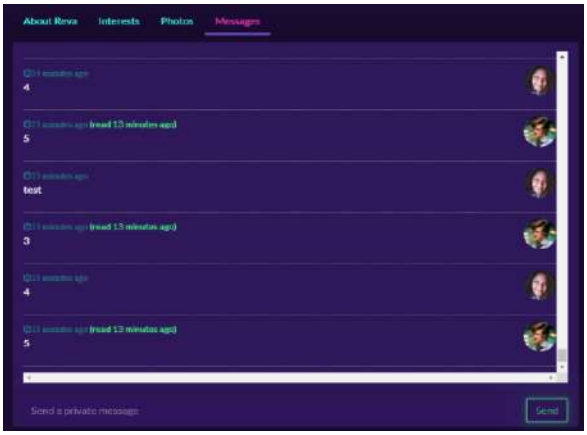
a)  b) 

Figure 55: a) User photos and b) Private correspondence with the user

Fig. 55b shows a tab with private correspondence with the user. The correspondence shows users' nicknames, photos, time of sending and time of reading messages.

Figures 56 show a page with information about all messages, unread, received, and sent messages. You can manage your messages by viewing the selected message by going to the user dialog, or deleting your selected message for everyone, or someone else's message just for yourself.

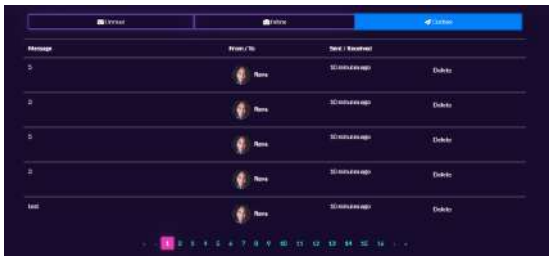
a)  b) 

Figure 56: a) Received messages and b) Sent messages

Figures 57 show the login from the profile of another user who was selected as the first user of the system and view the list of users who chose us, which allows you to start private correspondence between two users. That chose each other. Figure 57c shows the private correspondence with the initial user, on behalf of the selected user of the system.

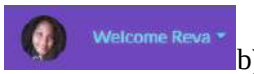
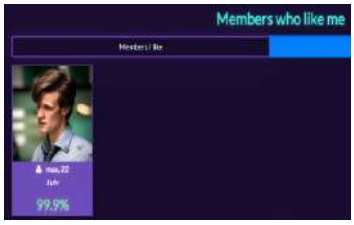
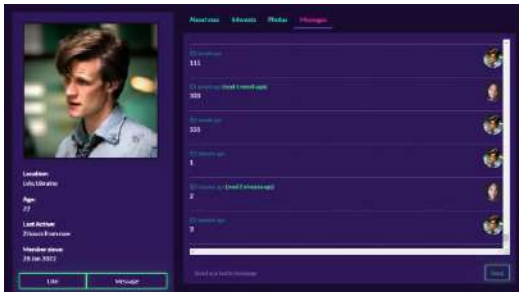
a)  b)  c) 

Figure 57: a) Another user 's login to system, b) Users who have selected the current user and c) Private correspondence of users

7. Conclusions

Nowadays, the socialization of individuals with common interests is an extremely important process, as most people try to simplify and automate all basic life processes, which usually take up a lot of free time, the same applies to the socialization process based on SEO-technologies and machine learning methods plays an important role in this, as it optimizes the process of socialization. During the implementation, an analytical review of literature sources was conducted, among which was briefly described all aspects of modern socialization of individuals, namely information about neural networks

for facial recognition and fuzzy search algorithms for processing textual information. It was also described the main purpose of the created system, why it was created, what are the main problems solved by creating this type of system. The reasons and factors that are important for the creation of this system were analysed. The systems that already exist and analogy of the created system were described; their advantages and disadvantages and concerning the created system of socialization of individuals on common interests were described. A systematic analysis of the object of study was conducted, the methodology of research of the subject area was described in detail and new information on the creation of this system was supplemented, important statement and substantiation of the problem of creating this system was made. The shortcomings of the use of the created information system, the object and subject of research of the system and their description were indicated. The necessary diagrams were also constructed, namely use case and activity diagrams, entity-relationship diagrams and state transition diagrams, which allowed to fully carry out a systematic analysis of the system of socialization of individuals by common interests, which allows further implementation of the software product.

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