Towards Better Presenting and Searching of Bells Knowledge

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Abstract. The paper presents an online platform with textual data, images, audio and video recordings related to bell knowledge. It was designed to provide digital data for representation of acquired knowledge. The platform includes data repository of bell knowledge objects and a new search engine.

Keywords: semantic web, ontology, digital archive, online platform

1 Introduction

The easier and wider access of new digital content of object in the field of cultural and historical heritage (CHH) is an important task of distribution of knowledge and affiliation of new groups of people.

The paper presents an online platform "Multimedia fund BellKnow" and a new search engine for bell knowledge objects.

1.1 Research background

This research is a result of investigations of approaches and methods for digital content presentation in the field of CHH[1].

Previous research in this area could be found in [4, 5, 8, 9, 10, 11].

We start our research during the project "Research and Identification of Valuable Bells of the Historic and Culture Heritage of Bulgaria and Development of Audio and Video Archive with Advanced Technologies (Bell)" [1, 12].

Research continues in the project "Multimedia fund BellKnow" (BellKnow) [2, 3, 7] where the main goal is to present that digital content and knowledge.

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2 Bell knowledge

The subject area of this research is bell objects. They are artifacts of great artistic value in the field of CHH, that are closely related with the spiritual, social and material life of society through the centuries [1, 2, 3, 7, 12]. To create digital content of objects of CHH we should consider their specific features and characteristics at particular subject area.

Semantic based knowledge of bell objects

The knowledge of bell objects is presented in the form of ontology. It contains a set of "objects" and a set of "properties". The ontology also contains a set of "axioms" which place restrictions on "individuals" and a type of allowed relations between them [6]. Ontology of bell objects and its additional structures are described in [3, 7], where semantic description of the bell includes concepts, relations, rules, restrictions, individuals and facts applicable for the subject area. The selection of basic concepts is based on real settings, situations and facts.

Multimedia digital archive of bell objects

Multimedia digital archive of bell objects contains textual data, digital images, audio and video recordings. All the content is well structured, indexed with metadata and secured. The main purpose of this digital archive is to store as much as possible data of bell objects. This means that all recordings have been processed with low data compression. But for needs of online presentation of this content, there is a functionality to: extract collections of recordings by user defined characteristics; process media files to optimized volume and etc.

The architecture of data of bell objects is formed by:

- Ontology of bell objects and some additional ontology structures;
- Dictionaries of terms and synonyms;
- Multimedia digital archive of bell objects;

And the basic data structure is as follows:

- Semantic annotations of objects:
  - Data of bell objects;
  - Data of bell places;
  - Data of making them up;
  - Data of bell geometric shape;
  - Data of bell sound;
  - Data of relations between objects;
- Textual corpuses of bell objects;
- Multimedia recordings of bell objects at "Multimedia fund BellKnow".
- Dictionaries of terms and synonyms.

3 Online platform “Multimedia fund BellKnow”

Online platform “Multimedia Fund BellKnow” represents textual data, images, audio and video recordings stored in the digital archive. This platform also presents the knowledge gained in research and analysis of bell objects.

Glossary of terms in the specific subject area is added in the platform. It overlaps ontological substructure and uses its semantic annotations.

The digital data and knowledge of bell objects could be shown individually, grouped by objects location or other characteristics, including the choice of the user. It includes images, media (audio and video) recordings, technical data, historical summaries, analyzes the sound and others.

In our work we also consider some experience in the same area and we use several techniques for presenting of digital knowledge online [5, 8, 9, 10, 11].

Functional modules integrated in the platform

The functionality embedded in "Multimedia Fund BellKnow" is based on ontology knowledge of the bell object and includes the basic activities such as creation, presentation, search and grouping of objects and information content. The platform contains following modules:

Module of presenting objects

This module represents bell objects, places or events. It takes data from ontology structure and multimedia archive and displays a lot of textual data, metadata, technical values, annotations, semantic relations and etc features in left frame and multimedia recordings in right. When it displays a multiple objects of collections or search results, there are a list of objects with less textual data and smaller multimedia tracks.

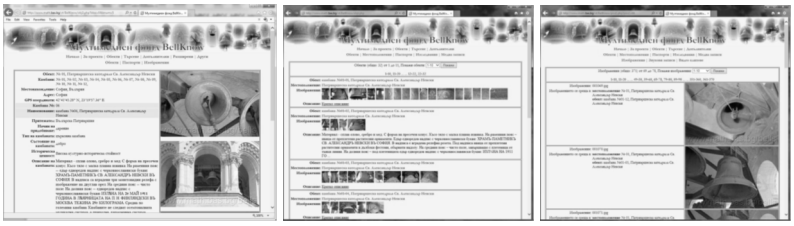

Fig. 1. Presenting bell objects in the platform

Module of certification and pasportization of bell objects

This module generates online model of digital passport of single bell object or group of objects at same location. This digital online passport documents bell objects with all necessary records and annotations for certification of bells.

Digital online passport presents media records (audio and video) – sounds of beating bell, ensemble ringtones of set of bells interviews, stories and more. The content of digital includes different sections such as: historical information, images, scheme of bells, media recordings, images, technical data, layout, analysis of sound and etc.

The online digital passport of bell objects is dynamically generated in real time and collects actual information stored in semantic annotations.

Module of inputting digital resources

This module optimizes inputting of digital resources, their metadata and semantic descriptions. The access to this module is restricted to trusted users.

Adding of digital resources is a step-by-step process as follows:

- Choice of resource - select a digital resource to add to the system
- Processing metadata of the resource - extract meta data from resource or add manually. The module provides the use of templates for optimizing the process of meta indexation
- Add semantic descriptions - by selecting the individual characteristics of the resource we add semantic descriptions to the ontological object . This process is optimized by the selection of controls and templates for a particular resource and the object to which it refers (ontological objects must be entered first)
- Digital processing of the resource - the resource is processed if it does not meet the performance requirements and then digitally protected before integrated into the system

Module of search engine

Bell knowledge consist textual corpuses at Bulgarian language, semantic XML-RDF-OWL annotations and multimedia recordings. The result of search is bell objects or bell places or collection of multimedia recordings.

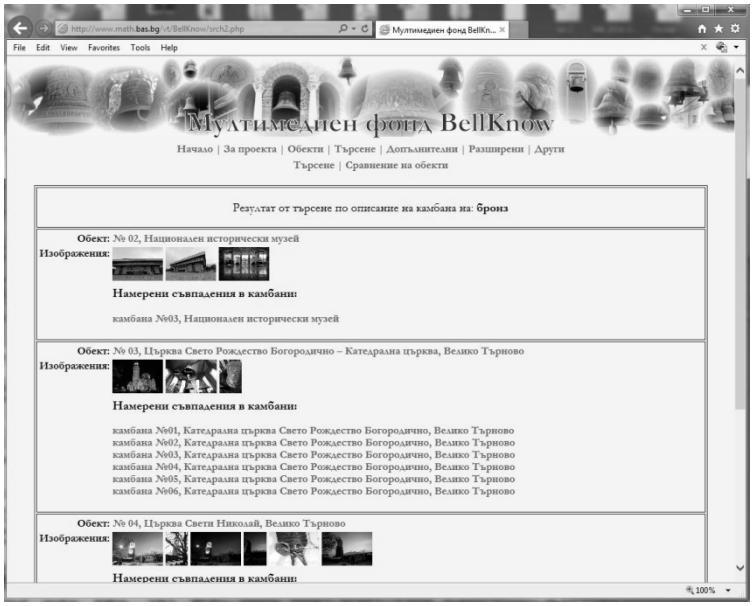

Fig. 2. Search panel at online platform "Multimedia fund BellKnow"

The method of search is as follows:

- Check search word or phrase for synonyms or translations into other languages. This is done using synonyms, terms and Multilingual dictionaries. The order of search phrases are: language, synonyms and term.
- Then all the result of previous search are searched in text corpuses and semantic annotations. The result of this step is objects as data types. It can be: bell objects, bell places, bell makings, bell geometrics and etc.
- Next is to search all of the meta data of multimedia recordings for synonyms, terms and objects ID.
- The result of all searches are bell objects.

Module of comparison of bell objects

The comparison of bell objects is a collation of some characteristics of group of objects. It is performed using the following components – type of media recordings; analyses of bell sound; photo collation; differences of size, dimensions and weight; material collation and etc. The result is a list of parameters, graphics and media records that present differences of the compared objects.

4 Conclusion and forthcoming work

We present a model of knowledge in specific subject area in a field of cultural and historical heritage. In detail is described the online platform "Multimedia fund BellKnow". We present functionality of all modules of the system. Special attention is made to the search engine. In the future we plan to use NoSQL database as a better solution for representation of non structured data.

5 References

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