The Russian Museum Culture Cloud

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Abstract. We present an architecture and approach to publishing open linked data in the cultural heritage domain. We demonstrate our approach for building a system both for data publishing and consumption and show how user benefits can be achieved with semantic technologies. For domain knowledge representation the CIDOC-CRM ontology is used. As a main source of trusted data, we use the data of the web portal of the Russian Museum. For data enrichment we selected DBpedia and the published Linked Data of the British Museum. Our work can be reached at www.culturecloud.ru.

Keywords: Semantic web · Semantic data publishing · CIDOC-CRM · Open data · Cultural heritage

1 Introduction

This submitted demo is the result of the first steps in the direction of building the Russian Cultural Heritage Cloud, which is intended to make the heritage data available to anyone by means publishing the data as Linked Data as well as through implementation of end-user applications to work with the data [1]. Our long-term goal is to build the overall Russian Heritage Cloud that will integrate data from many data providers like museums, galleries, archives, libraries and other institutions and that will also have a powerful user interface equipped with a set of practical tools for data acquisition, modification and publishing. The pilot project was started in cooperation with the Russian Museum in St. Petersburg, which holds the largest collection of Russian art in the world. The primary goal of our research was to demonstrate the applicability and benefits of usage of semantic data to tackle the challenges of cultural heritage transfer in the digital era. The system is meant to deliver benefits to two different target groups: the museum art experts and museum visitors. These two groups greatly differ in their needs, but the system covers the interests of both of them.

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2 Overview of the System

The system has been built using the *metaphacts Knowledge Graph Workbench*, a platform for the development of semantic applications. The system architecture diagram is depicted in the Fig. 1.

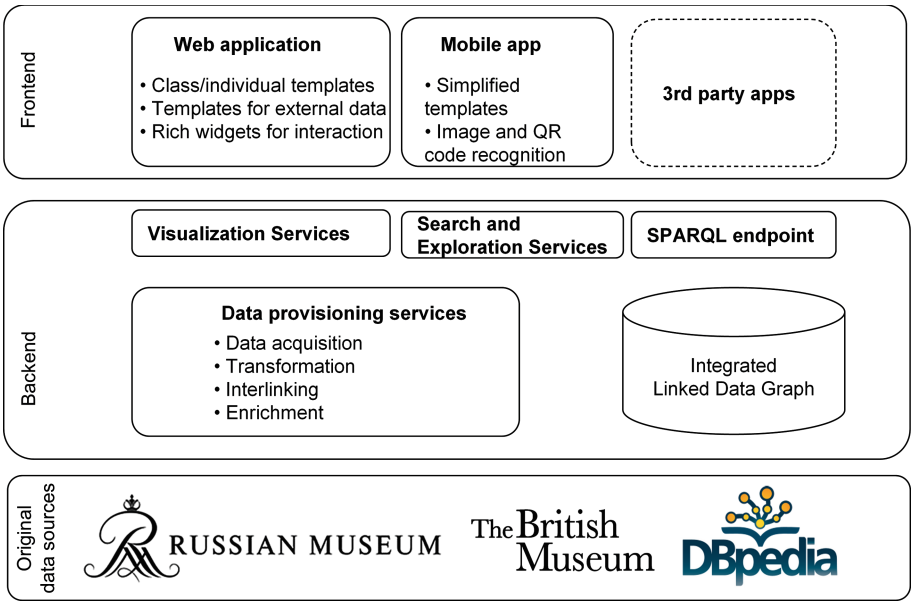

Fig. 1. Architecture of the system

Using the data provisioning services of the platform, the original data sources have been transformed, interlinked, enriched and finally ingested into a triple store (a Systap Blazegraph database), holding the integrated Linked Data graph. As described in detail in the subsequent section, Russian Museum relational data was transformed to RDF, represented using the CIDOC-CRM ontology. Where possible, links to DBpedia have been generated. The British Museum thesauri were used as genre and artwork type taxonomies. The resulting data in the triple store is published via a SPARQL endpoint, accessible at http://culturecloud.ru/sparql.

Using additional backend services of the platform, e.g. visualization, search and exploration services, two applications have been built: a web application and a mobile app, as described in detail in Sect. 3. The applications are accessible at http://culturecloud.ru/ On the frontend side we made use of the rich templating mechanism of the platform and created templates for the relevant CIDOC-CRM classes to visualize artworks and authors. Each template also includes data from linked DBpedia entities. The main purpose of the mobile application is to provide

museum visitors with additional information about art objects. It has the ability to recognize the artwork by making photo of it or by scanning a QR code. Special simplified templates were developed for this use case.

3 Features of the End-User Applications

We created two end user applications for consuming the data: a website application and a mobile application. The website can be accessed from any mobile device or desktop computer web browser. The mobile application is created for the Android platform.

3.1 Website Application

The website provides a way to navigate through linked culture cloud data. The website is built using a wiki-based templating mechanism, where every concept of the underlying ontology is associated with a template that defines how the data is presented and which kind of interactions are possible. In the templates, rich widgets for the various data modalities are embedded, including widgets for exploring image collections, timelines for temporal data, maps for geo-spatial data, etc. Some screenshots of widgets can be found on Fig. 2.

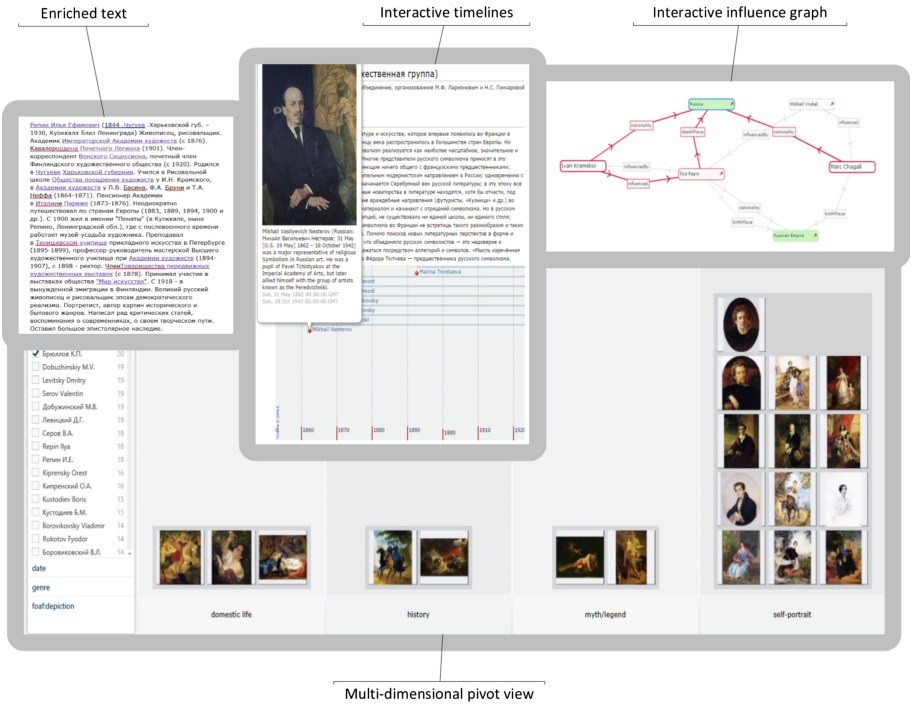

Fig. 2. Screenshots of the web application

The website also presents data in a number of traditional ways: text descriptions and illustrations of art works, hyperlinks connecting the web pages between each other, etc. At the same time the systems allows integration of more effective tools for data presentation, which provide a brighter use experience and prove to be more fruitful in a process of data exploration. Some of the widgets include:

Enriched text. Enriched text is a paragraph where some toponyms, personas and dates are linked against the semantic descriptions from external sources, in our case, these are: DBpedia and the British Museum. When the user clicks the link the article opens on same site. This delivers the additional context directly to the user and keeps him on site, while traditionally he would be forced to leave the original resource.

Interactive timelines. A Timeline widget enables additional visual demonstration of how long the process took place or in what sequence the events were occurring. For instance, our system employs timelines, when it demonstrates the artists lifetimes in relation to the art movement, to which the artists belong. The other use case for timelines is to place the art objects on artists life span to display his periods of activity and inactivity. This provides a means to learn and discover the facts interactively rather than reading long paragraphs of traditional text.

Interactive influence graph. The graph illustrates the influences of one artist on another. From this graph many intriguing conclusions could be made: who was the most influential artist in his time, who stands aside in the cultural art process, etc. The end-user can use such graph for finding other artists that can be of an interest to him based on the artists that he already knows. The art experts can construct more complicated graphs displaying connections between artists, art movements, countries, art school, etc.

Multi-dimensional Pivot widget. The Pivot widget enables to visual exploration of data by sorting and filtering it in multiple dimensions. For instance, one can select the artists of 1890 s that worked in the genres of portrait and sort their artworks by artists names. This is another exciting and interactive way to learn the content and make fascinating discoveries along the way. Such tool can simplify the routine work of an art expert when he is selecting the artworks for catalogues or when constructing the new exhibition.

Semantic search. A search widget allows to construct visually the structured, semantic queries against the fundamental relationships of the CIDOC-CRM ontology. The search widget provides auto-suggestions for search terms utilizing an entity index along with a suggestion of relationships that are applicable to a selected entity.

3.2 Mobile Application

The mobile applications is intended to make the visit to the museum more informative. It is done by enabling automatic identification of art work by taking

snapshot with a mobile device. A typical scenario that will be demonstrated is the following:

- The user walks through the exposition in the museum. When the user feels compelled, he takes a snapshot of the artwork that the user wants to know more about.
- The artwork is automatically recognized and identified by the mobile application.
- The user can see the annotation and other details about this artwork on the screen of his mobile device.
- The user can also see the other works of the artist and where they are stored.
- The user can rank the selected artwork according to his likes or dislikes (5-star rating).
- The users ranks are stored and associated with his public social network profile.

The feedback that we acquired from museum proves that the mobile application lies in line with their task to achieve long tail effect and provide ways of interaction with expositions.The Russian museum currently uses QR-code tags positioned beneath the art-object to allow identification of artifacts by the museums mobile app, but all museum stakeholders agree that identification by photo is preferable because it eliminates the need to tag the artifacts and QR-codes look too gaudy in antique palace interiors.

4 Conclusions

The feedback acquired from two major museum in Russia – Russian Museum and Kunstkamera (Peter the Great Museum of Anthropology and Ethnology) – revealed a high demand for the flexible and extensible representation models for building applications that allow to get access to digital cultural heritage. Our system illustrates potentials of semantic technologies for creation of such solutions including semantic search and visualizations both for art experts and regular museum visitors. One of the features we achieved is to make data deliverable to end user in a more informative way in comparison with any data source provisioning our system. For example, the initial Russian Museum dataset does not contain much information about authors. Interlinking with external source allowed us to show user additional information about authors, such as date of birth or person they influenced and so on.

Reference

1. Mouromtsev, D., Haase, P., Cherny, E., Pavlov, D., Andreev, A., Spiridonova, A.: Towards the linked russian culture cloud: Data enrichment and publishing. In: Accepted at ESWC 2015 (2015) (to appear)