Searching and Analyzing Coin Finds with Linked Data Based Web Application

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Abstract. This demo paper presents a demonstrator web application and data service called CoinSampo, that is created to open data about numismatic citizen finds reported in Finland between 2013 and 2023. The data includes some 18 000 individual numismatic objects. The data has been converted to Linked Open Data using light weight ontologies created based on the data. The CoinSampo web application queries the knowledge graph with SPARQL and offers the users faceted search and various visualization options. The application is aimed to be used by researchers, hobbyists and schools.

1 Introduction and Related Work

This demo paper presents a demonstrator web application and data service called CoinSampo, that was created to open data about numismatic citizen finds reported in Finland between 2013 and 2023 in Linked Open Data (LOD) format. The CoinSampo web application[5] and data service[6] were opened to public on February 28th 2024. The knowledge graph (KG) includes data about some 18 000 individual numismatic objects. The data was collected in the National Museum of Finland based on the reports made by finders, and includes all the reported finds from the time period.

The amount of reported metal-detecting has increased in recent years considerably. Coin finds are usually the most numerous object type reported by the public[3] and coins can be identified more precisely than other common finds, producing higher quality record data and making them specially suitable for describing semantically. For example, authorities and mints lend themselves naturally to being described not only with controlled vocabularies, but with ontologies including information such as dates and coordinates. Historical coins

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[5] https://coinsampo.ldf.fi
[6] https://www.ldf.fi/dataset/coinsampo

also moved internationally, making harmonizing and comparing international data especially relevant.

CoinSampo is a follow up to the previous FindSampo[6] service that opens data about archaeological citizen finds of all types that have been catalogued and taken in to museum collections. CoinSampo does not directly use ontologies of FindSampo, but the design is influenced by it. Nomisma.org[7] [1] is a collaborative international project that aims to provide necessary ontologies for representing numismatic concepts using LOD. Nomisma data has been used to create multiple web applications such as the Seluidic Coins Online [8]. Nomisma is currently mainly focused on the classical era, which limits it's applicability to Finnish data. CoinSampo is also inspired by the ARIADNEplus[9] [8] project. ARIADNEplus is a pan-European research infrastructure and aggregation project for all archaeological data, but coins find form a big part.

CoinSampo was created as part of the *DigiNUMA – Digital Solutions for European Numismatic Heritage*[10] [5,4,7] research project to respond to new needs in Cultural Heritage (CH) data management, research, and dissemination using LOD. In addition to the demonstrator presented here, we are also developing a more generic version of CoinSampo web application, that could be used to search and visualize any data that is using the Nomisma.org ontology.

2   CoinSampo Web Application

The CoinSampo knowledge graph was created using an existing tabular data collected by the Finnish National Museum, and converted to RDF format using light weight ontologies created from the data for concepts such as authorities, mints, and denominations. The ontologies are linked to external resources, mainly Wikidata[11], where possible. The data is served from an endpoint and can be queried using SPAQRL.

The CoinSampo web application [12] is based on the Sampo-UI[13] framework [2]. The application works by creating SPARQL queries based on selections made by users and visualizing the data using various JavaScript libraries. The user can refine the search using various facets and view the coin finds individually or as a table, or visualize the data by selecting one of the visualization tabs available. For example in Fig.1 a user has limited the search to coins from the Viking Age that were found in the Municipality of Nousiainen. The visualization shows arcs starting from the mint and ending to the find municipality. It is easy to see that the coins have been minted in various places around Europe, especially

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7 http://Nomisma.org

8 https://numismatics.org/sco/

9 https://ariadne-infrastructure.eu

10 Project homepage: https://seco.cs.aalto.fi/projects/diginuma

11 https://www.wikidata.org/

12 The source code of the portal is available at https://github.com/SemanticComputing/coinsampo-web-app.

13 https://github.com/SemanticComputing/sampo-ui

in Cologne, as shown by the wider arc starting from there, but also in more far away places such as the modern Uzbekistan. The mint concepts have been mapped to Wikidata and coordinates have been extracted from there. Similarly the municipalities are mapped to the Finnish place ontology YSO Places that includes coordinates for them.
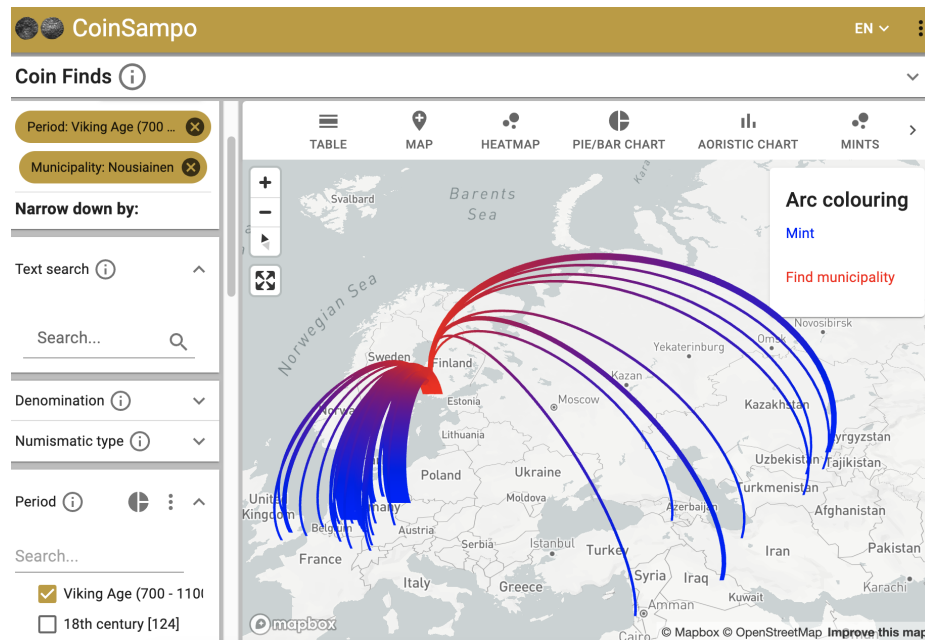

Fig. 1. An example of a visualization created with CoinSampo application showing identified mint sites where coins from the Viking Age found in municipality of Nousiainen have been minted.

In addition to the perspective for coin finds the CoinSampo web application also offers search perspectives for searching and visualizing authorities and mints. These are central elements of data about coin finds, and a wide range of properties can be assigned to them. Both of these ontologies are fully mapped to Wikidata and enriched from there with for example images. However, the properties of authorities and mints are not the focus of the application. Instead the search can be used to see how mints and authorities are repretented in the coin finds of the KG. For example, silver is material for only 18.75 percent of the coin finds, as can be easily seen using pie chart visualization, but the mints perspective shows that 77.8 percent of the mints in the KG are associated with

coin with material silver.[14] This offers a different way to view the data, and can offer new insights.

3 Conclusion

The CoinSampo demonstrator is an example of how practical and usable applications can be built on top of SPARQL endpoints. It also demonstrates how ontologies created based on the concepts in the data and mapped to external resources can be used to enrich the data and make it easier to search and visualize. CoinSampo democratizes access to information aabout the past by making the data easy to access and visualize to everyone without specialist training.

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[14] This is because the Viking Age coins that usually had silver as their material were used based on the value of the metal regardless of origin and authority, and therefore they come from a wider variety of minting places.