FindSampo: A Linked Data Based Portal and Data Service for Analyzing and Disseminating Archaeological Object Finds

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Abstract. This paper presents the FINDSAMPO system for analyzing and disseminating archaeological object finds made by the public. The system is based on Linked Open Data (LOD), and consists of a web portal and an open data service. The underlying knowledge graph contains data of some 3000 archaeological object finds catalogued in the archaeological collection of the Finnish Heritage Agency (FHA) from 2015 to 2020. The portal and LOD service have been open to public use since May 2021.

1 Introduction

1.1 Web Services for Citizens and Researchers

The popularity of recreational metal detecting has grown rapidly in many countries such as in Finland during the last decade, creating a large amount of new archaeological data. This paper demonstrates how archaeological object finds made by the public can be analyzed using the Linked Open Data (LOD) based FINDSAMPO service [14,20]. FINDSAMPO research prototype has been created by the SuALT project[5] aiming to study and improve the reporting process and analysis of archaeological finds based on collaboration of the public, academic researchers, archaeologists, and the Finnish Heritage Agency (FHA) [6,29,22].

A demonstrator based on data of some 3000 archaeological object finds catalogued in the archaeological collection of FHA from 2015 to 2020 has been open

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[5] SuALT project: https://blogs.helsinki.fi/sualt-project

to public use since May 2021, and has had over 3000 users during it's first six months. The FINDSAMPO demonstrator consists of a data service[6] and a semantic portal[7] with search functions and analytical tools. Figure 1 shows the front page of the FINDSAMPO portal with various perspectives to the data, and quick links to selected featured finds.

FINDSAMPO responds to a need for digital solutions to improve the management, accessibility and democratisation in cultural heritage management that stem from the recent popularity of recreational metal-detecting. In Finland, metal detecting is permitted but the Finnish Antiquities Act (295/1963) stipulates acts of law that must be followed also when metal detecting. There are also gerenal guidelines provided for recreational metal detectorists to prevent illegal acts and to protect cultural heritage. The Antiquities Act prohibits strictly metal detecting and especially digging at the ancient monuments and other archaeological sites. Certain areas are also protected by the Nature Conservaton Act. The Antiquities Act also requires that archaeological objects, including metal detected finds are expected to be at least 100 years old and do not have any known owner must be reported immediately to the FHA. The reporting of finds is guided to be done easily through FHA's electronic reporting service. In Finland, the FHA has the right to redeem archaeological finds to the national collections.[8] In the management process of the finds, the find information will also be entered into an electronic database that will feed the FINDSAMPO. Metal-detecting is therefore a form of crowd-sourcing information about the past. For the more serious (or avocational) metal-detectorists this activity is citizen science, where the citizen participates in the creation and discovery of new archaeological knowledge [30].

Metal-detecting in Finland has increased significantly in popularity in the last decade. The vastly increased amount of information generated challenges the heritage management. The larger context that this topic consequently links to is the pan-European need to develop an internationally operable and harmonised data infrastructure for using cultural heritage data from different countries in research.

In order to respond to the challenges in contemporary cultural heritage management, FINDSAMPO supports three overlapping stakeholder groups: 1) the public in analysing their finds and learning about archaeology, 2) cultural heritage professionals in analysing, managing, and publishing collection data, and 3) researchers in knowledge discovery using metal-detected citizen science data. In keeping with the ethos of open science and democratising access to cultural heritage the service has been designed to transfer knowledge from professionals to citizen scientists, and to provide a powerful set of digital tools for new knowledge discovery and creation among its users.

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[6] https://www.ldf.fi/dataset/findsampo

[7] https://loytosampo.fi/en

[8] https://www.museovirasto.fi/uploads/Arkisto-ja-kokoelmapalvelut/\Julkaisut/ muinaisjaannokset-ja-metallinetsin-2017.pdf
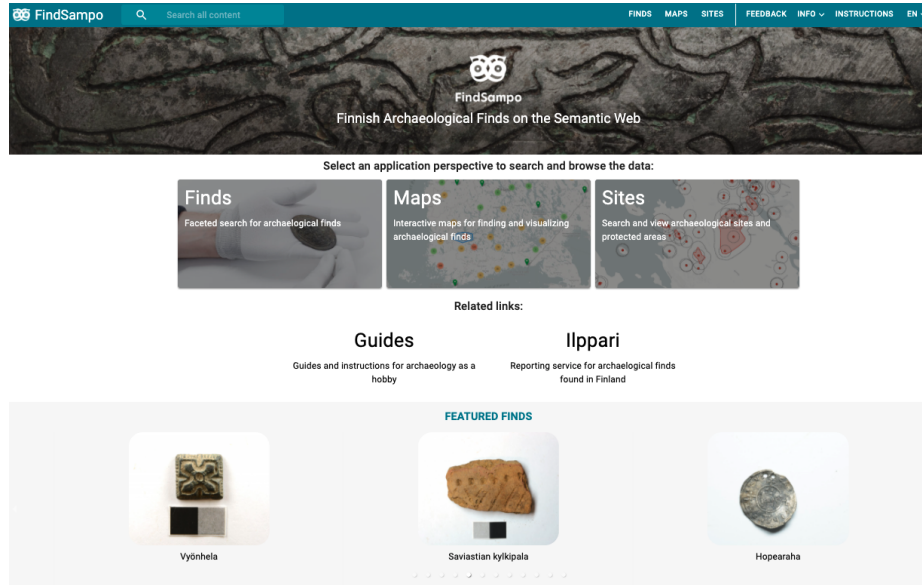
Fig. 1. Front page of the FindSampo portal.

The archaeological finds included in the service have been recovered by the public mainly by metal-detecting and reported to the FHA for recording. The FindSampo data constitutes an unprecedented reservoir of citizen science-generated archaeological heritage in Finland, equally accessible to researchers and to the broader public interested in heritage. The new archaeological object finds material it contains has proven to hold the potential for substantially adding to our understanding of the Finnish prehistorical and historical periods. Our goal is to allow the end users to improve themselves and also learn more about archaeology. In this way, archaeological data becomes more quickly and comprehensively available and accessible for research purposes and Digital Humanities [5].

This paper presents an overview of the service and the technical design principles and implementation of the FindSampo Portal and it's underlying data service. FindSampo Portal is yet another member in the "Sampo" series[9] of Linked Open Data services and semantic portals [12], based on a national Semantic Web infrastructure [11].

1.2 Related Work

Our work was motivated by the growing popularity of metal detecting in recent years. As a result, many countries are developing web services to collect, analyse, and study archaeological data.

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[9] For a list of Sampo portals, see https://seco.cs.aalto.fi/applications/sampo/.

1. The largest of them, Portable Antiquities Scheme (PAS)[10], records[11] archaeological discoveries found by members of the public in England and Wales since 1997 [1].
2. Digital Metal Finds (DIME)[12] is an online platform for reporting metal detecting finds in Denmark [28].
3. Portable Antiquities of the Netherlands (PAN)[13] is an online portal in use in the Netherlands [26].
4. Metal-Detected Artefacts (MEDEA)[14] is an online portal developed in Flanders for metal detectors [2,28];
5. ILPPARI[15] is a service of the Finnish Heritage Agency (FHA) for reporting archaeological object finds found by the public in Finland. The service also includes tools for public to report archaeological sites and possible damages concurred to them. [29].

Nomisma.org[23] is an example of an international project that concentrates on a specific type of objects, in this case coins. Nomisma.org uses a detailed model to describe various aspects of numismatic data using LOD. Numerous datasets have been published using the data model, and some of these datasets include also citizen finds.

FINDSAMPO is an application of the "Sampo model" [13], a collection of principles that have evolved gradually when creating a series of semantic portals[16]. The principles behind the Sampo model in use in FINDSAMPO have been explored and developed before in different contexts. For example, the notion of collaborative content creation by data linking is a fundamental idea behind the Linked Open Data Cloud movement[17] and has been developed also in various other settings, e.g., in ResearchSpace[18]. The idea of providing multiple analyses and visualizations to a set of filtered search results has been used in other portals, such as the ePistolarium[19] [21] for epistolary data, and using multiple perspectives have been studied as an approach in decision making [16]. Faceted search [24,25], also known as "view-based search" and "dynamic ontologies", is a well-known paradigm for explorative search and browsing [17] in computer science and information retrieval, based on S. R. Ranaganathan's original ideas of faceted classification in Libary Science in the 1930's. The two step filter-analyse usage model is used in prosopographical research [27] (without the faceted search component). The novelty of the Sampo model lies in consolidating several ideas

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[10] PAS: https://finds.org.uk/database
[11] 1.4 million finds have been reported by more than 14,000 citizens by now.
[12] DIME: https://www.metaldetektorfund.dk
[13] PAN: https://portable-antiquities.nl
[14] MEDEA: https://vondsten.be
[15] ILPPARI: https://www.kyppi.fi/ilppari
[16] This series is explained with references in https://seco.cs.aalto.fi/applications/sampo/.
[17] https://lod-cloud.net
[18] https://www.researchspace.org
[19] http://ckcc.huygens.knaw.nl

and in operationalizing them for developing applications in Digital Humanities; something that the field of the Semantic Web seems to be missing as argued in [8].

1.3 Applying the Sampo Model on a Framework Level

The Sampo model principles can be used directly for creating semantic portals. However, it is also possible to apply them first to create an application domain specific framework and reuse it for developing different related application instances, which is arguably cost-efficient. Fig. 2 illustrates the idea with FIND-SAMPO and LetterSampo [9] frameworks as examples. The highest conceptual layer includes the Sampo model with its principles based on domain agnostic, logical Semantic Web standards of the W3C and Linked Data publishing principles. On the next, domain specific level, model level solutions and principles are applied to create a domain specific framework by using a domain specific data model that can be populated using domain specific vocabularies and ontologies (e.g., archaeological object types, archives involved, historical places, etc.). This layer includes also a domain specific template designed using the Sampo-UI framework [15] that can be copied and used as a starting point for creating application instances. The template tells, e.g., what thematic application perspectives, data-analysis tools, and ready-to-use UI components are available in this application domain. Finally, applications can be created by adding in specific datasets into the framework, by creating a Sampo-UI implementation of the portal interface, and by publishing the data in a Linked Data service with a SPARQL endpoint. In the figure, the LetterSampo framework has been used for two such applications corresponding to the epistolary datasets of CKCC (ca. 20 000 letters related to the Republic of Letters provided by the Huygens Institute [7,18], the Netherlands, and correspSearch (ca. 151 000 letter dataset [4,3] aggregated by the Berlin-Brandenburg Academy of Sciences [9]. In the case of FINDSAMPO, archaeological find collections from the Finnish Heritage Agency (FHA) are used in one instance and another one is based of the Portable Antiquities Schema (PAS) of the British Museum is being developed using the same framework[20] [19].

2 FindSampo Data Model and Data Service

2.1 Data Model

For the heritage agencies in Finland, and presumably around the world, a central problem are the limited available resources for information technology. We have therefore tried to use as simple model[21] for the data as possible. The data model is also constructed so that the faceted search for finds is efficient. The data

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[20] https://seco.cs.aalto.fi/projects/diginuma/

[21] The documentation of the data model, and other information, can be accessed at www.ldf.fi/dataset/findsampo.
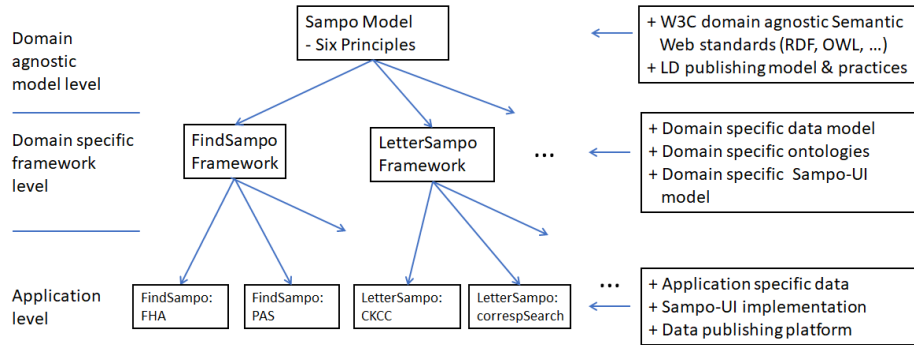
Fig. 2. Three conceptual layers for creating Sampo portals: Sampo Model, Sampo frameworks, and applications [9]. The idea is to re-use generic solutions of the model layer in domain specific frameworks and then frameworks for application instances in different domains.

points are attached to the Find entities, that are central to the data, with short property paths. We generally use a purpose build data model. In some cases we use certain relevant elements from well known standards, such as CIDOC Conceptual Reference Model (CRM)[22]. However these are mainly used as property names, and we do not implement, for example, full event structure of CIDOC CRM.

We created a FINDSAMPO Core ontology for representing the most relevant data relating to the object finds. Most important part of the data are the Find entities representing the object finds, and almost all the data is directly attached to those with either data type properties or object properties. The FINDSAMPO core properties include properties for object type, material, dating, and so on. We would expect any data relating to citizen science object finds would generally include these properties. In addition to the core properties we use specific properties to represent the data as it is in it's original source. These properties would be different for all different sources, and represent the data in the format used in that source. There can also be various properties for types of data that is not included as part of core properties. While the core properties aim to use ontologized object values, and standard data types, these source specific properties are only literal can can use various different data types.

Below is presented a simplified example, with selected properties, of a RDF representation of a single Find in Turtle format. Most of the properties here are either core properties, represented with prefix "findsampo-core" or properties specific to the FHA finds database, that are represented with the prefix "ltk-s". For example, in the Turtle notation below the property "ltk-s:length" denotes the original value for the object length in the FHA database as it is written there. The property "findsampo-core:length" on the other hand expresses the

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[22] https://www.cidoc-crm.org/

object length in standard decimal format. We also use SKOS prefLabel property
for the main human readable label of the find, and we use Dublin Core source
property to represent the source of data for the Find. Most properties attach
the data directly to the Find, but with time spans and coordinate points we use
a more complex representation where they are separate entities. Time spans are
modelled with properties based on CIDOC CRM and for coordinates we use the
W3C basic geographic vocabulary[23]. This is to make it easier to integrate with
various existing tools.

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@prefix crm: <http://erlangen-crm.org/current/> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix ltk-s: <http://ldf.fi/schema/findsampo/extended/ltk/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix findsampo-core: <http://ldf.fi/schema/findsampo/core/> .
@prefix finds: <http://ldf.fi/findsampo/finds/> .

finds:km_39824-45 a findsampo-core:Find ;
    findsampo-core:find_site_coordinates
      <http://ldf.fi/findsampo/find_sites/find_site_of_39824-45> ;
    findsampo-core:has_creation_time_span
      [ crm:P82a_begin_of_the_begin "-0500-01-01"^^xsd:date ;
      crm:P82b_end_of_the_end "1300-12-31"^^xsd:date ] ;
    findsampo-core:identifier "KM39824:45" ;
    findsampo-core:length 56.0 ;
    findsampo-core:material
      <http://ldf.fi/findsampo/materials/p10> ;
    findsampo-core:object_type
      <http://ldf.fi/findsampo/object_types/hevosenkenkaesoljet> ;
    findsampo-core:period
      <http://ldf.fi/findsampo/periods/p17> ;
    findsampo-core:weight 35.0 ;
    findsampo-core:width 10.0 ;
    ltk-s:amount "1" ;
    ltk-s:find_name "Hevosenkenkäsolki" ;
    ltk-s:find_number "39824:45" ;
    ltk-s:length "56" ;
    dct:source "Museoviraston löytötietokanta" ;
    skos:prefLabel "Hevosenkenkäsolki KM39824:45" .
```

In the end, creating a simple model for the relevant properties of object finds
is relatively easy. Internationally the central properties of the data seem to be
mostly similar, and the data from other countries could be represent with this
model as well. We have already created an initial conversion of PAS data to
FINDSAMPO model to run tests with it using our system. This can be done with

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[23] https://www.w3.org/2003/01/geo/

relatively little effort. What would be a more difficult question is the harmonization of the various annotation ontologies used in the data.

2.2 Ontologies

Representing the properties of object finds requires specific ontologies[24]. These include ontologies for object type, materials, and periods. We have used two different kinds of ontologies to represent the data: "annotation ontologies" and "facet ontologies". Annotation ontologies are used to represent the concepts in the data in shared and machine understandable manner, while the facet ontologies are used to offer an easy to use hierarchy of concepts to the users. We have used the Finnish Ontology for Museum Domain and Applied Arts (MAO/TAO)[25] ontology as the basis of our annotation ontologies, but instead of using MAO identifiers directly, we have created new identifiers for the concepts, that then have an exact match concept in MAO ontology. We have also created mapping for the concepts to the Art and Architecture Thesaurus (AAT)[26]. We also added some semantic information to the concepts, such as machine readable dates for periods. The reasoning capabilities offered are limited, but make it possible to, for example, deduce the possible manufacture times of objects when given only a period.

MAO/TAO includes a hierarchy for the concepts, but this hierarchy can be unintuitive for users. For example "sword hilts" would not be under "swords" in MAO/TAO hierarchy, but instead under "parts", because sword hilt is not a sword. With domain experts we have created separate "facet ontologies" for the concepts that aim to make searching different types of finds easier for general public, and even for archaeologists. For example when a researcher would like to visualize find sites of iron age swords on a map, it isn't usually relevant if the find is a sword or only a part of a sword, and it is more convenient to simply select swords than having to know to select the sword and parts of swords. The facets ontologies can't be used to make certain logical deductions, but can be useful for quick analysis. It is obviously possible to classify archaeological objects in various different ways, and researches might want to use different classifications in different cases. One benefit of LOD is that it makes creating, using, and sharing various new hierarchy classifications easy.

It would have been possible to create the facet ontologies with some ontology editor. However, to make the creation easier, we opted to use a method where the hierarchies were created using a spread sheet and hierarchy was indicated using different column, so that the concepts on the first column is on the top level of the hierarchy, and a concept on the second column is a narrower concept of the first concept above it in the spreadsheet on the first column, and so on. We then had a purpose built Python script to convert these spreadsheets to RDF

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[24] Note that we use the term "ontology" in a broad sense that does not make a clear division between a "vocabulary" and an "ontology".

[25] https://finto.fi/maotao/en/

[26] https://www.getty.edu/research/tools/vocabularies/aat/

format. Using such method meant that the archaeology expert creating the facet ontology did not have to learn to use the often quite complex ontology editors. On the other hand some issues became apparent only when the ontologies were actually put to use. An ontology editor would better show how the hierarchy actually operates and would also help to avoid some spelling errors.

We created mappings for the Finnish MAO terms to international ontologies, especially the Getty Art & Architecture Thesaurus[27] (AAT), to allow easy comparison of the Finnish find data to similar international data. A mapping to ATT allows also linking to other international vocabularies through AAT. For example we have used a mapping created by the Ariadne[28] project between the AAT and the Forum on Information Standards in Heritage (FISH) Archaeological Objects Thesaurus[29] to create mapping between the Finnish ontology and the FISH ontology that is used for example by the The Portable Antiquities Scheme (PAS) of the British Museum.

2.3 Data Conversion

Source data of FindSampo is received in CSV format and is converted to RDF. The conversion pipeline consist of two main parts: the data conversion and the ontology conversion. Both processes use Python scripts mainly based on RDFLib[30] library, that convert CSV files to RDF. Fig. 3 shows the basic steps in the conversion process. In addition to the Python libraries, we have not used any of the various existing tools for converting CSV data to RDF format, because we wanted to define the hierarchies for the ontologies in a specific format, but also because in our experience using the tools of Python, or some other programming language, directly is generally more convenient when dealing with imperfect data that needs cleaning.

First part of the pipeline is the ontology creation process, where the ontologies defined in CSV are converted to RDF format. The pipeline then runs an initial process that creates a simple RDF file with only literal values. Enriching process is then run which cleans up data and creates ontologized values for data based on the ontology definitions. After the data is updated, a triple store is automatically built with the updated data.

The data and ontology conversions are done with similar Python scripts for convenience, but the processes do not depended on each other and they could be done separately and in different ways. Ideally the existing ontology infrastructure would be so strong that we could use entirely ready made ontologies.

The most difficult part of the data conversion process was ontologization the the terms used in the data. The find database used by the FHA allows submitting data freely and no strict vocabulary had been used. It was relatively easy to ontologize the terms used for periods and materials in the FHA data, but

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[27] https://www.getty.edu/research/tools/vocabularies/aat/
[28] http://legacy.ariadne-infrastructure.eu/
[29] http://www.heritage-standards.org.uk/fish-vocabularies/
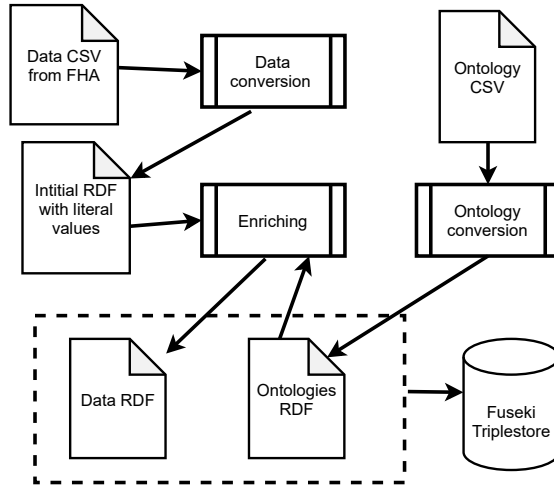[30] https://rdflib.readthedocs.io/en/stable/

Fig. 3. Conversion pipeline

the terms for object types required more work. We mapped the object types of finds to MAO ontology using "object names" of each object. This was the most detailed description of the type of the objects available in structured format in the find database. An archaeology student was hired to manually do the mapping for object names, as well as to do the mapping from annotation ontology to AAT.

We run the whole conversion pipeline again when the source data is updated and the triple store is automatically build again with new data. The process is fully repeatable, and makes it easy to also fix possible errors in the data. In practice we expect to update the data only rarely. The LOD service[31] is run on the Linked Data Finland platform[32] [10], which is powered by a combination of the Fuseki SPARQL server[33] and a Varnish Cache web application accelerator[34] for routing URIs, content negotiation, and caching. Currently there are around 240 000 triples in the FindSampo main graph.

3   FindSampo Semantic Portal

The FindSampo Data Service includes currently over 3000 archaeological finds made by the public. The FindSampo Portal queries this data service with SPARQL, and offers search, exploration, and analysis tools for DH researchers and hobbyists. The finds can be filtered using faceted search [24] with hierarchical facets based on ontologies, and then visualized using maps with external layers

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[31] The service can be queried freely with SPARQL at http://ldf.fi/findsampo/sparql
[32] https://ldf.fi
[33] https://jena.apache.org/documentation/fuseki2/
[34] https://varnish-cache.org
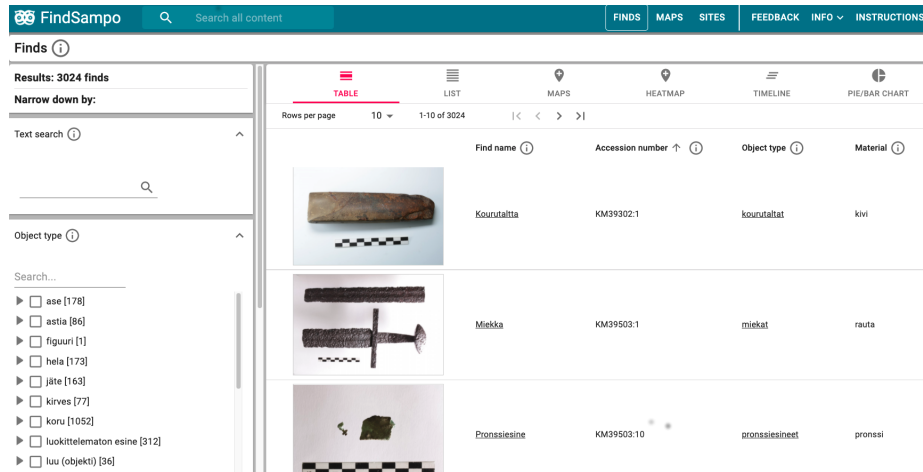
Fig. 4. The main search view of FindSampo Portal showing finds as a paginated table on the right, and search facets on the left.

from the GIS services[35] of the FHA, various types of charts, and a timeline. On the front page, see Figure 1, the user is presented with tree different perspectives: "Finds", "Maps", and "Sites".

The Finds perspective allows for searching and analyzing the archaeological object finds in the knowledge graph using facets and various visualizations. Maps perspective here is just a quick link for user for map visualizations of this perspective. Faceted search can be used to get the information of some specific find, and it can also be used to analyze and compare groups of finds. As default the individual finds are presented as a table as the default option on wider screens, or as a more mobile friendly list with mobile devices. The mobile friendly list option was created after the initial publication of the portal based on feedback from metal detectorists. Figure 4 shows one opened facet and results with pictures of individual finds when available. The various charts and timelines can be selected from tabs to visualize the relative distributions of the selected groups of finds. Currently the user can select visualizations from clustered map, heatmap, timeline, pie or bar charts, and line charts. In addition there is an option to download the data in CSV format.

The clustered map shows interactive markers on a map based on the find coordinates of each find. The clustering is made for performance reasons. The finds can be visualized using different base maps and map layers (selected in the box on the top right) including, e.g., street maps, satellite images, and a lidar-based elevation model.

Heatmap is a more research oriented tool that shows the data about the finds as a spatial heatmap. Figure 6 shows an example of a simple visualization for data-analysis, that can be made easily. The user has selected prehistory period

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[35] https://kartta.museoverkko.fi/?lang=en

Fig. 5. An entity landing page of a single find.

from the period facet and the heatmap tab to view the results. It is easy to see that the red area, that signify a lot of nearby finds, are concentrated in Häme and close to the city of Turku, and large areas of Finland have only a small number of finds. A researcher will have to determine if this tells something about the prehistory of Finland, or if this is related more to the popularity of metal-detecting hobby in certain areas.

The timeline tab can be used to visualize temporal spread of groups of finds in certain areas. Timeline component groups the finds by province in which they were found (y-axis), and by period (x-axis). The start and end years for the periods are retrieved from the period ontology developed with domain experts, instead of directly from the finds. Pie chart tab can be used to visualize distributions as pie or bar charts. These can be used to easily visualize, for example, the relative number of coins in finds from the medieval period.

Each individual object find has its own "home page" that contains detailed information about the find. Figure 5 shows an example of an entity landing page of a single find. This entity page of the find includes the detailed information of

the find, a map showing the find coordinates, and recommended links to similar finds in Finland and abroad. The object types and periods have their own pages in the same way. The collect information such as the time span of a certain period and links to the related finds.

We have created links to PAS data as an example of connecting international data. This feature shows the possibilities and challenges that a linked data approach can have. The links to PAS as created through mapping FINDSAMPO object types to AAT vocabulary, that is then mapped the FISH vocabulary used by PAS. This means that there is one extra step that can cause various issues for the linking. In practice this can be seen in that in many cases a link is missing, or it can be less than optimal. For example an entity page of a sword find, as in figure 5, has a link to a certain object in PAS database that is determined to be similar, based on it's type "sword". Similarly entity page of object type of swords has a link to PAS database search for swords. In practice this can take user to a page of a sword pommel, as those are expressed in PAS data to be of type "sword". The accuracy of this kind of mapping is limited to the least accurate conceptualization.

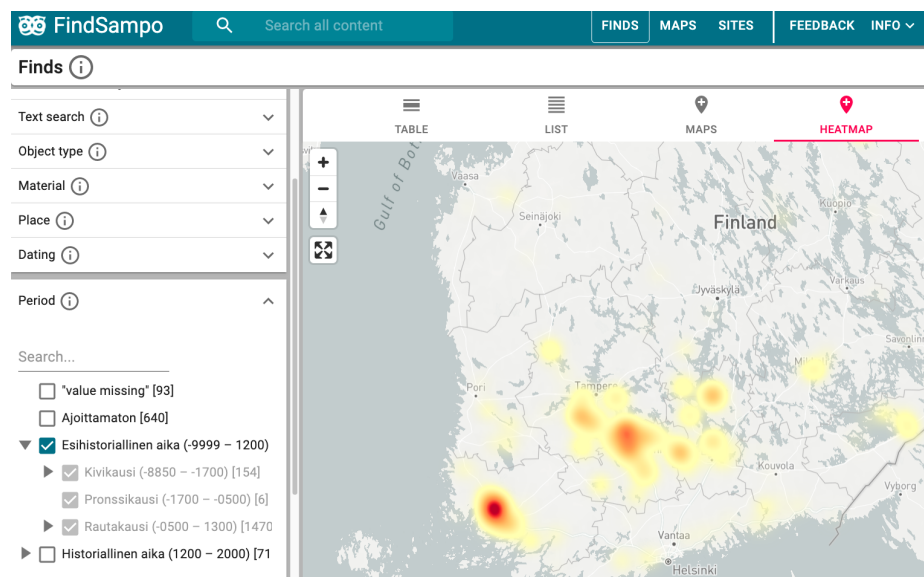**Fig. 6.** An example of using FINDSAMPO PORTAL for data analysis: showing prehistoric finds as a heatmap.

The Sites perspective can be used to show finds made by the public and the registered archaeological sites of FHA. This data is received directly from FHA API. As an example, Fig. 7 shows finds (green markers, one of which is opened) and protected archaeological sites (red areas) along the Aura River in Turku, the

former capital of Finland. A buffer zone of 200 meters where metal detecting is not recommended is automatically calculated and shown around the sites with a dashed line. The maps can be used by researchers for analysis, and by hobbyists to get information on promising places to practice metal detecting as well as on protected sites where detecting should be avoided. This kind of mobile friendly map is particularly useful for metal-detectorists.
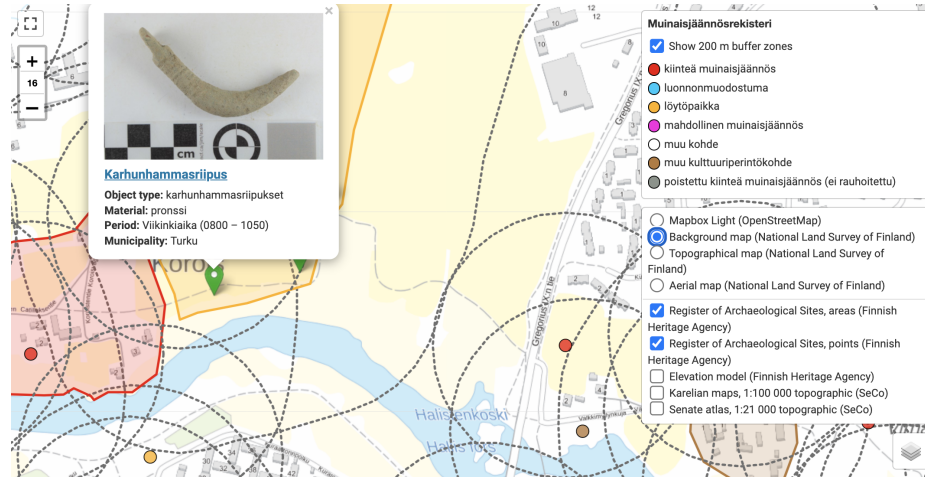

Fig. 7. Archaeological finds and protected sites along the Aura River in the City of Turku as shown in the FINDSAMPO portal.

The user interface of the portal is implemented with the Sampo-UI framework [15], and the source code is available on GitHub[36] with an open license. The performance of the portal is limited mainly by the underlying SPARQL endpoint. Faceted search can consume lot of computational resources, especially when using hierarchical facets. Counting the hit counts every time the facets are updated can be resource intensive. This is not an issue with the number of finds currently in the FINDSAMPO knowledge graph. However this would become issue with when using larger data with perhaps millions of finds. When adapting FINDSAMPO framework for larger number of finds, the hierarchical facets can be converted to flat ones, or perhaps counting the hit counts could be disabled.

4 Discussion

4.1 Contributions

The apps built into the FINDSAMPO offer a powerful set of tools for examining and analysing archaeological finds, and creating new knowledge and understanding of the past. As an archaeological cultural heritage service FINDSAMPO has

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[36] https://github.com/SemanticComputing/findsampo-web-app

been designed to organise, present and make widely available a complex form of crowd-sourced and heterogenous data.

Metal-detected public archaeology is an inherently international field. Find data cannot be viewed as restrictively national cultural heritage, and from a research and knowledge discovery perspective the various public finds archaeological databases are natural partners to each other. LOD offers a natural way of harmonizing international data in a way that makes interoperability possible. Mappings created to international vocabularies from FINDSAMPO concepts make it possible to create research of metal-detected finds that transcendents data from single countries. The data model of FINDSAMPO also offers a way to represent such find data in simple and interoperable way.

4.2 Future work

In future we aim to continue to update FINDSAMPO with new finds made my metal-detectorists in Finland. We also are starting a continuation project that seeks to add a a new perspective to FINDSAMPO that is concentrated to coins. Coins are a special case of object finds as they are very numerous, and have many coin specific properties, such as mint or ruler, that other finds generally do not have.

FINDSAMPO is part of a larger pan-European movement in digital cultural heritage services. Major undertakings such as the EU-funded ARIADNEplus project[37] are presently developing data alignment methodology for combining diverse national archaeological databases. Research for transnational data services based on the FINDSAMPO framework is currently being taken forward by a new pilot project funded by the Helsinki Institute for Social Sciences and Humanities at the University of Helsinki, which seeks to integrate the PAS dataset within the FINDSAMPO framework as a test case of its international use-potential.

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