NFDI4Objects
Research Data Infrastructure for the Material Remains of Human History

TRAIL 2.6:

Solving vagueness modelling issues in numismatics and ceramology

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Summary

Research data contain fuzzy and uncertain interpretive statements about objects, which must be recorded and provided FAIRly. Based on the solutions developed in TRAIL 2.2 – which extends existing modelling approaches and transformation rules between modelling concepts – this TRAIL focuses on a FAIRification tool to handle vagueness. The TRAIL addresses the enrich & interpret and reuse & cite aspects of the research data lifecycle. In this context, the challenge is to create a web-based data enrichment tool that can be used to create machine-readable qualified references and supports relevant attributes related to modelling vagueness. The implementation of

semantic modelling concepts of vague object statements are tested in two cases: Roman coins with depictions of ships and graffiti on Roman gold coins and vessels. In addition, the browser-based Academic Meta Tool (AMT), which already supports the creation of networks of weighted properties, will be further developed into a dynamic web service (API). This TRAIL will implement an API for AMT. Adaptations to the AMT meta-ontology for describing vague semantic statements, which forms the logical basis for AMT, will be published as a blue paper, and the test data on using the tool in practice will be summarised in an evaluation report.

Description

The TRAIL will improve a Software Application Service (SAS): AMT is developed by the RGZM and i3mainz. AMT enables semantic modelling of vague statements based on both an overarching AMT meta-ontology and application-specific AMT ontologies. This can be used for rule-based reasoning. Within this TRAIL, the existing JavaScript version of the AMT is being transformed into a dynamic JAVA API by a group at the University of Cologne led by Prof. Dr. Øyvind Eide. Data Services (DaS) will be provided by N4O partners (Heidelberg University, RGZM) to trial the new API as a reference implementation. These are research data on ship iconographies, graffiti on Roman (gold) coins and maker graffiti on terra sigillata, in which the individual facets of vagueness and uncertainty are discernible in the object descriptions using free text fields:

Research data of the NAVIS:3 database of the RGZM refer to Roman coins, including ship depictions (iconography). These ship depictions contain vaguenesses and uncertainties regarding ambiguous assignments (Thiery/Mees, 2018).

Numismatic research data from SFB project 933 Material Textkulturen (Material Text Cultures), A11: Graffiti auf römischen Goldmünzen: Bedeutungsspektrum und Kommunikationsstrategien (Graffiti on Roman gold coins: spectrum of meaning and communication strategies) carry graffiti (epigraphy) described and recorded as individual letters. These are annotated according to the presumed reading direction and spatially located on the coin. The description of these graffiti features contains vaguenesses and uncertainties.

Primary graffiti (epigraphy) in the research domain-specific database Samian Research contain vaguenesses and uncertainties concerning intended potter's attributions (e.g. vessel makers cursive signatures inscribed before kiln firing).

The AMT ontologies specialised in these three datasets are being modelled at the Heidelberg University (Centre for Ancient Numismatics at the Department of Ancient History and Epigraphy, Dr. Susanne Börner). In addition, a seminar will be held at the Faculty of Philosophy, Department for Digital Humanities, University of Cologne. The semantic modelling of vagueness using the AMT meta-ontology and the students' use of the AMT will be evaluated in the seminar as well as the results being used to further develop the tool. The resulting teaching materials (e.g. slides, data sets, videos) will be made available for other courses in open access (OER), so that the knowledge transfer to students and the specific research community is guaranteed in cooperation with

TA6. Specific models for vagueness in research data are currently only available in a few humanities domains (e.g. numismatics: Tolle/Wigg-Wolf, 2015). These will be evaluated beforehand in TRAIL 2.2 and documented in a white paper. This TRAIL uses the Resource Description Framework (RDF) based modelling of the AMT meta-ontology and develops it further. The different specialised AMT ontologies of the three used DaSs will be compiled and evaluated in a best practice white paper so that the findings can be scaled for use in other contexts. The challenge of this TRAIL is to model vagueness in research data, which occurs in a wide variety of research domains and granularities and is currently not usually semantically modelled. The furtheranced AMT will be an innovative API-based research tool for modelling vagueness and reasoning based on it. Furthermore, it will be used to create Interoperable Dataset Services (IntS).

Relevance

The TRAIL addresses the enrich & interpret and reuse & cite aspects of the research data lifecycle. Users and stakeholders who will benefit most are scholars, students and data curators. The results of this TRAIL enable stakeholders to apply the results of TRAIL 2.2 in practice, i.e. to model vague statements in research data as uniformly as possible. These results will be discussed in a white paper and serve as a basis for further research. The potential for other, non-participating communities is great, since problems with semantic modelling of statements on fuzziness and wobbliness occur in virtually all research domains (cf. TRAIL 2.2). AMT was developed in the context of mainzed and is currently used in the humanities, cultural studies and engineering (geodesy). The AMT research tool and the resulting modelling strategies will be used and developed in cooperation with other NFDI consortia and research domains NFDI4Culture (TA2: Standards, data quality and curation; TA3: Research tools and data services), NFDI4Memory (TA1 Data quality; TA2 Data connectivity) and Text+ (Cross-cutting topic data, service and software quality frameworks). Two elements of FAIR are addressed in this TRAIL: interoperability and reusability. First, a large number of relevant object attributes will be provided with precise and explicit vagueness in exemplary datasets, which can be better reused thanks to the higher data transparency. Creating a new API for AMT, applying the LOD principles (i.e. machine-readable knowledge representations expressed in standardised formats and qualified references to other data) as well as the W3C standard RDF in a research community-specific version, ensures that the data modelled using the AMT are machine readable and interoperable. For the NFDI as a whole, AMT as a web-based tool for data enrichment and the underlying semantic modelling approaches will contribute technologically and conceptually to unveil vague and uncertain statements and therefore will allow data FAIRification. The digital methods used are scalable and usable for other NFDI consortia and working groups with similar data structures (e.g. NFDI4Culture, TA3, M4, as well as the working group “Graphen & Netzwerke” of the “Verband Digital Humanities im deutschsprachigen Raum” and CAA).

Deliverables

- Development and implementation of AMT as API (**SAS**)
- Best practice modelling for graffiti on Roman gold coins; ship depictions on Roman coins and pottery production graffiti (blue paper, **IntS**)
- Evaluation of the modelling approaches (best practice white paper)
- OERs for communicating and evaluating the results in teaching (**QuaS**)
- **N4O Commons**: white paper / blue paper

FAIR[1]	I1:RDA-I1-02D; R1.3:RDA-R1.3-02D
TRAILS	based on TRAIL 2.2

[1] Nach Tabelle 1 von Bahim, C., Casorrán-Amilburu, C., Dekkers, M., Herczog, E., Loozen, N., Repanas, K., … Stall, S. (2020). The FAIR Data Maturity Model: An Approach to Harmonise FAIR Assessments. Data Science Journal, 19(1), 41. DOI: http://doi.org/10.5334/dsj-2020-041 cc by 4.0