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Guided ontology-backed semantic annotation with neonion

Bachelors thesis: Using Wikidata as a referential knowledge source for entity linking and interactive controlled vocabulary alignment

Jakob Höper
hoeper@zedat.fu-berlin.de
Institute of Computer Science
Freie Universität Berlin

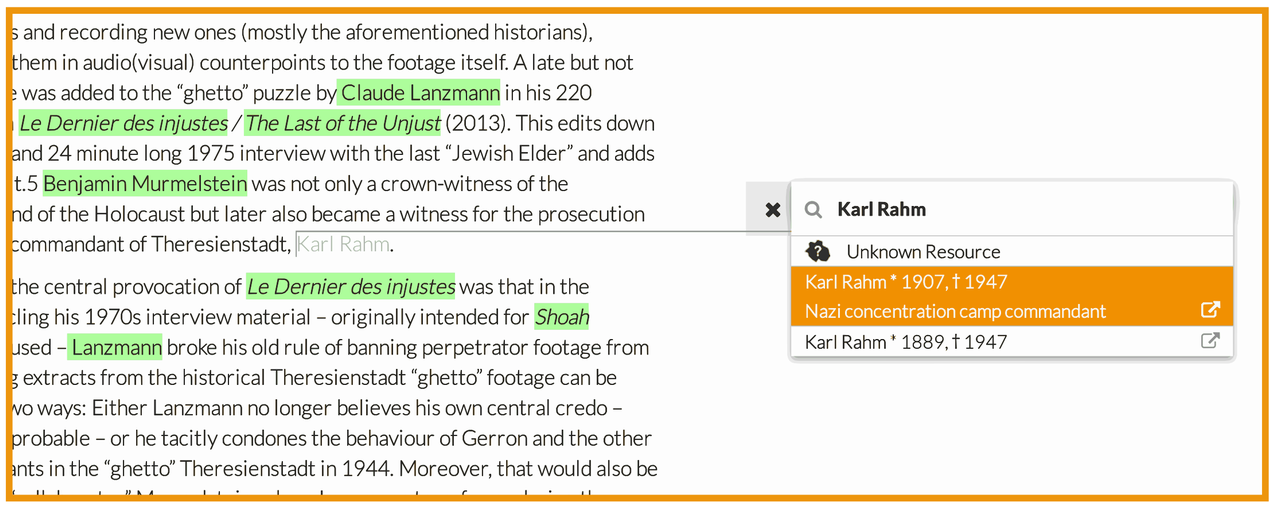
Thesis Advisor:
Prof. Dr. Claudia Müller-Birn
clmb@inf.fu-berlin.de
Human-Centered Computing
Institute of Computer Science
Freie Universität Berlin

neonion is a light-weight collaborative workbench for scholarly reading and annotation of documents [1]. Apart from basic forms of annotation, like highlighting and commenting selected portions of text, the software provides a model for semantic information extraction tasks like concept tagging and annotating relations [2]. It also contains modules for automation of such tasks, and even comes with a triple store engine for retrieval of semantic statements.

Although its technical capabilities and conceptual complexity are no unique features among the various existing approaches toward semantic annotation and enhancement, neonion aims at optimizing usability and follows paradigms for synergystic interaction between users and underlying automated processes. This focus on usability and mixed-initiative user interfaces [5] is a consequence of the observation that researchers who don't come from a technical background won't adopt semantic technologies as commonly as their collegues in life sciences or technical domains. Scholars from the humanities, who could make valuable contributions as subject-matter experts on their respective fields of research, often hesitate to use available tools, expecting them not to be designed for their needs or to require too much prior knowledge about semantic web technologies.

Development of features and extensions of the neonion semantic annotation software aims at meeting the needs of subject-matter experts who are interested in generating explicit semantic data from their research and publications. In order to offer usable tooling while at the same time enabling researchers, authors and editors to generate structured extensions to their content in a way that yields interoperable and schematically sound semantics, we propose a semi-automated approach which interacts with the user based on their input and lets them choose from recommendations for vocabulary alignment.

neonion's user interface for **annotating relations**. Occurences of Named Entities are classified by annotations assigning concepts from a controlled vocabulary. Available properties for description of relationships are visually indicated as hinted connections between entities of applicable class membership.



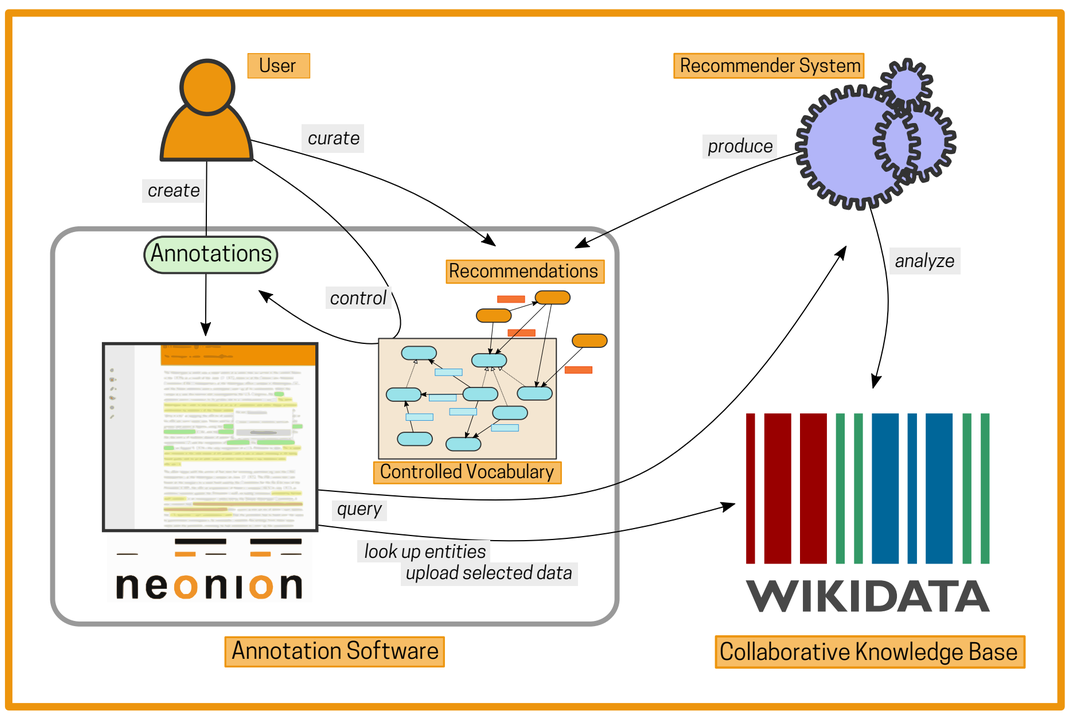
Entity linking in neonion, using Wikidata item page identifiers for contextualization. When users select some text in annotation mode, a search dialog appears next to the document and Wikidata is queried for matching items. Results are restricted to matching instances of appropriate classes in order to ensure valid input.

Free collaborative knowledge base Wikidata serves as a semantic backbone for structured data in Wikimedia projects. It is meant to cover of all public knowledge rather than selected scholarly and scientific domains and its large community of currently almost 20 000 active users and workflows for import of other knowledge bases such as Freebase seem to promise continuing progress. neonion is genuinely designed to allow connection to external knowledge bases in its annotation model and the internal knowledge organisation system it uses as a vocabulary for annotation. However, designing an ontology to formally define terminology and semantics for a specific research field requires not only subject-matter knowledge and labour time, but also comprehension of and skill in employed technologies.

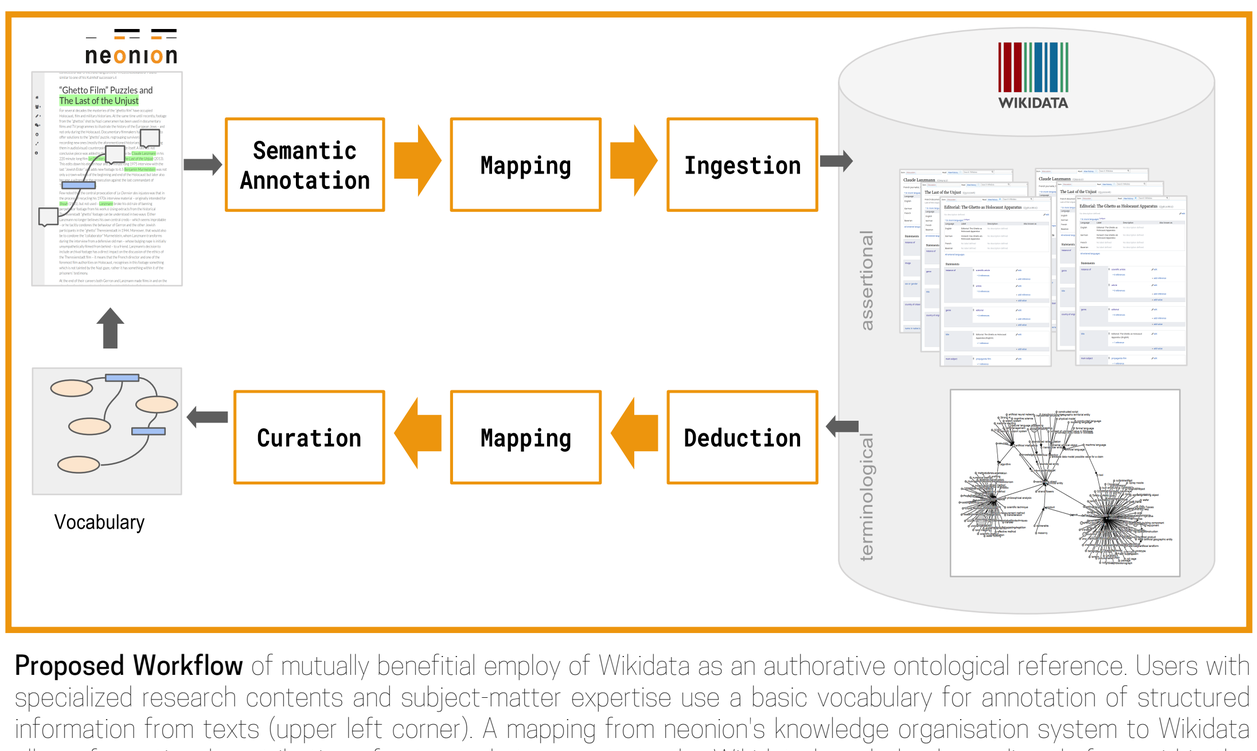
A closer connection of neonion and Wikidata is expected to archieve mutual benefits.

- Use terminological knowledge gathered from Wikidata to extend annotation vocabulary: Align vocabulary with domain of annotated content.
- Use mapping of vocabulary elements to extract Wikidata statements from neonion annotations: Add new factual claims to Wikidata or confirm facts known to Wikidta with bibliographic references to annotated publication.

The proposed functionality is being added to neonion as a propotypical implementation targeting a specific workflow involving scholarly texts from an scientific online journal. In order to assess whether Wikidata as a community repository for common knowledge can be used to extract domain ontologies based on subjects covered in scholarly texts, the **open access online journal Apparatus** [3] was chosen as a specialized textual resource, with cinematographic and historical studies with focus on central and eastern Europe as the specific knowledge domain to be covered. In order to generate candidates for vocabulary amendments, association rule mining **property recommender system Snoopy** is used [4].



IWithout need for prior configuration, new users can start on annotating their documents with a very basic controlled vocabulary. Thanks to its mapping to Wikidata terms, semantic recommenders can easily exploit Wikidata's structured contents and determine related class items and properties which can be suggested to the user as additional concept and property elements of their vobulary. Continuous creation of annotation generates a content-aligned vocabulary curated by the user.



Proposed Workflow of mutually benefitial employ of Wikidata as an authorative ontological reference. Users with specialized research contents and subject-matter expertise use a basic vocabulary for annotation of structured information from texts (upper left corner). A mapping from neonion's knowledge organisation system to Wikidata allows for optional contribution of extracted statements to the Wikidata knowledge base directly from within the neonion workbench. On the other hand, existing descriptions of identified entities are retrieved from Wikidata and schematic knowledge is deduced (bottom right corner). In combination with an association rule mining-based property recommender, neonion is able to suggest candidates for vocabulary extension to the user, who can thereby align new annotation choices with terminological semantics based on the actual content they work with.

References

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