Wiki Lexicographica. Linking Medieval Latin Dictionaries with Semantic MediaWiki

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Abstract

This paper reports the results of a survey of which the main aim was to scrutinize consequences of adopting a wiki model in alignment of Medieval Latin dictionaries. In the first section, the objectives as well as the methodology of the project are presented. As a framework, we used Semantic MediaWiki (SMW), and for the purpose of the research several entries from four dictionaries were selected. In the following sections we scrutinize the presentation, search, and collaboration features provided by SMW. We demonstrate how intrinsic wiki concepts, such as namespaces, templates, property-value pairs etc., may be employed in macro- and microstructure display. Next, alternative modes of accessing lexicographical data are presented such as maps, timelines, charts etc. After that search capabilities are analyzed, among which the most important appear to be semantic properties search and faceted browsing. Lastly, the paper considers on different ways which SMW can encourage researchers to collaborate and enrich dictionary content.

Keywords: Medieval Latin; wiki-interface; multilingual dictionaries linking; dictionary alignment

1. Introduction

In 1913 the idea of a Pan-European dictionary of Medieval Latin was clearly expressed by the research community, but not until the early 1920s did work begin on preparing *Novum Glossarium Mediae Latinitatis* which covered four centuries (IX–XII) of Latin language use (Langlois, 1924), replacing the older and already obsolete *Glossarium* of Charles du Fresne, sieur du Cange (Du Cange, 1883). From the very beginning it was also clear that, due to various periodization of the Middle Ages, the compilation of national dictionaries was necessary. This is the reason why there now exist a dozen dictionaries which vary not only in their chronological (500–1600 AD) and regional (from Spain to Poland; from Sweden to Italy) coverage, but also in their advancement (three were completed, but the majority of projects are works in progress).

Yet, with the advent of e-lexicography the founding idea of the common dictionary of European Latin should again be considered. A first step was made during the congress of Medieval Latin lexicography in Barcelona in 2004, where several elements of microstructure were proposed as a basis for dictionary alignment, among them headword, etymology and sense definitions (Heid, 2004). This proposal,

however, was put forward without major consideration of such "technical" issues as software framework, encoding schema or data structure. Over subsequent years the community witnessed the emergence of several e-lexicography and e-corpora projects, among which one should mention:

(1) electronic editions of Du Cange's *Glossarium*[1], *Novum Glossarium Mediae Latinitatis*[2], dictionaries of medieval Latin from Polish[3] and Catalan[4]sources;

(2) corpora of medieval Latin in Catalonia[5], Galicia[6], and Poland[7].

This rapid development, in turn, has raised an interest in encoding standards and lexicographical data interoperability. At the same time, several institutional enterprises have been launched in order to foster research collaboration and sustain data exchange, one of them being COST Action 1005 "Medioevo Europeo"[8]. Its goal, as the project's description says, is the development of a so-called "Virtual Centre of Medieval Studies", a common interface for querying until now dispersed databases, text collections, library catalogues, etc. After being appointed as experts of the project on behalf of Medieval Latin dictionary teams, we advanced the idea of a wiki-based tool. In the present paper, we discuss a working prototype of such a wiki, an interface and research environment which could potentially serve as a unified edition of Medieval Latin dictionaries and lexical databases.

2. Objectives and procedures

As a framework for our survey we choose MediaWiki (MW)[9] which is best known as an application running in the background of Wikipedia. Once installed, it was subsequently supplemented with a bunch of plugins of which the essential one was Semantic MediaWiki (SMW)[10], an extension that enhances MediaWiki with semantic dimension, enabling advanced data annotation and as a consequence finer data retrieval. MW enables an explicit declaration of the exact meaning of the data

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[1] Accomplished, available at http://ducange.enc.sorbonne.fr/.

[2] In progress, due to be finished in 2013, more information on http://glossaria.eu.

[3] *eLexicon Mediae et Infimae Latinitatis Polonorum*, in progress, due to be finished in mid-2014, http://scriptores.pl.

[4] In progress, more information at http://gmlc.imf.csic.es/.

[5] *CODOLCAT. Corpus Documentale Latinum Cataloniae*, http://gmlc.imf.csic.es/codolcat/index.php.

[6] *CODOLGA. Corpus Documentale Latinum Gallaeciae*, http://www.cirp.es/codolga/.

[7] *Fontes Mediae Latinitatis Polonorum*, in progress, due to be finished in 2016, more information at http://scriptores.pl.

[8] http://www.medioevoeuropeo.org/

[9] http://www.mediawiki.org

[10] http://semantic-mediawiki.org/

contributed to the wiki page by annotating it with the property name:

[[Property_name::Property_value]]
eg. [[Headword::Mandragora]].

Software choice was driven by the project goals and objectives, which can be summarized as follows:

1. Software should already exist and be free. There was no funding envisaged in the project for writing software from scratch, since it is treated as a means of fostering discussion rather than as a goal of the project.

2. Software should be open-source. The lexicographical and corpus data in the emerging projects, in the majority of cases, are (or soon will be) available under liberal licensing models, as should be therefore the tools used in their retrieval. Since the goal of the project is to foster collaboration and data exchange, participating projects cannot be excluded or limited by the use of binary file formats or infrastructures closed to further refinement.

3. Stable development, and community support. In order to ensure project longevity, the tool should be actively developed and supported by a stable number of code contributors.

4. Compliant with dictionary-type data.

5. Multilingual interface.

6. Collaboration-oriented.

7. Easy to use.

MW and SMW are not only free and fully open-source, but they have also been created with encyclopedia-like data in mind to provide an internationalized interface. Thanks to its popularity, MW may also encourage less advanced users to actively collaborate.

SMW, although steadily gaining in popularity, has not yet been employed in vast lexicographic projects. According to the list of sites using SMW[11], extension has been implemented in such projects as *Liddell-Scott-Jones Ancient Greek Lexicon Edition* [12] , *An interactive online etymological dictionary of Lepontic* [13] , or *Neuroscience Lexicon*[14]. None of them were known to the authors in early 2012 when

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[11] http://smw.referata.com/wiki/Special:BrowseData/Sites.

[12] http://lsj.translatum.gr/.

[13] http://www.univie.ac.at/lexlep.

[14] http://neurolex.org/

works on integrated query interface were launched.

For the purpose of the present paper, 4–6 entries from four dictionaries were chosen and subsequently encoded by typing wiki syntax code. Whenever possible, lexicographical content was passed to the formerly created templates[15], which automatize not only text formatting, but also semantic annotation of data. For instance, when a content author types {{headword|mandragora}}, a template "headword" is called upon with the first argument set to "mandragora". Once triggered, the template:

(1) sets property "headword" to "mandragora" and displays text string "mandragora" on entry page[16];

(2) sets property "headword_canonical" to "mandragora" without displaying the word itself on the entry page[17].

The annotation task was primarily conducted by the authors of this paper with the help of Renaud Alexandre (IRHT CNRS). Subsequently, several members of other lexicographical teams have become familiar with the wiki editing interface (especially wiki syntax) and have been asked to correct or edit entries from scratch.[18]

3. Macrostructure

the main goal of the present database was to enable a unified retrieval of dispersed dictionaries, the provenance of lexicographical data is that they should always be easily traceable. Firstly, this enables an acknowledgement of the institutions and research teams which have developed the machine-readable dictionaries. Secondly, it offers users the possibility of limiting their search results. In our prototype, separation of dictionary entries has been assured by resorting to the mechanism of wiki namespaces[19], each entry being preceded by a 2-letter prefix indicating the dictionary from which it originates: namespace:entry_headword, e.g. for Latin word *decipula* 'a snare, trap', a full page title is *PL:Decipula* which results in the following entry link: .../index.php?title=PL:Decipula. This separation allows users to browse each dictionary in a traditional way by referring to the entry list (.../index.php?title=PL).

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[15] http://www.mediawiki.org/wiki/Help:Templates.

[16] The code in template is [[Headword::{{{1}}}|{{{1}}}]], where number stands for argument order number.

[17] The code being {{#set:Headword_canonical={{#regex:{{{1}}}|/\w+\s*)+/}}}}. Canonical form of entry headword is computed by applying to a full headword a simple regular expression which gets rid of symbols, numbers etc.

[18] Their names can be found in Acknowledgment section of the present paper.

[19] http://www.mediawiki.org/wiki/Namespaces.

Main namespace has been reserved for so-called "super-entries", i.e., entries of the unified dictionary which serve as an index for all headwords. A super-entry page for the headword *depost*, for example, will provide a list of the dictionaries in which the word is attested (with appropriate links), as well as other information about the word in question that can be retrieved by means of the embedded queries. This information is presented in the form of timelines and maps of the attested word occurrences which have been extracted from respective dictionary entries:
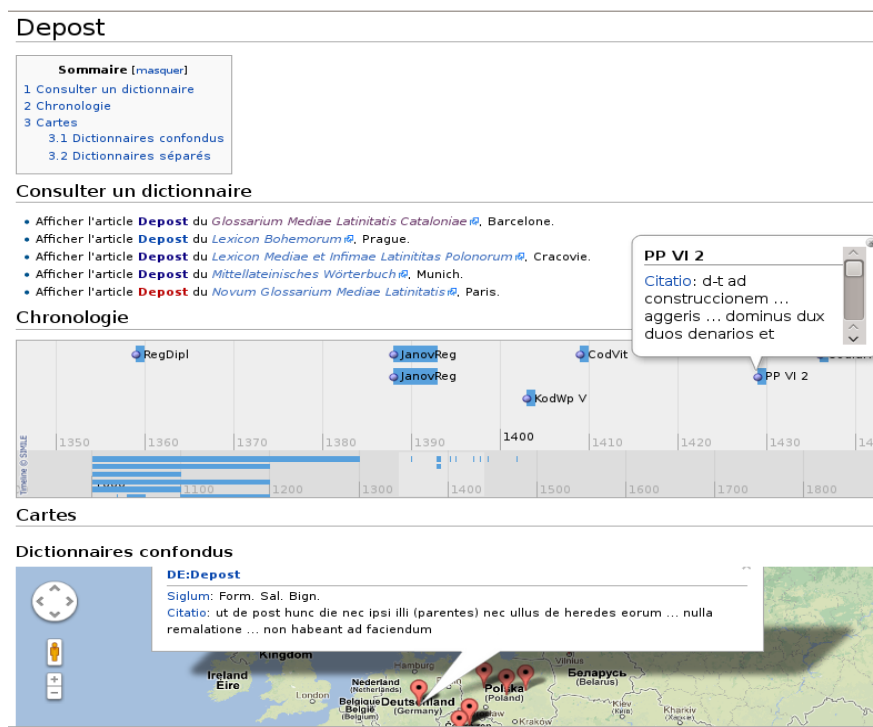
Figure 1: Super-entry page

Spatio-temporal information retrieval, as at the heart of the WikiLexicographica, was possible, because each source quotation is stored as a so-called "semantic internal object" (SIO)[20], a complex data structure which permits encapsulation of multiple property-value pairs. SIOs include in particular:

(1) reference to the entry to which they belong;

(2) source reference abbreviation;

(3) bibliographical data (page, verse etc.);

(4) proper citation;

(5) date of text composition;

(6) geographical provenance of the text.

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[20] http://www.mediawiki.org/wiki/Extension:Semantic_Internal_Objects.

```
{{#set_internal:CitInt
|Cit_siglum={{{1}}}
|Cit_ref={{{2}}}|
|Cit_datum={{{3|}}}
|Cit_citatio={{{4|}}}
|Cit_start={{#if:{{{5|}}}|{{{5|}}}|{{#show:{{NAMESPACE}}:{{{1|}}}|?Fons start}} }}
|Cit_end={{#if:{{{6|}}}|{{{6|}}}|{{#show:{{NAMESPACE}}:{{{1|}}}|?Fons end}} }}
|Cit_genus={{#show:{{NAMESPACE}}:{{{1|}}}|?Fons genus}}
|IsPartOfLemme={{NAMESPACE}}:{{PAGENAME}}
|Cit_geo={{#show:{{NAMESPACE}}:{{{1|}}}|?Fons geo}}
|Cit_coordinates={{#geocode:{{#show:{{NAMESPACE}}:{{{1|}}}|?Fons geo}} }}
}}
```

Figure 2: SIO structure

Since in Medieval Latin dictionaries neither chronological (5) nor geographical (6) data are explicitly declared for each quotation, values of these properties are usually computed from information provided in source description pages which form an essential part of integrated dictionary macrostructure.

Source pages belong to the same namespaces as the entries themselves. They are distinguished from them by category attribution: whereas entries belong to the category *Voces* (*lat.* 'words'), source description pages are marked as *Fontes* (*lat.* 'sources'). Source description pages consist of manually typed or database-extracted metadata which are subsequently passed to a bunch of embedded queries. So, for instance, the wiki syntax:

> {{fons|EU|France, Lille||1150|1200|Alan. Ins. elucid.|Elucidatio in Cantica canticorum. – PL 210 col. 51-110|commentarius}}

results in a page (Figure 3) which shows a source provenance map, a bibliographical record and so on. The most interesting item, however, is the section *Citationes* (*lat.* 'quotations') where the user can find a list of headwords in which the source in question is referenced with its appropriate quotations. As long as we do not have at our disposal a complete, research-driven corpus of Medieval Latin, dictionaries can only be considered provisional corpora including a selection of Medieval Latin literature in seemingly good editions.

Sources and their quotations can subsequently be browsed, traditionally in the form of alphabetically-ordered lists. However, the user can also:

(1) sort by frequency in dictionaries;

(2) browse them on a timeline;

(3) access them on a google map.
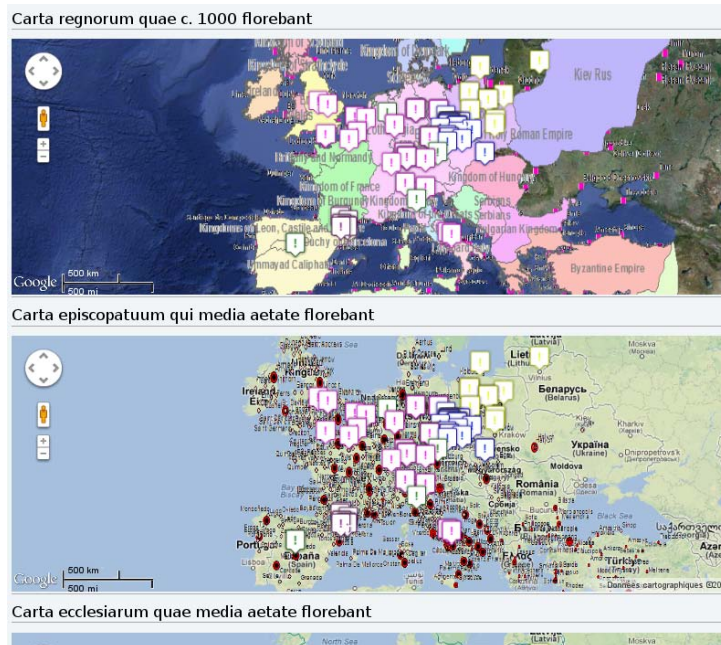
Figure 3: Source description page

Figure 4:   Map layers

In our survey, the last form of lexicographical data analysis has been enriched (Figure 4) thanks to the map layers provided by the project *Digital Atlas of Roman*

and Medieval Civilization[21]. One is now available for viewing source citations in the context of administrative boundaries of the medieval world and in the light of regional variation of medieval intellectual culture.[22]

4. Microstructure

Medieval Latin dictionaries have as their primary public the research community; a fact which too often means that their entry structure is far from being user friendly. In our wiki we attempt to address this problem by providing two parallel access points to the dictionary microstructure. The first perspective presented to the user visiting the entry page, is a basic one (Figure 5). It comprises essential lexicographical information, such as graphic forms, inflection type, gender, and abbreviated sense definitions. The basic view tab, though, is also a place where the user is offered an overall picture of word occurrences. Entry source citations here are conveniently epitomized in text type chart, timeline, and map. Therefore, a quick glance should suffice to estimate in what Medieval genres, when and where the word in question would be cited most frequently.
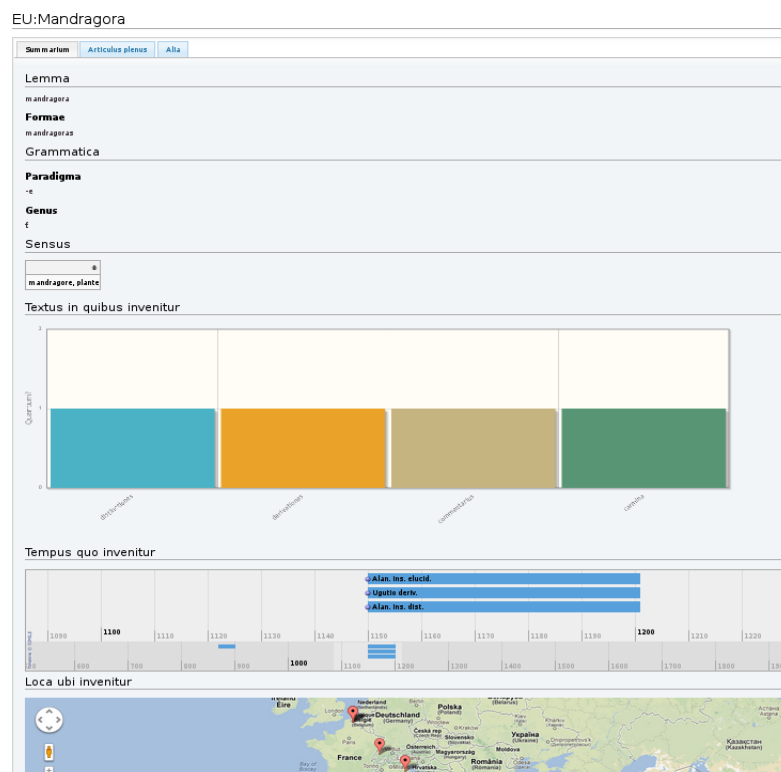
Figure 5: Dictionary entry (basic view)

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[21] http://darmc.harvard.edu/icb/icb.do.

[22] This was possible due to the use of such layers as „medieval kingdoms", „universities C12-C15" etc.

In the subsequent tab, the user can consult full entry with all idiosyncrasies that each dictionary editorial system is affected with. The relative variety of typographic conventions, as well as different levels of data explicitness, renders the preservation of original entry display for each dictionary a very difficult, if not impossible, task. This is one of the reasons why, in our opinion, the wiki interface should not be considered a means of text-oriented digitization of lexicographical work. The other major problem stems from the relatively flat textual data representation in Semantic MediaWiki: it is not easy (if at all possible) to properly reflect the nested tree structure of the dictionary entry by means of wiki syntax only. It can seem a serious limitation, considering that Medieval Latin lexicographers tend to make a heavy use of sense nesting in order to account for semantic change. Thus, a more appropriate approach seems to be data-oriented recompilation of source data into the desired output format, even if some of the original data (in particular, formatting) are lost. The burden of preserving original work in its typographic, sequential, etc., order may, then, be shifted towards each separate project rather than the integrated query interface.

Figure 6: Dictionary entry ('Other resources' tab)

The next tab of each entry comprises links to other linguistic resources (Figure 6). Firstly, users can easily verify whether the same headword exists in other dictionaries included in the wiki. Secondly, it is proposed to search the headword in

other Latin dictionaries. Lastly, links to textual corpora and text collections are provided. This is also where lexicographical data may be enriched with world knowledge. The example of *mandragora* 'mandragora' shows possible fields of lexicon-encyclopaedia interface enrichment: here, links point to plant taxonomy pages, to the Wikipedia entry on *mandragora*, and to the images accessible in WikiMedia Commons.

5. Search and Browse Capabilities

Search and browse capabilities of the presented infrastructure are partly known from Wikipedia and its derivatives. It comes as no surprise that entries may be retrieved by means of a simple full text search. As in Wikipedia, when typing a word beginning in an ajax-based search form, the user is given suggestions. Naturally, it is also possible in the advanced mode to limit search results to specific namespaces, i.e. dictionaries.[23]

The framework, which is the object of the present study, seems to reach its full potential, however, thanks to the semantic layer provided by SMW. Semantic properties embedded in each entry can be browsed, for instance, thanks to the factbox displayed on the bottom of the entry page (Figure 7).

Figure 7: Entry page factbox

After clicking the "magnifying glass" icon near the value of each property, the user is taken to the page where all the entries with the same value set for the selected property will be listed. For example, in the case of *mandragora*, if one clicks on the zoom icon near the value *f.* (*femininum, lat.* 'feminine') of property "gender", one is redirected to the page where all feminine substantives from all dictionaries included in the wiki are listed. Similar results can be obtained from the "Special Page", where users can process a simple semantic search, by directly specifying in a two-field form, the property and its value they are looking for (Figure 8).

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[23] Full-text search capabilities may be enhanced by using plugins list at
  http://www.mediawiki.org/wiki/Fulltext_search_engines.
  They have not been subject to the tests in the present survey.

Figure 8: Direct search for values of semantic properties

More advanced semantic queries can be formulated from within two other search interfaces available in SMW-based wiki, accessible from "Special Pages": Special:Ask and Special:BrowseData. The first (Figure 9) requires of the users a basic knowledge of SMW syntax, but it also provides them with numerous output formats from which they can choose, e.g., different types of charts, timelines, maps, tables, slides etc.[24]

Figure 9: Semantic search (Special:Ask page)

"Special:BrowseData" (Figure 10), on the other hand, includes search patterns envisaged by each wiki creator and depends only on their creativity, user requirements, and last but not least, time or funding limitations. It enables faceted browsing of semantic properties of wiki data. In the case of our framework, the data in question are source and entry pages. The latter can be browsed according to the

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[24] Display of search results is provided by Semantic Result Formats plugin (http://semantic-mediawiki.org/wiki/Semantic_Result_Formats).

part of speech they represent, inflectional type, gender, domain of use, etc., while the first can be browsed according to all the metadata previously mentioned.

Figure 10: Semantic faceted browsing (Special:BrowseData page)

6. Collaboration

From its beginning, the wiki-based interface that is the subject of the present study has been conceived as a means of promoting collaboration between researchers of different expertise in medieval studies. Lexicographical data enriched with encyclopaedic information extracted from knowledge databases may be a good starting point for a prospective framework of medieval culture research. User contributions should be encouraged by the reuse of a Wikipedia-like interface, with its well-known collaboration feature, namely "Discussion page". Despite the fact that MediaWiki was created for projects in which anonymous editing is welcomed, one can, however (1) impose access and edition limitations in order to get rid of the acts of vandalism and (2) provide admin users with the right to accept or deny any changes. Users who are familiar with wiki syntax can be assigned edit rights and contribute to entries or source pages without any difficulty. However, even non-technical oriented users may contribute to the wiki, if given the chance to use simple edit forms. In the framework demonstrated in the present paper, this is the case of the source pages which can be modified in a traditional way, by entering the wiki syntax code, or by filling in forms provided by wiki developers (Figure 11).[25]

One can expect the wiki to be fed at first with data from ongoing lexicographic projects, and later enriched by the users themselves. Batch import of lexicographical information from existing dictionaries may be carried out, e.g., by means of RDF

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[25] This is possible thanks to the plugin called Semantic Forms (http://www.mediawiki.org/wiki/Extension:Semantic_Forms).

import plugin. In spite of the fact that the dictionaries under analysis may seem to differ essentially, at least as far as their micro- and macrostructures are concerned, their electronic versions are considered to be TEI compliant, and follow rules indicated in the chapter of TEI Guidelines devoted to the encoding of machine-readable dictionaries (TEI Consortium, 2013).[26] Since WikiLexicographica has to serve as a common interface for data retrieval, shared information schema should be conceived as well. The extent of data extraction could then be decided according to time or financial limitations; however, the burden of mapping between particular schemas and the common one needs to be shifted to each lexicographic team.

The second main contributor of WikiLexicographica is expected to be the research community, namely philologists, linguists, historians, palaeographers; briefly, all those who work with Medieval Latin texts. Apart from simple form or meaning corrections and additions, users may be encouraged, e.g., to propose the addition of new words found in their sources or the deletion of existing ones if manuscripts deny lexicographers' reading; to supply entries with world knowledge which in turn can greatly support text comprehension; to create links between words by making their relations explicit, and so on.

7. Conclusions

MediaWiki, the software underlying Wikipedia, is enhanced with semantic data annotation capabilities offered by Semantic MediaWiki extension, and appears to be a tool mature enough to serve as an interface for lexicographical data retrieval. It provides presentation and collaboration features with which an average Wikipedia user can already be familiar. Interface popularity itself is likely to encourage contributions, even from those less technical-oriented researchers. It is, however, the retrieval of semantic properties that should attract a major interest of researchers since charts, timelines and maps, as well as embedded queries, offer a fresh and inventive look at lexicographical data.

8. Acknowledgment

Content of the WikiLexicographica was partially typed by members of respective

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[26] So far no attempt has been made in order to standardize medieval Latin dictionaries schema according to, for instance, Lexical Markup Framework.

dictionaries teams: Renaud Alexandre (Novum Glossarium), Susanna Allés Torrent (Glossarium Mediae Latinitatis Cataloniae), Pavel Nývlt (Lexicon Bohemorum), Marta Segarrés Gisbert (GLMC).

9. References

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