Multi-Perspectival Representation of Historical Reality

Ontology-Based Modeling of Non-Common Conceptualizations

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Overview

Introduction

Multiperspectivity

There are various use cases or requirements for knowledge representation in the domain of (Digital) History. For example. historical reality has to be represented:

1. as seen from the divergent perspectives of different historians,
2. as perceived by different historical actors, or
3. as reported in different historical sources.

Problem Statement

- The representation of historical reality as seen from different perspectives has requirements beyond the straightforward 'reality representation' (Smith 2004) focused on physical reality (Smith and Ceusters 2010) in the domain of the natural sciences:
  - 'Ontology' in computer and information science is defined as "formal, explicit specification of a shared conceptualization" (Studer, Benjamins, and Fensel 1998) (extending the famous definition by Gruber (1993)).
  - However, the divergent, non-common and 'unshared' conceptualizations of different historians demand more than these approaches.
- Philosophical ontology would have an important role for a "coherent conception of historical knowledge" (Little 2010).
- Though, the applied ontology approach is widely neglected in the domain of Digital History and in the Digital Humanities in general.

Applied Ontology

> If neither the standard nor the simple patterns meets your needs, we think you will have to consider a solution that involves some philosophy.
>
> — Garbacz and Trypuz (2017)
> "Representation of tensed relations in OWL: A survey of design patterns"

- Hence, I propose an approach towards ontology-based modeling of historical knowledge informed by philosophy of history.
- My goal is to provide an applied ontology approach in order to support historians in modeling their expert knowledge about historical events.
- For this purpose, I suggest a modular architecture reusing and extending Ontology Design Patterns (ODPs) (Hitzler et al. 2016) for knowledge modeling tasks in the domain of (Digital) History.

Related Work

Ontologies in the Life Cycle of Historical Information

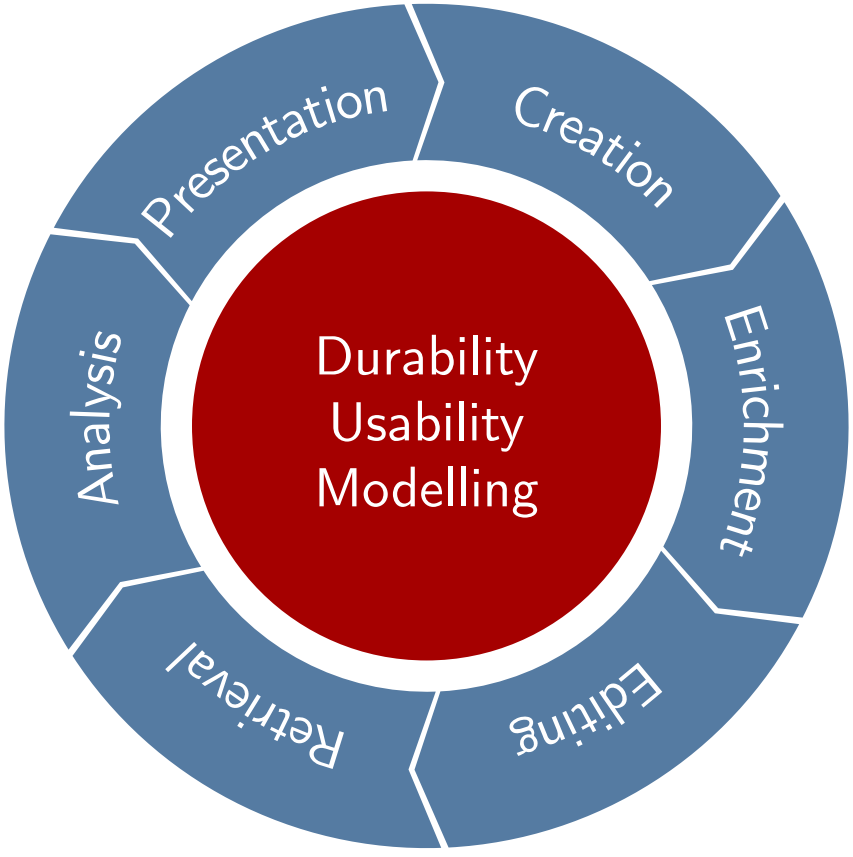

Figure 1: Life Cycle of Historical Information (adapted from Boonstra, Breure, and Doorn 2004). Ontologies are typically applied in the enrichment and editing phases (cf. Meroño-Peñuela et al. 2014, p. 10), but not in the analysis phase of the life cycle.

Simple Event Model (SEM)

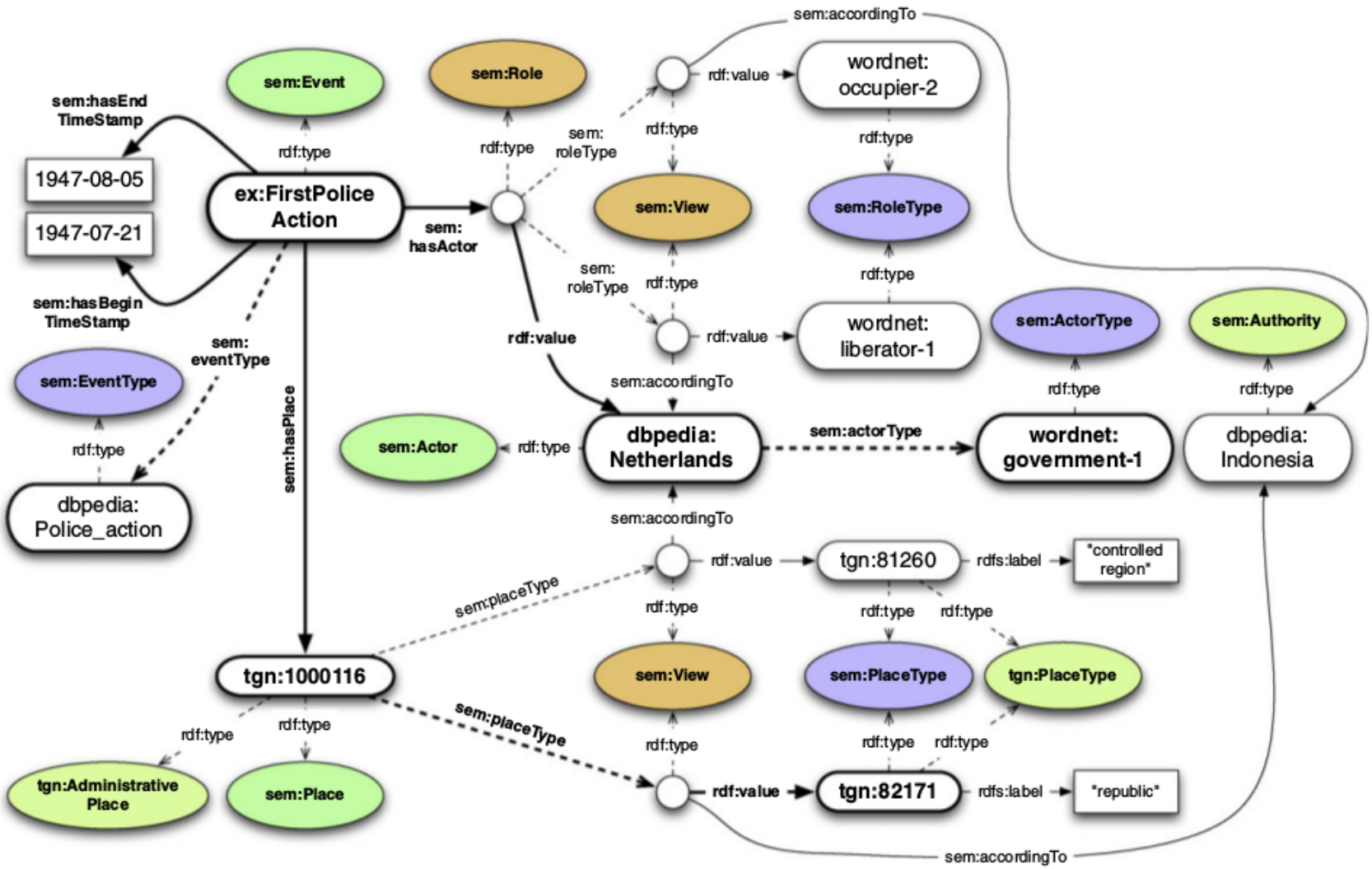

Figure 2: SEM allows to model different views on historical events via its `sem:accordingTo` property (from Hage et al. 2011)

Multiple Interpretation Data Model (MIDM)

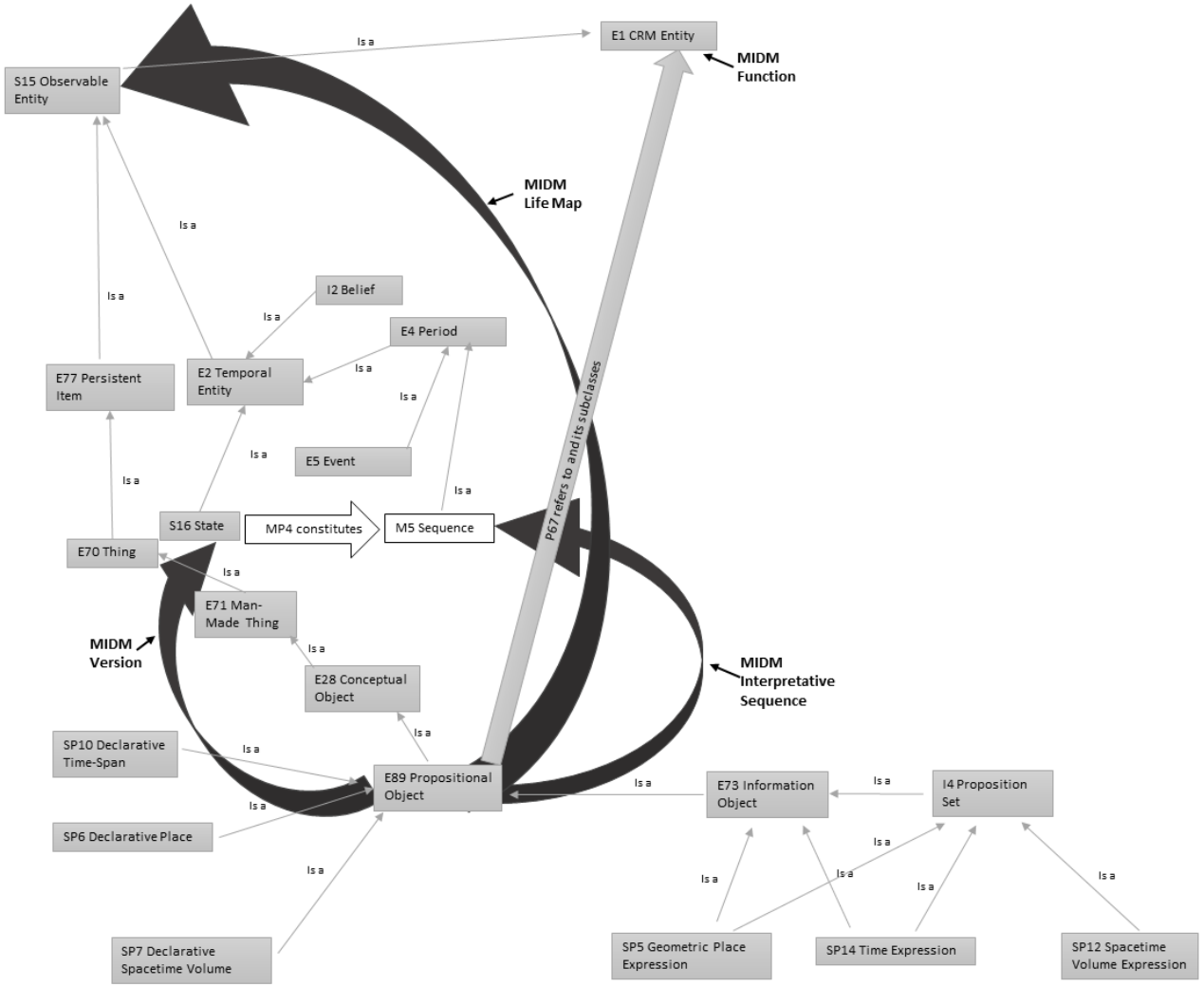

Figure 3: MIDM allows to model different conceptualizations of historical processes (`M5 Sequence` class) (from Ruymbeke, Hallot, and Billen 2017)

Event-Model-F (F)

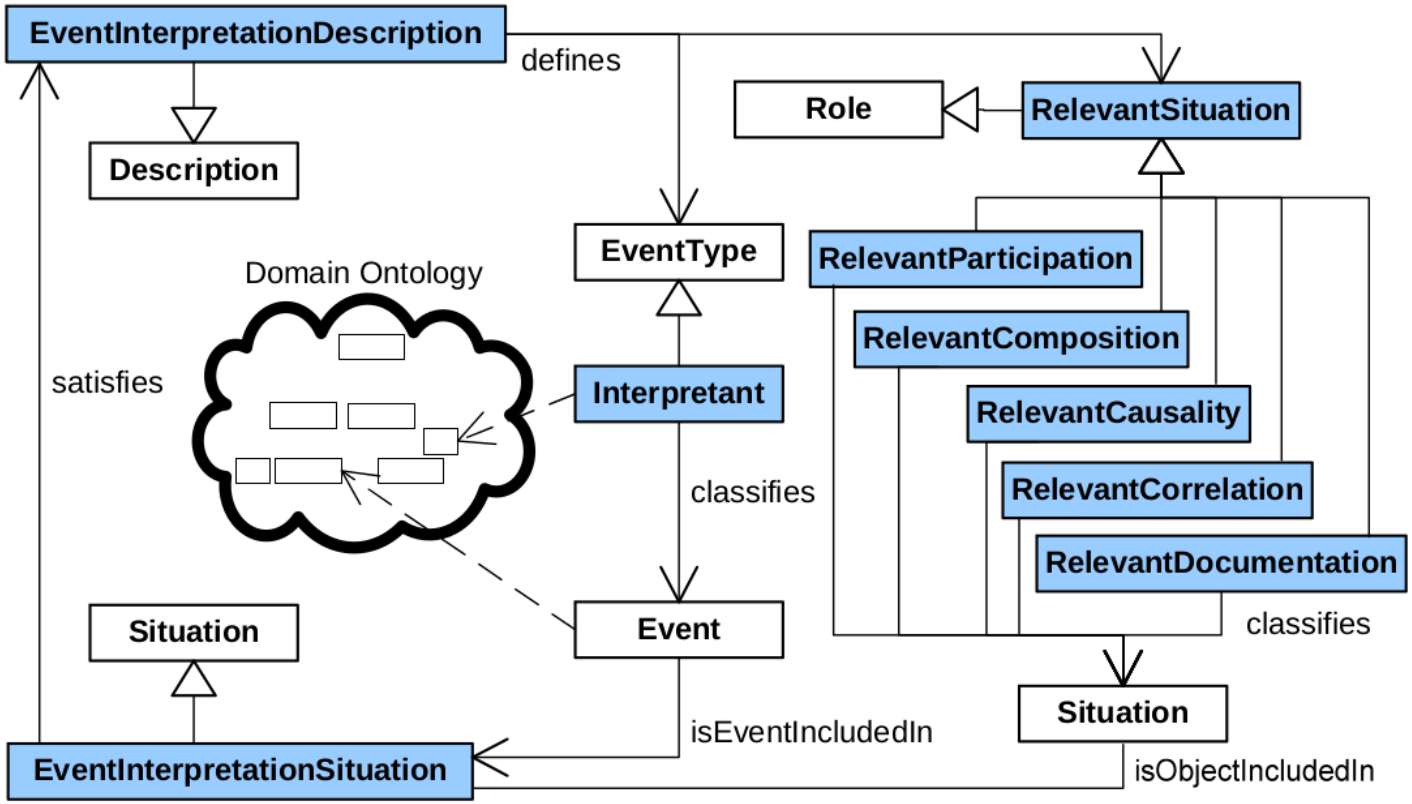

Figure 4: F's Event Interpretation Pattern (from Scherp et al. 2009). F is based on the DOLCE+DnS Ultralite (DUL) and is therefore well prepared for modeling multiple conceptualizations of historical events.

Knowledge Modeling for Historical Understanding

From Conceptualization to Ontology-based Modeling

- Historians perform conceptualization and create concepts in order to understand historical events.
- Philosophers of history analyzed this activity as 'colligation'.
- Walsh (1951, p. 59) defines colligation as "the procedure of explaining an event by tracing its intrinsic relations to other events and locating it in its historical context".
- Regarding ontology-based modeling, conceptualizing can be considered as modeling: "the more schematic the conceptualization in a discipline, the more its practitioners are likely to engage with models rather than concepts" (McCarty 2005a, p. 25).

Suffrage, feudal, democracy, treaty... history's building blocks: learning to teach historical concepts

Jacques Haenen and Hubert Schrijnemakers
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In the UK, thoughtful history teachers have long lamented the fact that the majority of pupils emerge from their compulsory history schooling at 14 with a limited or inadequate understanding of those key historical concepts that are necessary to make sense of the world in adult life. Whilst more able pupils seem to pick things up quite well through the traditional array of teaching methods, we all know that, worryingly, the majority remain too ignorant or too unsophisticated in their understandings to participate fully as active, independent, critical citizens in a democracy. Much recent practice in the last ten years or so has begun to address this. In the UK a body of practice and professional literature now exists on ways of helping pupils to link, arrange, classify, use labels, create new headings and play with shifting categories (such as approaches to 'thinking skills' that emphasise classification, to analytical writing in history or to 'word level' work in the National Literacy Strategy). Yet three key areas remain undeveloped, or at the very least, not widely discussed by UK teachers. These are, first, the processes by which trainee teachers come to realise the massive gap between their own conceptual vocabulary and that of their very different pupils; second, ways of classifying historical concepts for the purposes of teaching; and, third, fresh ways of developing and *assessing* 'deep' understanding in pupils – the kind of understanding that will last and that will help to anchor new knowledge. Jacques Haenen and Hubert Schrijnemakers address each of these areas in a fascinating analysis of current practice of initial teacher education in the Netherlands. This article will be of particular interest to mentors, trainers and managers of trainee teachers or newly qualified teachers; to heads of department developing their thinking about the role of concepts and knowledge in their progression policies; and to Advanced Skills Teachers looking for new ways of developing *others'* pedagogical thinking in order to improve performance.

Introduction

In our teacher education courses we discuss with the student teachers educationally relevant topics from the field of learning theory. To student teachers of history one of these topics is the acquisition of historical concepts. It is our purpose to teach them how to guide their pupils when constructing historical concepts. Through practical experiences and classroom assignments, the student teachers become aware of some of the problems that can arise when teachers convey ready-made concepts to be learnt by heart by their pupils. Student teachers have to learn the difference between pupils who really understand an historical concept and pupils who only repeat words without full conceptual understanding. Practice teaches us that such undigested knowledge is of no use to pupils and rapidly evaporates.[1]

Colligation as Tracing and Classifying Historical Events

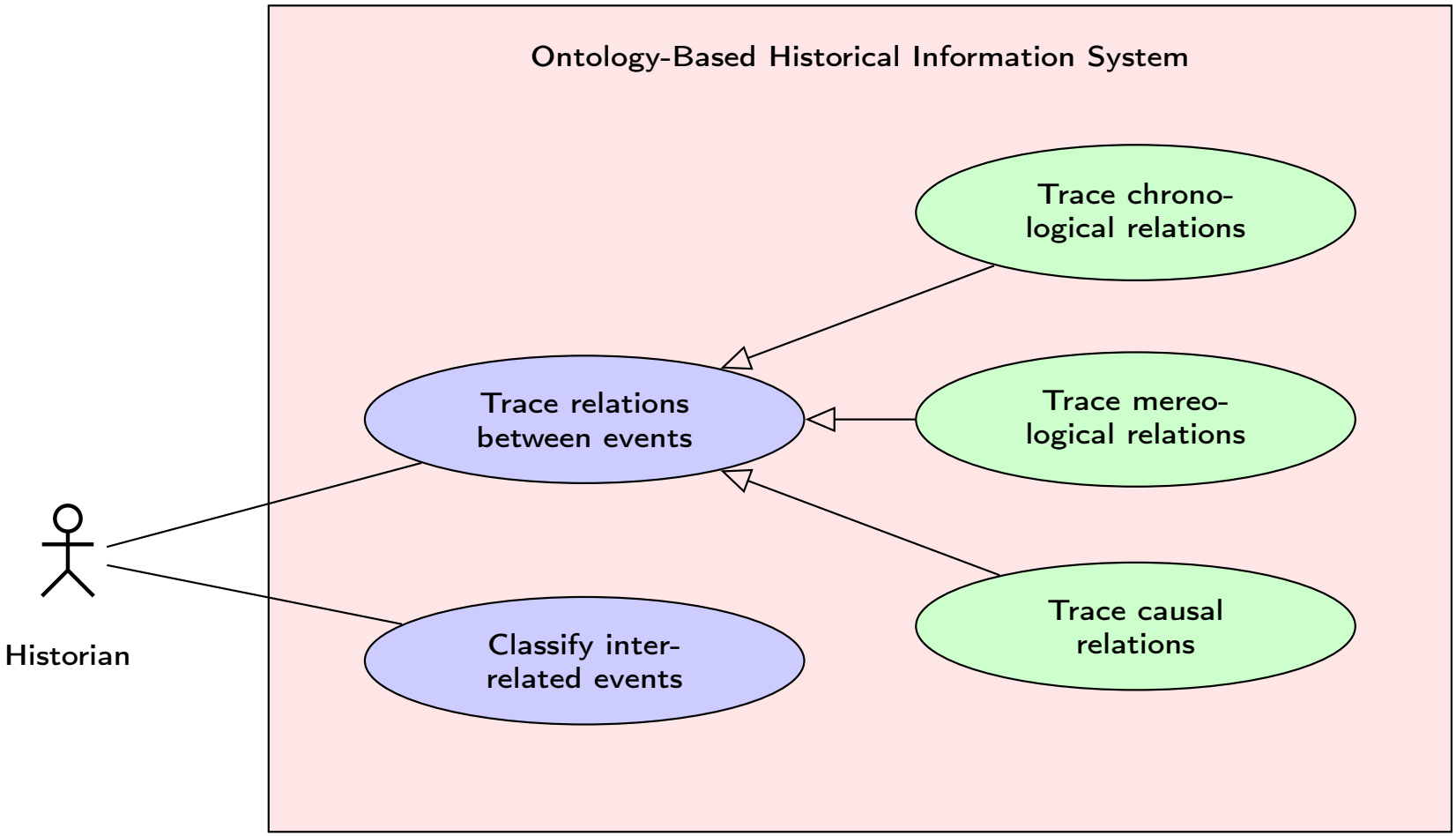


Figure 5: Meeting the requirements of knowledge modeling for historical understanding by supporting the method of c o l l i g a t i o n: The historian connects the pieces of historical facts and classifies his final interpretation under a colligatory concept.

Analysis of Historical Event Relationships

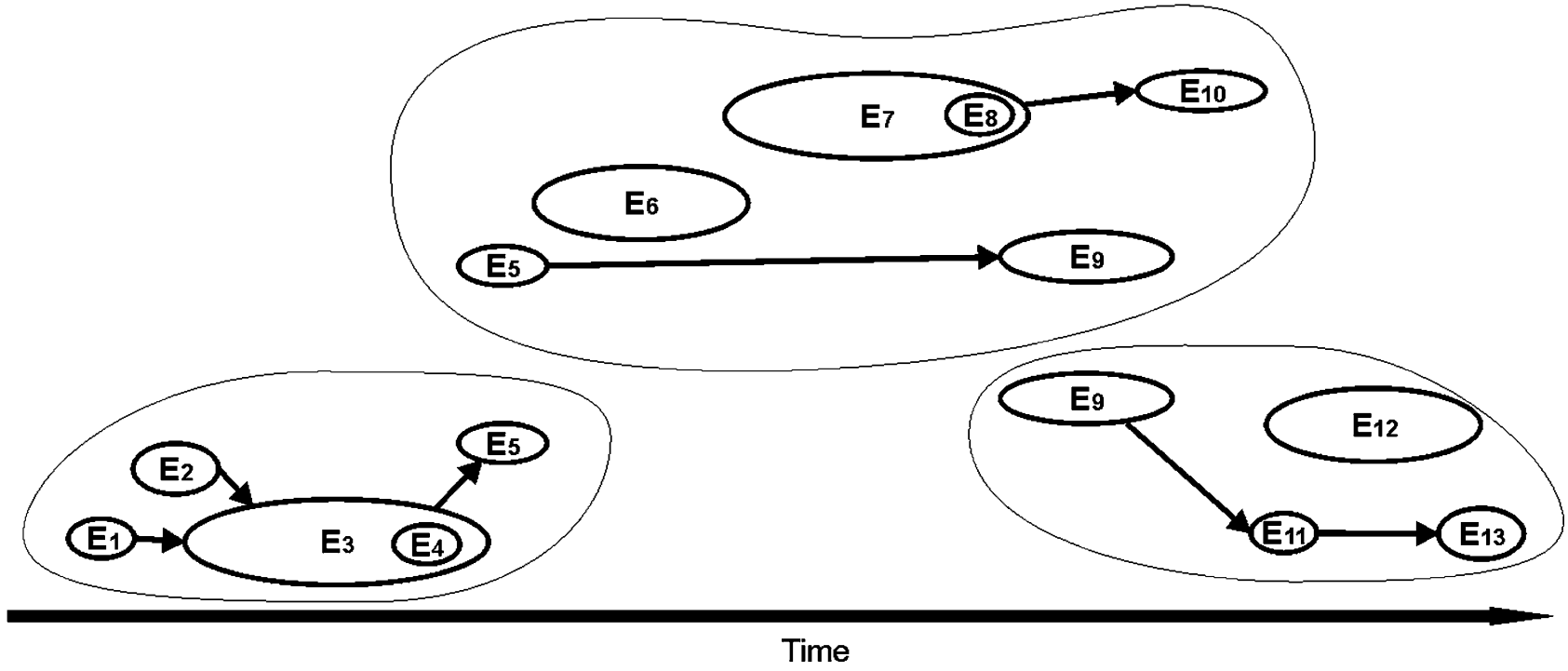


Figure 6: Depiction of chronological, mereological, and causal relationships between historical events (from Mostern and Johnson 2008, fig. 3)

The Two-Step Procedure of Colligation

The Two Tasks of the Procedure

1. The historian traces the relations between historical events and connects the pieces with properties for
   - chronological (e. g. `P114 is equal in time to` – `P120 occurs before` in CRM),
   - mereological (e. g. `P9 consists of` in CRM), and
   - causal dependence relationships (e. g. `P15 was influenced by`, `P17 was motivated by`, or `O13 triggers` in CRM) (see also Bartalesi and Meghini 2017, pp. 116–118).
2. The historian classifies his interpretation under a colligatory concept.

Application of the Descriptions and Situations ODP

- The Descriptions and Situations ODP (DnS) (Gangemi and Mika 2003) is applied to support the two-step process of colligation.
- A Description represents the colligatory concepts and relations grasped in a "synoptic judgment" (Mink 1987).
- In bio-medical ontologies Descriptions are used to represent medical diagnoses (see for example Gangemi, Catenacci, and Battaglia 2004).
- There is indeed an interesting analogy between the synoptic judgments of a historian and medical diagnoses of a physician ...

Analogy between the Synoptic Judgements of a Historian and the Medical Diagnoses of a Physician

> The best analogy I can suggest for the way in which synoptic judgments are reached is that of a physician's diagnosis—a combination of broad medical knowledge, relevant evidence drawn from various tests, a knowledge of various theoretical possibilities for explanation, and skill in seeing which interpretation of the evidence works best in a particular case—the difference being, of course, that the physician deals primarily with law-bound physiological processes, the historian primarily with human conduct and purposive action.
>
> — Schroeder (1997)
> "History and International Relations Theory: Not Use or Abuse, but Fit or Misfit", p. 69

Descriptions and Situations in the Context of Historical Explanation

- A Situation represents the explanatory relevant historical context, i. e. historical events and their interrelations.
- The intent of the Situation pattern is to "represent contexts or situations, and the things that are contextualized"[1].
- A Description "provides an interpretation to a set of observed entities"[2].
- Hence, a Situation is a historical context of related events and entities as interpreted in a synoptic judgement (represented by a Description).
- Therefore, Descriptions and Situations allow to represent multiple perspectives on one and the same historical phenomenon by modeling Descriptions which define colligatory concepts as expressed in different historical narratives.

[1] http://ontologydesignpatterns.org/wiki/Submissions:Situation

[2] http://ontologydesignpatterns.org/wiki/Submissions:Description

Ontology Design Pattern for Multiperspectivity

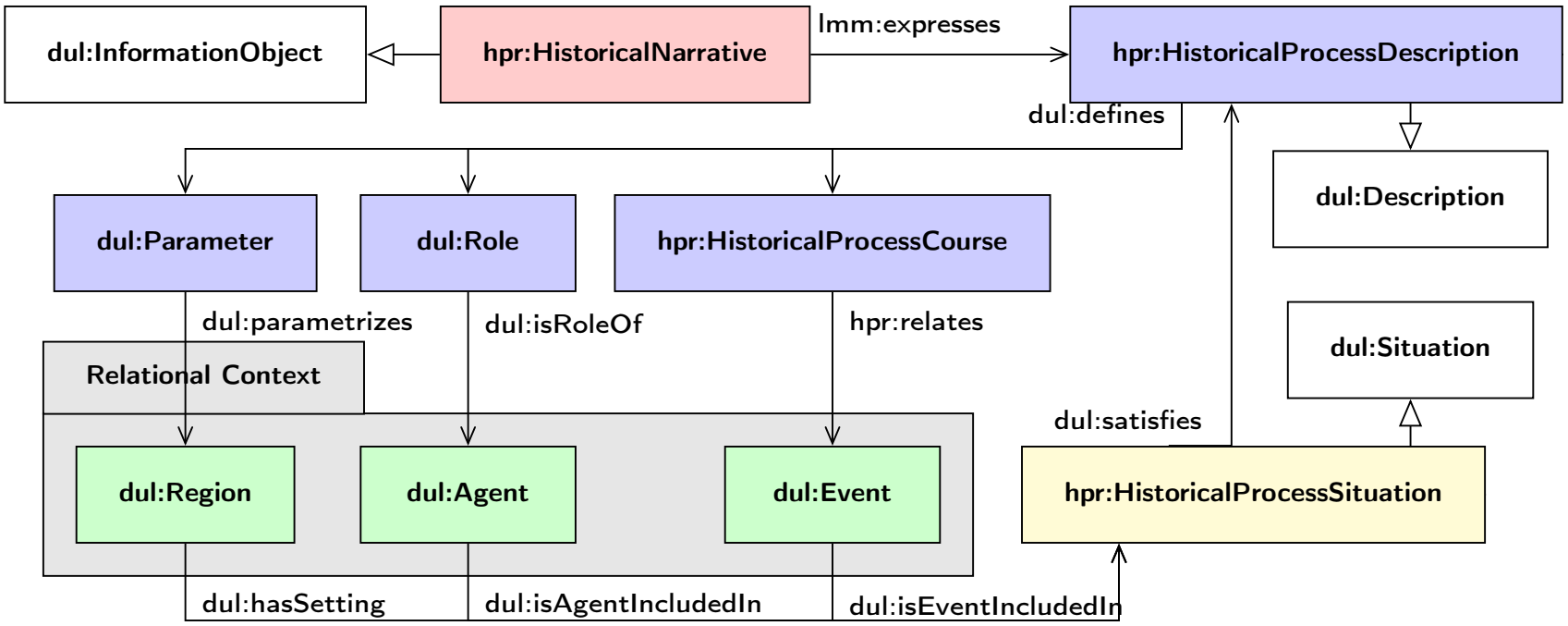


Figure 7: Descriptions and Situations ODP from DUL adapted for the representation of different conceptualizations of historical processes as conceived in divergent historical narratives. The Historical Process Representation ODP sketched here (extensions in namespace prefix `hpr` aligned to DUL) support the two-step process of colligation. In short, the interrelated events are reified by a Situation which satisfies a Description.

Elements of Historical Knowledge Representation

Event-based Modeling

. . . enables the representation of temporal, mereological, and causal or constitutive relations between events.

Role-based Modeling

. . . enhances event-based modeling with thematic and social roles played by the agents involved in events.

Levels of Reality

. . . to represent entities on different ontological levels (e. g. political and economical in the social sphere).

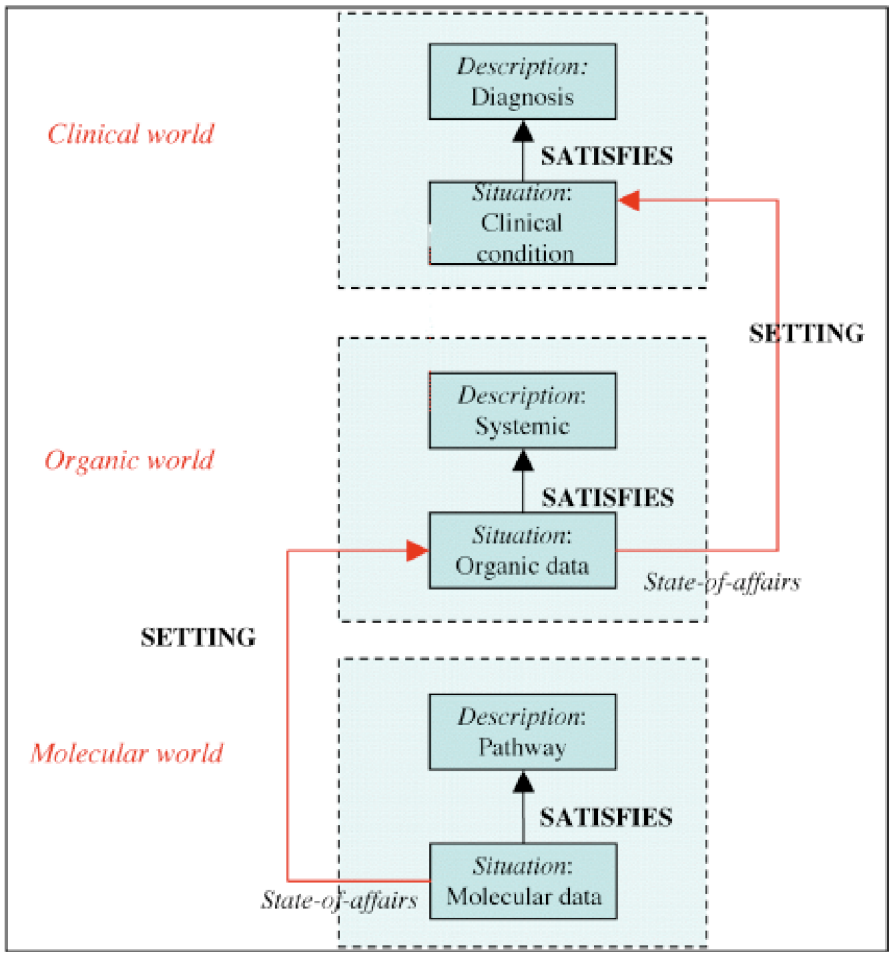


Figure 8: Example for epistemological layering in the biomedical domain by Gangemi, Catenacci, and Battaglia (2004, fig. 6)

Semiotics

. . . has to be added to the ontology to further clarify the representation of historical reality. Indeed there is some confusion in the distinction between representation and the r e p r e s e n t e d with the distinction between representation and r e a l i t y in the DnS pattern used without explicit modeling of semiotic relations (cf. Hoekstra et al. 2009, p. 27).

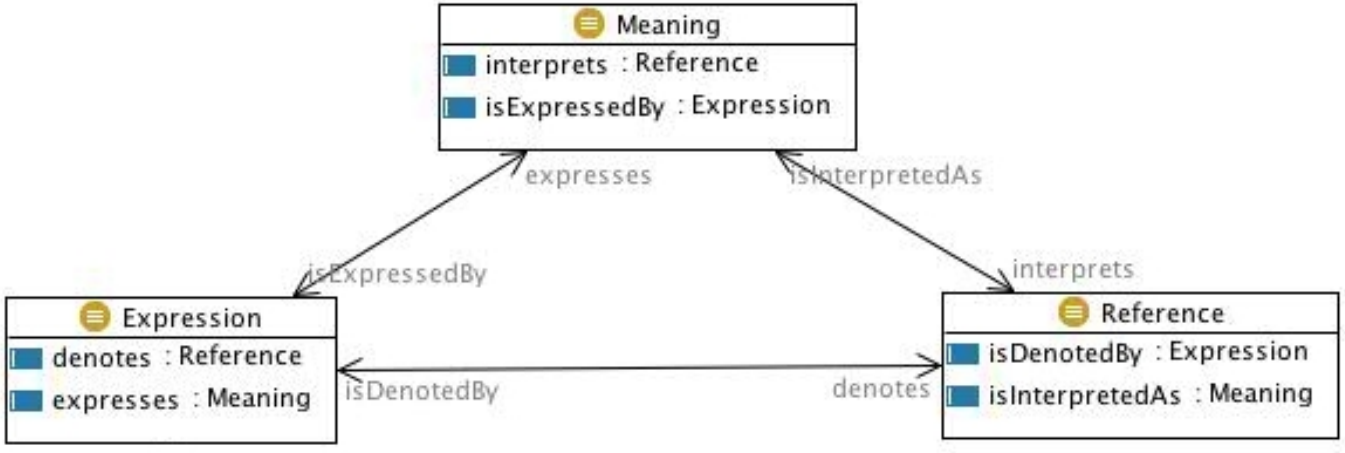


Figure 9: Semiotic triangle as implemented in the Linguistic Meta-Model (LMM) ODP (Picca, Gliozzo, and Gangemi 2008, fig. 2)

Frames

. . . are considered as knowledge patterns and can be used to validate ODPs (Presutti, Blomqvist, et al. 2012). Presutti, Draicchio, and Gangemi (2012) argue that the units of meaning in Semantic Web technologies should be frames, not just classes and properties.

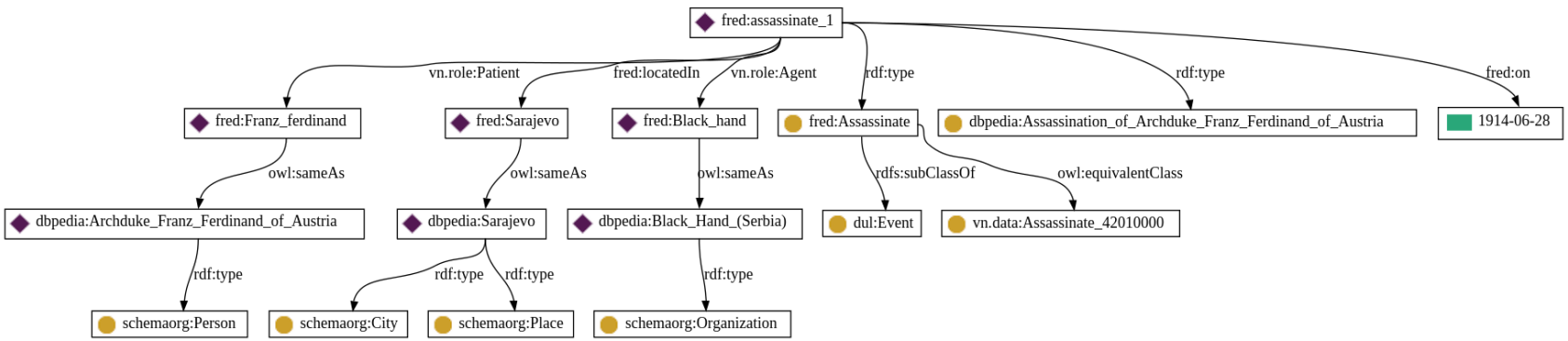


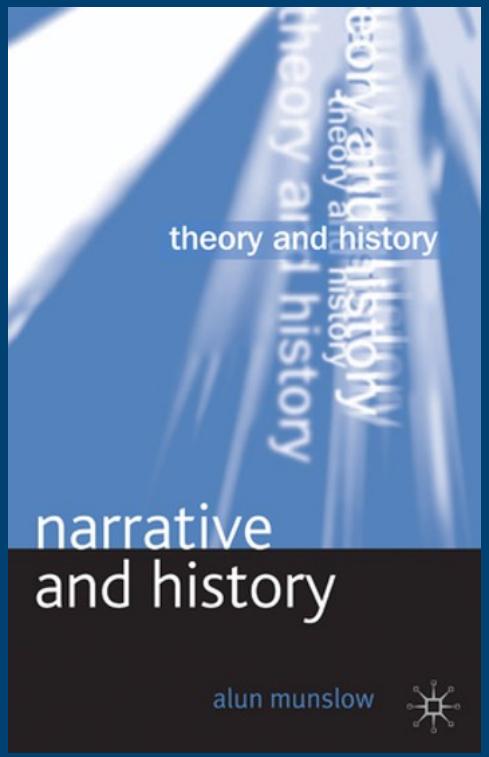
Figure 10: FrameNet-based semantic enrichment with FRED (Gangemi, Presutti, et al. 2017)

Conclusion, Future Work and Outlook

Summary

I have outlined that the Descriptions and Situations (DnS) and Linguistic Meta-Model (LMM) ODPs can well support

- the classification of historical events by colligatory concepts as well as
- the multi-perspectival representation of historical reality as seen from the viewpoints of different historians as they are
  - conceived in their synoptic judgements and
  - presented in their historical narratives.



In writing a history for the past we create a semiotic representation that encompasses reference to it, an explanation of it and a meaning for it.

— Munslow (2007)
Narrative and History, p. 9

Current State and Next Steps

What still is needed: special ODPs have to be created following a modular approach in order to model causal narratives, conflict trajectories, biographies, historical travelogues, etc. for specific case scenarios and use cases—e. g.

- modeling multiple causal narratives for comparative historical analysis or
- modeling divergent conflict histories as seen from the perspectives of conflict parties or as reported in different historical sources

Next steps: further development and the evaluation of the approach in selected case studies

MetaBosnia Case Study in Modeling I

- Campbell (1998) presents a chronology of 32 historical events identified and extracted from 10 different narratives about the Bosnian War.
- Ontology-based modeling with the DnS pattern will show how these events are conceptualized and interrelated in the controversial perspectives as presented in the different narratives.
- I consider the chronology as (chronicle-like) 'background narrative' in the sense of Bergmann (2016, p. 58).
- As such, it is the common ground for all the different perspectives.

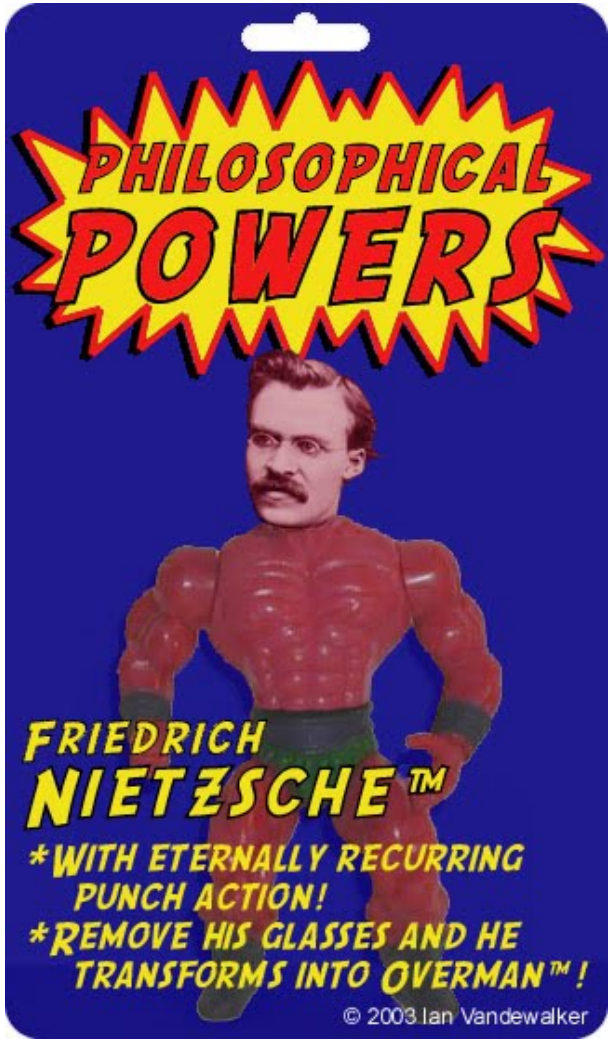
MetaBosnia Case Study in Modeling II

Listing 1: The first two events in the MetaBosnia chronology

```
:1 a dul:Event
  dc:identifier "1" ;
  rdfs:label "Brawl between Serbs and Muslims, near Foča" ;
  dul:hasTimeInterval [
    a dul:TimeInterval ;
    dul:hasIntervalDate "1990-08"^^xsd:gYearMonth ;
    ti:hasIntervalStartDate "1990-08-01"^^xsd:date ;
    ti:hasIntervalEndDate "1990-08-31"^^xsd:date .
  ] .

:2 a dul:Event
  dc:identifier "2" ;
  rdfs:label "Bosnian Serbs establish paramilitaries" ;
  dul:hasTimeInterval [
    a dul:TimeInterval ;
    dul:hasIntervalDate "1990-09"^^xsd:gYearMonth ;
    ti:hasIntervalStartDate "1990-09-01"^^xsd:date ;
    ti:hasIntervalEndDate "1990-09-30"^^xsd:date .
  ] .
```

The Prospects of Perspectival Explanation I



The Prospects of Perspectival Explanation II

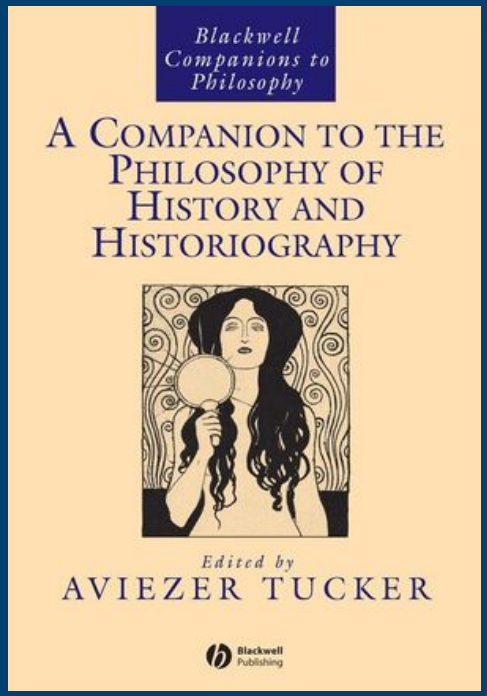
Nietzschean Perspectivism

> There is o n l y a perspectival seeing, o n l y a perspectival "knowing"; and t h e m o r e affects we allow to speak about a matter, t h e m o r e eyes, different eyes, we know how to bring to bear on one and the same matter, that much more complete will our "concept" of this matter, our "objectivity", be.
>
> — Nietzsche (1887)
> GM III, 12

The Prospects of Perspectival Explanation III

Problem of Combining Perspectives

> Aggregating event directories into a larger framework will not yield a more complete view of the past, because there is no "whole view" of the past to be completed. However, a more complete view of d i s c o u r s e a b o u t the past could be achieved by juxtaposing different portraits made from different perspectives.
>
> — Shaw (2010)
> "Events and Periods as Concepts for Organizing Historical Knowledge", p. 73



Phenomenology could offer a philosophy of historicity, neither a philosophical account of history, nor of historiography—our knowledge of history and its limits—but of what it means to say that we are historical beings in the first place, or that we experience ourselves, others, and objects around us, as having an essentially historical dimension.

— Webermann (2009)
"Phenomenology"

The Demand of Philosophy of History Taken Seriously

- D i g i t a l historians s h o u l d be able to formalize their expert knowledge.
- There remains the challenge of the computational requirements of "total explicitness and absolute consistency" (McCarty 2005b, p. 5) (see also Mostern and Johnson 2008, p. 1099) due to the problem of the 'semantic gap' between narrative descriptions and ontology-based models of historical processes (see also Mehler and Lücking 2014).
- As Saab and Fonseca (2015) assert, "formal ontologies are problematic in that they simultaneously crystallize and decontextualize information, which in order to be meaningful must be adaptive in context".
- In the end, one has to be careful not to commit "cliocide" (Alker 2008) by modeling away all the crucial subtleties of historical reality.
- Applied ontology has to help (digital) historians to bridge the gap.

Modeling knowledge using digital tools and platforms provides a powerful perspective from which to engage in critical analysis of the rhetorical force and ideological shape of these very modes. Practice and theory inform each other in the process of making. Without making, theory has no traction. Without theory, practice has no critical purchase.

— Burdick et al. (2012)
Digital_Humanities, p. 119

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