Ontological Requirements for Smart Navigation of Philosophical Resources

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Summary

1. PhiloSurfical: learning through semantic navigation
   - aims and generic approach
   - tool description
2. An ontology for the philosophical domain
   - requirements
   - approach
   - examples of modeling patterns *for* navigation
3. Ontology evaluation
   - knowledge acquisition experiment
4. Conclusions and future work

part one...

PHILOSURFICAL

PhiloSurfical: background and rationale

- PhiloSURFical (2005): learning through semantic navigation
  - prototyped with Wittgenstein's **Tractatus** Logico-Philosophicus (1921)
  - **Annotation of learning materials** *by means of* a domain ontology
  - Reasoning on annotated resources
  - Dynamic reorganization according to different perspectives
  - Mechanisms for **contextual navigation**
  - Tools for providing not answers, but documents!

- Other notable projects:
  - InPhilo Project (USA, 2007)
    Ontological backbone for the Stanford Encyclopedia of Philosophy
    Funded by the *National Endowment for the Humanities Digital Humanities Initiative*
  - Discovery Project (Europe, 2006)
    Generic framework for collaborative annotation/navigation in the *philo*-SW
    Funded by the EU EcontentPlus Grant (2M)

What we'd like: a vision...

Interpretative



Max Black 1909-1988,
Commentary on the Tractatus

7
What we cannot speak about we must pass over in silence.



Ludwig Wittgenstein 1889-1951,
Tractatus Logico-Philosophicus

Comparative

B. Russell, 1872-1970

6.2
Mathematics is a logical method. The propositions of mathematics are equations, and therefore pseudo-propositions.



Cambridge, 1920-1930



Textual

empiricism platonism

logicism

realism formalism

Theoretical

epistemology

ph.of logic

Theoretical

ph.of mathematics

ph.of language

F. Ramsey, 1903-1930

G.E.Moore, 1873-1948

PhiloSurfical: pedagogical approach

- Pedagogical framework: **constructivism**
  - learning through *active* discovery of relevant resources
  - attempts to tackle the hard problem of "situating" the learning of *abstract* concepts (i.e. "descriptions of the world" in Laurillard terms, 1993)
  - support for *analysis* and *interpretation* skills development (Carusi, 2003)

- The **ontology** acts as the '**brain**' of the system
  - Defines all the possible 'senses' (=meanings) an entity can have in the context of the software application
  - **Complex queries need a complex structure!**

PhiloSURFical: main page

PhiloSurfical
Browse Thematically Wittgenstein's Tractatus Logico-Philosophicus

Welcome... | Browse the text | Browse the annotations | Browse the pathways | Browse the ontology

What is PhiloSURFical?

PhiloSURFical is a tool for browsing a philosophical text, taking advantage of a map of the concepts relevant to the text. You can imagine it as the real book, with the enhancement of a *smart* analytical index, which is constantly updated depending on the context. Find out more using the help buttons!

Why the Tractatus?

The PhiloSURFical application has been prototyped with Wittgenstein's Tractatus Logico-Philosophicus. The choice of the Tractatus is not casual: it is a very structured text, therefore it facilitates the analytical task of dissecting its components and annotating them. Secondly, the Tractatus is a very influential work in the twentieth century philosophy, investigating several issues concerning language and meaning,which in recent times have become of interest to various other discipines. Finally - cause it's *freely available*!!
[legalese: **The Tractatus Logico-Philosophicus is used solely for the purposes of research for a non-commercial purpose under s 29(i) of the Copyright designs and Patents Act 1988.**]

How does it work?

Thanks to an underlying *ontology*, that is, a formal representation of the entities of a world. We created this model with the specific purpose of facilitating the exchange of philosophy-related data on the web. PhiloSURFical shows how this can be done: all the contents you see are processed by means of the ontology. This technology exists in the context of the Semantic Web initiative: we expect that whenever more resources in the humanities (but not only) will be 'marked-up' using these techniques, the scope and complexity of the available scholarly applications will also improve considerably. To find out more, check out the F.A.Q. section or go to the main project site.

PhiloSURFical: browsing the text

Welcome... | Browse the text | Browse the annotations | Browse the pathways | Browse the ontology

Book Outline:

Collapse All Expand All Toggle All

1
1.1
1.11
1.12
1.13
1.2
1.21
2
Empty Node
2.01
2.011
2.012
2.0121
2.0122
2.0123
2.01231
2.0124
2.013
2.0131
2.014
2.0141

Objects contain the possibility of all states of affairs.

2.0141 Ogden-translation | Pears-translation | German-edition

The possibility of its occurrence in atomic facts is the form of the object.

The possibility of its occurring in states of affairs is the form of an object.

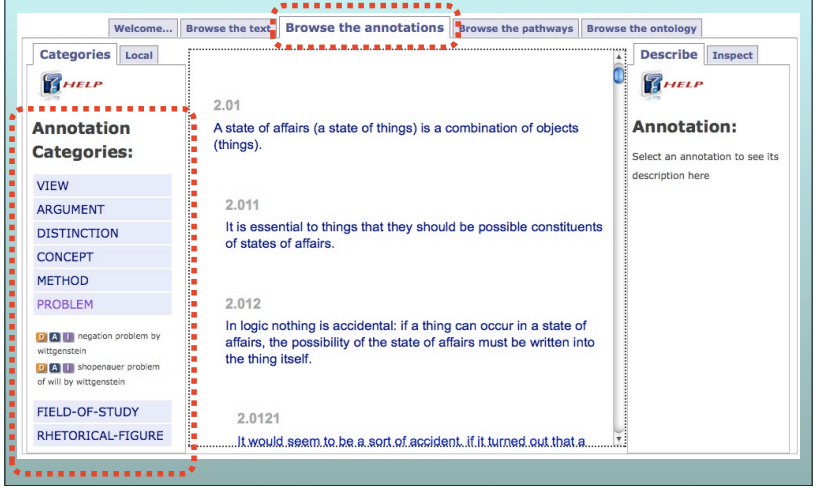
Die Möglichkeit seines Vorkommens in Sachverhalten, ist die Form des Gegenstandes.

2.02

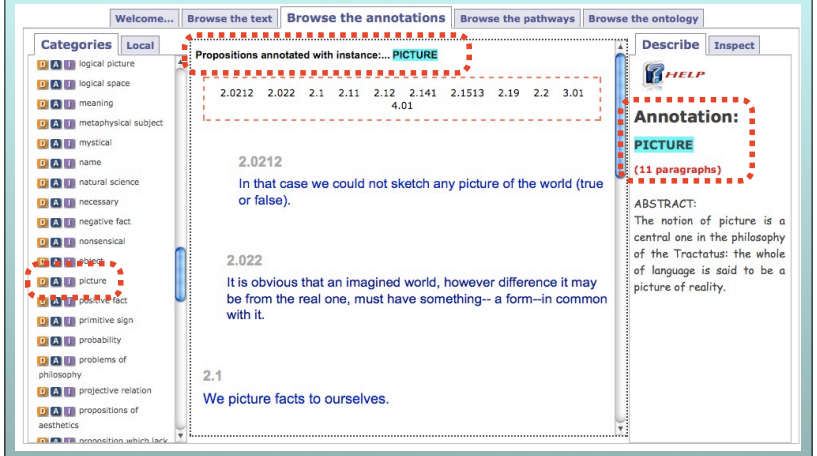
The object is simple.

2.0201

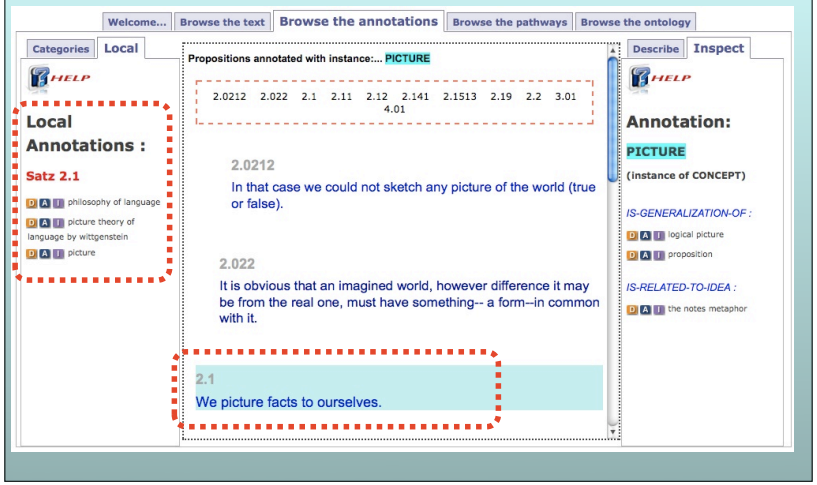
PhiloSURFical: annotation categories



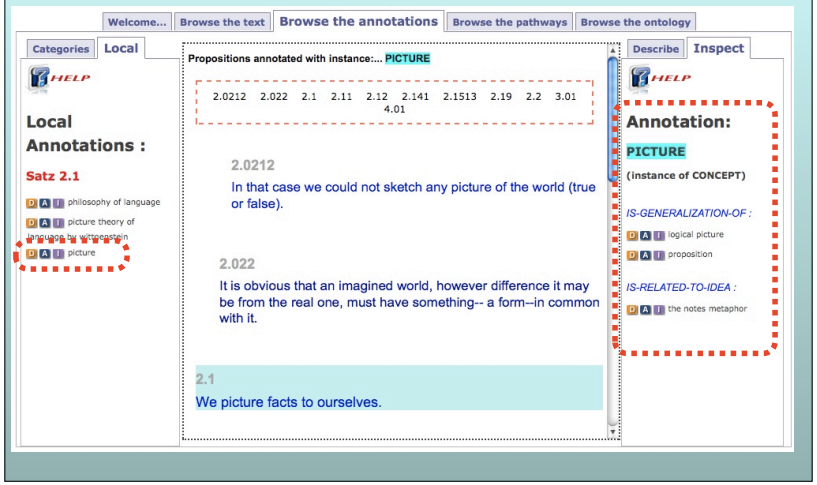
PhiloSURFical: clicking on annotations



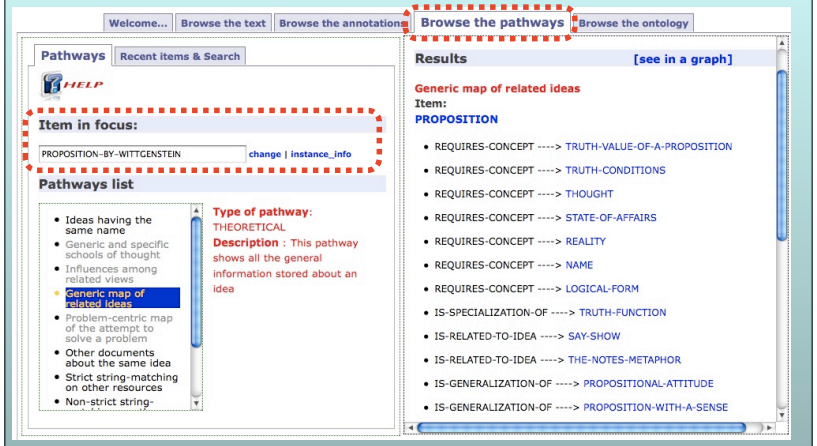
PhiloSURFical: local annotations



PhiloSURFical: inspecting annotations



PhiloSURFical: using the 'pathways'



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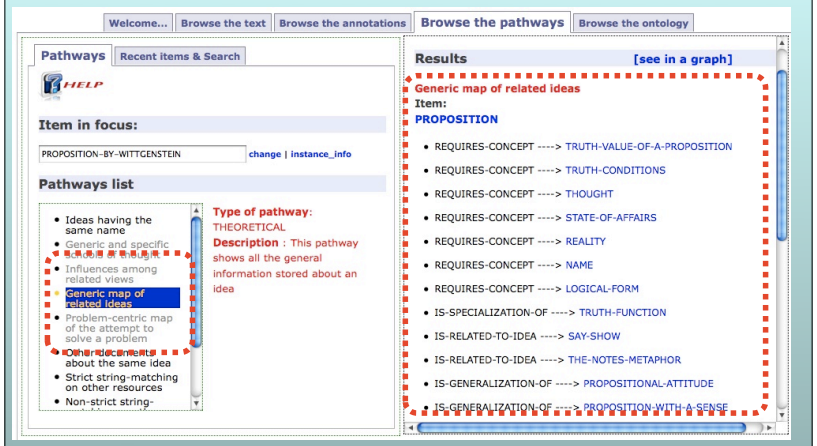
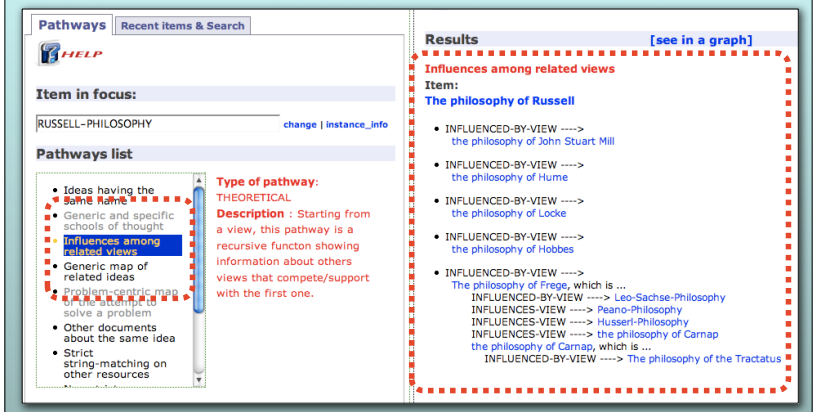
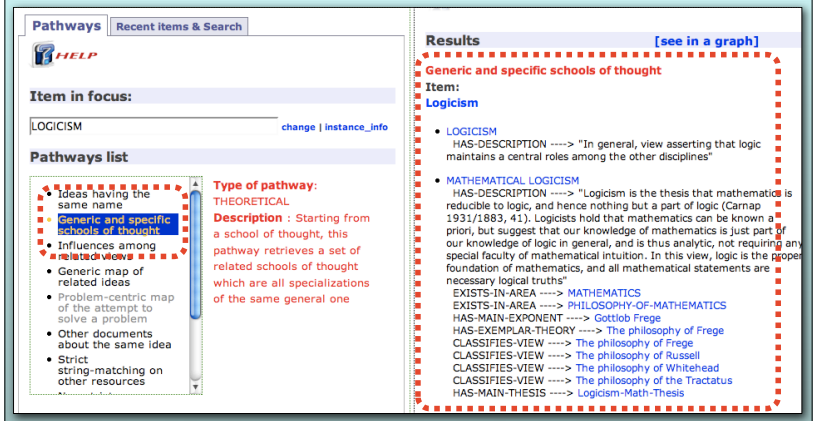


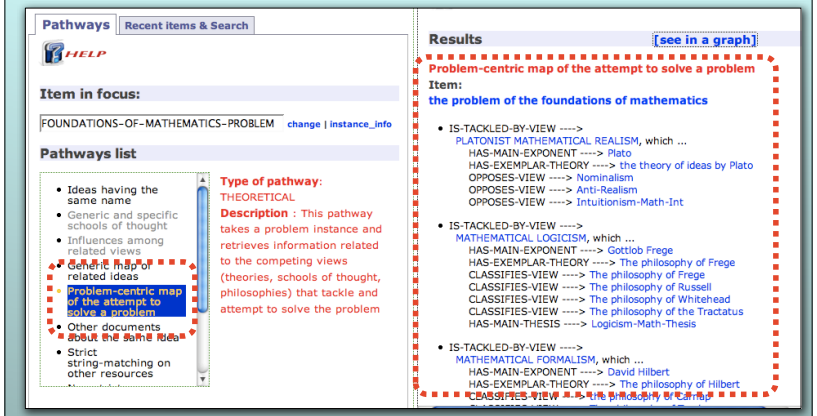
Pathway: influences among related views



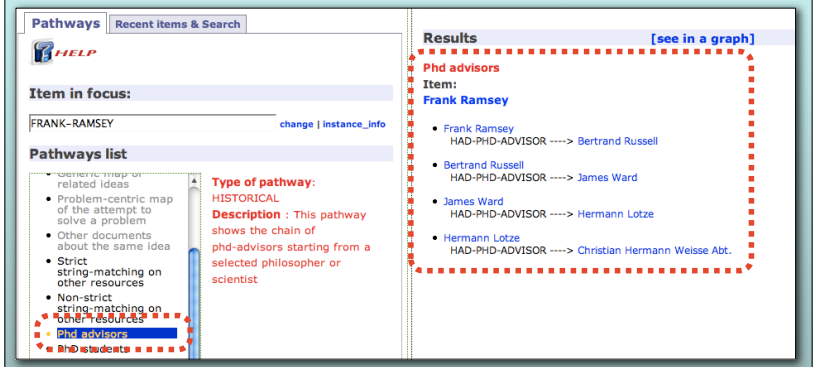
Pathway: generic and specific schools



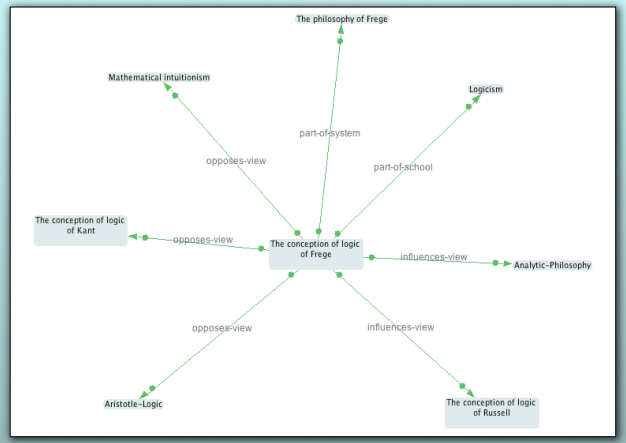
Pathway: problem-centric map



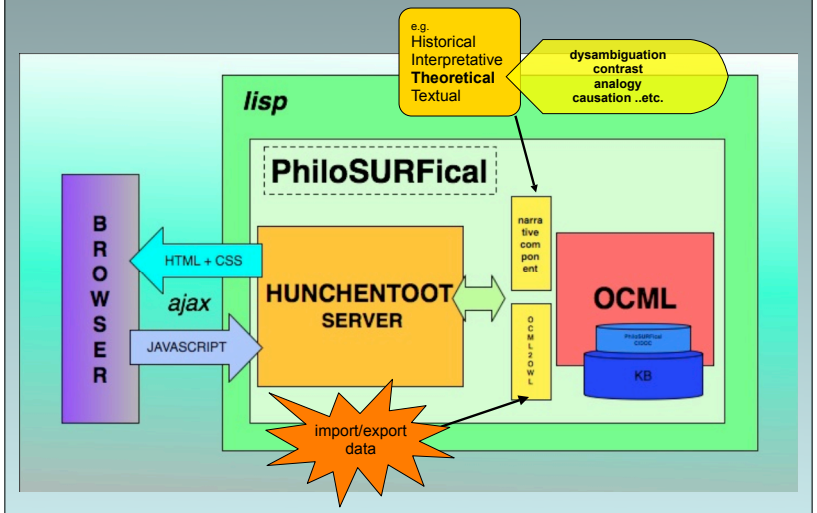
Pathway: PhD lineage



Pathway: graphical representation



PhiloSURFical : system design



part two...

ONTOLOGY

Generic Approach

A Pragmatic Perspective

- Ontologies are not about truth or beauty.
- They are agreements, made in a social context, to accomplish some objectives.
- It's important to understand those objectives, and be guided by them.

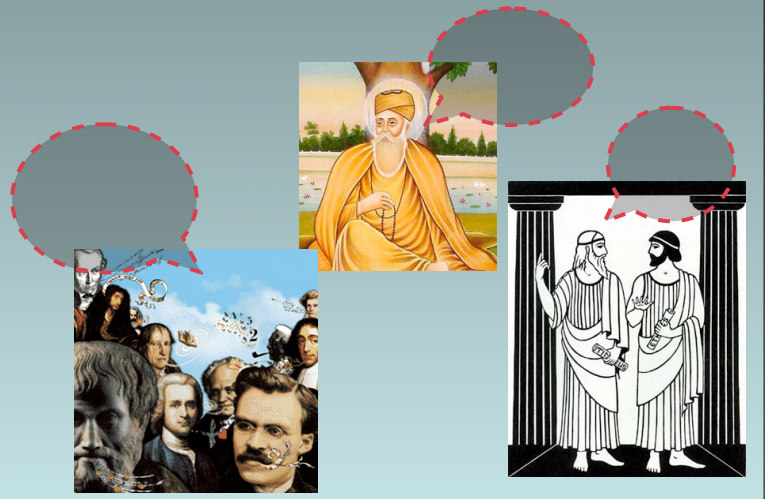
Adapted from Gruber, 2003

The Semantic Web is about sharing and accessibility: REUSE!

What do philosophers deal with?



...ideas.. but not only!



Requirements:

Varying granularity

e.g. a philosophy is unique, but still within a tradition

Uncertainty

e.g. the birth of Heraclitus

Viewpoints

e.g. theories, schools and other philosophical ideas



Historical events

e.g. publication of a book, meeting, work conception

Contradictory information

e.g. concurring opinions on the same subject

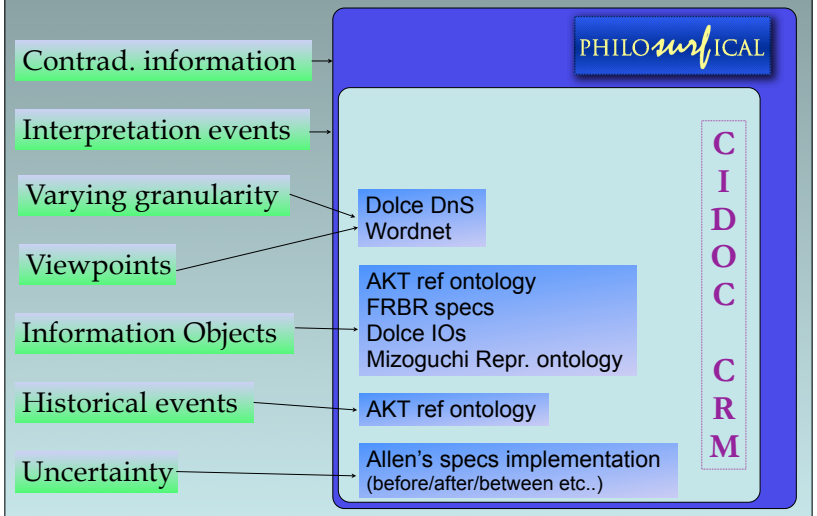
Information objects

e.g. texts, paintings, musical works and their contents

Interpretation events

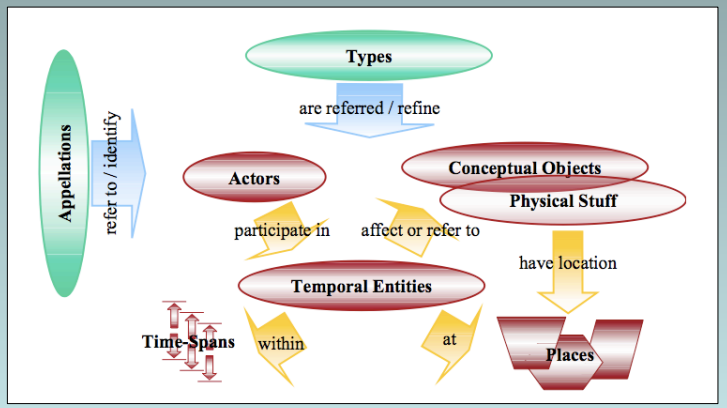
e.g. "the paragraph is about concept X"

Requirements: approach



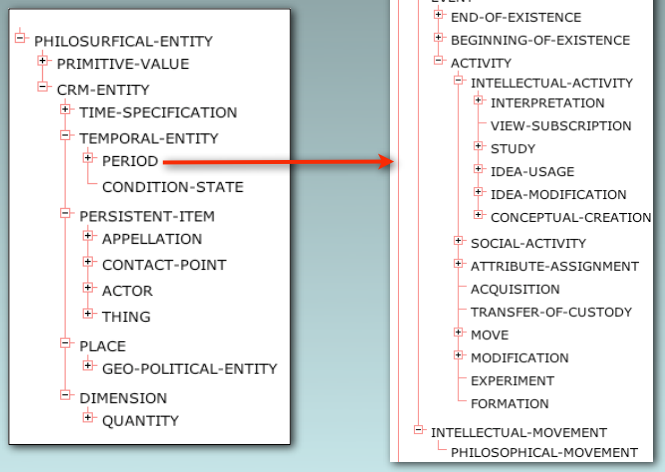
CIDOC Conceptual Reference Model

1996 ICOM initiative, 2006 **ISO standard** (version 4.2)

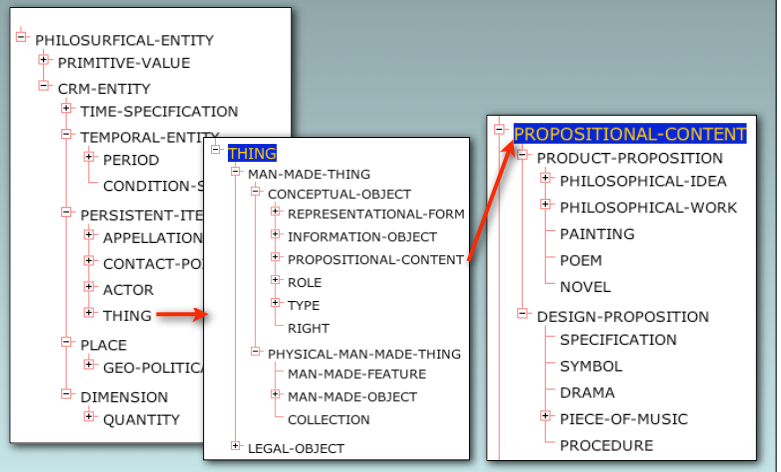


Adapted from CIDOC specification, 2005

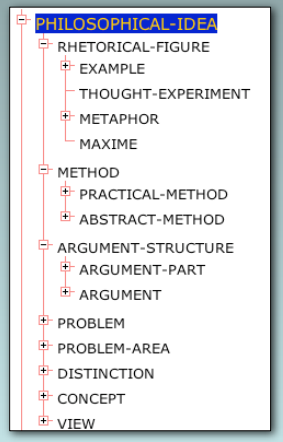
Onto Walkthrough: temporal entities



Onto Walkthrough: conceptual objects



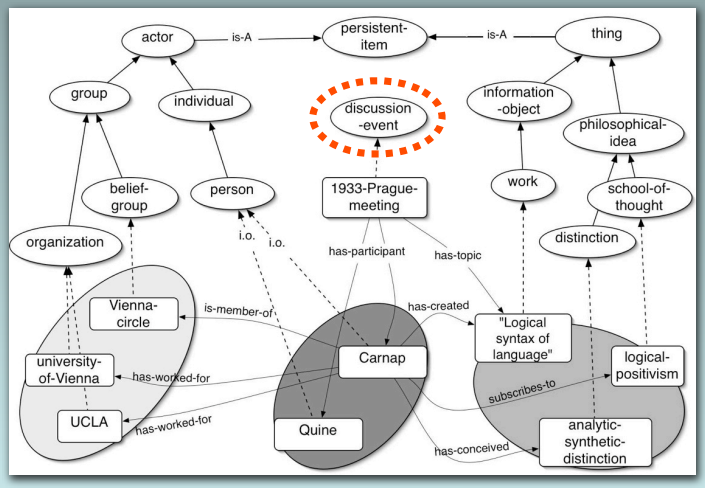
Onto Walkthrough: philosophical ideas



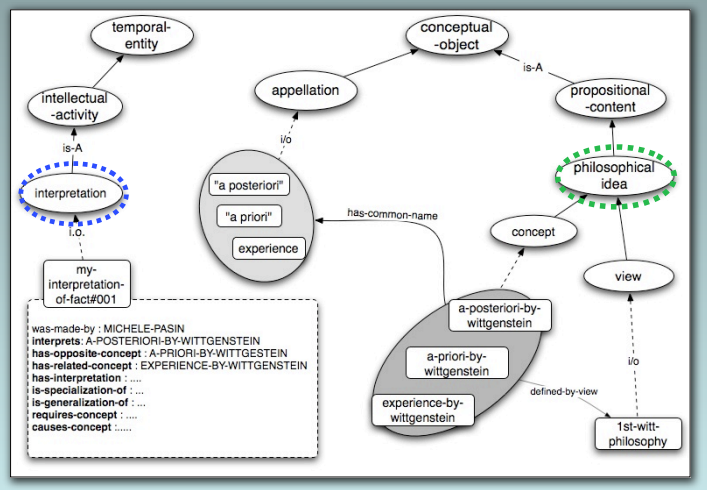
- **Constructivist** approach: 'pragmatic minimalism'
  ..."stone" can be a concept, if there's a view defining it!

- **Goal**: individuate the types of non-physical objs which play a role in the construction of viewpoints!

Example: a philosophical event



Important: interpretations vs ideas

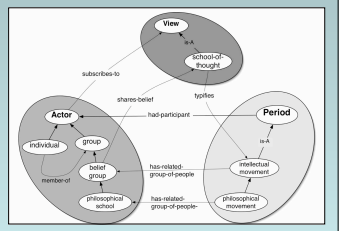


Modeling pattern I: how many rationalisms?

- Problem: natural language often hides type-differences

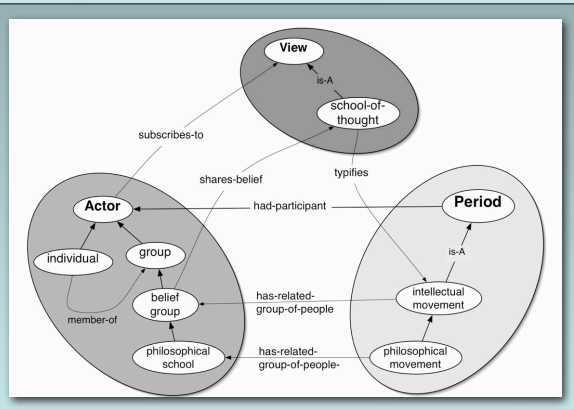
- Tip: taking advantage of natural language ambiguities, so to present resources which are potentially explicative

- Advantage: it allows navigations of ontologically distant entities (belief-groups, views, events)



Ex. I: how many senses of rationalism?

*"This theory is clearly a new and re-shaped **rationalism**"*
*"Descartes was one of the founders of modern **rationalism**"*
*"Throughout history, the attacks of **rationalism** against empiricism has diminished"*



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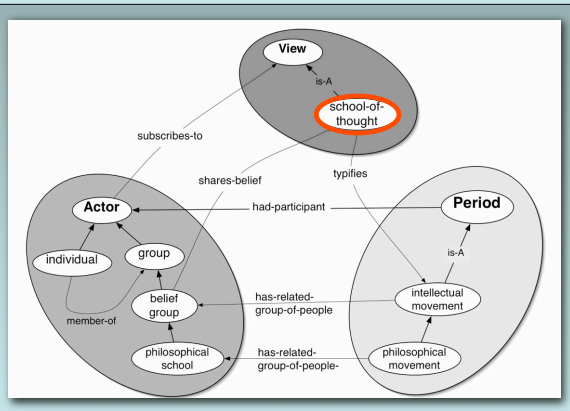

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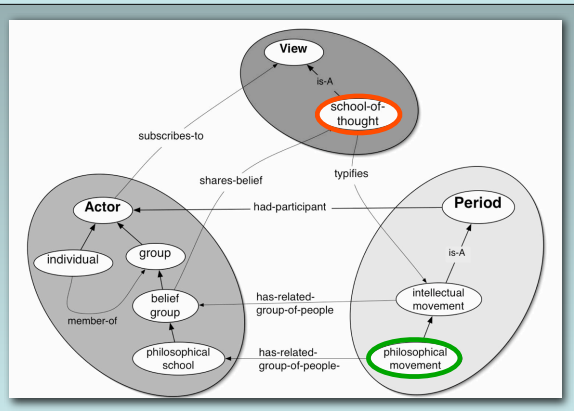

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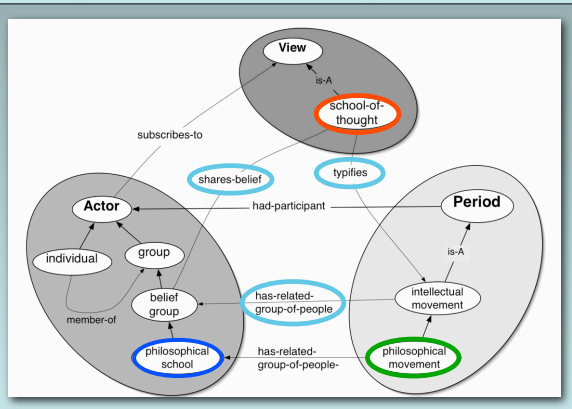
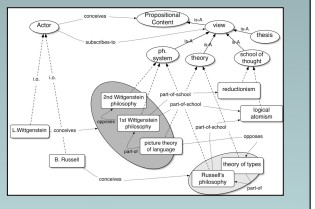


Pattern II : various granularities for theories

- Concerns only the "philosophical idea" branch of the ontology

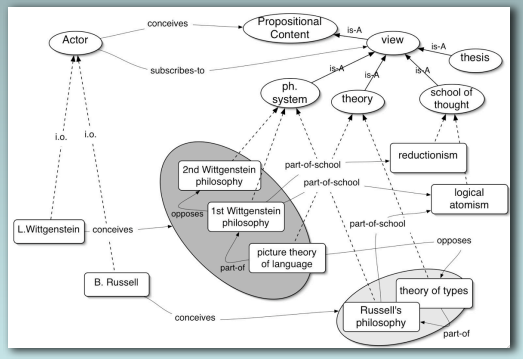
-Taxonomies of viewpoints?
- Dolce: not suited for philosophical ideas
- Cyc: very convoluted, unusable
- Wordnet: flat hierarchy



- Allows navigations which give viewpoints a "theoretical" context
  - e.g. views an author had, within a problem area, consistent with a school of thought etc..

Ex. II: not all views are theories!

"Wittgenstein's philosophy, differently from Frege's one, deals also with problems typical of aesthetics"
"The 2nd Wittgenstein philosophy is much inspired from a kantianism, than from a logical positivism"
"Within the pictorial theory of language, Wittgenstein demonstrated that we can derive complex sentences from atomic ones"



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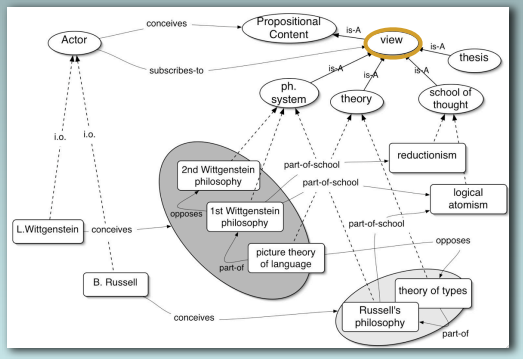

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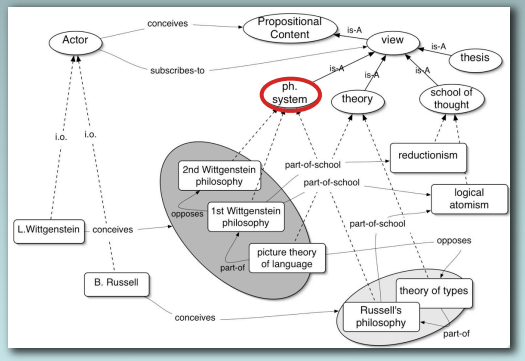

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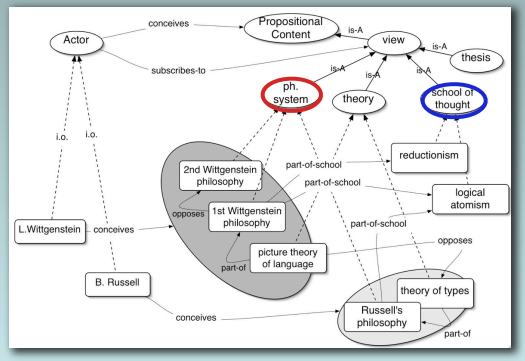

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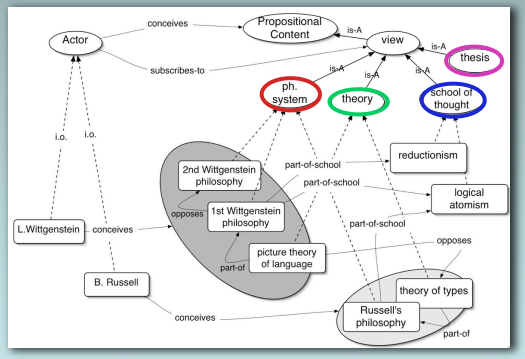


Pattern III : "problematic" problem-areas..

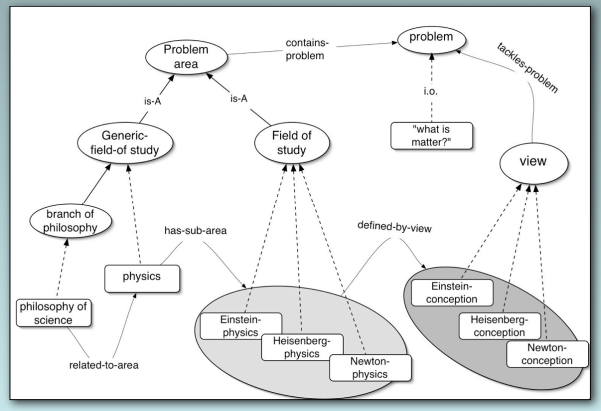
- Issue: we usually employ the notion of *field-of-study* to organize disciplines, but how is this defined?
  - field-of-study vs problem-area

- Often scholars redefine their discipline:
  - how to maintain interoperability, even when two instances of "logic" mean totally different things?
  - how does a field-of-study relate to the *view* which defines it?

- Advantage: allows navigations among problem-areas that border with each other, and the theories they 'include'..
  - e.g. pathway focusing on the employment of a theory across disciplines

Ex. III: "Problematic" problem-areas..

*"**Physics** deals with problems linked to the definition of the properties of matter, and many others"*
*"The problems of newtonian **physics** have just become a particular case of those in einstein **physics**"*
*"Across time, the problems and methods of **physics** have been changing considerably"*



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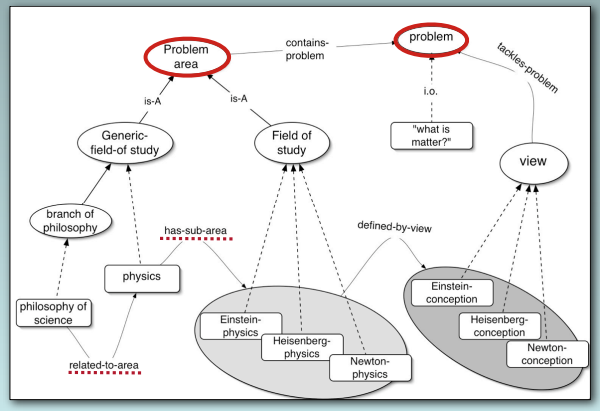

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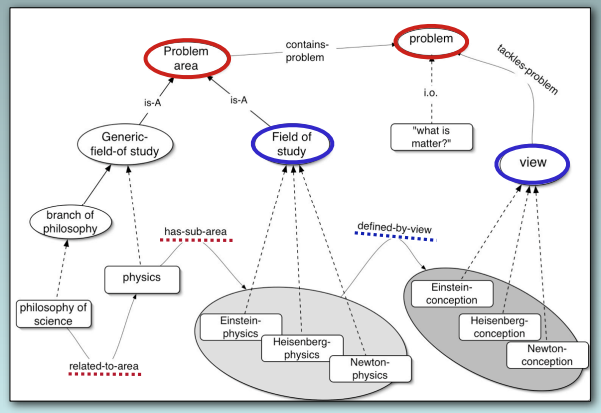

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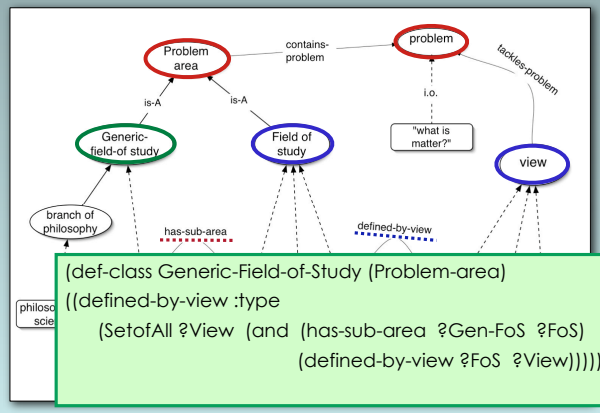



```
(def-class Generic-Field-of-Study (Problem-area)
((defined-by-view :type
    (SetofAll ?View  (and  (has-sub-area  ?Gen-FoS  ?FoS)
                           (defined-by-view ?FoS  ?View))))))
```

Lesson learned: modeling patterns for navigation

- **Disclaimer**: different from "normal" ontology modeling patterns!
  - not focused on architectural issues
  - not involved in the ontology creation process
  - they are not prescriptive!

- Purpose: interpreting a (philosophical) concept/text, so to create ***applicable*** formal models for navigation
  - they open up new senses which can be used for exploring a subject domain

- **Strategy**: taking advantage of natural language ambiguities, overlapping word senses, hidden categories in language
  -the granularity of the ontology is crucial!

Summary of key achievements

New approach for modeling philosophical domain
- In particular, viewpoints and other ideas

Implementation includes:

Domain **model**
- 440 classes (100 cidoc)
- +15000 instances (at the time of speaking)
  - ~7000 persons related to philosophy
  - ~ 500 ideas mostly related to the first wittgenstein
  - ~ 700 interpretations of ideas and texts
  - ~ 7000 events (mainly teacher/student relationships

PhiloSURFical **tool** (source code available)

Supports smart browsing of a philosophical text, tx to the ontology

part three...

EVALUATION

Ontology Evaluation: choosing an approach

Qualitative vs Quantitative approach (Brewster, 2004)
- e.g. mathematical and statistical methods for formally assessing the logical consistency or completeness of a model.
- direct evaluation of an ontology by a chosen group of people, who are asked to rate it using different scales and methods.

Gold standard / **Criteria based** / Task-based (Yu et al., 2007)
- the ontology is evaluated according to a set of proposed criteria (including clarity, consistency, completeness, conciseness, expandability, correctness, coverage, minimal ontological commitment, minimal encoding bias)

Ex. Ontoclean (Guarino and Welty, 2002)
- methodology aimed at separating out classes from properties
- they propose a series of schematic and precise principles (e.g., rigidity, identity, etc.) which aim at revealing the *objective* ontological status of the entities we want to describe.
- **problem**: philosophy is way too abstract and subjective for this method to work! thus our 'pathway-creation' oriented approach in building the ontology..

Evaluation of the ontology: KE experiment

How do our classes mirror philosophers' understanding?

- Knowledge Elicitation experiment: **card sorting** using philosophical concepts

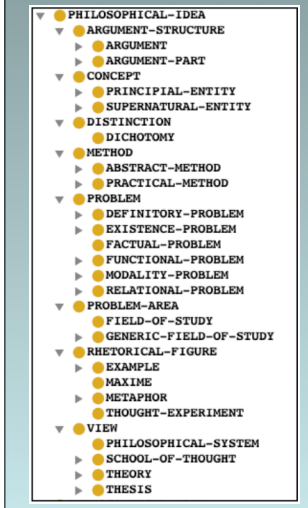
21 ontology	20 logical atomism	23 world	11 substance problem
18 wittgenstein's ontology	10 philosophy of religion	9 Ludwig Wittgenstein	14 truth table method

Example of the sorting results

Table for VOLUNTEER-2 ---- Language: ENGLISH ---- Declared knowledge level: HIGH)

Criteria	Categories	Cards 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Type of entities and connection to Wittgenstein	Individuals connected to Wittgenstein									X														
	Aspects of philosophy connected to Wittgenstein	X																	X					
	Schools of thought connected to Wittgenstein															X	X				X		X	
	Topics Wittgenstein worked on						X				X	X		X	X			X						X
	Not connected to Wittgenstein		X	X	X			X	X				X							X		X		
Abstract/concrete distinction	concrete entities									X										X				X
	abstract entities	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X		X	X	X	
Types of entities	Methods			X		X							X		X									
	Individuals									X										X				
	doctrines		X		X									X								X		
	domains of enquiry						X				X						X						X	X
	doctrines tight to particular individuals and times, or broader views	X						X	X							X			X					
	phenomena																	X						X
	problems												X											
Relation to philosophy	Related to philosophy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Types of entities, alternative classification	Movements, within a certain historical setting. Note that movements are defined in terms of doctrines, even if doctrines usually exists inside movements	X						X	X							X	X		X				X	
	Broad areas of enquiry, with no historical dimension						X				X											X		
	doctrines, which can be associated with a period, but the historical dimension is not important		X											X	X						X			
	methods			X		X							X		X									
	individuals									X														
	explananda												X					X						X
Degree of connection to Wittgenstein	Connected to Wittgenstein	X					X			X	X	X		X	X	X	X	X	X			X		X
	Not connected to Wittgenstein		X	X	X			X	X				X							X		X		

Evaluation: summary of results #1



- All of respondents' constructs could be matched correctly to our model (**completeness** & **correctedness**)

- Many classes remained unevaluated, since respondents did **not** mention them at all (e.g. the structure of problems)

- **First time** a card-sorting technique used in such an 'abstract domain': thus should be considered an exploratory technique, rather than a well-established knowledge elicitation strategy..

Evaluation: summary of results #2

Ontology Class	evaluation	rationale
METHOD PRACTICAL-METHOD SCIENTIFIC-METHOD PRECEPT ABSTRACT-METHOD ARGUMENTATIVE-METHOD RULE-OF-INFERENCE LOGICAL-MATHEMATICAL-METHOD	*positive*	We gathered evidence about 'methods' with meta-criterion 1 and 9. However, we do not have any evidence about the correctness of the subclasses of method.
PROBLEM FACTUAL-PROBLEM MODALITY-PROBLEM RELATIONAL-PROBLEM FUNCTIONAL-PROBLEM DEFINITORY-PROBLEM COMPOSITION-PROBLEM EXISTENCE-PROBLEM	*positive*	Various people used the 'problem' category, especially within meta-criterion 1 and 4. However, we do not have any evidence about the correctness of the subclasses of 'problem'.
PROBLEM-AREA GENERIC-FIELD-OF-STUDY SCIENTIFIC-DISCIPLINE HUMANISTIC-DISCIPLINE FIELD-OF-STUDY	*positive*	We gathered evidence for the 'problem-area' category, especially within meta-criterion 1 and 3. However, we do not have any evidence about the correctness of its subclasses.
CONCEPT	*neutral*	Some of the cards could have been modeled as 'concepts'. But the respondents used this category rarely and inconsistently.
VIEW SCHOOL-OF-THOUGHT CONTEXTUALIZED-SCHOOL-OF-THOUGHT PHILOSOPHICAL-SYSTEM THEORY SCIENTIFIC-THEORY PHILOSOPHICAL-THEORY THESIS PRINCIPLE SELF-EVIDENT-PRINCIPLE LAW	*positive*	We gathered evidence for the 'view' category, although respondents did not call it so. This happened within meta-criterion 1 and 6. Also three of its subclasses have been highlighted ('school of thought', 'philosophical system' and 'theory').

- **4 out of 8** direct subclasses of philosophical-idea have a direct match with the criteria used by respondents for organizing the cards.

- this is **not** a shortcoming of the methodology but just a limitation imposed by the cards' **scope** and variety!

- Conclusion: **encouraging** results, but need more and more accurate KA experiments to come up with a solid theory!

Conclusions

Future work - **ontology**:

- Try to use a different approach: role modeling
  -what's the identity criteria usable to determine philosophical whole concepts from partial ones? Is ontoClean really unusable?
- key topics that need more investigation (*that's also why I'm here!*):
  - formalization & reasoning on information objects
  - formalization & reasoning on interpretation objects

Future work - **philoSurfical**:

- Build bridges to other sources in the web-of-data: e.g. DBpedia
- Make the PhiloSURFical kb available as a sparql endpoint
- transform it into an app that consumes RDF directly!
- add annotation capabilities to the tool, so that it becomes a 'shell'

. . . thank you . . .



http://staff.cch.kcl.ac.uk/~mpasin/