Book Reviews

Edited by Joseph T. Tennis

Book Review Editor

Maria Teresa Biagetti, ed. *Le ontologie*. *AIDAinformazioni* 28 (2010), n. 1-2. ISSN 1121-0095. Available: http://www.aidainformazioni.it/indici/tuttonline/2010-12.pdf (accessed 7 January 2011).

"Le ontologie" edited by Maria Teresa Biagetti is a special issue of *AIDAinformazioni*, journal on information science. This issue specifically focuses on ontologies and, by doing so, probably provides the first example of an Italian LIS journal dealing extensively with this subject and furnishing an introduction to the topic also to non-experts, in Italy. The purpose of this monographic issue is best outlined in the editor's note, stating that this issue opens the ranks to a cognitive path in information science, following a perceived growing need to pause, taking a step back from our enveloping reality, and reflecting on our domain of research, in order to be able to grab those hidden structures and bonds that only a wider perspective is able to unveil. This seems the thought that best summarizes the aim of *Le Ontologie*, and the reason behind its naissance. It is a publication made up of 5 papers from distinguished researchers operating in different Italian contexts, plus Claudio Gnoli's contribution for the KO column of the journal.

- Maria Teresa Biagetti, Università La Sapienza, Roma, "Le ontologie come strumenti per l'organizzazione della conoscenza in rete," pp. 9-31
- Maria Teresa Pazienza, Università di Roma Tor Vergata, "Ontologie e Web semantico: proprietà e problematiche connesse al loro uso diffuso," pp. 33-61
- Stefania Costantini, Università dell'Aquila, together with Davide Lanti and Alessio Paolucci "Agenti ed Ontologie: verso la Web Intelligence," pp. 63-86
- Fausto Giunchiglia and Vincenzo Maltese, Università di Trento, "Ontologie leggère a faccette," pp. 87-106
- Silvia Gaio, Stefano Borgo, Claudio Masolo, Alessandro Oltramari and Nicola Guarino, ISTC-CNR, Trento, "Un'introduzione all'ontologia DOLCE," pp. 107-125
- Claudio Gnoli, Università di Pavia, "Web-publish or perish" for the column "Organizzazione della conoscenza," pp. 129-131.

The structure of this review is the following: a first section will deal with presenting the contents and structure of the issue of *AIDAinformazioni* being reviewed and highlighting main points in each article. A second section will then address the publication as a whole, its added-value, providing a number of qualitative comments.

Contents

The succession of the 5 articles dealing with ontologies defines a progression in specificity, evolving from the first introductory paper on ontologies as knowledge organization tools for the Web and their language, to their use and applications envisaging the complexity of including collective entities; to examples of the power of ontologies as communication tools for intelligent logical agents; to lightweight ontologies with knowledge organized in terms of facets; to finally descriptive upper-level ontologies, with the case of DOLCE.

Besides editing the special issue and presenting it, Biagetti contributes with the first, introductory paper. Ontologies are presented as the best suited tools to overcome the limits in information access when knowledge organization on the Web pursues a semantic navigation. Ontologies are considered as better-suited tools than thesauri and classifications for the aim of document expansion, offering more semantic relations and the overcome of semantic ambiguity. Ontologies are viewed as means to recall information without following necessarily predetermined paths; where document expansion at the indexing stage will allow to establish new relationships between resources during information retrieval, despite, she notes, the lingering limit posed in the automatic query expansion by the different ontological modeling possibilities and therefore the different results in the obtained expanded concepts. Once the potential

of ontologies is acknowledged, the author provides a compact summary of the steps that from the 1950s computer science and artificial intelligence have undergone in the search for formal knowledge representation. Starting from classical definitions of ontology: "An ontology is an explicit specification of a conceptualization" (Gruber 1993, 199); and "An ontology is a formal, explicit specification of [a] shared conceptualization" (Studer et al. 1998, 161), the author deals with conceptualizations and shared conceptualizations, with the need to define a shared meaning prior to developing the actual ontology and with the compromise, not necessarily universally accepted, of a binary relationship between a concept and an object. Biagetti refers here especially to Charles Sanders Peirce and his theory of knowledge in which systems of signs are of a triadic nature, and knowledge requires a sign, the object signified, and the interpretant, where the interpretant is in turn a sign, and the sign again an interpretant, positioning the sign in an open network of interpretants according to the Peircean principle of infinite semiosis or endless series of interpretants, preventing the definition of a final interpretant for a given sign (Peirce, CP 1.339 in Petrilli 2010, 53). Here it would have been interesting to have a parenthesis on conceiving shared conceptualizations across different linguistic systems, with reference to positions in structural linguistics. Though later on (p.17) Biagetti approaches this direction by pointing to the different cultural, ideological and scientific models underpinning an ontology, clearly perceivable by, for example, observing the many-sided results obtained when searching for ontologies by typing keywords in the Swoogle search engine. Further on, an examination of different types of ontologies, from lightweight ontologies, to Topic Maps, to domain and upper-level (heavyweight) ontologies leads the author to a closer look at RDF and then OWL. Providing a fairly complete description of the three sublanguages, OWL Lite, OWL DL and OWL Full, the author gives the reader examples of the different ways in which these handle classes and individuals, examples of restrictions on properties, devoting a last section to OWL 2, the revised and extended version of OWL. In the final paragraphs of her paper, Biagetti provides a complete panorama on WordNet, its nature, its composition as well as the developments of the late 1990s with the EuroWordnet project, and beginning of 21st century OntoWordNet aligned to DOLCE-Lite-Plus (see also Gaio et al.). In closing her contribution Biagetti enters into details on the upper-level ontology SUMO, Suggested Upper Merged Ontology, candidate for the Standard Upper Ontology Working Group, using a simplified version of KIF, SUO-KIF and providing a mapping to all of the Wordnet synsets, and then on Cyc, a very large, multi-contextual knowledge base and inference engine, developed in the frame of an artificial intelligence project started in 1984 with the aim to provide a "deep" layer of understanding that can be used by other programs to make them more flexible.

The paper on ontologies and Semantic Web by Pazienza is itself too a good candidate for an introduction to the subject, with a stronger devotion to tracing the steps and decisions inherent to creating an ontology. Distinguishingly clear, linear and well-structured, the descriptive character of this paper seems to perfectly suit a didactic use. The author retraces the fortune of ontologies as being strongly related to the growing relevance of the Semantic Web. After clarifying the bond between these, due to the possibility of adding explicit semantics to the content of a document by means of an ontology, the author provides a neat overview of what is meant when talking about an ontology in artificial intelligence and knowledge representation, providing and commenting on a number of definitions. After enumerating in which ways an ontology is an explicit description of reality, through properties and its relationships between concepts, objects, events, a description of ontologies follows according to their specificity, top-level, domain, task and application ontologies, including a digression on the widely adopted domain ontologies. The innovative contribution of Pazienza in the framework of this publication is due to the section devoted to ontologies and collective phenomena. The author gives a very accurate overview of the relevance of collective phenomena within the field of ontology, introducing the various types as well as their ontological relationships, providing examples and schematic explanations. This section is likely to be responsible for a great part of the interest in this paper, though the references should have probably included the "Taxonomy of Collective Phenomena" by Wood and Galton (2009). Nonetheless, very helpful for an ideal reader wanting to gain a first general perspective on ontologies will also be the following paragraphs in Pazienza's paper. Here the author touches upon the main stages and subjects relevant in ontology construction. Choices pertaining to the depth, breadth and degree of population of the ontology, when the decision to create one has been taken, are envisaged. Further also the term extraction; synonyms identification and definition of concepts, hierarchical organi-

zation, ontology learning, and ontology population stages are taken into account, including semi-automatic annotation. Before introducing the platform for semantic bookmarking and ontology development, Semantic Turkey, the reader finds another interesting section of the paper, once again very neatly structured and extremely complete and clear, on the evaluation of quality and technology properties of an ontology and on the evaluation of tools for ontology construction. Also in this case, direct reference to external bibliography might have been useful (Angele and Sure 2001, for example). Through Semantic Turkey a user can keep track of relevant information from visited web sites and organize collected contents according to imported or personally edited ontologies, thus turning the Firefox Web browser into a rich and extensible framework for knowledge acquisition, management and exchange. In concluding, Pazienza remarks that once the potential and the role ontologies can play are clear, once it is clear that the richer the ontology the more useful it will be, the need to develop frameworks for ontology development and management will emerge, alongside with the need to evaluate results from a cognitive as well as a technological point of view.

Costantini, Lanti and Paolucci contribute to the issue by focusing on advanced aspects of an ontology with regard to application contexts. The authors specifically concentrate on the role and potential of the use of ontologies with agents, on the use of ontologies in the integration and manipulation of structured and unstructured data sources. Ontologies, understood as "a contract for meaning," are presented as the answer to identifying and representing a precise semantics for entities and properties being formally represented, the core of a Semantic Web. The authors go on by mentioning the RDF data model and then OWL, to move on to tools employed to create an ontology, briefly touching upon programming and editing tools, as well as tools for data storage and the SPARQL query language. All these concepts will then return in the main section of the paper, dealing with ontologies and agents and the active logic programming language, DALI. As for the application of ontologies in multi-agent systems, the authors firstly deal with the aid ontologies provide in bridging gaps between agents, by fostering their communication, and subsequently discuss the role played by ontologies that act as specific knowledge bases in a given domain of interest, i.e. the domain being the theoretical knowledge that the agent should have in order to be able to act successfully. The DALI platform is a logic programming language allowing to define software components (agents) able to monitor external events, to achieve given goals, and featuring positive social ability. DALI agents communicate messages via FIPA ACL. When a DALI agent receives a message by another agent, the message is submitted to a check level. If the message gets over this control, the agent then invokes meta-level reasoning in order to understand the content of the message. Meta-level reasoning is exploited to try to understand messages coming from other software entities, and uses the agent's ontology and other properties of the terms occurring in the message in order to correctly interpret it. Access to the ontology takes place by means of the underlying "communication ontology library," the actual link between ontologies and the agent. Later in their text the authors linger on data integration efforts principally achieved through mapping with the aim of semantic data integration. Furthermore they touch upon raw textual sources and the challenges posed by Natural Language Processing, closing with the observation that the measure and significance of the relationships between ontologies far exceeds the sum of its single parts, in line with Tim Berners Lee's paradigm of Linked Data.

Giunchiglia and Maltese concentrate on the use of ontologies for the categorization of objects, e.g., photos, books, web pages, where labels of nodes are organized according to facets, in order to capture different aspects of meaning. The whole paper presents a very clear organization and specifically features some basic concepts in the domain of ontologies. The plain and clear organization of the content, in line with Biagetti and Pazienza's sections, confirms the didactic character that this special issue might harvest. The authors introduce and formally define (classification) lightweight ontologies, operating a distinction, first of all, between descriptive and classification ontologies. Subsequent sections are devoted to facets, Ranganathan's five fundamental categories and (the here adopted) Bhattacharyya's proposed refinement of PMEST, the four DEPA categories (POPSI). The paragraph dealing with faceted lightweight ontologies aims at highlighting the advantage of the faceted approach providing explicit logical relations among concepts and groups of concepts, various perspectives on complex entities as well as flexibility and eased extensibility to the whole structure. They provide examples on how to use faceted classification schemes and specifically on POPSI's methodology enabling to bridge the gap in those cases in which the subject specification is only partial by providing the missing

contextual information. For non-Italian speaking readers, it might be useful to add that the content of this contribution can be found in Giunchiglia, Dutta & Maltese (2009), of which the Italian paper provides a revised translation.

The last contribution is by Gaio, Borgo, Masolo, Oltramari and Guarino and again is a very clear and neatly structured introductory paper, this time on foundational ontologies and specifically on DOLCE, Descriptive Ontology for Linguistic and Cognitive Engineering. In its opening the paper presents the fundamental distinction between philosophical ontologies and formal ontologies, and then a section on lightweight versus foundational (heavyweight) ontologies with the aim of highlighting the advantages of the latter (see also SUMO in Biagetti's paper). The semantic and conceptual consensus that foundational ontologies raise facilitates interaction and cooperation among (artificial, human or both) agents, enabling to exclude conceptual or terminological ambiguities. The authors then provide an overlook of the international project WonderWeb, in the framework of which DOLCE was developed at the beginning of the 21st century. The aims of DOLCE, essentially seizing the ontological categories underlying natural language and human common sense, are extensively described, followed by a presentation of approaches in the building of an ontology, before moving on to directly describing the descriptive, multiplicative approach adopted in DOLCE. The authors later on provide a presentation of the basic categories of the ontology, underlying natural language, aimed at reflecting the linguistic structures and human common sense and then move on to the basic relationships established among particulars. In closing their paper, the authors present some selected examples of applications of this ontology with respect to cases in which DOLCE has been used as starting point to develop new ontologies, as well as cases in which DOLCE has been integrated with pre-existing ontologies in order to improve them.

The special issue is closed by Gnoli's column of the journal, devoted to knowledge organization. Inspired by the International UDC Seminar 2009, "Classification at a Crossroads: multiple directions to usability" (The Hague, October 2009), Gnoli discusses the expertise and research behind traditional KOSs and the emerging less refined new tools that aim at facing specific needs, though risking to reinvent the wheel. The quick competition brought by the Web context necessitates an intervention in order to find a compromise, and NKOS and a number of research groups, active across Europe and working in this direction, are mentioned. The main point made by Gnoli, grounded on the choice for 'crossroads' in the title of the UDC Seminar as well as on Dan Brickley's and Dagobert Soergel's opinions expressed in their keynotes, is that the necessary intervention consists in granting access to the developed tools, possibly public access on the Web, despite the traditional management models and the frequent need to sell user rights by the managing institution (fundamental for its survival). KOSs are like languages, they need to be used in order to survive, Gnoli says: Web-publish or perish. In line with this warning, the author brings the example of the UDC Consortium that has granted free online access to over 2000 UDC classes, planning to add further languages to the currently available ones.

The issue

As far as the whole special issue is concerned, this has two main qualities. First of all it provides a fairly up-to-date excursus on the subject ontologies providing basic knowledge on the topic, as well as examples of several approaches and existing applications, and reference to further external bibliography. Not only Biagetti's contribution with her dedicated introductory purpose, but also each of the following four papers provide a very clear and detailed theoretical description of the framework of the cases specifically treated, clarifying key concepts, schematizing, summing up and pointing to authoritative sources. The style, too, despite the miscellaneous initiative, addresses in all cases an ideal reader with basic knowledge in the field and interested in a reference source. The second main quality of this issue of *AIDAinformazioni* concerns its function as a reference source, specifically due to the fact that the publication is entirely in Italian. It also consists of an authoritative source as far as the the terminology of the subject is concerned. The fact that in a number of cases the authors introduce a term then adding in brackets its English equivalent (e.g. Costantini et al.), or the fact that Giunchiglia and Maltese consider translating (and revising) a recent publication into Italian are clear signs of the effort being made in providing the Italian speaking community with standardized terminology or, at least, proposals for a terminology that is not rarely directly adopted into the Italian language in the form of direct loans from the English language or loan translations. Gaio et al.'s article provides examples: in describing the DOLCE ontology the authors

deal with its upper-level categories and discuss the fundamental distinction between enduring and perduring entities. In doing so they speak about "continuanti (enduranti) e occorrenti (perduranti)" (p.116). "Enduranti" and "perduranti" clearly borrowed from the English, though shyly, already tend to break through, despite the existence and notified use of "continuanti" and "occorrenti." The role that a reference source can play in this process is unquestioned, in order to avoid the success of unhappier translations like "consistenza" for "consistency" instead of "coerenza," easily detectable on the Web especially in co-occurrence with "classes," and also in this issue of *AIDAinformazioni* (p.54). Finally, being a collection of single articles inside a special issue of a journal, lacking a systematic editing, some repetitions or overlaps do occur, especially in the initial descriptive theoretical paragraphs of the five papers.

References

Angele, Jürgen and Sure, York. 2001. *Whitepaper: Evaluation of Ontology-based Tools*. Excerpt from the IST-2001-29243 Report, OntoWeb. D1.3. Tools. Available: *digbib.ubka.uni-karlsruhe.de/volltexte/documents/2550* (accessed 7 January 2011).

Giunchiglia, Fausto , Dutta, Biswanath and Maltese, Vincenzo. 2009. Faceted lightweight ontologies. In Borgida, Alexander T. et al., *Conceptual modeling: foundations and applications. Lecture notes in computer science* 5600: 36-51.

Gruber, Thomas R. 1993. A translation approach to portable ontology specifications. *Knowledge acquisition* 5(2): 199-220.

Petrilli, Susan. 2010. *Sign crossroads in global perspective: semioethics and responsibility*, John Deely, editor. New York: Transactions.

Studer, Rudi, Benjamins, V. Richard and Fensel, Dieter. 1998. Knowledge engineering: principles and methods. *Data & Knowledge Engineering* 25: 161-98.

Wood, Zena and Galton, Anthony. 2009. A taxonomy of collective phenomena. *Applied ontology* 4: 267-92.

Barbara De Santis
PhD student
Dipartimento di Studi Interdisciplinari su Traduzione, Lingue e Culture, Università di Bologna.
barbara.desantis2@unibo.it

Alan Gilchrist, ed. *Information Science in Transition*. London: Facet Publishing, 2009. Xxix, 401 pages. ISBN 978-1-85604-693-0.

This collection of articles, originally special edition 34(4) of the *Journal of Information Science,* chronicles the development and achievements of the information science (IS) discipline and outlines its current challenges and research directions. The authors are pre-eminent researchers, many of whom have been involved in their field since inception. Many of the chapters will be of great use to students or those wanting to better understand a topic, as they provide rich references to key studies, centres and individuals that have helped shape the knowledge base.

Although not all of the topics covered sit squarely within the scope of this journal, most are of interest and some provide crucial overviews of past and present work in the organisation of knowledge.

The volume can be loosely divided into those dealing with analysis of the discipline as a whole, those summarising and evaluating work on a strand of information science, and those describing applications of information science approaches in a particular domain. Space prevents all chapters being covered here, but I will try to do justice to the spirit and flavour of the whole.

In "Fifty years of UK research in information science," Jack Meadows looks at the *Journal of Information Science* and the *Journal of Documentation* in order to derive the dominant themes in the published research. He concludes that the major thematic areas of information retrieval, library and information services, information seeking, bibliometrics and communication emerge from the collected articles. He goes on to flesh out these themes with some dominant historic areas of focus and emerging trends such as impact and scientometrics research within bibliometrics. He also notes areas of permeability between these IS-claimed topics and those of other disciplines, such as between information seeking and communications and between information retrieval and computer science. Usefully, Meadows also points to changes in funding regimens to help explain shifts in focus over the years, and particularly notes the trend to shorter projects and funder-driven agendas. Meadows finishes by accepting the submergence of IS into informatics, while recognising the validity of its contribution to date.

David Bawden continues an analysis of the IS contribution to knowledge in "Smoother pebbles and the shoulders of giants: the developing foundations of information science." Bawden digs a little deeper into