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Bibliography

- Agnoloni, T., Bacci, L., Francesconi, E., Peters, W., Montamegni, S., and Venturi, G. (2009). A two-level knowledge approach to support multilingual legislative drafting. In Breuker, J., Casanovas, P., Klein, M., and Francesconi, E., editors, *Law, Ontologies and the Semantic Web*, Frontiers of Artificial Intelligence and Applications. IOS Press, Amsterdam.
- Allen, J. (1984). Towards a general theory of action and time. *Artificial Intelligence*, 23:123–154.
- Allen, J. F. and Ferguson, G. (1994). Actions and events in interval temporal logic. Technical Report TR521, Rochester University, Department of Computer Science, NY.
- Anderson, J. and Bower, G. (1973). *Human associative memory*. Winston & Sons, Washington, DC.
- Antoniou, G. and van Harmelen, F. (2003). Web ontology language: OWL. In *Handbook on Ontologies in Information Systems*, International Handbooks on Information Systems, pages 67–92. Springer.
- Antoniou, G. and van Harmelen, F. (2004). *A Semantic Web Primer*. MIT Press.
- Baader, F., Brandt, S., and Lutz, C. (2005). Pushing the \mathcal{EL} envelope. In *Proceedings on the 19th Joint International Conference on Artificial Intelligence (IJCAI 2005)*.
- Baader, F., Bürckert, H.-J., Heinsohn, J., Hollunder, B., Müller, J., Nebel, B., Nutt, W., and Profitlich, H.-J. (1991). Terminological knowledge representation: A proposal for a terminological logic. In *Description Logics*, pages 120–128.
- Baader, F., Calvanese, D., McGuinness, D., Nardi, D., and Patel-Schneider, P. F., editors (2003). *The Description Logic Handbook - Theory, Implementation and Applications*. Cambridge University Press.
- Baader, F. and Hanschke, P. (1991). A scheme for integrating concrete domains into concept languages. Technical Report RR-91-10, Deutsches Forschungszentrum für Künstliche Intelligenz GmbH, Kaiserslautern, Germany.
- Baader, F. and Hollunder, B. (1991). Kris: Knowledge representation and inference system. *SIGART Bull.*, 2(3):8–14.

- Barry Smith, e. a. (2007). The OBO Foundry: coordinated evolution of ontologies to support biomedical data integration. *Nature Biotechnology*, 25(25):1251–1255.
- Bechhofer, S., Harper, S., and Lunn, D. (2006). SADIE: Semantic annotation for accessibility. In *5th International Semantic Web Conference*, Athens, GA, USA. LNCS 4273.
- Bechhofer, S., van Harmelen, F., Hendler, J., Horrocks, I., McGuinness, D. L., Patel-Schneider, P. F., and Stein, L. A. (2004). OWL web ontology language reference. W3C recommendation, World Wide Web Consortium (W3C). M. Dean, G. Schreiber (eds.).
- Bench-Capon, T. and Coenen, F. (1991). Isomorphism and legal knowledge based systems. *Artificial Intelligence and Law*, 1(1):65–86.
- Bera, P. and Wand, Y. (2004). Analyzing OWL using a philosophy-based ontology. In Varzi, A. C. and Vieu, L., editors, *Formal Ontology in Information Systems, Proceedings of the Third International Conference (FOIS 2004)*, volume 114 of *Frontiers in Artificial Intelligence and Applications*. IOS Press.
- Berners-Lee, T. (1999). *Weaving the Web: Origins and Future of the World Wide Web*. Texere Publishing.
- Berners-Lee, T., Hendler, J., and Lassila, O. (2001). The Semantic Web. *Scientific American*, 284(5):34–43.
- Biezunski, M., Bryan, M., and Newcomb, S. R. (1999). Topic maps: Information technology – document description and markup languages. Technical Report 13250:2000, ISO/IEC.
- Bobillo, F., Delgado, M., and Gómez-Romero, J. (2007). An ontology design pattern for representing relevance in OWL. In *Proceedings of the 6th International Semantic Web Conference (ISWC 2007)*, Busan, Korea.
- Bobrow, D. G. and Winograd, T. A. (1976). An overview of KRL, a knowledge representation language. Technical report, Xerox Palo Alto Research Center, Stanford, CA, USA.
- Bodenreider, O., Smith, B., and Burgun, A. (2004). The ontology-epistemology divide: A case study in medical terminology. In Varzi, A. C. and Vieu, L., editors, *Formal Ontology in Information Systems, Proceedings of the Third International Conference (FOIS 2004)*, *Frontiers in Artificial Intelligence and Applications*, pages 185–195, Torino. IOS Press.
- Boer, A. (2000). The Consultancy Game. In Breuker, J., Leenes, R., and Winkels, R., editors, *Legal Knowledge and Information Systems. Jurix 2000: The Thirteenth Annual Conference*, *Frontiers in Artificial Intelligence and Applications*, pages 99–112, Amsterdam. IOS Press.
- Boer, A. (2006). Note on production rules and the legal knowledge interchange format. Technical report, Leibniz Center for Law, Faculty of Law, University of Amsterdam.

- Boer, A. (2009). *Legal Theory, Sources of Law & the Semantic Web*. PhD thesis, Faculty of Law, Universiteit van Amsterdam. To be published.
- Boer, A., Gordon, T. F., van den Berg, K., Di Bello, M., Förhécz, A., and Vas, R. (2007a). Specification of the legal knowledge interchange format. Deliverable 1.1, Estrella.
- Boer, A., Hoekstra, R., Winkels, R., van Engers, T., and Willaert, F. (2002). *METAlex: Legislation in XML*. In Bench-Capon, T., Daskalopulu, A., and Winkels, R., editors, *Legal Knowledge and Information Systems (Jurix 2002)*, pages 1–10, Amsterdam. IOS Press.
- Boer, A., van Engers, T., Peters, R., and Winkels, R. (2007b). Separating law from geography in GIS-based e-government services. *Artificial Intelligence & Law*, 15(1):49–76.
- Boer, A., van Engers, T., and Winkels, R. (2005a). Mixing legal and non-legal norms. In Moens, M.-F. and Spyns, P., editors, *Jurix 2005: The Eighteenth Annual Conference*, Legal Knowledge and Information Systems, pages 25–36, Amsterdam. IOS Press.
- Boer, A., van Engers, T., and Winkels, R. (2005b). Open standards for spatial regulations: an interdisciplinary approach. In *Proceedings of the Holland Open Software Conference*, Amsterdam, Netherlands.
- Boer, A., Winkels, R., and Hoekstra, R. (2001). The CLIME Ontology. In Winkels, R. and Hoekstra, R., editors, *Proceedings of the Second International Workshop on Legal Ontologies (LEGONT)*, pages 37–47, Amsterdam, Netherlands.
- Boer, A., Winkels, R., van Engers, T., and de Maat, E. (2004a). A content management system based on an event-based model of version management information in legislation. In Gordon, T., editor, *Legal Knowledge and Information Systems. Jurix 2004: The Seventeenth Annual Conference*, Frontiers in Artificial Intelligence and Applications, pages 19–28, Amsterdam. IOS Press.
- Boer, A., Winkels, R., van Engers, T., and de Maat, E. (2004b). Time and versions in *METAlex* XML. In *Proceeding of the Workshop on Legislative XML*, Kobaek Strand.
- Boer, A., Winkels, R., and Vitali, F. (2007c). Proposed XML standards for law: Metalex and LKIF. In Lodder, A. R. and Mommers, L., editors, *Legal Knowledge and Information Systems. Jurix 2007: The Twentieth Annual Conference Annual Conference*, volume 165 of *Frontiers in Artificial Intelligence and Applications*, pages 19–28. IOS Press.
- Borgida, A., Brachman, R., McGuinness, D., and Resnick, L. (1989). Classic: A structural data model for objects. In *Proceedings of the 1989 ACM SIGMOD International Conference on Management of Data*, Portland, OR. ACM Press.
- Brachman, R. (1979). On the epistemological status of semantic networks. In Findler, N., editor, *Associative Networks*, pages 30–50. Academic Press, New York.

- Brachman, R. (1983). What IS-A is and isn't. *IEEE Computer*, 16(10):30–36.
- Brachman, R. and Schmolze, J. (1985). An overview of the KL-ONE knowledge representation system. *Cognitive Science*, 9(2):171–216.
- Brachman, R. J., McGuiness, D. L., Patel-Schneider, P. F., Resnick, L. A., and Borgida, A. (1991). Living with CLASSIC: When and how to use a KL-ONE-like language. In Sowa, J. F., editor, *Principles of Semantic Networks: Explorations in the Representation of Knowledge*, pages 401–456. Morgan Kaufmann, San Mateo, US.
- Bratko, I. (1986). *Prolog Programming for Artificial Intelligence*. Addison-Wesley, Reading, MA.
- Bredeweg, B. (1994). Model-based diagnosis and prediction of behaviour. In Breuker, J. and de Velde, W. V., editors, *CommonKADS Library for Expertise Modelling*, pages 121–153. IOS-Press/Ohmsha, Amsterdam/Tokyo.
- Bredeweg, B., Salles, P., and Neumann, M. (2006). *Ecological Informatics: Scope, Techniques and Applications*, chapter Ecological Applications of Qualitative Reasoning, pages 15–47. Springer, Berlin, 2nd edition.
- Bredeweg, B. and Struss, P. (2004). Current topics in qualitative reasoning. *AI Magazine*, 24:13–16. special issue on Qualitative Reasoning.
- Breuker, J. (1990). Towards a Workbench for the Legal Practitioner. In van Noordwijk, C., Schmidt, A., and Winkels, R., editors, *Legal Knowledge Based Systems: Aims for Research and Development, JURIX-1990*, pages 25 – 36, Lelystad. Koninklijke Vermande BV.
- Breuker, J. (1994). *CommonKADS Library of Expertise Modelling*, chapter A Suite of Problem Types, pages 57 – 88. IOS-Press/Ohmsha, Amsterdam/Tokyo.
- Breuker, J. (1997). Problems in indexing problem solving methods. In *Proceedings of the Workshop on Problem Solving Methods for Knowledge Based Systems, International Joint Conference on Artificial Intelligence (IJCAI'97)*, Nagayo, Japan.
- Breuker, J. (2004). Constructing a legal core ontology: LRI-Core. In Freitas, F., Stuckenschmidt, H., and Volz, R., editors, *Proceedings WONTO-2004, Workshop on ontologies and their applications*, pages 115–126. LivroRapido, Porto Alegre, BR.
- Breuker, J., Boer, A., Hoekstra, R., and van den Berg, K. (2006). Developing content for LKIF: Ontologies and frameworks for legal reasoning. In van Engers, T. M., editor, *Legal Knowledge and Information Systems. JURIX 2006: The Nineteenth Annual Conference*, volume 152 of *Frontiers in Artificial Intelligence and Applications*.
- Breuker, J. and Hoekstra, R. (2004a). Core concepts of law: taking common-sense seriously. In Varzi, A. and Vieu, L., editors, *Proceedings of Formal Ontologies in Information Systems (FOIS-2004)*, pages 210–221. IOS-Press.

- Breuker, J. and Hoekstra, R. (2004b). Direct: Ontology based discovery of responsibility and causality in legal case descriptions. In Gordon, T., editor, *Legal Knowledge and Information Systems. Jurix 2004: The Seventeenth Annual Conference.*, pages 59–68, Amsterdam. IOS Press.
- Breuker, J. and Hoekstra, R. (2004c). Epistemology and ontology in core ontologies: FOLaw and LRI-Core, two core ontologies for law. In Gangemi, A. and Borgo, S., editors, *Proceedings of the EKAW Workshop on Core Ontologies in Ontology Engineering.* CEUR.
- Breuker, J., Hoekstra, R., Boer, A., van den Berg, K., Rubino, R., Sartor, G., Palmirani, M., Wyner, A., and Bench-Capon, T. (2007). OWL ontology of basic legal concepts (LKIF-Core). Deliverable 1.4, Estrella.
- Breuker, J., Valente, A., and Winkels, R. (2004). Use and reuse of legal ontologies in knowledge engineering and information management. In Benjamins, V., Casanovas, P., Breuker, J., and A.Gangemi, editors, *Law and the Semantic Web*, pages 36 – 64. Springer.
- Breuker, J. and Van De Velde, W., editors (1994). *CommonKADS Library for Expertise Modeling: reusable problem solving components.* IOS-Press/Ohmsha, Amsterdam/Tokyo.
- Breuker, J. and Wielinga, B. (1987). Knowledge acquisition as modelling of expertise: the KADS-methodology. In Addis, T., Boose, J., and Gaines, B., editors, *Proceedings of the European Knowledge Acquisition Workshop*, pages 102 – 110, Reading GB. Reading Press.
- Breuker, J. A. (1981). *Availability of Knowledge.* PhD thesis, COWO, University of Amsterdam.
- Brockmans, S., Colomb, R. M., Haase, P., Kendall, E. F., Wallace, E. K., Welty, C. A., and Xie, G. T. (2006). A model driven approach for building OWL DL and OWL full ontologies. In Cruz, I. F., Decker, S., Allemang, D., Preist, C., Schwabe, D., Mika, P., Uschold, M., and Aroyo, L., editors, *International Semantic Web Conference*, volume 4273 of *Lecture Notes in Computer Science*, pages 187–200. Springer.
- Buchanan, B. G. and Shortliffe, E. H., editors (1984). *Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project.* Addison-Wesley Series in Artificial Intelligence. Addison-Wesley, Reading, MA.
- Bylander, T. and Chandrasekaran, B. (1987). Generic tasks for knowledge-based reasoning: The “right” level of abstraction for knowledge acquisition. *International Journal of Man-Machine Studies*, 26(2):231–243.
- Calvanese, D., de Giacomo, G., Lembo, D., Lenzerini, M., and Rosati, R. (2005). Tailoring owl for data intensive ontologies. In *Proceedings of the 1st OWL: Experiences and Directions Workshop (OWLED 2005).*
- Carbonell, J. R. (1970). *Mixed-Initiative Man-Computer Instructional Dialogues.* PhD thesis, Massachusetts Institute of Technology.

- Casanovas, P., Casellas, N., Vallbe, J.-J., Poblet, M., Benjamins, R., Blázquez, M., Pena, R., and Contreras, J. (2006). Semantic web: a legal case study. In Davies, J., Studer, R., and Warren, P., editors, *Semantic Web Technologies*. Wiley.
- Casellas, N., Casanovas, P., Vallbé, J.-J., Poblet, M., Blázquez, M., Contreras, J., Cobo, J. M. L., and Benjamins, V. R. (2007). Semantic enhancement for legal information retrieval: Iuriservice performance. In *The Eleventh International Conference on Artificial Intelligence and Law, Proceedings of the Conference (ICAIL 2007)*, pages 49–57, Stanford Law School, Stanford, California, USA. ACM.
- Chalupsky, H. (2000). OntoMorph: a translation system for symbolic knowledge. In Cohn, A., Giunchiglia, F., and Selman, B., editors, *Principles of Knowledge Representation and Reasoning: Proceedings of the Seventh International Conference (KR2000)*, San Francisco, CA. Morgan Kaufmann.
- Chandrasekaran, B. and Johnson, T. R. (1993). Generic tasks and task structures: History, critique and new directions. In David, J. M., Krivine, J. P., and Simmons, R., editors, *Second Generation Expert Systems*. Springer Verlag.
- Chaudhri, V. K., Farquhar, A., Fikes, R., Karp, P. D., and Rice, J. (1998). OKBC: A programmatic foundation for knowledge base interoperability. In *Proceedings of AAAI-98*, pages 600–607, Madison, WI.
- Clancey, W. J. (1983). The epistemology of a rule-based expert system - a framework for explanation. *Artificial Intelligence*, 20(3):215–251. First published as Stanford Technical Report, November 1981.
- Clark, P., Thompson, J., and Porter, B. (2000). Knowledge patterns. In Cohn, A., Giunchiglia, F., and Selman, B., editors, *Proceedings of the 7th International Conference KR'2000*, pages 591–600, CA. Kaufmann.
- Collins, A. M. and Quillian, M. R. (1969). Retrieval time from semantic memory. *Journal of Verbal Learning and Verbal Behavior*, 8:240–247.
- Connolly, D., van Harmelen, F., Horrocks, I., McGuinness, D. L., Patel-Schneider, P. F., and Andrea Stein, L. (2001). DAML+OIL (march 2001) reference description. Note, W3C.
- Cregan, A., Schwitter, R., and Meyer, T. (2007). Sydney OWL syntax - towards a controlled natural language syntax for OWL 1.1. In Golbreich, C., Kalyanpur, A., and Parsia, B., editors, *Proceedings of OWL: Experiences and Directions (OWLED 2007)*, volume 258 of *CEUR Workshop Proceedings*, Innsbruck, Austria.
- Cuenca Grau, B., Horrocks, I., Kazakov, Y., and Sattler, U. (2007). Ontology reuse: Better safe than sorry. In Calvanese, D., Franconi, E., Haarslev, V., Lembo, D., Motik, B., Turhan, A.-Y., and Tessaris, S., editors, *Description Logics*, volume 250 of *CEUR Workshop Proceedings*. CEUR-WS.org.
- Cuenca Grau, B., Motik, B., Wu, Z., Fokoue, A., and Lutz, C. (2009). OWL 2 Web Ontology Language: Profiles. Technical report, W3C.
- Dahllöf, M. (1995). On the semantics of propositional attitude reports.

- Davidson, D. (2001). *Essays on Actions and Events*. Oxford University Press, Oxford.
- Davis, R. (1984). Diagnostic reasoning based on structure and behavior. *Artificial Intelligence*, 24:347–410.
- Davis, R. and King, J. J. (1984). *Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project*, chapter The Origin of Rule-Based Systems in AI, pages 20–52. Addison-Wesley Series in Artificial Intelligence. Addison-Wesley, Reading, MA.
- Davis, R., Shrobe, H. E., and Szlovits, P. (1993). What is knowledge representation? *AI Magazine*, 14(1):17–33.
- de Maat, E., Winkels, R., and van Engers, T. (2006). Automated detection of reference structures in law. In van Engers, T. M., editor, *Legal Knowledge and Information Systems. Jurix 2006: The Nineteenth Annual Conference*, volume 152 of *Frontiers in Artificial Intelligence and Applications*, pages 41–50. IOS Press.
- de Maat, E., Winkels, R., and van Engers, T. (2008). Making Sense of Legal Texts. In Grewendorf, G. and Rathert, M., editors, *Formal Linguistics and Law, Trends in Linguistics - Studies and Monographs (TiLSM)*. Mouton, De Gruyter, Berlin.
- Delgado, J.; Gallego, I. L. S. and García, R. (2003). IPRonto: An ontology for digital rights management. In *16th Annual Conference on Legal Knowledge and Information Systems, JURIX 2003*, volume 106 of *Frontiers in Artificial Intelligence and Applications*. IOS Press.
- den Haan, N. (1992). TRACS A Support Tool for Drafting and Testing Law. In *Information Technology and Law – Fifth International Conference on Legal Knowledge Based Systems, JURIX-1992*. Koninklijke Vermande.
- den Haan, N. (1996). *Automated Legal Reasoning*. PhD thesis, University of Amsterdam.
- Dennett, D. C. (1987). *The Intentional Stance*. MIT-Press.
- Doerr, M., Hunter, J., and Lagoze, C. (2003). Towards a core ontology for information integration. *Journal of Digital Information*, 4(1).
- Donnelly, M. (2005). Relative places. *Applied Ontology*, 1(1):55–75.
- Doyle, J. and Patil, R. (1991). Two theses of knowledge representation: Language restrictions, taxonomic classifications, and the utility of representation services. *Artificial Intelligence*, 48(3):261–298.
- Drummond, N., Rector, A., Stevens, R., Moulton, G., Horridge, M., Wang, H., and Seidenberg, J. (2006). Putting OWL in order: Patterns for sequences in OWL. In *Proceedings of OWLED 2006*, Athens, GA.
- Elhag, A. A., Breuker, J. A., and Brouwer, B. W. (1999). On the formal analysis of normative conflicts. In van den Herik et al., H., editor, *JURIX 1999: The Twelfth Annual Conference*, *Frontiers in Artificial Intelligence and Applications*, pages 35–46, Nijmegen. GNI.

- Farquhar, A., Fikes, R., and Rice, J. (1997). The ontolingua server: a tool for collaborative ontology construction. *International Journal of Human-Computer Studies*, 46(6):707–727.
- Feigenbaum, E. (1980). Knowledge engineering: the applied side of artificial intelligence. Technical report, Department of Computer Science, Stanford University.
- Fensel, D., Horrocks, I., Harmelen, F. V., Decker, S., Erdmann, M., and Klein, M. (2000). OIL in a nutshell. In Dieng, R., editor, *Proceedings of the 12th European Workshop on Knowledge Acquisition, Modeling, and Management (EKAW'00)*, volume 1937 of *Lecture Notes in Artificial Intelligence*, pages 1–16. Springer-Verlag.
- Fernández, M., Gómez-Pérez, A., and Juristo, N. (1997). METHONTOLOGY: From ontological art towards ontological engineering. In *AAAI-97 Spring Symposium on Ontological Engineering*, pages 33–40.
- Fernández-López, M. and Gómez-Pérez, A. (2002). Overview and analysis of methodologies for building ontologies. *The Knowledge Engineering Review*, 17(2):129–156.
- Forbus, K. D. (1984). Qualitative process theory. *Artificial Intelligence*, 24:85–168.
- Gangemi, A. (2005). Ontology design patterns for semantic web content. In et al., Y. G., editor, *International Semantic Web Conference*, volume 3729 of *Lecture Notes in Computer Science*, pages 262–276. Springer.
- Gangemi, A. and Euzenat, J., editors (2008). *Knowledge Engineering: Practice and Patterns, 16th International Conference, EKAW 2008, Acitrezza, Italy, September 29 - October 2, 2008. Proceedings*, volume 5268 of *Lecture Notes in Computer Science*. Springer.
- Gangemi, A., Fisseha, F., Keizer, J., Lehmann, J., A.Liang, Pettman, I., Sini, M., and Taconet, M. (2004). A core ontology of fishery and its use in the fishery ontology service project. In Gangemi, A. and Borgo, S., editors, *Proceedings of the EKAW Workshop on Core Ontologies in Ontology Engineering*.
- Gangemi, A., Guarino, N., Masolo, C., Oltramari, A., and Schneider, L. (2002). Sweetening ontologies with DOLCE. In Gomez-Perez, A. and Benjamins, V., editors, *Proceedings of the EKAW-2002*, pages 166–181. Springer.
- Gangemi, A. and Mika, P. (2003). Understanding the semantic web through descriptions and situations. In *Proceedings of CoopIS/DOA/ODBASE*, pages 689–706.
- Gangemi, A., Sagri, M., and Tiscornia, D. (2005). A constructive framework for legal ontologies. In Benjamins, V., Casanovas, P., Breuker, J., and Gangemi, A., editors, *Law and the Semantic Web*, pages 97–124. Springer Verlag.
- Gasse, F., Sattler, U., and Haarslev, V. (2008). Rewriting rules into SROIQ axioms. In Baader, F., Lutz, C., and Motik, B., editors, *Description Logics*, volume 353 of *CEUR Workshop Proceedings*. CEUR-WS.org.

- Genesereth, M. R. and Fikes, R. E. (1992). Knowledge Interchange Format, Version 3.0 Reference Manual. Technical Report Logic-92-1, Computer Science Department, Stanford University, Stanford, CA, USA.
- Genesereth, M. R. and Nilsson, N. J. (1987). *Logical Foundations of Artificial Intelligence*. Morgan Kaufmann, Los Altos.
- Georgeff, M., Pell, B., Pollack, M., Tambe, M., and Wooldridge, M. (1999). The belief-desire-intention model of agency. In Müller, J., Singh, M. P., and Rao, A. S., editors, *Proceedings of the 5th International Workshop on Intelligent Agents V: Agent Theories, Architectures, and Languages (ATAL-98)*, volume 1555, pages 1–10. Springer-Verlag: Heidelberg, Germany.
- Ghilardi, S., Lutz, C., and Wolter, F. (2006). Did i damage my ontology? a case for conservative extensions in description logics. In Doherty, P., Mylopoulos, J., and Welty, C. A., editors, *KR*, pages 187–197. AAAI Press.
- Gordon, T. (2007). Constructing arguments with a computational model of an argumentation scheme for legal rules. In Winkels, R., editor, *Proceedings of the Eleventh International Conference on Artificial Intelligence and Law*, pages 117–121. IAAIL, ACM.
- Gordon, T., Prakken, H., and Walton, D. (2007a). The carneades model of argument and burden of proof. *Artificial Intelligence*, 171(10-11):875–896.
- Gordon, T. F., van den Berg, K., Kordelaar, P., Lee, J., Sekkat, S., and Wyner, A. (2007b). Formal specifications of the knowledge formats of participating LKBS vendors. Deliverable 1.2, Estrella.
- Grenon, P. (2003). Nuts in BFO’s nutshell: Revisions to the bi-categorical axiomatization of BFO. Technical Report ISSN 1611-4019, Institute for Formal Ontology and Medical Information Science (IFOMIS).
- Grosz, B., Volz, R., Horrocks, I., and Decker, S. (2003). Description logic programs: Combining logic programs with description logics. In *Proceedings of the 12th International World Wide Web Conference (WWW 2003)*.
- Grossi, D. (2007). *Designing Invisible Handcuffs. Formal Investigations in Institutions and Organizations for Multi-agent Systems*. SIKS dissertation series, Utrecht University. 2007-16.
- Grossi, D., Meyer, J.-J. C., and Dignum, F. (2005). Modal logic investigations in the semantics of counts-as. In Gardner, A., editor, *Proceedings of the Tenth International Conference on Artificial Intelligence and Law (ICAIL)*, pages 125–140, Bologna, Italy. IAAIL, ACM Press.
- Gruber, T. R. (1993). A translation approach to portable ontology specifications. *Knowledge Acquisition*, 5(2):199–220.
- Gruber, T. R. (1994). Toward principles for the design of ontologies used for knowledge sharing. In Guarino, N. and Poli, R., editors, *Formal Ontology in Conceptual Analysis and Knowledge Representation*, Deventer, The Netherlands. Kluwer Academic Publishers.

- Grüniger, M. and Fox, M. S. (1995). Methodology for the design and evaluation of ontologies. In *IJCAI'95, Workshop on Basic Ontological Issues in Knowledge Sharing*.
- Guarino, N. (1994). The ontological level. In Casati, R., Smith, B., and White, G., editors, *Philosophy and the Cognitive Sciences, Proceedings of the 16th International Wittgenstein Symposium*, pages 443–456, Vienna. Hölder-Pichler-Tempsky.
- Guarino, N. (1997). Understanding, building, and using ontologies: A commentary to using explicit ontologies in kbs development, by van heijst, schreiber, and wielinga. *International Journal of Human and Computer Studies*, 46:293–310.
- Guarino, N. (1998). Formal ontology and information systems. In Guarino, N., editor, *Proceedings of FOIS'98*, pages 3–15, Trento, Italy. IOS Press.
- Guarino, N. and Giaretta, P. (1995). Ontologies and knowledge bases: Towards a terminological clarification. In Mars, N., editor, *Towards Very Large Knowledge Bases – Knowledge Building and Knowledge Sharing 1995*, pages 25–32, Amsterdam. IOS Press.
- Guarino, N. and Welty, C. (2002). Evaluating ontological decisions with OntoClean. *Communications of the ACM*, 45(2):61–65.
- Guarino, N. and Welty, C. A. (2004). An Overview of OntoClean. In Staab, S. and Studer, R., editors, *Handbook on Ontologies*, chapter 8. Springer Verlag.
- Halaschek-Wiener, C., Katz, Y., and Parsia, B. (2006). Belief base revision for expressive description logics. In *OWL: Experiences and Directions 2006*.
- Hamscher, W. C., Console, L., and de Kleer, J., editors (1992). *Readings in Model-Based Diagnosis*. Morgan Kaufmann, San Mateo, CA.
- Hart, H. and Honoré, T. (1985). *Causation in the Law*. Oxford University Press, New York, second edition edition.
- Haslanger, S. (2003). *The Oxford Handbook of Metaphysics*, chapter Persistence Through Time, pages 315–354. Oxford University Press.
- Hayes, P. (1977). In defence of logic. In Reddy, R., editor, *Proceedings of the 5th International Joint conference on Artificial Intelligence (IJCAI 1977)*, pages 559–565, Cambridge, MA. William Kaufmann.
- Hayes, P. (2004). RDF semantics. Recommendation, W3C.
- Hayes, P. J. (1985). The second naive physics manifesto. In Hobbs, J. R. and Moore, R. C., editors, *Formal Theories of the Commonsense World*, volume 1 of *Ablex series in Artificial Intelligence*, pages 1–36. Ablex, Norwood, NJ.
- Heflin, J., Hendler, J., and Luke, S. (1999). SHOE: A knowledge representation language for internet applications. Technical Report CS-TR-4078 (UMIACS TR-99-71), Dept. of Computer Science, University of Maryland at College Park.

- Herre, H., Heller, B., Burek, P., Hoehndorf, R., Loebe, F., and Michalek, H. (2006). General formal ontology (GFO) - basic principles. *Onto-med report*, Institute of Medical Informatics, Statistics and Epidemiology (IMISE).
- Hobbs, J. R. (1995). Sketch of an ontology underlying the way we talk about the world. *International Journal of Human-Computer Studies*, 43:819–830.
- Hoekstra, R. (2001). Errors in modelling and representation. Master's thesis, University of Amsterdam.
- Hoekstra, R. (2008). Use of OWL in the legal domain (statement of interest). In Clark, K. and Patel-Schneider, P. F., editors, *Proceedings of OWL: Experiences and Directions (OWLED 2008 DC)*, Washington, DC (metro).
- Hoekstra, R. and Breuker, J. (2007). Commonsense causal explanation in a legal domain. *Artificial Intelligence & Law*, 15(3):281–299. Special issue on Legal Ontologies and Artificial Intelligence Techniques.
- Hoekstra, R. and Breuker, J. (2008). Polishing diamonds in OWL 2. In Gangemi, A. and Euzenat, J., editors, *Proceedings of the 16th International Conference on Knowledge Engineering and Knowledge Management (EKAW 2008)*, LNAI/LNCS. Springer Verlag. To be published.
- Hoekstra, R., Breuker, J., Bello, M. D., and Boer, A. (2007). The LKIF Core ontology of basic legal concepts. In Casanovas, P., Biasiotti, M. A., Francesconi, E., and Sagri, M. T., editors, *Proceedings of the Workshop on Legal Ontologies and Artificial Intelligence Techniques (LOAIT 2007)*.
- Hoekstra, R., Breuker, J., Di Bello, M., and Boer, A. (2008). LKIF Core: Principled ontology development for the legal domain. In Breuker, J., Casanovas, P., Klein, M., and Francesconi, E., editors, *Law, Ontologies and the Semantic Web*, *Frontiers of Artificial Intelligence and Applications*. IOS Press, Amsterdam. To be Published.
- Hoekstra, R., Liem, J., Bredeweg, B., and Breuker, J. (2006). Requirements for representing situations. In Grau, B. C., Hitzler, P., Shankey, C., and Wallace, E., editors, *Proceedings of the OWLED'06 workshop on OWL: Experiences and Directions 2006*, volume 216 of *CEUR Workshop Proceedings*, Athens, Georgia (USA).
- Hohfeld, W. (1919). *Fundamental Legal Conceptions as Applied in Legal Reasoning*. Yale University Press. Edited by W.W. Cook, fourth printing, 1966.
- Horn, W., editor (1990). *Causal AI Models: Steps Toward Applications*. Hemisphere Publishing Corporation.
- Horridge, M., Jupp, S., Moulton, G., Rector, A., Stevens, R., and Wroe, C. (2007). A practical guide to building OWL ontologies using Protégé 4 and CO-ODE tools. Technical Report 1.1, The University of Manchester.
- Horrocks, I. (2000). A denotational semantics for standard OIL and instance OIL. Technical report, OnTo Knowledge Project.

- Horrocks, I., Kutz, O., and Sattler, U. (2006). The even more irresistible *SROIQ*. In *Proceedings of the Tenth International Conference on Principles of Knowledge Representation and Reasoning*, pages 57–67.
- Horrocks, I. and Patel-Schneider, P. F. (2003). Three theses of representation in the semantic web. In *Proceedings of the 12th International Conference on World Wide Web (WWW 2003)*, pages 39 – 47, Budapest, Hungary. ACM Press.
- Horrocks, I., Patel-Schneider, P. F., and van Harmelen, F. (2003). From *SHIQ* and RDF to OWL: The making of a web ontology language. *Journal of Web Semantics*, 1(1):7–26.
- Horrocks, I. and Sattler, U. (2001). Ontology reasoning in the *SHOQ(D)* description logic. In *Proceedings of the Seventeenth International Joint Conference on Artificial Intelligence*.
- Horrocks, I., Sattler, U., and Topies, S. (1999). Practical reasoning for expressive description logics. In Ganzinger, H., McAllester, D., and Voronkov, A., editors, *Proceedings of the 6th International Conference on Logic for Programming and Automated Reasoning (LPAR'99)*, volume 1705 of *Lecture Notes in Artificial Intelligence*, pages 161 – 180. Springer Verlag.
- ISO/IEC (2007). Common Logic (CL) - a framework for a family of logic-based languages. Technical Report 24707:2007, ISO/IEC.
- Jansweijer, W., Breuker, J., van Lieshout, J., van der Stadt, E., Hoekstra, R., and Boer, A. (2001). Workflow Directed Knowledge Management. In Stanford-Smith, B. and Chiozza, E., editors, *E-work and E-commerce: Novel solutions and practices for a global networked economy*, pages 755–762, Amsterdam. IOS-Press. ISBN 1.58603.205.4.
- Jimenez-Ruiz, E., Cuenca Grau, B., Sattler, U., Schneider, T., and Berlanga, R. (2008). Safe and economic re-use of ontologies: A logic-based methodology and tool support. In *Proceedings of OWLED 2008 DC*.
- Kaljurand, K. and Fuchs, N. E. (2007). Verbalizing OWL in attempto controlled english. In Golbreich, C., Kalyanpur, A., and Parsia, B., editors, *Proceedings of OWL: Experiences and Directions (OWLED 2007)*, volume 258 of *CEUR Workshop Proceedings*, Innsbrück, Austria.
- Kant, I. (1997). *Lectures on Metaphysics. Part III: Metaphysic Mrongovius (1782-1783)*. Cambridge University Press, Cambridge.
- Kelsen, H. (1991). *General Theory of Norms*. Clarendon Press, Oxford.
- Kim, J. (1998). *Mind in a Physical World: An Essay on the Mind-Body Problem and Mental Causation*. Representation and Mind. MIT Press, Cambridge, Massachusetts. Series editors: Hilary Putnam and Ned Block.
- Klarman, S., Hoekstra, R., and Bron, M. (2008). Versions and applicability of concept definitions in legal ontologies. In Clark, K. and Patel-Schneider, P. F., editors, *Proceedings of OWL: Experiences and Directions (OWLED 2008 DC)*, Washington, DC (metro).

- Klein, M. (2001). Combining and relating ontologies: An analysis of problems and solutions. In *Proceedings of the Workshop on Ontologies and Information Sharing (at IJCAI 2001)*, pages 53–62, Seattle, WA.
- Konev, B., Lutz, C., Walther, D., and Wolter, F. (2008). CEX and MEX: Logical diff and semantic module extraction in a fragment of OWL. In *Proceedings of OWLED 2008 DC*.
- Kowalski, R. A. (1974). Predicate logic as a programming language. In *Proceedings of the IFIP Congress*, pages 569–574, Stockholm. North Holland Publishing Co.
- Krötzsch, M., Rudolph, S., and Hitzler, P. (2006). On the complexity of horn description logics. In Cuenca Grau, B., Hitzler, P., Shankey, C., and Wallace, E., editors, *Proceedings of the 2nd Workshop on OWL: Experiences and Directions (OWLED-06)*. CEUR Workshop Proceedings.
- Krötzsch, M., Rudolph, S., and Hitzler, P. (2008a). Description logic rules. In Ghallab, M., Spyropoulos, C. D., Fakotakis, N., and Avouris, N., editors, *Proceedings of the 18th European Conference on Artificial Intelligence (ECAI-08)*, pages 80–84. IOS Press.
- Krötzsch, M., Rudolph, S., and Hitzler, P. (2008b). ELP: Tractable rules for OWL 2. Technical report, Institute AIFB, Universität Karlsruhe, Karlsruhe, Germany.
- Krötzsch, M., Rudolph, S., and Hitzler, P. (2008c). Expressive tractable description logics based on *SRQIQ* rules. Technical report, Institut AIFB, Universität Karlsruhe (TH), Karlsruhe, Germany.
- Lakoff, G. (1987). *Women, Fire and Dangerous Things*. University of Chicago Press.
- Lakoff, G. and Núñez, R. (2000). *Where Mathematics Comes From*. Basic Books.
- Lame, G. (2004). Using nlp techniques to identify legal ontology components: Concepts and relations. *Artificial Intelligence and Law, This Issue?*
- Lehmann, J. (2003). *Causation in Artificial Intelligence and Law - A modelling approach*. PhD thesis, University of Amsterdam - Faculty of Law - Department of Computer Science and Law.
- Lehmann, J., Borgo, S., Masolo, C., and Gangemi, A. (2004). Causality and causation in DOLCE. In Varzi, A. C. and Vieu, L., editors, *Formal Ontology in Information Systems, Proceedings of the International Conference FOIS 2004*, Frontiers in Artificial Intelligence and Applications, pages 273–284, Torino. IOS Press.
- Lehmann, J. and Gangemi, A. (2007). An ontology of physical causation as a basis for assessing causation in fact and attributing legal responsibility. *Artificial Intelligence and Law*. Special Issue on Legal Ontologies and Artificial Intelligence Techniques.

- Leibniz, G. W. (1903). *Opuscules et fragments inédits de Leibniz: extraits des manuscrits de la Bibliothèque royale de Hanovre*. Alcan, Paris. Reprinted Hildesheim, Georg Olms, 1961.
- Lenat, D. B. (1995). CYC: A large-scale investment in knowledge infrastructure. *Communications of the ACM*, 38(11):33–38.
- Lenat, D. B., Guha, R. V., Pittman, K., Pratt, D., and Shepherd, M. (1990). Cyc: toward programs with common sense. *Commun. ACM*, 33(8):30–49.
- Levesque, H. and Brachman, R. (1985). A fundamental tradeoff in knowledge representation and reasoning. In Levesque, H. and Brachman, R., editors, *Readings in Knowledge Representation*, pages 41–70. Morgan Kaufmann.
- Levesque, H. J. (1984). Foundations of a functional approach to knowledge representation. *Artificial Intelligence*, 23:155–212.
- Levesque, H. J. and Brachman, R. J. (1987). Expressiveness and tracability in knowledge representation and reasoning. *Computational Intelligence*, 3:78–93.
- Loebe, F. (2003). An analysis of roles. Technical Report 6, Research Group Ontologies in Medicine, University of Leipzig. Onto-Med Report.
- Loebe, F. (2007). Abstract vs. social roles, towards a general theoretical account of roles. *Applied Ontology*, 2(2):127–158.
- Lutz, C. (1999). The complexity of reasoning with concrete domains. LTCS Report 99-01, RWTH Aachen. Preliminary Version.
- MacGregor, R. and Bates, R. (1987). The LOOM knowledge representation language. Technical Report ISI/RS-87-188, ISI, University of Southern California.
- Marcus, S., editor (1988). *Automating Knowledge Acquisition for Expert Systems*. Kluwer, Reading MA.
- Masolo, C., Borgo, S., Gangemi, A., Guarino, N., and Oltramari, A. (2003). WonderWeb ontology library. Deliverable D18, version 1, ISTC-CNR (Italy).
- Masolo, C., Vieu, L., Bottazzi, E., Catenacci, C., Ferrario, R., Gangemi, A., and Guarino, N. (2004). Social roles and their descriptions. In *Proceedings of Knowledge Representation Workshop*.
- McCarthy, J. (1959). Programs with common sense. In *Proceedings of the Teddington Conference on the Mechanization of Thought Processes*, pages 75–91, London. Her Majesty's Stationary Office.
- McCarthy, J. (1980). Circumscription – a form of non-monotonic reasoning. *Artificial Intelligence*, 13:27–39.
- McCarthy, J. and Hayes, P. J. (1969). Some philosophical problems from the standpoint of artificial intelligence. *Machine Intelligence*, 4.
- McGuinness, D. and van Harmelen, F. (2004). OWL web ontology language overview. W3C recommendation, World Wide Web Consortium (W3C).

- Michon, J. (1990). Implicit and explicit representations of time. In Block, R., editor, *Cognitive models of psychological time*, pages 37–58. Lawrence Erlbaum.
- Miles, A. and Bechhofer, S. (2008). SKOS simple knowledge organization system reference. Working draft, W3C.
- Miller, G. (1990). WordNet: An on-line lexical database. *International Journal of Lexicography*, 3(4). (Special Issue).
- Minsky, M. (1975). A framework for representing knowledge. In Winston, P., editor, *The Psychology of Computer Vision*. McGraw-Hill, New York.
- Minsky, M. (1982). Why people think computers can't. *AI Magazine*, 3(4).
- Minsky, M. (1984). *The Society of Mind*. Simon & Schuster Inc.
- Mommers, L. (2002). *Applied legal epistemology: building a knowledge-based ontology of the legal domain*. PhD thesis, University of Leiden.
- Moser, M. G. (1983). An overview of nkl, the new implementation of klone. Technical Report 5421, Bolt, Beranek, and Newman, Inc., Cambridge, MA. Research in Natural Language Understanding.
- Motik, B. (2007). On the properties of metamodeling in OWL. *Journal of Logic and Computation*, 17(4):617–637.
- Motik, B., Cuenca Grau, B., and Sattler, U. (2007a). Structured objects in OWL: Representation and reasoning. Technical report, University of Oxford, UK.
- Motik, B., Horrocks, I., and Sattler, U. (2007b). Bridging the gap between OWL and relational databases. In Patel-Schneider, P. and Shenoy, P., editors, *Proceedings of the 16th International Conference on World Wide Web (WWW 2007)*, Banff, Alberta, Canada. ACM Press.
- Motik, B., Patel-Schneider, P. F., Parsia, B., Bock, C., Fokoue, A., Haase, P., Hoekstra, R., Horrocks, I., Ruttenberg, A., Sattler, U., and Smith, M. (2009). OWL 2 Web Ontology Language: Structural Specification and Functional-Style Syntax. Technical report, W3C.
- Motik, B., Sattler, U., and Studer, R. (2005). Query answering for OWL-DL with rules. *Journal of Web Semantics: Science, Services and Agents on the World Wide Web*, 3(1):41 – 60.
- Motta, E. (1999). *Reusable Components for Knowledge Modelling*. FAIA-Series. IOS Pres, Amsterdam NL.
- Mylopoulos, J. (1981). An overview of knowledge representation. In Brodie, M. L. and Zilles, S. N., editors, *Proceedings of the Workshop on Data Abstraction, Databases and Conceptual Modelling, Pingree Park, Colorado, June 23-26, 1980*, volume 11 of *SIGMOD Record*, pages 5–12. ACM.
- Neches, R., Fikes, R., Finin, T., Gruber, T., Paqtil, R., Senator, T., and Swartout, W. R. (1991). Enabling technology for knowledge sharing. *AI Magazine*, 12(3):36–56.

- Nejdl, W., Wolpers, M., and Capelle, C. (2000). The RDF schema specification revisited. In *Modelle und Modellierungssprachen in Informatik und Wirtschaftsinformatik, Proceedings of Modellierung 2000*.
- Newell, A. (1982). The knowledge level. *Artificial Intelligence*, 18(1):87–127.
- Newell, A. (1993). Reflections on the knowledge level. *Artificial Intelligence*, 59:31–38.
- Newell, A. and Simon, H. A. (1972). *Human Problem Solving*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Niles, I. and Pease, A. (2001). Towards a standard upper ontology. In Welty, C. and Smith, B., editors, *Proceedings of the 2nd International Conference on Formal Ontology in Information Systems (FOIS-2001)*, Ogunquit, Maine.
- Noy, N. (2005). Representing classes as property values on the semantic web. Working group note, W3C. <http://www.w3.org/TR/swbp-classes-as-values/>.
- Noy, N. and Rector, A. (2006). Defining n-ary relations on the semantic web. Working group note, W3C. <http://www.w3.org/TR/swbp-naryRelations/>.
- Noy, N. F. and Musen, M. A. (2000). PROMPT: Algorithm and tool for automated ontology merging and alignment. In *Proceedings of the Seventeenth National Conference on Artificial Intelligence and Twelfth Conference on Innovative Applications of Artificial Intelligence*, pages 450 – 455.
- Nuyts, J., Byloo, P., and Diepeveen, J. (2005). On deontic modality, directivity, and mood.
- Oberle, D., Ankolekar, A., and et al., P. H. (2007). DOLCE ergo SUMO: On foundational and domain models in the SmartWeb Integrated Ontology (SWIntO). *Journal of Web Semantics: Science, Services and Agents on the World Wide Web*, 5:156–174.
- Ogden, C. K. (1930). *Basic English: A General Introduction with Rules and Grammar*.
- Orwell, G. (1949). *Nineteen Eighty-Four. A novel*.
- Pan, J. and Horrocks, I. (2002). Metamodeling architecture of web ontology languages. In Gruz, I., Decker, S., Euzenat, J., and McGuinness, D., editors, *The Emerging Semantic Web, Frontiers in Artificial Intelligence and Applications*. IOS Press.
- Pan, J. Z. and Horrocks, I. (2003). RDFS(FA) and RDF MT: Two Semantics for RDFS. In Fensel, D., Sycara, K., and Mylopoulos, J., editors, *Proceedings of the 2nd International Semantic Web Conference (ISWC2003)*.
- Parsia, B., Halaschek-Wiener, C., and Sirin, E. (2006). Towards incremental reasoning through updates in owl-dl. In *Proceedings of WWW 2006*, Edinburgh, UK.

- Patel-Schneider, P. (1984). Small can be beautiful in knowledge representation. In *Proceedings of IEEE workshop on principles of knowledge-based systems*.
- Patel-Schneider, P. F., Hayes, P., and Horrocks, I. (2004). OWL web ontology language semantics and abstract syntax. Recommendation, World Wide Web Consortium (W3C).
- Patel-Schneider, P. F. and Swartout, B. (1993). Description-Logic Knowledge Representation System Specification from the KRSS Group. Technical report, Bell-Labs Research.
- Pearl, J. (2000). *Causality: Models, Reasoning and Inference*. Cambridge University Press, Cambridge.
- Pedrinaci, C., Domingue, J., and de Medeiros, A. K. A. (2008). A core ontology for business process analysis. In Bechhofer, S. and Hauswirth, M., editors, *Proceedings of the 5th European Semantic Web Conference (ESWC 2008)*, Tenerife, Spain.
- Pepper, S., Vitali, F., Marius, L., Gessa, N., and Presutti, V. (2006). A survey of RDF/Topic Maps interoperability proposals. Working group note, W3C.
- Pinker, S. (2007). *The Stuff of Thought*. Allen Lane, Penguin Books, London, England.
- Pinto, H. S. and Martins, J. P. (2000). Reusing ontologies. In *Proceedings of AAAI2000 Spring Symposium Series, Workshop Bringing Knowledge to Business Processes*, number SS-00-03 in AAAI Technical Report, pages 77–84, Menlo Park, California, USA. AAAI Press.
- Post, E. L. (1943). Formal reductions of the general combinatorial decision problem. *American Journal of Mathematics*, 65(2):197–215.
- Presutti, V., Gangemi, A., David, S., de Cea, G. A., Suárez-Figueroa, M. C., Ponsoda, E. M., and Poveda, M. (2008). A library of ontology design patterns: reusable solutions for collaborative design of networked ontologies. Deliverable D2.5.1, NeOn Project.
- Puerta, A. R., Egar, J. W., Tu, S. W., and Musen, M. A. (1992). A multiple-method shell for the automatic generation of knowledge acquisition tools. *Knowledge Acquisition*, 4:171–196.
- Quillian, M. R. (1966). Semantic memory. Report AFCRL-66-189, Bolt Beranek & Newman, Cambridge, Massachusetts.
- Rector, A. (2005). Representing specified values in OWL: "value partitions" and "value sets". Working group note, W3C. <http://www.w3.org/TR/swbp-specified-values/>.
- Rector, A., Drummond, N., Horridge, M., Rogers, J., Knublauch, H., Stevens, R., Wang, H., and Wroe, C. (2004). OWL pizzas: Practical experience of teaching OWL-DL: Common errors & common patterns. In Motta, E., Shadbolt, N., Stutt, A., and Gibbins, N., editors, *Proceedings of the European Conference on Knowledge Acquisition*, pages 63–81.

- Rector, A. L. (2003). Modularisation of domain ontologies implemented in description logics and related formalisms including owl. In *Proceedings of K-CAP'03*, pages 121 – 128, Sanibel Island, Florida. ACM Press.
- Rubino, R., Rotolo, A., and Sartor, G. (2006). An owl ontology of fundamental legal concepts. In van Engers, T. M., editor, *Legal Knowledge and Information Systems. JURIX 2006: The Nineteenth Annual Conference*, volume 152 of *Frontiers of Artificial Intelligence and Applications*. IOS Press.
- Sartor, G. (2006). Fundamental legal concepts: A formal and teleological characterisation. Technical report, European University Institute, Florence / Cirsfid, University of Bologna.
- Schaffer, J. (2003). The metaphysics of causation. *Stanford Encyclopedia of Philosophy*.
- Schank, R. and Abelson, R. (1975). Scripts, plans, and knowledge. In *Proceedings of the 4th International Joint Conference on Artificial Intelligence*, Tblisi, USSR.
- Schank, R. and Abelson, R. (1977). *Scripts, Plans Goals and Understanding*. Lawrence Erlbaum, New Jersey.
- Schreiber, G., Akkermans, H., Anjewierden, A., de Hoog, R., Shadbolt, N., Van den Velde, W., and Wielinga, B. (2000). *Knowledge Engineering and Management: The CommonKADS Methodology*. MIT Press.
- Schreiber, G., Wielinga, B., Akkermans, H., van de Velde, W., and Anjewierden, A. (1994). Cml: The CommonKADS conceptual modelling language. In *A Future for Knowledge Acquisition*, volume 867 of *LNCIS*, pages 1–25. Springer Verlag.
- Schreiber, G., Wielinga, B., and Jansweijer, W. (1995). The kaktus view on the 'o' world. In *Proceedings of IJCAI95 Workshop on Basic Ontological Issues in Knowledge Sharing*, Montreal, Canada.
- Schwitler, R., Kaljurand, K., Cregan, A., Dolbear, C., and Hart, G. (2008). A comparison of three controlled natural languages for OWL 1.1. In Clark, K. G. and Patel-Schneider, P. F., editors, *Proceedings of OWL: Experiences and Directions (OWLED 2008 DC)*, Washington, DC (metro).
- Searle, J. R. (1995). *The Construction of Social Reality*. The Free Press, New York, NY.
- Seidenberg, J. and Rector, A. L. (2006). Representing transitive propagation in OWL. In Embley, D. W., Olivé, A., and Ram, S., editors, *ER*, volume 4215 of *Lecture Notes in Computer Science*, pages 255–266. Springer.
- Smith, B. (1978). An essay in formal ontology. *Grazer Philosophische Studien*, 6:39–62.
- Smith, B. (2004). Beyond concepts: Ontology as reality representation. In Varzi, A. C. and Vieu, L., editors, *Formal Ontologies in Information Systems, Proceedings of the Third International Conference (FOIS-2004)*. IOS Press.

- Smith, B. (2005). Against fantology. In Reicher, M. and Marek, J., editors, *Experience and Analysis*, pages 153–170. öbvahpt, Wien.
- Smith, M. K., Welty, C., and McGuinness, D. L. (2004). OWL web ontology language guide. W3C recommendation, World Wide Web Consortium (W3C).
- Sowa, J. F. (2000). *Knowledge Representation: Logical Philosophical, and Computational Foundations*. Brooks Cole Publishing Co, Pacific Grove, CA.
- Stefik, M. (1986). The next knowledge medium. *AI Magazine*, 7(1):34–46.
- Steimann, F. (2000). On the representation of roles in object-oriented and conceptual modelling. *Data and Knowledge Engineering*, 35(1):83–106.
- Swartout, B., Patil, R., Knight, K., and Russ, T. (1996). Toward distributed use of large-scale ontologies. In *Proceedings of the Knowledge Acquisition Workshop (KAW'96)*, Banff, Alberta, Canada.
- Uschold, M. (1996). Building ontologies: Towards a unified methodology. In *16th Annual Conf. of the British Computer Society Specialist Group on Expert Systems*, Cambridge, UK.
- Uschold, M. and Grüninger, M. (1996). Ontologies: principles, methods, and applications. *Knowledge Engineering Review*, 11(2):93–155.
- Uschold, M. and King, M. (1995). Towards a methodology for building ontologies. In *Workshop on Basic Ontological Issues in Knowledge Sharing, IJCAI-95*, Montreal, Canada.
- Valente, A. (1995). *Legal Knowledge Engineering: A Modelling Approach*. PhD thesis, University of Amsterdam, Amsterdam.
- Valente, A. (2005). Types and roles of legal ontologies. In Benjamins, V., Casanovas, P., Breuker, J., and Gangemi, A., editors, *Law and the Semantic Web*, volume 3369 of *Lecture Notes in Artificial Intelligence*, pages 65–76. Springer.
- Valente, A. and Breuker, J. (1995). ON-LINE: An architecture for modelling legal information. In *International Conference on Artificial Intelligence and Law (ICAIL-1995)*, pages 307–315.
- Valente, A. and Breuker, J. (1996). Towards principled core ontologies. In Gaines, B. and Musen, M., editors, *Proceedings of the Knowledge Acquisition Workshop - 96*, Banff, Canada.
- Valente, A. and Breuker, J. (1999). Legal modelling and automated reasoning with ON-LINE. *International Journal of Human-Computer Studies*, 51(6):1079–1125.
- Valente, A., Breuker, J., and van de Velde, W. (1998). The CommonKADS library in perspective. *International Journal of Human-Computer Studies*, 49:391–416.
- van de Ven, S., Breuker, J., Hoekstra, R., Wortel, L., and El-Ali, A. (2008a). Automated legal assessment in OWL 2. In *Legal Knowledge and Information Systems. Jurix 2008: The 21st Annual Conference, Frontiers in Artificial Intelligence and Applications*. IOS Press.

- van de Ven, S., Hoekstra, R., Breuker, J., Wortel, L., and El-Ali, A. (2008b). Judging Amy: Automated legal assessment using OWL 2. In *Proceedings of OWL: Experiences and Directions (OWLED 2008 EU)*.
- van Engers, T. and Glassée, E. (2001). Facilitating the legislation process using a shared conceptual model. *IEEE Intelligent Systems*, 16(1):50–58.
- van Engers, T., Kordelaar, P., Hartog, J. D., and Glassée, E. (2000). POWER: Programme for an ontology based working environment for modeling and use of regulations and legislation. In Tjoa, Wagner, and Al-Zobaidie, editors, *In Proceedings of the 11th workshop on Databases and Expert Systems Applications (IEEE)*, pages 327–334, Greenwich London. ISBN: 0-7695-0680-1.
- van Harmelen, F. and Balder, J. (1992). $(ML)^2$: a formal language for KADS models of expertise. *Knowledge Acquisition*, 4(1):127–161. Special issue: ‘The KADS approach to knowledge engineering’.
- van Heijst, G., Schreiber, A. T., and Wielinga, B. (1997). Using explicit ontologies for kbs development. *International Journal of Human-Computer Studies*, 46(2/3):183–292.
- van Lambalgen, M. and Hamm, F. (2005). *The Proper Treatment of Events*, volume 4 of *Explorations in Semantics*. Blackwell Publishing.
- Vilain, M. (1984). KI-two, a hybrid knowledge representation system. Technical report, BBN Laboratories, Cambridge, MA.
- Villanueva-Rosales, N. and Dumontier, M. (2007). Describing chemical functional groups in owl-dl for the classification of chemical compounds. In *OWL: Experiences and Directions (OWLED 2007)*.
- Visser, P. R., Jones, D. M., Bench-Capon, T., and Shave, M. (1997). An analysis of ontology mismatches; heterogeneity versus interoperability. In *AAAI 1997 Spring Symposium on Ontological Engineering*, Stanford, CA.
- Vrandečić, D. (2005). Explicit knowledge engineering patterns with macros. In Welty, C. and Gangemi, A., editors, *Proceedings of the Ontology Patterns for the Semantic Web Workshop at the ISWC 2005*, Galway, Ireland.
- Wang, T. D. and Parsia, B. (2007). Ontology performance profiling and model examination: First steps. In et al., K. A., editor, *ISWC/ASWC*, volume 4825 of *Lecture Notes in Computer Science*, pages 595–608. Springer.
- Wielinga, B. and Schreiber, A. (1993). Reusable and sharable knowledge bases: a european perspective. In *Proceedings of First International Conference on Building and Sharing of Very Large-Scaled Knowledge Bases*, Tokyo, Japan. Information Processing Development Center.
- Wielinga, B. J., Schreiber, A. T., and Breuker, J. A. (1992). KADS: A modelling approach to knowledge engineering. *Knowledge Acquisition*, 4:5–53.
- Winkels, R., Boer, A., Breuker, J., and Bosscher, D. (1998). Assessment based legal information serving and cooperative dialogue in clime. In *Proceedings of Jurix-98*, pages 131–146, Nijmegen, Netherlands. GNI.

- Winkels, R., Boer, A., and Hoekstra, R. (2002). CLIME: lessons learned in legal information serving. In van Harmelen, F., editor, *Proceedings of the European Conference on Artificial Intelligence (ECAI 2002)*, Amsterdam. IOS-Press.
- Winkels, R., Bosscher, D., Boer, A., and Breuker, J. (1999). Generating exception structures for legal information serving. In Gordon, T., editor, *Proceedings of the Seventh International Conference on Artificial Intelligence and Law (ICAIL-99)*, pages 182–195. ACM, New York.
- Winkels, R. and de Bruijn, H. (1996). Case frames: Bridging the gap between a case and the law. In Carr, I. and Narayanan, A., editors, *Proceedings of the First European Conference on Computers, Law and AI*, pages 205–213, Exeter. EUCLID.
- Woods, W. (1975). What's in a link? foundations for semantic networks. In Bobrow, D. and Collins, A., editors, *Representation and Understanding*, pages 35–82. Academic Press, New York.

Index

- CommonKADS*, 30, 32
- HARNES, 140

- ABox, 36
- Ajax, 40
- annotation
 - axiom, 59
 - rich, 59
- ASCII, 42
- association class, 157
- axiom closure, 60, 97

- backfiring, 200
- Basic English, 88
- basic level, 88, 130
- basic level primacy, 88
- basic notion, 199
- basic-level categorisation, 88
- BFO, 86
- blank node, 53
- brute fact, 159

- Carneades, 118
- causal knowledge, 120
- causation, 172
 - actual cause, 174
 - agent, 174
 - interpersonal, 174
 - negative, 174
 - physical, 174
- Class
 - anonymous class, 53
 - named class, 53
 - nominal, 53
 - operator, 53
 - restriction, 54
- CLASSIC, 33, 69
- classification, 33
- CLIME, 1, 121
 - ontology, 121

- CLIPS, 29
- closed world assumption, 51
- cluster, 122
- clusters, 87
- CommonKADS, 85
- CommonLogic, 124
- compiled knowledge, 25
- conceptual model, 29
- conceptual retrieval, 121
- conceptualisation, 76
- conservative extension, 114
- constitutive rule, 159
- contextual semantics, 59
- control knowledge, 30, 118
- counts-as, 159
- CSS, 40
- CYC, 126
- CYCL, 126

- damage, 191
- DAML+OIL, 51, 52, 71
- DAML-ONT, 51, 71
- DARPA, 51
- decidable, 63
- default, 17
- definitional knowledge, 120
- Description Logics, *see* DL
- description logics, 10, 34
- design knowledge, 25
- design model, 29
- design pattern, 81, 109, 200
 - content pattern, 113–115, 200
 - logical pattern, 113–115, 200
 - metaphoric use, 115
 - micro pattern, 200
 - ontology design pattern, 111, 113
 - ontology engineering design pattern, 111
 - structure pattern, 115, 200
- design stance, 159

- DIG, 69
- DL, 34, 65, 69
 - SROIQ, 64
 - tree model, 64
- DLP, 63
- DOLCE, 86, 158
- domain theory, 26, 30
- Dublin Core, 84, 86

- E-POWER, 1
- epistemic adequacy, 10
- epistemological adequacy, 11, 36
- epistemological framework, 119
- epistemological level, 74
- epistemological promiscuity, 81, 124
- epistemological status, 118
- epistemology, 32
- expert system, 14

- FACTory, 126
- fantology, 73
- FOAF, 86
- FOL, 34
- FOLaw, 119
- Frame, 89
- frame, 16, 104
 - frame based, 16
 - frame system, 17
 - slot, 17
- Frame Language, 33
- Frame Ontology, 69
- frame problem, 10
- framework, 104, 199
 - epistemological, 105, 107
 - mereological, 106
 - situational, 106
- functional embodiment, 88
- Functional Ontology of Law, *see* FOLaw

- GALEN, 62
- Gene Ontology, 61
- generic concept inclusion, 144
- global restriction, 172
- Guidon, 25

- heuristic adequacy, 10, 11, 36
- HTML, 40, 50
 - XHTML, 43
- hugeness problem, 30
- hybrid system, 11, 19, 33

- identity, 102
 - criteria, 102
- import closure, 60
- imports closure, 97
- Individual, 55
- inference knowledge, 31
- influence, 175
- information processing system, 13
- instance, 16
- intentional stance, 159
- inter lingua, 69
- interaction problem, 30, 33, 73, 75, 108
- interpretive attachment, 19, 148
- IPS, 13, 15
- is-a, 16

- KA, 28
- KADS, 32
- KANDOR, 33
- KB, 29
- KDE, 1
- KIF, 50, 69, 124
- KL-One, 18, 33
- KL-Two, 33
- knowledge
 - engineering, 199
- knowledge acquisition, 28
- knowledge acquisition bottleneck, 30, 73, 76, 203
- Knowledge Base, 29
- knowledge level, 36
- knowledge management, 67
- knowledge model, 29
- knowledge modelling step, 109
- knowledge pattern, 112
- knowledge representation, 9
- knowledge service, 32
- KRIS, 34
- KRL, 18
- KRSS, 51, 69
- KRYPTON, 33

- LAM, *see* legal abstract knowledge
- language compatibility, 100, 197, 198
- legal abstract knowledge, 120
- legal argumentation, 119
- legal assessment, 119
- legal planning, 119
- legal qualification, 120, 123

- level, level21
 - computer system, 21
 - conceptual, 23
 - epistemological, 23
 - implementational, 23
 - linguistic, 23
 - logical, 23
- lex posterior, 119
- lex specialis, 119, 121
- lex superior, 119
- liability, 191
- literal
 - plain, 44
 - typed, 44
- LKIF Core, 86, 198
- lockdown, 145
- LOOM, 33, 69
- LRI Core, 127, 133
- macro, 200
- marker property, 165–170, 179, 180, 192
- medium of human expression, 28
- memory
 - associative memory, 15
 - semantic memory, 15
- meta-legal knowledge, 119
- metaphoric use, 200
- middle-out approach, 87, 130
- MILE, 121
- mismatch
 - language, 91
 - semantic, 91
- model theory, 34, 50
- monotonic, 63
- morphism, 112
- motif, 173
- Mycin, 25, 119
- n-ary relation, 156
- named link, 16
- namespace, 42
- natural language processing, 40
- neats, 10
- negation as failure, 51
- Newspeak, 88
- nominalism, 76
- normative knowledge, 119
- object oriented programming, 17
- observer relative, 102
- OCL, 118
- OIL, 51, 71
- OKBC, 69
- ON-LINE, 120
- Ontoclean, 198
- Ontolingua, 68
- ontological commitment, 28, 32, 66, 195
- ontological level, 74
- ontological status, 66
- ontologically objective, 102
- ontologically subjective, 102
- Ontology, 66
- ontology, 32, 37, 66, 195
 - application, 93
 - core, 93, 199
 - domain, 93
 - engineering, 199
 - extraction, 70
 - formal, 197
 - foundational, 95, 124
 - generic, 93
 - knowledge management, 197
 - knowledge representation, 78, 195, 197
 - learning, 70
 - representation, 75, 93
 - top, 93
 - unified, 94, 126, 127
- ontology engineering, 67
- ontology interaction problem, 98, 196
- open world assumption, 35, 51, 63
- OpenCYC, 127
- OWL, 37, 39, 52, 65, 71, 82
 - $\mathcal{EL}++$, 61
 - DL, 52
 - Full, 52
 - Lite, 52
 - OWL 2, 57
 - OWL 2 EL, 61
 - OWL 2 QL, 62
 - OWL 2 RL, 62
 - owl:Ontology, 60
 - profile, 60
 - Punning, 59
 - SROIQ, 62
- particular, 76
- plane, 17

- pre-conceptual, 88
- problem solving method, 31, 107, 200
- procedural attachment, 18, 148
- production system, 13
- Prolog, 13
- Property
 - abstract role, 57
 - annotation, 59
 - asymmetric, 58
 - chain inclusion, 58
 - complex, 57, 170
 - composite, 57
 - concrete role, 57
 - datatype property, 57
 - disjoint, 58
 - equivalence, 56
 - functional, 55
 - inverse functional, 56
 - irreflexive, 58
 - object property, 57
 - owl:differentFrom, 55
 - owl:equivalentClass, 53
 - owl:import, 60
 - owl:inverseOf, 55
 - owl:sameAs, 55, 64
 - rdf:Property, 59
 - reflexive, 58
 - symmetric, 56
 - transitive, 56
- property inheritance, 16
- proportionality, 175
- PSM, 31
- purpose, 83
- RBox, 36
- RDF, 43
- RDF Schema, 43, 47
 - rdf:type, 47
 - RDFS MT, 50
 - rdfs:Class, 47
 - rdfs:Datatype, 47
 - rdfs:Literal, 47
 - rdfs:Resource, 47
 - rdfs:subClassOf, 47
 - rdfs:subPropertyOf, 47, 55
- RDFS, 39, *see* RDF Schema, 52
- realism, 72
- regulative rule, 159
- reification, 45, 157
- Resource, 44
- responsibility knowledge, 120
- restricted language thesis, 33, 51, 198
- Restriction
 - qualified cardinality, 58
 - Self, 58
- reuse, 17
 - informal, 96
 - semi formal, 97
- rigidity, 74
- role inclusion axiom, 164
- role limiting, 30, 32
- RSS, 84, 86
- safe implementation, 114
- safe reuse, 172
- scope, 83
- script, 104
- scruffies, 10, 14
- semantic network, 15, 41, 47
- Semantic Web, 15, 37, 39, 41, 65, 82
 - layer cake, 41
- serialisation, 45
- SGML, 42
- SHIF(D), 53
- SHOE, 50, 70
- SHOIN(D), 52
- SI-Nets, 18
- signature, 112
- skeletal model, 30
- SKOS, 43, 203
- SNOMED-CT, 61
- stratification, 92
- structural description, 19, 33
- structured object, 147
- subjective entity, 190
- suitability factor, 92
- summarisation, 161, 200
- SUMO, 86, 124
- SUO, 86
- surrogate, 28
- syllogism, 11
- syntactic sugar, 58, 200
- task knowledge, 30
- tautological trap, 89
- TBox, 36
- theorem proving, 36
- Topic Maps, 43
 - XTM, 43

-
- TopicMaps, 156
 - TRACS, 120

 - UML, 43, 118
 - Unicode, 41
 - UTF, 42
 - Unified Modelling Language, 157
 - UML, 70
 - unique name assumption, 35, 55
 - unity, 103
 - universal, 73, 76
 - URI, 42
 - URL, 42
 - URN, 42

 - Web Ontology Language, *see* OWL,
see OWL
 - world knowledge, 120

 - XML, 42
 - XML Schema, 43