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Prototypicality Gradient and Similarity Measure: A Semiotic-Based Approach Dedicated to Ontology Personalization

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ABSTRACT

This paper introduces a new approach dedicated to the Ontology Personalization. Inspired by works in Cognitive Psychology, our work is based on a process which aims at capturing the user-sensitive relevance of the categorization process, that is the one which is really perceived by the end-user. Practically, this process consists in decorating the Specialization/Generalization links (i.e. the is-a links) of the hierarchy of concepts with 2 gradients. The goal of the first gradient, called Conceptual Prototypicality Gradient, is to capture the user-sensitive relevance of the categorization process, that is the one which is perceived by the end-user. As this gradient is defined according to the three aspects of the semiotic triangle (i.e. intentional, extensional and expressional dimension), we call it Semiotic based Prototypicality Gradient. The objective of the second gradient, called Lexical Prototypicality Gradient, is to capture the user-sensitive relevance of the lexicalization process, i.e. the definition of a set of terms used to denote a concept. These gradients enrich the initial formal semantics of an ontology by adding a pragmatics defined according to a context of use which depends on parameters like culture, educational background and/or emotional context of the end-user. This paper also introduces a new similarity measure also defined in the context of a semiotic-based approach. The first originality of this measure, called SEMIOSEM, is to consider the three semiotic dimensions of the conceptualization underlying an ontology. Thus, SEMIOSEM aims at aggregating and improving existing extensional-based and intentional-based measures. The second originality of this measure is to be context-sensitive, and in particular user-sensitive. This makes SEMIOSEM more flexible, more robust and more close to the end-user's judgment than the other similarity measures which are usually only based on one aspect of a conceptualization and never take the end-user's perceptions and purposes into account.

KEYWORDS

Semantic Measure, Conceptual Prototypicality, Lexical Prototypicality, Gradient, Ontology Personalization, Semiotics

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References

[1] S. Harnad, "Categorical perception," Encyclopedia of Cognitive Science, Vol. LXVII, No. 4, 2003. [Online]. Available: http://cogprints.org/3017/.

[2] T. Gruber, "Toward principles for the design of ontolo- gies used for knowledge sharing," in Formal Ontology in Conceptual Analysis and Knowledge Representation, N. Guarino and R. Poli, Eds. Deventer, The Netherlands: Kluwer Academic Publishers, 1993.

[3] C. K. Ogden and L. Richards, "The meaning of meaning: A study of the influence of language upon thought and of the science of symbolism," Harcourt, iSBN–13: 978– 0156584463, 1989.

[4] D. L. M. Gabora, D. E. Rosch, and D. D. Aerts, "Toward an ecological theory of concepts," Ecological Psychology, Vol. 20, No. 1–2, pp. 84–116, 2008. [Online]. Available: http://cogprints.org/5957/.

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[5] E. Rosch, “Cognitive reference points,” Cognitive Psych- ology, No. 7, pp. 532–547, 1975.

[6] M. McEvoy and D. Nelson, “Category norms and instant- ce norms for 106 categories of various sizes,” American Journal of Psychology, Vol. 95, pp. 462–472, 1982.

[7] C. Morris, “Foundations of the theory of signs,” Chicago University Press, 1938.

[8] S. Bluck and K. Li, “Predicting memory completeness and accuracy: Emotion and exposure in repeated autobiographical recall,” Applied Cognitive Psychology, No. 15, pp. 145–158, 2001.

[9] J. Park and M. Nanaji, “Mood and heuristics: The influence of happy and sad states on sensitivity and bias in stereotyping,” Journal of Personality and Social Psychology, No. 78, pp. 1005–1023, 2000.

[10] M. Mikulincer, P. Kedem, and D. Paz, “Anxiety and categorization-1, the structure and boundaries of mental categories,” Personnality and Individual Differences, Vol. 11, No. 11, pp. 805–814, 1990.

[11] C. M. Au Yeung and H. F. Leung, “Formalizing typic- ality of objects and context-sensitivity in ontologies,” in AAMAS ’06: Proceedings of the fifth international joint conference on Autonomous Agents and Multiagent Systems. New York, NY, USA: ACM, ISBN 1-59593-303-4, pp. 946–948, 2006.

[12] C. M. Au Yeung and H. F. Leung, “Ontology with likeliness and typicality of objects in concepts,” in Proceedings of the 25th International Conference on Conceptual Modeling–ER 2006, S. B. Heidelberg, Ed., Vol. 4215/2006, ISSN 0302-9743 (Print), 2006.

[13] P. Resnik, “Using information content to evaluate sem- antic similarity in a taxonomy,” in 14th International Joint Conference on Artificial Intelligence (IJCAI 95), Montral, Vol. 1, pp. 448–453, August 1995.

[14] A. Tversky and D. Kahneman, “Judgment under uncer- tainty: Heuristics and biases,” Science, No. 185, pp. 1124 –1131, 1974.

[15] D. Lin, “An information-theoric definition of similarity,” in Proceedings of the 15th International Conference on Machine Learning, pp. 296–304, 1998.

[16] J. Jiang and D. Conrath, “Semantic similarity based on corpus statistics and lexical taxinomy,” in International Conference on Research in Computationnal Linguistics, pp. 19–33, 1997.

[17] C. d’Amato, S. Staab, and N. Fanizzi, “On the influence of description logics ontologies on conceptual similarity,” in EKAW 2008, International Conference on Knowledge Engineering and Knowledge Management Knowledge Patterns, pp. 48–63, October 2008.

[18] R. Rada, H. Mili, E. Bicknell, and M.Blettner, “Deve- lopment and application of a metric on semantic nets,” IEEE Transactions on Systems, Man and Cybernetics, Vol. 19, No. 1, pp. 17–30, 1989.

[19] C. Leacock and M. Chodorow, “WordNet: An electronic lexical database,” Cambridge, MA, The MIT Press, 1998, ch. Combining local context and wordnet similarity for word sense identification, pp. 265–283.

[20] Z. Wu and M. Palmer, “Verb semantics and lexical selec- tion,” in Proceedings of the 32nd Annual Meeting of the Association for Computational Linguistics, pp. 133–138, 1994.

[21] E. Blanchard, M. Harzallah, and P. Kuntz, “A generic framework for comparing semantic similarities on a subsumption hierarchy,” in Proceedings of the 18th Eur- opean Conference on Artificial Intelligence (ECAI ’2008). IOS Press, pp. 20–24, 2008.

[22] P. Jaccard, “Distribution de la flore alpine dans le bassin des dranses et dans quelques rgions voisines,” Bulletin de la Socit Vaudoise de Sciences Naturelles, Vol. 37, pp. 241–272, 1901, (in French).

[23] M. Sanderson and W. Croft, “Deriving concept hiera- rchies from text,” in Proceedings of the 22nd Inter- national ACM SIGIR Conference, pp. 206–213, 1999.

[24] M. Buffa, F. Gandon, G. Ereteo, P. Sander, and C. Faron, “Sweetwiki: A semantic wiki,” Special Issue of the Journal of Web Semantics on Semantic Web and Web 2.0, Vol. 6, pp. 84–97, February 2008.