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Norwegian University of Science and Technology, Department of Computer and Information Science, Information Systems Group

Monika Lanzenberger

Vienna University of Technology,
A-1040 Vienna, Austria
lanzenberger@ifs.tuwien.ac.at

1 Results and Ongoing Work

Visual ontology alignment, which is related to the work of both host institutions, is my main focus. In addition, I published some results from my Ph.D. thesis. In the following I give a summary of visual ontology alignment.

Visualization has an appealing potential when it comes to exploring or verifying complex and large collections of data such as ontologies. In particular, Information Visualization (InfoVis), which works with abstract and non-spatial data, offers a bundle of techniques to represent hierarchical or semi-structured data. Many ontology tools integrated visualization in one way or the other during the last decade. However, ontology alignment is a quite new research field and currently its main results are alignment algorithms in order to bring the concepts of two ontologies into concordance automatically. But not everything can be done by machines, user interaction is still essential in order to control, approve and optimize the alignment results. So far only a few alignment tools implemented interactive functionality to support the required user interaction suitably. In particular, we identified two relevant tools among the numerous efforts in ontology management: OLA [8] and to a certain degree Prompt-Viz [9] are related to our work. However, when working with these tools it is difficult to understand why certain actions in the alignment or merging process took place and what their consequences are. Although both tools implement an interesting approach, we identified several shortcomings. An ontology alignment tool should provide the user with details and overview in an easily understandable way. Based on a thorough literature study on relevant ontology tools (I identified about 50 tools which I am describing in an extensive state-of-the-art report) and the requirement analysis we are developing AlViz (Alignment Visualization) which is a plug-in for Protégé [11] offering four views linked together in order to visualize ontologies for alignment. The pre-processed associations of two OWL ontologies found by the foam tool [6] are the input. In addition to graphs, AlViz adopts text-oriented views for the details. Fig. 1 shows AlViz visualizing the alignment of two ontologies about tourism. We apply small world graphs [10],

which use clusters to group the nodes of a graph according to the selected level of detail. It represents the concepts based on selected mutual properties such as `IsA`, `IsPart`, `IsMember`, `locatedIn`, `IsDistinct`. The tool is fast enough to perform at interactive speed because of the clustering. Starting with a framework for evaluating conceptual model quality [7], we extended it for ontology alignment quality. Its main components are linguistic concepts of syntax, semantics and pragmatics. AlViz aims at making such quality measurement accessible in practice. The tool is an ongoing project and is currently being implemented to be followed by an evaluation. Our current research questions are: (1) which alignment tools exist and how do they perform the necessary tasks? (2) What are the relevant steps in the ontology alignment process and how would they benefit from visualization? (3) Which metaphors are currently used in ontology visualization and which tools do exist? (4) Are tools available for the visual support of ontology alignment? (5) What are the requirements for the development of a visual ontology alignment tool and how can we evaluate such criteria. And finally, (6) what application fields can benefit from a visual ontology alignment tool?

2 Host Institution and Co-operation with Colleagues

With the Information Systems Group at the NTNU I found active and motivating colleagues who made it easy to integrate within the team. They organized scientific meetings regularly which provided me with an overview on their recent papers and ongoing research. In April I presented my work to this group which initiated the submission of papers together with some group members. Especially, with Jennifer Sampson, Csaba Veres, and Guttorm Sindre I had many interesting discussions. Xiaomeng Su who finished her Ph.D. thesis shortly after my arrival in Norway supported me with relevant literature. Her thesis "Semantic Enrichment for Ontology Mapping" was a good starting point for my research in ontology alignment. Further co-operation regarding paper submissions and a project proposal is planned.

3 Other Contributions to the Scientific Community

Scientific reviewer for the following conferences (2005):
IEEE Visualization, Minneapolis, USA
IEEE Symposium on Information Visualization, Minneapolis, USA

References

Accepted Publications 2005 (Monika Lanzenberger)

1. Lanzenberger, M.; Pohl, M.: Media Informatics or Software Engineering: Why do women study computer science? In: The Gender Politics of ICT, Archibald, J.;

Emms, J.; Grundy, F.; Payne, J.; Turner, E. (eds.), 6th International Women into Computing Conference, July 14-16, 2005, London, UK, Middlesex University Press.

Abstract:
Since 1997 there has been an increase of female students in computer science in Austria. We discuss possible reasons for this development, e.g., diversification of the studies emphasizing the application aspects (new Bachelor studies), the introduction of new fields in computer science studies, an increased demand for IT specialists holding an academic degree, and a higher percentage of young female Internet users. Women seem attracted by certain Bachelor studies like Media Informatics and Medical Computer Science and deterred by Computer Engineering and Information & Software Engineering. However, from a feminist point of view the introduction of studies like Medical Computer Science could reify gender stereotypes.

2. Lanzenberger, M.; Miksch, S.; Pohl, M.: Exploring Highly Structured Data - A Comparative Study of Stardinates and Parallel Coordinates, In: Proceedings of the IV05, 9th International Conference on Information Visualisation, July 6-8, 2005, London, UK, IEEE Computer Science Society, pp. 312-320.

Abstract:
Comparing different Information Visualization (InfoVis) techniques is a challenging task and a necessary step to reach the users and their tasks. We evaluated the effectiveness in visualizing psychotherapeutic data of two InfoVis techniques, namely the Stardinates and the Parallel Coordinates by a comparative study with 22 participants. Based on three research questions we interpret the results of our study in order to derive statements on both visualization techniques. We evaluated (1) the time participants were engaged in testing our material, (2) the number of correct answers, (3) subjects statements, which were categorized by the type of statement, and (4) the subjects key statements in comparison to those defined by an expert. Our empirical results indicate that the Stardinates are a more appropriate method for interpreting such highly structured data in detail whereas Parallel Coordinates show advantages for gaining information at the first glance.

3. Kargl H., Lanzenberger, M.: Technological Toolkit for Entrepreneurs 40, In: Proceedings of the ED-Media 05, World Conference on Educational Multimedia, Hypermedia & Telecommunications, June 27-July 2, 2005, Montreal, Canada, AACE, pp. 4806-4811.

Abstract:
The TTE@40-platform (Technological Toolkit for Entrepreneurs @ 40) is an e-learning solution primarily focused on people at the age of 40 and above which are starting their own businesses. The aim when designing this system was to build an easy to use customized solution for people with different previous background. This aim should be achieved using individual information and the interactivity of this learning approach, which allows an answer to any open question, which may arise while reading portals content. This ambitious aim will be reached through multidimensional explanations, pre selected courseware, a dynamically growing meta-knowledge base and examples. With this approach we hope to describe a concept

for an e-learning solution, which bring the right information for the right people at the right time.

Submitted Publications 2005 (Monika Lanzenberger)

(Currently within the reviewing procedure)

4. Lanzenberger, M. and Sampson, J.: AlViz: Alignment Visualization for Ontology Management, Submitted to: IEEE Transactions on Knowledge and Data Engineering, Special Issue on Knowledge and Data Engineering in the Semantic Web Era.

   Abstract:
   The integration of ontologies can provide a shared understanding of common domains, which is an important aspect in ontology management. Through an extensive review of current research in ontology alignment and ontology visualization we have identified major theoretical and practical issues, which need to be addressed. We describe requirements and motivating scenarios for visual ontology alignment and explain how visualization can support end users during the alignment of ontologies. Based on our findings we implement AlViz, which is a multiple view plug-in for Protégé that assists with the alignment of ontologies visually and enables the user to understand and adapt the alignments derived from the Foam algorithm. Six research questions structure our work on alignment visualization.

5. Sampson, J., Lanzenberger, M., Krogstie, J., and Sølvberg A.: AlViz: A Visualization Tool for Quality Ontology Alignment, Submitted to CAISE 06, the 18^{th} Conference on Advanced Information Systems Engineering.

   Abstract:
   One important aspect for enabling interoperability between heterogenous information sources is the alignment of ontologies. Through an extensive review of current research in ontology alignment we have identified theoretical and practical issues which still remain to be solved. Two of these challenges are addressed in our current work. First, there is a need for a framework for evaluating the quality of ontology alignments and second there is a lack of tools for supporting end user understanding of the ontology alignment. To that end, we describe a theoretical framework for evaluating ontology alignment quality and we develop AlViz a multiple view plug-in for Protégé that assists with the alignment of ontologies visually, and enables the user to evaluate the ontology alignments.

Related Work

6. Foam.: Framework for Ontology Alignment and Mapping http://www.aifb.uni-karlsruhe.de/WBS/meh/foam/ 2005
7. Lindland, O.I., Sindre, G., and Sølvberg, A.: Understanding quality in conceptual modelling. IEEE Software, **11**(2) p. 42–49 1994
8. Euzénat, J., Loup, D., Touzani, M. and Valtchev, P.: Ontology Alignment with OLA. In Proceedings of the 3^{rd} EON Workshop, 3^{rd} Intl. Semantic Web Conference. November 2004

9. Perrin, D.: PROMPT-Viz: Ontology Version Comparison Visualizations with Treemaps. M.Sc. Thesis University of Victoria. 2004
10. van Ham, F. and van Wijk, J.J.: Interactive Visualization of small world graphs. In Proceedings of IEEE Symposium on Information Visualization 2004. CSPress, p. 199–206. 2004
11. Grosso, E., Eriksson, H., Fergerson, R.W., Tu, S.W. and Musen, M.M.: Knowledge-modeling at the millenium the design and evolution of Protégé -2000. In Proceedings of the 12^{th} Int. Workshop on Knowledge Acquisition, Modeling and Managment, 1999

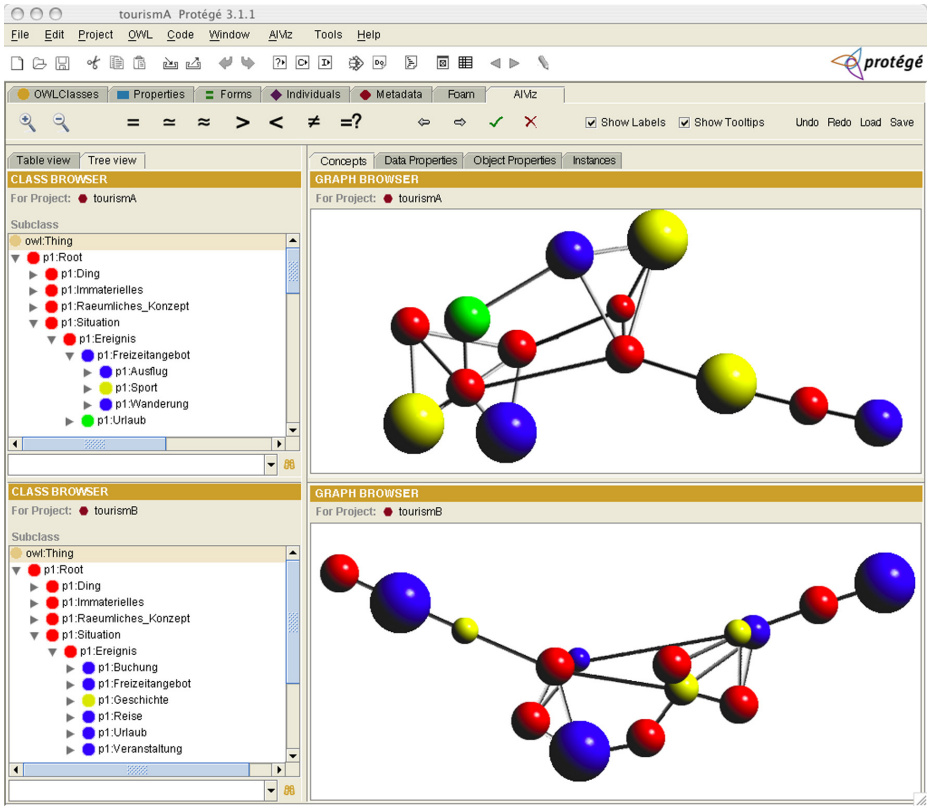

Fig. 1. AlViz: the four views of the tool visualize two ontologies named `tourismA` and `tourismB`. The nodes of the graphs and dots next to the list entries represent the similarity of the ontologies by color. The size of the nodes results from the number of clustered concepts.