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Interview with Gerhard Brewka

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Abstract This interview with Gerhard Brewka was conducted by correspondance in May 2018. The question set was compiled by Torsten Schaub and Stefan Woltran.

About

Gerd Brewka pioneered the area of nonmonotonic reasoning in Germany. He started with tutorials on nonmonotonic reasoning at the German AI spring school, KIFS, in the eighties and is internationally regarded as the German figurehead of the area since early on. Moreover, his career allowed him to experience various research environments starting from GMD (now Fraunhofer) in Saint Augustin, to ICSI at Berkeley, California, over TU Vienna, finally settling down at Leipzig University.

Interview

How did you get started in NMR, the precursor of ASP?

Together with a friend of mine, Karl Wittur, we were looking for a topic for our diploma thesis. In the library of the computer science department in Bonn we stumbled over the AIJ special issue on nonmonotonic reasoning. That's how it all started.

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You were among the pioneers of NMR in Germany. How did you experience this time and how could we envisage the German NMR landscape at this time?

It was boom time for expert systems then. Much work went into expert system shells and the like. I always felt more theoretical foundation was needed to address relevant issues in KR. That's what fuelled my interest in thorough logical foundations. There was a handful of people with similar interests in Germany at the time. Not enough for regular meetings, so we started the annual Dutch-German workshop on nonmonotonic reasoning which kept going for many years, until the field was established well-enough and people started to attend international events regularly. Let me just add that Prof. Bibel, my thesis supervisor, was very open-minded and gave me the freedom to pursue the topics I was interested in. I am still very grateful for this.

When you moved to Vienna in the mid-nineties, how did you experience the Austrian NMR landscape?

Well, Vienna was — and still is — a very special place for people interested in KR. Georg Gottlob was extremely active in many different areas, from databases to KR and NMR. With his extraordinary background in complexity theory he brought to bear many new aspects. Thomas Eiter, then a member of Georg's group, was around, and so was Nicola Leone. This was a small but very active group. Unfortunately, for me this lasted for about 2 years only. I went back to Germany for family reasons.

Finally, you moved to Leipzig, and got to know the East-German NMR landscape. How did you experience it?

There were people interested in logic programming, in particular my colleague Heinrich Herre who is still highly active and now working on theoretical foundations of ontologies. But to be honest, my major intention at the time was not to revive the East-German landscape, it was to make sure Leipzig was visible in the international KR landscape. This was also one of the motivations behind creating a DFG funded doctoral school on knowledge representation shortly after I arrived in Leipzig.

When and how did you realize the virtue of ASP as a proper paradigm, as opposed to the initial idea of a semantics for logic programming?

I was in regular contact with the people who initiated this paradigm shift, in particular Ilkka Niemelä and Mirek Truszczyński. I have to admit, though, that at the time I underestimated its impact.

ASP is often considered as a continuation of nonmonotonic logics. Would you rate this as a demise or rather a resurrection?

I very much support the continuation view. After all, very much the same persons were involved. For instance, stable semantics was co-invented by Vladimir Lifschitz, who had spent a lot of effort to turn circumscription into a manageable KR formalism. Ilkka and Mirek had worked on autoepistemic and other modal nonmonotonic logics for a long time. It looked just natural to me that after many years of study of foundational issues the focus went towards efficient and effective systems. This was also a natural reaction to criticisms from outside — and within — the community.

Truth maintenance systems were a popular computational approach to NMR in the 80ies and have disappeared as a branch of KR despite their close relationship to ASP. Can you comment on this?

Well, I can only speculate. Maybe people in logic programming just were a step ahead and got the semantics right. Maybe logic programming already had a longer tradition with people acquainted with Prolog.

ASP has also strong roots in knowledge representation as well as database systems. How do you judge the influence of knowledge representation on ASP, and vice versa?

For me these are not different topics: ASP is an example of what knowledge representation should look like: theoretical foundation combined with effectiveness. The compromise between expressiveness and effectiveness is at the core of KR. It is easy to invent highly expressive logics, it is much more difficult — and useful — to find the right compromise between expressiveness and efficiency. For me, this is at the heart of KR.

Argumentation and Preferences are two other areas of your interest. How do they relate for you to ASP?

The relation to preferences is easy: preferences come into play whenever a problem has a large number of solutions, and one wants to apply further, soft criteria to distinguish among them. In other words: preferences can be very useful in selecting answer sets corresponding to preferred solutions. Also the relationship between ASP and argumentation is strong, ranging from fundamental similarities in basic definitions — it is not an incident that one of the important semantics for argumentation frameworks is called "stable" — to the use of ASP as target language in compilations of argumentation frameworks. The fact that many implementations of argument systems nowadays are based on such compilations provides additional evidence for the usefulness of ASP. On the other hand, in argumentation sometimes questions pop up one would not normally consider in logic based approaches, just think of proof standards or burden of proof.

In this volume, we also have a paper by Pedro Cabalar and David Pearce on the logical foundations of ASP. Why did it take quite a while until the importance of corresponding monotonic logics (viz the logic of here and there) (for instance, to test strong equivalence) was recognized by the NMR and ASP community?

Well, my personal view is that the investigation of the logic of here and there is highly interesting from a theoretical perspective and has helped to analyse and solve a number of important theoretical problems. On the other hand, I believe the intuition underlying ASP can be conveyed without reference to the logic of here and there. This intuition is actually very simple: include the head of a rule in an answer set whenever its body holds, and do not include anything in an answer set without reasonable justification. A reasonable justification is a derivation using rules which are not "ruled out" because of default negation. I think this is all that is needed to understand the intuition behind ASP.

In the underlying logics, negation is defined in terms of implication, which plays the central role. On the other hand, ASP is usually conceived as being centered upon negation-as-failure. What is your view on this putative discrepancy?

For me the negation-as-failure view is still the more natural one, but maybe this is based on my personal history. However, I also realize that students find ASP easier to grasp this way.

Looking backward, what do you consider as the major highlights in the short history of ASP?

Well, the fact that nonmonotonic reasoning now has produced tools which are able to handle real industrial problems is certainly a major highlight.

AI nowadays is often identified with Machine Learning, while classical logic-based approaches seem to have lost ground substantially in the field. Will we strike back and how?

A number of prominent researchers in areas like natural language understanding or vision, where machine learning techniques are dominant, are beginning to understand that without the representation of background and commonsense knowledge further progress will come to its limits. Explainable AI is another theme where logic will play an essential role. What is an explanation after all? A reason or justification given for an action or belief. Since "reason" appears to be an essential part of the definition of explanations, the science whose major focus is reasoning should not be worried.

Where has ASP left its footprints and where could it have its major impact in the future?

I think ASP has brought us an important step closer to the vision of declarative problem solving. The benefits are only beginning to materialize, and I expect to see a lot more interesting applications in the near future.

If ASP made it on the front-page of the New York Times, what could be the headline?

In the early nineties while I was still at GMD, the German Research Center for Mathematics and Data Processing, we had a joint project with TU Darmstadt. Together with a young researcher from Darmstadt — his name was Torsten Schaub — we were working on a nonmonotonic system for designing office layouts. What we had in mind was a "beautifier" that would optimize layouts according to various criteria. We were not overly successful at the time. I now could imagine the following headline: "New Your Times: First Issue with New Layout Designed by an AI System." Of course, I imagine that system to be based on Answer Set Programming.

This interview was conducted by correspondence.

Gerhard Brewka was born in 1955 in Regensburg, Germany. He is married and has 3 daughters and 5 grandchildren. He received the diploma in Computer Science from University of Bonn in 1984 and the Ph.D. in Computer Science from University of Hamburg in 1989. He was a member of the Artificial Intelligence Group of Gesellschaft für Mathematik und Datenverarbeitung, Sankt Augustin, from 1984 to 1994 and visiting researcher at the International Computer Science Institute, Berkeley, CA, from 1991 to 1992. In January 1995 he became full professor for Knowledge Based Systems at the Technical University of Vienna. Since September 1996 he is chair for Intelligent Systems at the University of Leipzig where he was heading the doctoral programme in knowledge representation from 1998 to 2008. Since 2002 he is an ECCAI Fellow selected by the European Coordinating Committee of Artificial Intelligence.