SUMMARY OF VISIT TO ICOT: LESSONS FROM JAPAN

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1 Automated Legal Reasoning

At ICOT as elsewhere in the research world, the idea is modest and the objectives attainable. First, design adequate models of the processes of legal argument and interpretation. Then, better user-interfaces, information retrieval, and expert systems will be possible in the legal domain.

I am here because there has been a convergence of ideas: Giovanni Sartor (ITALY), Tom Gordon (GERMANY), Henry Prakken and Jaap Hage (NETHERLANDS), Katsumi Nitta (JAPAN), and I (USA) have all been writing essentially the same things on AI and Law. We agree on what is a legal argument. We agree that there must be a criterion for deciding when one argument defeats another. We agree on how conclusions become justified through argument. We each have our own protocol for introducing arguments in a disputational process.

The problems now are connecting the formal work on argument with the legal domain and practical knowledge for legal reasoning. Formal models of argument are important. Even Aristotle said that there are two modes of inquiry: syllogism and debate. The syllogism has been the main idea of formal systems (logics) for a century. In contrast, the formal model of argument is perhaps only a decade old.

Because of the importance of modeling argument, most researchers have been very general in their work; very few researchers have actually tried to tackle the problem of applying the ideas.

At ICOT we find the reverse is true. The application of the ideas shall drive the basic research. Argument is interesting only insofar as it supports software systems for the legal domain. Thus, temporal and causal aspects of knowledge representation have been taken more seriously. Also, functionality that might be interesting to potential users is more important than trying to demonstrate a program that takes evidence and makes conclusions, like a theorem-prover. We find that lawyers' opinions have been used in the design of systems. We

find that a large base of cases described in fairly good detail is being used for all prototyping.

2 The system HELIC-II

At the AI and Law meeting in Boston earlier this year, the emphasis was on Quixote, which is just and object-oriented database language. During the visit here, I saw HELIC-II which is a case-retrieval system. This was more interesting than the Quixote demonstration because of the domain, though it had a similar functionality. The central question in HELIC-II is what should be the criterion of similarity for matching past cases. HELIC-II uses a threshold to prevent cases from being retrieved on mere surface similarities.

The problem is determining what is an appropriate threshold. Certain kinds of distinctions among cases might be made by referring to cases that have very little in common with the current case.

Suppose there is a new case of alleged abandonment in which all but a single fact correspond to the precedent case of abandonment. But the abandoned person is an escaped criminal. Clearly if there is a case of abandoning fugitives, it would be more relevant. But suppose there is no such prior case. Then one would want to know about cases involving fugitives, even if they are not close to the current case. Suppose that the closest prior case that has to do with this factor, the fact of the abandoned person being a fugitive, is be very unlike the present case. Maybe the closest case that has to do with fugitives is a case of capturing a fugitive and accidentally killing him. This is not at all like abandonment, but it is an interesting distinction. I wonder whether HELIC-II's thresholding of similarity would allow such a case to be found.

Sometimes a small dissimilarity of two cases is a nuisance. Sometimes it is an important factor on which to make a distinction. Ashley's HYPO model is the best example of accomodating this kind of reasoning. In the former, HELIC-II works. In the latter, HELIC-II might not.

On the other hand, case-retrieval such as HELIC-II provides Dr. Nitta's group with a smaller set of cases to worry about. Our models of analogy potentially permit all sorts of terrible analogies. These create too many arguments to deal with. Consequently, managing the computation has been a topic of research. Managing the computation has shown us interesting philosophical lessons, but has taken us away from practical systems.

3 Viewpoints

The newest idea I have heard here is Dr. Nitta's meta-meta-ordering, which he calls viewpoints. We all know that lex superior is an ordering on rules; hence, on arguments. Sometimes, lex superior is more important than lex posterior.

This is an ordering on orderings. It is a viewpoint. Viewpoints may themselves be ordered.

Everyone wants to do meta-reasoning and meta-meta-reasoning. The problem is that nobody knows what should be the content of the argument at these high levels of abstraction. Dr. Nitta imports his ideas from legal education. This is a good idea.

Much of this reasoning could be simulated on the lower levels. In the same way, high-level languages can be compiled. But it is appropriate for the knowledge to be represented at higher levels of abstraction, and I applaud this honesty. It is good modelling. This idea is well-paired with the *Pleadings Game* model of dispute. Gordon's *Pleadings Game* seeks to identify issues through dialogue rather than resolve them automatically, as do Prakken and Loui. The ability to claim viewpoints and constrain meta-meta-claims to natural categories is superb.

I am looking forward to writing about new HELIC-II and seeing a demonstration. Some may view it as an incremental advance over Gordon's thesis. However, Gordon's ideas make much more sense to me in Dr. Nitta's setting. I believe that the game that new HELIC-II defines will continue to be an important and lasting form of an argument game.

One problem with the issue-identifying (*Pleadings Game*) approach is that it is less ambitious than those who want to try to resolve disputes automatically. Defining the game does not by itself produce new technology. We will have to have a program that can play one or both sides of the game before it will be something we can build useful software upon.

I worry about the complexity of the definitions for unification in the knowledge representation language in HELIC-II. I assume that these definitions are for a logic programming community.

I have no doubt that Mr. Sakata and Mr. Shibasaki will provide Dr. Nitta with excellent support.

I have left a copy of several software systems of our group that Mr. Sakata can study if he has any questions about how we implemented the debate mechanism. These programs are NATHAN and SOPHIE. I have also left RCSTAT (a.k.a. AMCRD) which is of historical interest, and ARGCOL which is an investigation of the appropriate format for hypertext display of arguments.

4 Temporal Knowledge Representation

Mr. Tojo showed me his language and calculus for aspects of verbs. We could not remember whose work on narratives was similar to this work. I recall only old work from Reichenbach and the work of Alex Lascarides and her co-authors. I know that there is more relevant work and we agreed that I should send him references when I return to my office and look through my papers.

I have no objection to what Mr. Tojo is doing. He is the most philosophical

of Japanese researchers. He is doing the kind of work that Western scholars think Japanese cannot do. We talked about how Mr. Tojo must be sensitive to the demands of intellectuals while at the same time showing that his ideas are applicable. The first demands clarity and simplicity. The second requires that the examples have realistic detail.

I am confident that Mr. Tojo will be an important Japanese scholar in the years to come. While I do not agree that his current work is an essential part of the legal application project, I believe it could be very good work that will receive international attention.

Mr. Tojo and I agreed that (a) if the similarity of cases depends on temporal relations, such as "whether a marriage application had been filed when the fiance moved in", then his abstractions and concepts will be very important; and (b) if the important legal concepts are static, such as whether "a poster" is "public speech", then the nuances he provides will not matter.

5 Visitors

The most sensible thing I saw here was the program for having visiting researchers. Usually when I consult I am critical of the decision to seek an external consultant. It is usually a waste of money.

ICOT however is trying to publicize its achievements. Having ranking researchers from the US visit is an excellent approach.

I have seen Japanese researchers at Amsterdam and in Boston trying to explain their work in a conference format. It simply does not work. The language barrier is a problem. But a bigger problem is that Western researchers who have not seen each other for a few months always have something to talk about. So they might genuinely want to take the time to hear about the Japanese work. But instead, they find it more important to brain-storm with their Western colleagues. They ignore the Asian researchers, and others, such as French, who do not speak quickly. This is unfair, but it is a reality.

By coming to ICOT, we make a fair trade. I have an interesting trip and learn about new activity. Japanese researchers are able to set the agenda and take the time to explain the ideas in an effective and interactive way. There is almost no language barrier in this setting. It is expensive to have me here, but no more expensive than sending an extra person or two to a conference. Since I will be writing about the ICOT work in my subsequent publications, I believe that the money has been well spent.

After a short week here, I feel close to my Japanese colleagues. I could imagine having several to visit my University in the near future, as funding permits.

6 Funded Activity

Finally, a note about the relative level of funding for AI and Law in Japan and in the US.

In the US, there is no natural funding source for AI and Law. Of the major granting institutions, NIH, NSF, and ARPA, none naturally supports this area. Only the last has ever shown an interest in legal reasoning, and probably not for sustainable reasons. Funding this work is in the public interest, but it falls between the historical and bureaucratic divisions of government funding.

There is no US industry that can fund basic research in the automation of legal tasks. In fact, the practicing professionals and their collectives, and the existing providers of information services in law, have an incentive to hold back the technology.

Meanwhile, successes in this area could improve social relationships, decrease a society's overhead and dependence on frequent legal action, and educate the populace about the nature of the legal system. It is a natural undertaking for AI researchers since it is almost entirely a symbolic activity.

We see coordinated efforts in Europe and in Japan to advance the state of the art in this area. In the US, there is no organization. The researchers are usually alone and cannot undertake major projects. Until quasi-legal commercial applications can be found by entrepreneurial thinking, there will be no commitment to large-scale development such as at ICOT. If ICOT is unhappy with the technology that results from this area, it should consider the challenge that its researchers have faced: its researchers have had to take the international lead on large-scale prototyping in this area.

I have mixed feelings to see that research directors in other countries have more foresight than we do in the States. It is possible that the US will be one of the last developed countries to have first-rate technology penetrate its legal counseling activities and supplement its legal profession.

7 Acknowledgements

I would like to thank Dr. Nitta for his invitation to visit. Mr. Ohsaki has been extremely loyal and helpful during my stay. Ms. Kitakata must also be thanked. I would recommend that other researchers visit Japan after the enjoyable and productive week that I have spent here.

Now that I have made further contact with Prof. Yoshino at Meijigakuin University (whose invitation to speak I accepted) and Dr. Sawamura at Fujitsu (whose invitation I was unable to accept), I hope to be in contact with my Japanese colleagues continuously.

Ronald Prescott Loui

Education

Harvard. B.A. *m.c.l.* June 1982. Applied Mathematics.

University of Rochester. M.S. October 1985. Computer Science.

University of Rochester. Ph.D. September 1987. Computer Science and Philosophy.

Academic Posts

Primary

Stanford. Cognitive Science Postdoctoral Affiliate. October 1987 to May 1988.

Washington University. Assistant Professor of Computer Science. Adjunct Assistant Professor of Philosophy (courtesy, to 1991). Faculty, Center for Intelligent Computer Systems and Senior Fellow, Center for Semantic Control and Optimization. August 1988 to March 1994.

Washington University. Associate Professor of Computer Science. March 1994 to present.

Visiting

University of Bahia Blanca, ARGENTINA, Summer 1994 (expected).

GMD, GERMANY, Summer 1994 (expected).

Research Area

Research focuses on computationally and mathematically precise theories of reasoning and their relation to existing traditions in philosophy of science, logic, cognitive science, social science, management science, economics, and law. Currently interested in legal software technologies.

Support

National Science Foundation.

New proposals to REU (SURA), KMCS (Language Games for Argument), and ITOP (Arbitration and Argument).

Research Experiences for Undergraduates Program: Summer Undergraduate Research Assistants, $60,240. May 1992 to September 1994.

Research Experiences for Undergraduates Program: Summer Undergraduate Research Assistants, $85,570. May 1991 to September 1993.

Research Experiences for Undergraduates Program: Summer Undergraduate Research Assistants, $35,330. May 1990 to September 1991. With Will D. Gillett.

Knowledge Models and Cognitive Systems Program: Applications and Investigations of Resource-Bounded Argument, $109,000 with $4000 REU Supplement. October 1990 to September 1992.

AAAI and McDonnell Douglas Corporation. Workshop on Defeasible Reasoning with Specificity and Multiple Inheritance, $10,000. August, 1988.

Consulting and Industrial Affiliations.

Consultant. McDonnell Douglas Corporation, St. Louis. August 1989 to June 1990.

Consultant. National Science Foundation, Washington, D.C. April 1989.

Consultant. Xerox PARC, Palo Alto, and Xerox Webster, Rochester. June 1988 to August 1988.

Research Affiliate. Rockwell Palo Alto Laboratory. April 1988 to August 1988.

Summer Intern. Digital Equipment Corporate Research. May 1983 to September 1983.

Research Supervision

Washington University (thesis advisor).

Guillermo Simari, D.Sc. Computer Science, January 1990. "Mathematics of Defeasible Reasoning and Its Implementation." Nominated for ACM award.

Gadi Pinkas, D.Sc. Computer Science, October 1992. "Inference in Symmetric Connectionist Networks" (external examiner: D. Touretzky). Under review at MIT Press.

External Dissertations (external examiner or doctoral opponent).

Peter Eklund, Ph.D. Computer Science, University of Linkoeping (SWEDEN), September 1991. "An Epistemic Approach to Interactive Design in Multiple Inheritance Hierarchies" (student of S. Haegglund).

Gerard Vreeswijk, Ph.D. Computer Science, Vrije Universiteit Amsterdam (NETHERLANDS), March 1993. "Studies in Defeasible Argumentation" (student of J. Meyer).

George Ferguson, Ph.D. Computer Science, University of Rochester, June 1994 (unofficial external member of committee). "Explicit Representation of Events, Actions, and Plans for Assumption-Based Plan Reasoning" (student of J. Allen).

Pawan Kumar, Ph.D. Computer Science and Engineering, Indian Institute of Technology (INDIA), Spring 1993. "Model-Theoretic Semantics for Some Logics for Commonsense Reasoning," (student of H. Karnick).

Local Doctoral Committees: Kanaan Faisal (CS), Victor Griswold (CS), Amol Joshi (Chemical Engineering), Rose Gamble (CS), Gene Freudenberg (Mathematics), Yuanlan Wu (Systems Science & Mathematics), J. Andrew Fingerhut (CS, expected), Nilesh Jain (CS, expected), James Revetta (Systems Science & Mathematics, expected).

Other supervision includes: Benjamin Weber, B.S. honors thesis, 1993. Peter Nicastro, St. Louis Science Center Award-Winning Project, 1992. Twenty-one undergraduate projects.