

AAR

Newsletter 1

March, 1983

From the president....

The formation of the organization of AAR appears most timely. The attendance at talks giving an introduction to automated reasoning or focusing on applications ranges from 70 to 150, and the audiences are clearly excited and enthusiastic. Requests for information or for literature number in the hundreds, with representatives from various industries showing marked interest.

Jorg Siekmann mailed 15,000 fliers on March 1 announcing the existence of AAR. They were sent to various people who are on the IJCAI mailing list. The announcement is a formal printing and is quite attractive. Currently we have 60 members in AAR. Siekmann is to be congratulated for formulating and implementing this idea.

We anticipate having a number of AAR members from outside the United States. Unfortunately, U.S. banks are not always helpful or very cooperative. This presents a currency exchange problem. We are considering having a European chapter to circumvent this difficulty. If you have an alternative suggestion, please convey it to me or to Larry Henschen. Henschen can be reached at the Computer Science and Electrical Engineering Department, Northwestern University, Evanston, Il. 60201. I can be reached at the following address.

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Workshops and Conferences

Tutorial/Workshop at Argonne

As many of you may know, last year we held the first tutorial/workshop at Argonne on Automated Reasoning. The attendance was by invitation only. During the session breaks, the pitch of conversation was unusually high, with many questions about the potential use of an automated reasoning program and many conjectures about methodology. As a direct result of that workshop, various collaborative efforts are pending. We plan to have a second tutorial/workshop on Automated Reasoning this June, and will report on its reception in a future newsletter.

Ed Snow of INTEL, an attendee at the workshop, suggested the following problem from circuit design. Design a circuit with inputs A, B, and C and with outputs **not** A, **not** B, and **not** C, using as many OR gates and as many AND gates as you like but using no more than two NOT gates. We are pleased to report that

such a circuit was successfully designed by the LMA system. The diagram of the circuit is quite complicated.

CADE Conference

At the 6th CADE conference in New York, Jorg Siekmann agreed to be chairman of the committee to obtain additional open questions suitable for attack with an automated reasoning program. He and Michael M. Richter are vigorously pursuing this goal. They have placed in various journals an AAR request for open questions. Just this morning, March 7, Richter called and said he is writing to additional mathematics journals and logic journals to have them announce this AAR project. Siekmann and Richter are to be congratulated for their zeal and organization. Problems can be sent to Siekmann or Richter at the following addresses:

Michael M. Richter
Universitat Aachen
Lehrstuhl fur Angewandte
Mathematik
Templergraben 55
5100 Aachen
West Germany

Jorg H. Siekmann
Universitat Karlsruhe
Institut fur Informatik I
Postfach 6380
7500 Karlsruhe 1
West Germany

Jorg Siekmann's arpanet address is wrightson@rutgers.

As an example of what is likely to happen, a mathematician from the University of Virginia has assembled a number of "small open problems" that he suspects are candidates for attack with a reasoning program.

AMS Meeting

Woody Bledsoe is to be commended for his success in setting up the biannual awards for Automated Theorem Proving. The first were given in Denver at the Winter meeting of the AMS. Hao Wang was awarded the prize for "milestones," and Steve Winker and Larry Wos shared the award for "current achievement." Bledsoe is also to be commended for arranging a special session on Automated Theorem Proving that was held at the winter meeting and at which a number of papers were presented. Strong consideration is being given to publishing the papers that were given at the special session, perhaps as a monograph.

Future Journals and/or Newsletters

Reidel is now seriously considering publishing a Journal of Automated Reasoning. A market survey will be taken, the results of which will decide the issue.

The following features or columns have been suggested for regular (or irregular) inclusion in future AAR newsletters. Please comment on the suggestions and, if you wish, add to them.

1. Short technical papers, not to exceed 600 words.
2. Announcements of results.
3. Position papers, not to exceed 600 words.
4. Announcements of meetings and workshops.
5. Descriptions of new programs.
6. Experiments with programs, including failures.
7. Challenge problems, including previous successes if such exist.

8. Clause sets (or alternate representation) with the accompanying problem description and a request for an idea for improving performance.
9. Concepts with a request for representation in clause form or in some other form acceptable by an automated reasoning program.

Submissions in any of the above categories are welcome and can be sent to either Larry Henschen or Larry Wos.

At the 6th CADE conference in New York, Rob Shostak agreed to serve as chairman of the committee to gather standard problems. The need for a large set of problems, each accompanied by a representation in clause form or some other acceptable form, fully commented, and hopefully with a solution in the given notation, has sharply increased. Such problems would be very useful for those just entering the field of automated reasoning. They illustrate what can be done, what is being contemplated, and what some of the difficulties are. Problems are required to test new and existing software. In fact, I have just received another request (from the University of Virginia) for a problem set to be used to test a number of new automated theorem-proving programs. We include the following problem, contributed by Rusty Lusk, to illustrate one form such submissions might take.

The Truth-tellers and Liars Puzzle

On a certain island the inhabitants are partitioned into those who always tell the truth and those who always lie. I landed on the island and met three inhabitants A, B, and C. I asked A, "Are you a truth-teller or a liar?" He mumbled something which I couldn't make out. I asked B what A had said. B replied, "A said he was a liar." C then volunteered, "Don't believe B, he's lying!" What can you tell about A, B, and C?

Clauses for the Truth-tellers and Liars:

$P(x)$ means "x is true".
 $T(x)$ means "x is a truth-teller".
 $L(x)$ means "x is a liar".
 $Says(x,y)$ means "x says y".
 The symbol "|" means "or"; "&" means "and".

"T", "L", and "Says" appear as functions rather than predicates so that they can appear as arguments of "Says". To assert them we need the predicate "P".

Everyone is either a truth-teller or a liar, but not both:

$P(T(x) \mid P(L(x)))$;
 $\neg P(T(x)) \mid \neg P(L(x))$;

What truth-tellers and liars are:

if $P(T(x)) \ \& \ P(Says(x,y))$ then $P(y)$;
 if $P(L(x)) \ \& \ P(Says(x,y))$ then $\neg P(y)$;
 if $P(y) \ \& \ P(Says(x,y))$ then $P(T(x))$;
 if $\neg P(y) \ \& \ P(Says(x,y))$ then $P(L(x))$;

What they told me on the island:

P(Says(A,Unknown));
P(Says(B,Says(A,L(A))));
P(Says(C,L(B)));

The following is the output from the LMA-based theorem-proving system *intthp*. The inference rule used is hyperresolution. The clauses describing the utterances of A, B, and C are placed in the set of support. No special heuristics are used, except that the least complex clause is always selected as the given clause from the set of support.

axioms:

1 P(T(x1)) | P(L(x1));
2 -P(T(x1)) | -P(L(x1));
3 -P(T(x1)) | -P(Says(x1,x2)) | P(x2);
4 -P(L(x1)) | -P(Says(x1,x2)) | -P(x2);
5 -P(x1) | -P(Says(x2,x1)) | P(T(x2));
6 P(x1) | -P(Says(x2,x1)) | P(L(x2));

set of support:

7 P(Says(A,Unknown));
8 P(Says(B,Says(A,L(A))));
9 P(Says(C,L(B)));

generated:

10 P(Unknown) P(L(A));	ancestors: 7 3 1
11 P(L(B)) P(L(C));	ancestors: 9 3 1
12 P(T(C)) P(T(B));	ancestors: 9 4 1 1
13 P(Says(A,L(A))) P(L(B));	ancestors: 8 3 1
14 P(Says(A,L(A))) P(T(C));	ancestors: 8 3 12
15 P(L(B)) P(L(A));	ancestors: 13 3 1
16 P(L(B)) P(T(A));	ancestors: 13 4 1 1
17 P(L(B)) P(Unknown);	ancestors: 13 4 10 10
18 P(Unknown) P(T(C));	ancestors: 17 2 12
19 P(T(C)) P(T(A));	ancestors: 18 4 1 7
20 P(L(A)) P(T(C));	ancestors: 15 2 12
21 P(L(B));	ancestors: 15 4 7 17
22 P(T(C));	ancestors: 21 2 12

Problems with the accompanying documentation are to be sent to Dr. R. Shostak at the following address.

Dr. R. Shostak
Computer Science Laboratory
333 Ravenswood Ave.
Menlo Park, Ca. 94025

Rob Shostak's arpanet address is shostak@sri-csl.

Since the compilation of this problem set is no small task, we ask for volunteers to assist Dr. Shostak. We suggest that such volunteers contact him directly.

The next edition of the AAR newsletter is intended to contain material of the type listed above. The form and content of this letter will reflect the wishes of the members of AAR.

We close with thanks to those at the 6th CADE conference for their idea and persistence in forming this organization. The evidence points to marked success for the AAR organization. R. Hong, who is employed by Grumman and who is also an IEEE chairman, is distributing information about AAR. He is just one example of the excitement that we are generating. As some mathematicians and some physicists say, "The first and second derivatives are both positive."

--Larry Wos
President, AAR