TECHNICAL SUMMARY REPORT

University of Texas
W. W. Bledsoe (Principal Investigator)
Grant GJ-32269
September 1, 1972 – February 28, 1975
Research in Automatic Theorem Proving

August 31, 1973   ATP-11

1. SUMMARY.

During the last year we developed a man-machine theorem proving system based on earlier work and tested it on a variety of theorems in General Topology [1]. This is still very much in the developmental stage and is expected to grow and, hopefully, become more effective as an aid to the mathematician.

Also developed was a "graphic" proving system which will become an integral part of our larger system, which stores hypotheses information, and consequences of it, in a "graph" for easy use on smaller problems [2].

A Ph.D. thesis on "Equality Atom Term Locking" was completed by Dallas Lankford. This extends the concept of LOCKING to equality substitutions in paramodulation.

Another Ph.D. thesis was completed by Vesko Marinov which gives mathematical relationships between the length of the longest clause and the number of clauses in a set of clauses in Resolution.

One interesting concept which was introduced into our man-machine programs was that of the "PAIRS procedure" [1]. It is in the spirit of backchaining, but instead of being triggered by a single match, it is rather triggered by "a double partial match". It provides another way (along with the REDUCE table) of storing easily accessible semantic information and advice to the program. The trend in our programs is now away from the syntactic oriented concepts which were exhibited by earlier Resolution programs, and toward natural deduction type systems which utilize semantic procedures similar to those used by man.

2. See 1.

3. PERSONNEL.

W. W. Bledsoe – Professor of Mathematics and Computer Science
     Principal Investigator

James Vick – Assistant Professor of Mathematics
     (Practiced on system)

William Henneman – Assistant Professor of Computer Science
     Researcher and Consultant

Michael Ballantyne – Graduate Student in Mathematics
     Researcher and Programmer

William Bennett – Graduate Student in Mathematics
     Researcher and Programmer

Peter Bruell – Graduate Student in Mathematics
     Researcher and Programmer

Vesko Marinov – Graduate Student in Computer Science
     Researcher and Programmer
     (Finished his Ph.D.)

Dallas Lankford – Graduate Student in Mathematics
     Researcher and Programmer
     (Finished his Ph.D.)

Howard Ludwig – Undergraduate Student in Mathematics
     Programmer

4. PUBLICATIONS.

A. Published

   1. W. W. Bledsoe and Peter Bruell, "A Man-Machine Theorem Proving System", Third International Joint Conference on Artificial Intelligence, Stanford, California, August 20-23, 1973.

   2. W. W. Bledsoe and C. E. Wilks, "A Result on Borel Product Measures", Pacific Journal of Mathematics, 42, 1972, 569-79.

B. Accepted for Publication

   3. R. H. Bing, W. W. Bledsoe, and R. D. Mauldin, "Sets Generated by Rectangles", accepted for publication in the Pacific Journal of Mathematics, 51 (1974) 27-36.

C. In Preparation for Submission

   4. Michael Ballantyne and William Bennett, "Graphing Methods for Topological Proofs", Computer Science Department Memo, University of Texas, August, 1973.

   5. D. S. Lankford and R. S. Boyer, "Locking and Equality Atom Term Locking for Resolution and Paramodulation".

D. Ph.D. Theses

   6. Dallas Lankford, "Equality Atom Term Locking", Ph.D. Thesis, University of Texas, Austin, May, 1973.

   7. Vesko Marinov, "Maximal Clause Length Resolution", Ph.D. Thesis, Computer Science Department, University of Texas, Austin, August, 1973.

E. Internal Papers

   8. Peter Bruell, "A description of the functions of the Man-Machine Theorem Prover", Computer Science Department Memo, University of Texas, May, 1973.

   9. William Bennett and Michael Ballantyne, "Improved AI LISP Editor", Computer Science Department Memo, University of Texas, September, 1973.

5. RELATED ACTIVITIES.

In addition the principal investigator has taught courses in mathematics and computer sicence at the University of Texas and supervised graduate students. Starting this fall he will be chairman of the mathematics department.

We are exploring the possibility of using our man-machine prover, in its present form or reconstructed, as an aid in proving correctness of computer programs. This is being explored with Dr. Ralph London and Dr. Donald Good of the Information Sciences Institute at the University of Southern California.

W. W. Bledsoe
Professor of Mathematics
    and Computer Science
Principal Investigator