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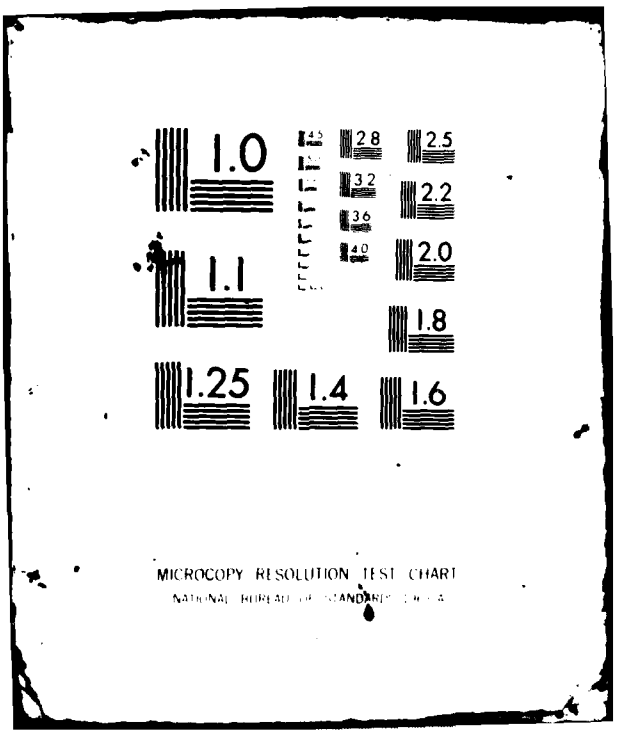
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MASS. INSTITUTE OF TECHNOLOGY
LABORATORY FOR COMPUTER SCIENCE
FINAL REPORT
TO THE US AIR FORCE
FOR RESEARCH IN ALGEBRAIC MANIPULATION
1980-1981
CONTRACT NO. AFOSR-80-0250

JOEL MOSES
PRINCIPAL INVESTIGATOR



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This report is a summary of the still ongoing research performed under the support of this grant.

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REPORT TO THE US AIR FORCE
RESEARCH ON ALGEBRAIC MANIPULATION
1980-1981

Our research in the past year has concentrated on algorithms for the integration of algebraic functions, these algorithms are being developed by Barry Trager. As explained in our recent proposal, this work is still incomplete. We are enclosing drafts of major sections of Trager's thesis with this report. We suggest, however, since this is largely work in progress, that this report might not be given large distribution at this time. Our goal is to complete this work in the current fiscal year.

Trager's attack on the integration problem is to be contrasted with a more straight forward approval of Dr. James Davenport of Cambridge. Davenport has taken Risch's suggested approach and implemented it with same variations. We believe that in many problems of practical interest Risch suggested performing special kinds of Laurent series expansions (Puiseux expansions) for the algebraic functions as its poles and at infinity. These expansions will introduce new algebraic constants into the computation. In practice, many of their constants will cancel and not show up in the integral at all. Trager's Master thesis showed how one could predict the constants that are actually required in the integral of a rational function. In this work, he is extending this approach to the much more difficult problems of the integration of algebraic functions.

Trager's attention to the computation effeciency of the algorithms is also noted in his research for relatively low bounds for the number of terms

one needs to consider in the integral. This work is unfortunately, not yet fully written up.

Related work that has arisen from this research appears in Davenport and Trager's article in the recent Symsac '81 conference. Their interest in complete factorization is motivated by the algebraic integration problem. The exact relevance of complete factorization to algebraic integration is still unclear. Professor Kleiman of the M.I.T. Mathematics Department has made some suggestions which may simplify the algebraic integration problem so that complete factorization is no longer required.