

Contents

List of Contributors

v

Foreword

ix

Interactive Systems from the User's Point of View

Interactive Programming and Automated Mathematics

Melvin Klerer

3

On the User's Point of View

Burton D. Fried

11

The APL\360 Terminal System

A. D. Falkoff and K. E. Iverson

22

The Maniac II System

Roger Lazarus, Mark Wells, and John Wooten, Jr.

38

AMTRAN: Automatic Mathematical Translation

Robert N. Seitz, Lawrence H. Wood, and Charles A. Ely

44

Structure of a Language for a Numerical Analysis Problem Solving System

Lawrence R. Symes and Roger V. Roman

67

REDUCE: A User-Oriented Interactive System for Algebraic Simplification

Anthony C. Hearn

79

Two Analyst-Oriented Computer Languages: EASL, POSE

Stewart I. Schlesinger, Lawrence Sashkin, and Kenneth C. Reed

91

VENUS: A Small Interactive Nonprocedural Language

Howard F. Matthews

97

AL: An Artificial Language

Gerald W. Bradley

101

Active Language I

Rene De Vogelaere

106

The Engineering Assistant: Design of a Symbol Manipulation System

Edgar H. Sibley

138

**CHARYBDIS: A LISP Program to Display Mathematical Expressions
on Typewriter-like Devices**

Jonathan K. Millen

155

Components of Interactive Systems

Coherent Programming in the Lincoln Reckoner

*Raymond A. Wiesen, Douwe B. Yntema, James W. Forgie, and
Arthur N. Stowe*

167

Algebraic Manipulation on Computers for Scientists and Engineers

Krzysztof S. Frankowski and C. Duane Zimmerman

178

**An Interactive Console Operating as Background in a Large Computer
System**

S. Schlesinger, L. Sashkin, and C. Aumann

179

Design Philosophy for an Interactive Keyboard Terminal

Melvin Klerer, Fred Grossman, and Charles H. Amann

183

A Facility for User Definition of Simple Problem Oriented Languages

D. M. Manelski, H. C. Lefkovits, and H. J. Hebert

192

Mathematical Symbol Processing

C. Abraham and T. Pearcey

196

LC²: A Language for Conversational Computing

J. G. Mitchell, A. J. Perlis, and H. R. Van Zoeren

203

**AMTRAN: Implications of an Interactive Mathematical Computer
System for an Educational Institution**

A. V. Jett, Jr.

215

What is Different about AMTRAN?

Richard J. Plocica

220

An Object Code for Interactive Applied Mathematical Programming

Kenneth Lock

222

**The Slave Interactive System: A One-User Interactive Executive Grafted
on a Remote-Batch Computing System**

Kenneth J. Busch and Gottfried W. R. Luderer

225

The Development of Systems for On-Line Mathematics at Harvard

Adrian Ruyle

241

Other Topics of Interest to Interactive Systems

An Analysis of Computer Operations Under Running Time Priority Disciplines	
<i>E. G. Coffman, Jr.</i>	257
A Message System for Interactive Dialog	
<i>G. C. Patton</i>	271
A Macroscopic Model of an Interactive Computing System	
<i>James N. Haag</i>	284
A Content-Evaluating Mode of Computer-Aided Instruction	
<i>G. K. Manacher</i>	286
OLDAS: An On-Line Continuous System Simulation Language	
<i>Richard P. Cullen</i>	294

Automation of Applied Mathematics

On the Construction of Polyalgorithms for Automatic Numerical Analysis	
<i>John R. Rice</i>	301
A Proposed Numerical Accuracy Control System	
<i>Herbert S. Bright</i>	314
A Learning Program for the Integration of Systems of Ordinary Differential Equations	
<i>L. J. Gallaher and I. E. Perlin</i>	335
On Experiences with PIL, an Interpretive Language, in an Undergraduate Numerical Methods Course	
<i>Joseph B. Muskat, Francis E. Sullivan, and Paul R. Borman</i>	341
Curve Fitting and Editing via Interactive Graphics	
<i>Arthur S. Priver and Barry W. Boehm</i>	343
FORTRAN Codes to Fit Curves Interactively	
<i>Lyle B. Smith</i>	346
Analyst Assistance Program (AAP)	
<i>Anne B. Ammerman</i>	349

Implementation of Interactive Systems

Mathematical Laboratories: A New Power for the Physical Sciences <i>Glen J. Culler</i>	355
Implementation of a Reckoner Facility on the Lincoln Laboratory IBM 360/67 <i>Peter B. Hill and Arthur N. Stowe</i>	385
The Implementation of APL\360 <i>L. M. Breed and R. H. Lathwell</i>	390
Implementation Considerations in a Numerical Analysis Problem Solving System <i>Roger V. Roman and Lawrence R. Symes</i>	400
An Implementation of Automatic Array Arithmetic by a Generalized Push-Down Stack <i>Juris Reinfelds</i>	411
An Example of the Manipulation of Directed Graphs in the AMBIT/G Programming Language <i>Carlos Christensen</i>	423
Syntax-Directed Recognition of Hand-Printed two-Dimensional Mathematics <i>Robert H. Anderson</i>	436
A Model for Interactive Systems Design <i>Helen M. Willett</i>	460
Summary <i>Burton D. Fried</i>	462
<i>Index</i>	467

