The IEEE Computer Society's Tenth Annual International

Computer Software & Applications Conference

Tutorials: October 6-7, 1986  Conference: October 7-10, 1986

a choice of four preconference tutorials

<table>
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<th>COMPSAC 86 Committees</th>
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<td>GENERAL CHAIRMAN</td>
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<td>Tsun S. Chow</td>
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<td>Sargent &amp; Lundy Engineers</td>
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<td>Joseph P. Cavano</td>
<td>Rome Air Development Center</td>
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<td>Amrit Goel</td>
<td>Syracuse University</td>
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<td>Robert B. Grafton</td>
<td>National Science Foundation</td>
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<td>Tadao Ichikawa</td>
<td>Hiroshima University, JAPAN</td>
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<td>Jie-Yong Juang</td>
<td>Northwestern University</td>
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IEEE COMPUTER SOCIETY
Doug DeGroot, Lecturer  
Monday, October 6, 1986  
Florentine Room—9:00 a.m.-5:00 p.m.

**Audience:** Intended for programmers, programming managers and software managers.

**Course Description:** PROLOG will be introduced and evaluated. Starting with a quick introduction to logic, the seminar continues with a series of complex PROLOG examples; Unification and resolution are explained; A simple PROLOG interpreter is explored to show how the control component of PROLOG works. A series of typical application domains of PROLOG are investigated. Upon completion the student should be able to begin writing PROLOG programs and develop an appreciation of the language's power, ease of expression and simplicity of control.

**Course Outline:**
- Fundamental logic
- Simple PROLOG Examples
- Data Structures
- Unification and Resolution
- A Simple PROLOG Interpreter
- PROLOG an Expert System
- Knowledge Database Management
- Control of Searching and Backtracking
- Implementation Details
- Performance Issues

Doug DeGroot received a B.S. in Mathematics and Ph.D. in Computer Science, both from the University of Texas at Austin. While there, he was a member of the Texas Reconfigurable Array Computer (TRAC) project, with special responsibility for operating system design and machine performance simulations. Upon graduating in 1981, he joined IBM's T. J. Watson Research Center. In July of 1985 he became Vice President of Research and Engineering at Quintus Computer Systems. He is Chairman of ACM's SIGARCH and served as Technical Chairman of the IEEE 1985 International Conference on Parallel Processing and General Chairman of the IEEE 1985 Symposium on Logic Programming.

Robert S. Arnold, Lecturer  
Monday, October 6, 1986  
Gold Room—9:00 a.m.-5:00 p.m.

**Audience:** This seminar is for software developers, maintainers, and managers—those concerned with how software deterioration can be prevented and with the techniques/tools for remedying it.

**Course Description:** Hard-to-change software is devalued software. This seminar is dedicated to preserving an organization's software investment. This seminar will:
- Show how software restructuring can help achieve software maintenance goals.
- Present over 30 techniques for restructuring software, and how to make a wise choice among them.
- Show how to calculate when software restructuring will pay, and when it won't.
- Show how to stop software structure from deteriorating in the first place.

**Course Outline:**
- The Benefits of Software Restructuring
- Software Renewal: A Restructuring Case Study
- Metrics for Software Structure
- Criteria for When to Restructure Software
- Incremental Restructuring: Software Change Without Software Deterioration
- A Survey of Software Restructuring Techniques
- Practical Issues in Applying Restructuring Techniques
- Deciding When Software Restructuring Will Pay

Robert S. Arnold is a member of the technical staff at the MITRE Corporation. He has taught professional seminars in software maintenance, software testing, software quality assurance, design techniques, C, and UNIX.*

Dr. Arnold is Program Co-Chair for the Conference on Software Maintenance—1987 and he is also a member of the IEEE Working Group on a Standard for Software Quality Metrics. Dr. Arnold received his Ph.D. in computer science from the University of Maryland in 1983 and his M.S. in computer science from Carnegie-Mellon University in 1977.

*UNIX is a trademark of AT&T Bell Laboratories.
NEW PARADIGMS FOR SOFTWARE DEVELOPMENT

William W. Agresti, Lecturer
Tuesday, October 7, 1986
Gold Room—9:00 a.m.-5:00 p.m.

Course Description: The software life-cycle "waterfall" model has been criticized recently as not always being a useful model of the development process. This tutorial exposes the limitations and assumptions of the life-cycle model. Prototyping, operational specification, and transformational implementation are presented as the bases of new paradigms of software development that respond to criticisms of the life-cycle model. Examples will illustrate how these three methodologies are being used today. The tutorial discusses an organization's transition from the life-cycle to newer paradigms. The framework for a more flexible development process is introduced.

Course Outline:
- Introduction—process models of software development; the evolution and assumptions of the conventional life-cycle
- Critiques of the Life-Cycle—its observed inadequacies relative to constantly shifting requirements, maintenance, specification/design interaction, end-user development, and reusability
- Prototyping—what, when, how and why to prototype; industry examples; support tools; evaluating a prototype; discarding vs. evolving a prototype
- Operational Specification—the operational approach; behavior-producing specifications; case studies
- Transformational Implementations—current approaches; examples of transformational systems; expert systems
- The Flexible Development Process—a proposed new base model of software development; its customization based on process drivers

William W. Agresti is a senior computer scientist with Computer Sciences Corporation in Silver Spring, Maryland. His applied research and development projects support the Software Engineering Laboratory at NASA's Goddard Space Flight Center. He is task leader on software engineering studies and project leader of a NASA-CSC team that is designing and building flight dynamics software in Ada. From 1973-83 he held various faculty and administrative positions at the University of Michigan-Dearborn, including founding Director of Computer and Information Sciences. Dr. Agresti received his B.S. degree from Case Western Reserve University, and the M.S. and Ph.D. from New York University.

"ADA is a registered trademark of the U.S. Government (Ada Joint Program Office)."

INTERACTIVE SOFTWARE DEVELOPMENT ENVIRONMENTS

Anthony I. Wasserman, Lecturer
Tuesday, October 7, 1986
Florentine Room—9:00 a.m.-5:00 p.m.

Course Description: This tutorial presents the state of the art in the use of interactive systems for software development. The seminar proceeds from general considerations of human factors and history of interactive systems, through examination of specific tools and development environments to an examination of both the short and medium term future of interactive development environments. Particular attention is given to the use of high-performance workstations based on bit-mapped graphical displays, and to the necessary software development tools for such an environment. A distinction is drawn between programming environments and more general software development environments.

Course Outline:
- Introduction
  Methodologies and Environments
  Components of Environments
  Programming Environments vs. Software Development Environments
- Software Tools
  Types of Tools
  Structured Editors for Program Development
  Debugging and Testing Aids
  Documentation Aids
- Tool Integration
  Architectures for Environments
  Tool Communication
  Open vs. Closed Architectures
  Hardware Support for Software Development Environments
  Programming Systems—INTERLISP
  Operating System Based Environments—UNIX
  The Software through Pictures* Environment
- Toward Improved Development Environments

Anthony I. Wasserman is Professor of Medical Information Science at the University of California, San Francisco, and a Lecturer in the Computer Science Division at the University of California, Berkeley. He is a founder and President of Interactive Development Environments, Inc., of San Francisco. He is the principal architect of the User Software Engineering methodology for the development of interactive information systems. His research interests include programming environments and software development methodology.

"*Software through Pictures is a trademark of Interactive Development Environments, Inc."
TUESDAY, October 7, 1986

6:00 p.m.-9:00 p.m. Pre-Conference Reception—Windsor Room

WEDNESDAY, October 8, 1986

9:00 a.m.-10:30 a.m. Opening Session—Gold Room
Welcome—Alan Davis, General Chairman
Award Presentation—Roy L. Russo, President, IEEE Computer Society
Overview of Program—John R. North, Program Chairman
The First 10 Years, Stephen S. Yau, COMPSAC Steering Committee Chairman
Keynote Address—
10:30 a.m.-11:00 a.m. Break
11:00 a.m.-12:30 p.m. Five Parallel Sessions

Session GH-1W—Great Hall
SOFTWARE PRODUCTIVITY METRICS
Minireview: Jai K. Navlakha, Florida International University, USA

Session GO-1W—Gold Room
SOFTWARE APPLICATIONS
Session Chairperson: John R. North, AT&T, USA
Evaluation of Ada from the Viewpoint of Control Engineering; Wolfgang A. Halang, University of Petroleum & Minerals, SAUDI ARABIA
Software Architecture for Advanced Communications Systems; Norihiro Aritaka, Yoshinobu Fujii, Katsuyoshi Yamaguchi and Shuzo Morita, FUJITSU LABORATORIES LTD., JAPAN
A User-Oriented Analysis of file Usage in UNIX*; Murthy V. Devarakonda and Ravishshankar K. Iyer, University of Illinois at Urbana-Champaign, USA

Session WI-1W—Windsor Room
THE ESPRIT SOFTWARE PROJECT SUPPORT ENVIRONMENT PROGRAM
Session Chairperson: John Hawgood, PA Computers and Telecommunications, ENGLAND
Panelists: Pierre-Yves Cunin, ESPRIT, BELGIUM
Jean Philippe Bourguignon, Bull, FRANCE
Chris Hort, Siemens, WEST GERMANY

Session FL-1W—Florentine Room
HIGH PERFORMANCE DISTRIBUTED COMPUTER SYSTEMS
Session Chairperson: Tsun S. Chow, AT&T Bell Laboratories, USA
Global State Identification for Load Balancing in a Computer System with Multiple Contention Busses; Jie-Yong Juang, Northwestern University and Benjamin Wah, University of Illinois at Urbana-Champaign, USA
Optimistic Concurrency Control-Schemes for Performance Enhancement; M. A. Basiouni and U. Khamare, University of Central Florida, USA
A Dynamic Task Scheduling Algorithm for Symmetric and Homogenous Distributed Systems; A. Ghafoor and Rajendra Inamdar, Syracuse University, USA

Session GP-1W—Grant Park Room
KNOWLEDGE-BASED SYSTEMS
Session Chairperson: Albert Hawkes, Sargent & Lundy Engineers, USA
Modularized OPS-Based Expert Systems Using UNIX Tools; Pamela T. Surko, AT&T Bell Laboratories, USA
Space Shuttle Main Engine Test Analysis: A Case Study for Inductive Knowledge-based Systems Involving Very Large Databases; Djamshid Asgari, Rockwell International and Kenneth L. Modesitt, California State University, USA
A Knowledge Based Software Maintenance Environment; Stephen S. Yau and Sying-Syang Liu, Northwestern University, USA

12:30 p.m.-2:00 p.m. Lunch Break
2:00 p.m.-3:30 p.m. Five Parallel Sessions

Session GH-2W—Great Hall
SOFTWARE QUALITY MANAGEMENT: US AND JAPANESE PERSPECTIVES
Session Chairperson: Joseph Cavano, Rome Air Development Center, USA
Panelists: Motoo Azuma, NEC Corporation, JAPAN
Jack McKissick, General Electric Company, USA
Tom Pingel, AT&T, USA
Katsumichi Yasuda, Hitachi, JAPAN

Session GO-2W—Gold Room
DATA ANALYSIS AND MODELING IN SOFTWARE ENGINEERING
Minireview: Amrit Goel, Syracuse University, USA

Session WI-2W—Windsor Room
DEVELOPMENT ENVIRONMENTS AND TOOLS
Session Chairperson: Edward R. Comer, Software Productivity Solution, USA
AISPE: An Advanced Industrial Software Production Environment; Giorgio Bruno, Paolo Spiller and Ivo Tota, Politecnico di Torino, ITALY
Automation Structured Analysis; Andy Simmons and Alan Hecht, Cadre Technologies Inc., USA
A Generation System for Language-Oriented Editors; Takao Tenma, Hideaki Tebotani, Minoru Tanaka and Tadao Ichikawa, Hiroshimo University, JAPAN

Session FL-2W—Florentine Room
DISTRIBUTED SYSTEMS
Session Chairperson: Jie-Yong Juang, Northwestern University, USA
The Design of an Adaptable Distributed System; Bharat Bhargava and John Riedl, Purdue University, USA
Discrete Event Simulation in a Distributed System; K. Venkatesh, T. Radhakrishnan and H. Li, Concordia University, CANADA
A Distributed Specification Model and its Prototyping; Yu Wand, GTE Laboratories Inc., USA

Session GP-2W—Grant Park Room
REASONING TECHNIQUES FOR KNOWLEDGE-BASED SYSTEMS
Session Chairperson: James Ferrans, Gould Research Center, USA
An Evaluation of Two New Inference Control Methods; Y. H. Chin and W. L. Peng, National Tsing Hua University, TAIWAN
Learning Dominance Relations in Combinatorial Search Problems; Chee-Fen Yu and Benjamin Wah, University of Illinois at Urbana-Champaign, USA
Fuzzy Reasoning Based on Lambda-LH-Resolution; Xu-Hua Liu, Carl K. Chang and Jing-Pha Tsai, University of Illinois at Chicago, USA

3:30 p.m.-4:00 p.m. Break
4:00 p.m.-5:30 p.m. Four Parallel Sessions

Session GP-3W—Grant Park Room
MEASUREMENT TOOLS
Session Chairperson: Nicholas Marseo, AT&T, USA
Software Quality Measurement Tools and Techniques; Deborah A. Cerino, Rome Air Development Center, USA
The Effective Configuration Management Environment; Michael W. Evans, Paul C. Houk, Karl M. Pearson and Gary W. Furr, EXPERTWARE, Inc., USA
Session WI-3W—Windsor Room
SOFTWARE TEAMS AND QUALITY
Session Chairperson: Motoei Azuma, NEC Corporation, JAPAN
Panelists: Terry Baker, IBM Corporation, USA
           Elizabeth A. Buie, Computer Science Corporation, USA
           Irene Greif, MIT, USA
           TBD, NTT, JAPAN
Session GH-3W—Great Hall
SOFTWARE REQUIREMENTS SPECIFICATION
Minireview: Paul C. Jorgensen, Arizona State University, USA

Thursday, October 9, 1986

9:00 a.m.-10:00 a.m. Plenary Session—Gold Room
SOFTWARE PRODUCTIVITY
Howard Yudkin, President, Software Productivity Consortium, Inc., USA
10:00 a.m.-10:30 a.m. Break

10:30 a.m.-12:00 p.m. Four Parallel Sessions
Session GH-4T—Great Hall
COMPARING ALTERNATIVE SOFTWARE ESTIMATION MODELS AND SYSTEMS—PART II
Session Chairperson: Howard A. Rubin, Hunter College, USA—ESTIMACS model
Panelists: Barry Boehm, TRW, USA
          Larry Putnam, Quantitative Software Management, USA—SLIM model
          Robert Tausworthe, USA
          T. Capers Jones, Software Productivity Research, USA—SPOR model
          Alan Albrecht, USA
          Ken Zwanzig, USA

Session GO-4T—Gold Room
REQUIREMENTS SPECIFICATIONS
Session Chairperson: Carl K. Chang, University of Illinois at Chicago, USA
Use of Formal Requirement Specifications with EDE in a Software Development Environment; Michael Goedicke, University of Dortmund, WEST GERMANY
Complete Specifications and the Sorcerer's Apprentice Problem; Paul C. Jorgensen, Arizona State University, USA
Requirements Clustering for Incremental Construction of Software Systems; P. Hsia, A. T. Yang and S. H. Jiam, University of Texas at Arlington, USA

Session WI-4T—Windsor Room
COMMUNICATION PROTOCOLS
Session Chairperson: Lorraine Duvall, IIT Research Institute, USA
Synthesis and Performance Evaluation of Error-Recoverable Protocols; C. V. Ramamoorthy, Y. Yaw, R. Aggarwal, J. Song, University of California at Berkeley and W. T. Tsai, University of Minnesota, USA
FLUIDE: A Multiple Data and Control Flow Computing Organization; Jacques Skubich, Institute National des Sciences Appliquees, FRANCE
A New Algorithm for Fast Protocol Validation; Yoshiaki Kakuda, Yasushi Wakahara and Masamitsu Norigoe, Kokusai Denshin Denwa Company, Ltd., JAPAN

Session FL-4T—Florentine Room
SPECIAL PURPOSE COMPUTER SYSTEMS FOR SUPPORTING AI APPLICATIONS
Minireview: Benjamin Wah, University of Illinois at Urbana-Champaign, USA
12:00 p.m.-1:30 p.m. Lunch Break
1:30 p.m.-3:00 p.m. Five Parallel Sessions
Session GH-5T—Great Hall
COMPLEXITY METRICS
Session Chairperson: Joseph Cavana, Rome Air Development Center, USA
An Approach to Measuring Data Structure Complexity; W. T. Tsai, M. A. Lopez, V. Rodriguez and D. Volovik, University of Minnesota, USA
On Complexity Metrics Oriented for Distributed Programs; S. M. Shatz, University of Illinois at Chicago, USA
An Empirical Evaluation of Program Complexity Metrics; Joy L. Knox and Kuo-Chung Tai, North Carolina State University, USA

Session FL-3W—Florentine Room
THE IMPACT OF KNOWLEDGE-BASED TECHNOLOGY
Session Chairperson: Carl K. Chang, University of Illinois at Chicago, USA
Panelists: Don McNamara, GE Corporate Research, USA
          Kiyoh Nakamura, FUJITSU LIMITED, JAPAN
          Weider Yu, AT&T Bell Laboratories, USA
          R. C. T. Lee, National Tsing Hua University, TAIWAN
6:00 p.m.-9:00 p.m. Conference Reception—Gold Room

SOFTWARE RELIABILITY
Session Chairperson: Leslie Eaton, AT&T-IS, USA
The Trouble with Software Reliability; G. Gordon Schumey and Halsey Chenoweth, Westinghouse Defense & Electronics Center, USA
New Directions in Software Reliability Analysis; Halsey Chenoweth and G. Gordon Schumey, Westinghouse Defense & Electronics Center, USA

Session GO-5T—Gold Room
REAL TIME REQUIREMENTS METHODS DEMONSTRATED
Session Chairperson: Don Utter, AT&T Network Systems, USA
Panelists: Mack Alford, General Electric Co., USA—Distributed Computing Design System; Paul Clements, Naval Research Laboratories, USA—AT-7—Software Cost Reduction; Derrick Hatley, Lier Siegler, USA—Real Time Structured Analysis; John Stockenberg, SoftTech, USA—SADT; Dan Teichroew, University of Michigan, USA— A Structured Approach; Stephanie White, Grumman Aerospace, USA—Comparison of Methods

Session WI-5T—Windsor Room
SUPERCOMPUTING FOR SOFTWARE APPLICATIONS
Session Chairperson: Benjamin Wah, University of Illinois at Urbana-Champaign, USA
Panelists: Faye Briggs, Rice University, USA
          Don Garra, Argonne National Laboratory, USA
          Kai Hwang, University of Southern California, USA
          Veljko Milutinovich, Purdue University, USA

Session FL-5T—Florentine Room
REUSABILITY OF PROGRAM CODE
Session Chairperson: Alan Davis, BTG, Inc., USA
SoftDA— A Reuse-Oriented Software Design System; Shuichiro Yamamoto and Sadahiro Isoda, Nippon Telegraph & Telephone, JAPAN
CIA—The C Information Abtractor; C. V. Ramamoorthy, and Yih-Farn Chen, University of California at Berkeley, USA
Support for Reusability in Genesis; C. V. Ramamoorthy, Vijay Garg and Atul Prakash, University of California at Berkeley, USA
3:00 p.m.-3:30 p.m. Break
3:30 p.m.-5:00 p.m. Five Parallel Sessions
Session GH-6T—Great Hall
SIZE METRICS
Session Chairperson: Amrit Goel, Syracuse University, USA
A Synthesis of Software Science Metrics and the Cyclic Number; Bina Ramamurthy and Austin Melton, Kansas State University, USA
How to Measure Software Size, and How Not To; Anany V. Levitin, Villanova University, USA
Software Development Effort Prediction Based on Function Points; George J. Knafi, DePaul University, and Jerome Sacks, University of Illinois at Urbana-Champaign, USA

Session GP-6T—Grant Park Room
FOURTH GENERATION LANGUAGES
Session Chairperson: Ashok Pahwa, USA
Panelists: Adarsh K. Arora, Gould Corporation, USA
Neil Blumenfield, Relational Database Systems, Inc., USA
Richard Hay, SIR Inc., USA
Stewart Schuster, Relational Technology, Inc., USA
Larry Stevens, Oracle Corporation, USA

Session GO-6T—Gold Room
REAL TIME REQUIREMENTS METHODS DEMONSTRATED
(continued)
Session Chairperson: Don Utter, AT&T Network Systems, USA
Panelists: Mack Alford, General Electric Co., USA—Distributed Computing Design System
Paul Clements, Naval Research Laboratories, USA—AT-Software Cost Reduction
Deborah Hatley, Lie Bursl; USA—Real Time Structured Analysis
John Stockenberg, SofTech, USA—SADT

Session GO-7F—Gold Room
SOFTWARE MAINTENANCE
Minireview: Wilma Osborne, NBS, USA

Session WI-7F—Windsor Room
VISUAL PROGRAMMING
Session Chairperson: Takayuki Dan Kimura, Washington University, USA
Panelists: Robert B. Grafton, National Science Foundation, USA
Gretchen P. Brown, Computer Corporation of America
Steve P. Reiss, Brown University, USA
Ephraim P. Gliner, University of Washington, USA
Bruce MacLennan, Naval Post Graduate School, USA

Session FL-7F—Florentine Room
FAULT TOLERANT SYSTEMS 1
Session Chairperson: Ravishankar Iyer, University of Illinois at Urbana-Champaign, USA
On Testing of Functionally Equivalent Components of Fault-Tolerant Software; Mladen A. Vouk, Michael L. Heisabella, Kue-Chung Tai and David F. McAllister, North Carolina State University, USA
Structuring Concepts for Robust Design; S. Pfleger, The University of Newcastle Upon Tyne, GREAT BRITAIN
A Design Method for Recoverable Distributed Communications Systems; Carl K. Chang and Tsang Ming Jiang, University of Illinois at Chicago, USA

Session WI-8F—Windsor Room
AUTOMATING THE CONFIGURATION MANAGEMENT PROCESS
Session Chairperson: Michael W. Evans, EXPERTWARE, Inc., USA
Panelists: Steve Christiansen, Sequent Computer Systems, Inc., USA
Leon Presser, Softool Corporation, USA
Winston Royce, Lockheed Software Technical Center, USA
Jack Munson, System Development Corporation, USA

Session FL-8F—Florentine Room
FAULT TOLERANT SYSTEMS 2
Session Chairperson: Ibrahim Onyuksel, Northwestern University, USA
Reliability Analysis of a 3-Version Software System; Janet R. Dunham and Linda A. Lauterbach, Center for Digital Systems Research, USA
Routing and Scheduling File Transfers in a Network with Time Constraints; Kazuo Sugihara, University of Hawaii at Manoa, USA
Model for Execution Time Behavior of a Recovery Block; Ashish K. Deb and Amir L. Goel, Syracuse University, USA

Dan Teichrow, University of Michigan, USA—A Structured Approach
Stephanie White, Grumman Aerospace, USA—Comparison of Methods

Session WI-6T—Windsor Room
TRANSITION TO WORKSTATIONS
Minireview: Andres Rudnik, GTE Communication Systems Corporation, USA

Session FL-6T—Florentine Room
DATABASE TECHNIQUES AND APPLICATIONS
Session Chairperson: Pramod Warti, AT&T Bell Laboratories, USA
A Multimedia Document Base System for Office Support Work; Asao Kaneko and Yoshinori Hara, NEC Corporation, JAPAN
Multidimensional Timestamp Processing; Bharat Bhargava and Pei-Jyun Leu, Purdue University, USA
Evaluating Database Update Schemes: A Methodology and Its Applications to Distributive Systems; Kathryn C. Kinsley, Datwise, Inc. and Charles E. Hughes, University of Central Florida, USA
Deterministic Learning Automata Solutions to the Object Partitioning Problem; B. J. Oommen and D. C. Y. Ma, Carleton University, CANADA

FRIDAY, October 10, 1986
9:00 a.m.-10:00 a.m. Plenary Session—Gold Room
10:00 a.m.-10:30 a.m. Break
10:30 a.m.-12:00 p.m. Four Parallel Sessions
Session GH-7F—Great Hall
METRIC EXPERIMENTS
Session Chairperson: George Knafi, DePaul University, USA
Software Metrics Interpretation Through Experimentation: Volney Rodriguez and Wei-Tek Tsai, University of Minnesota, USA
The Cost of Typographical Errors in Software Development; Frank B. Tatom, Engineering Analysis, USA
The Relationship Between Program Complexity and Slice Complexity During Debugging Tasks; Herbert D. Longworth, Linda M. Ottenstein and Martyn R. Smith, Michigan Technological University, USA

Session GO-7F—Gold Room
SOFTWARE MAINTENANCE
Minireview: Wilma Osborne, NBS, USA

Session WI-7F—Windsor Room
VISUAL PROGRAMMING
Session Chairperson: Takayuki Dan Kimura, Washington University, USA
Panelists: Robert B. Grafton, National Science Foundation, USA
Gretchen P. Brown, Computer Corporation of America
Steve P. Reiss, Brown University, USA
Ephraim P. Gliner, University of Washington, USA
Bruce MacLennan, Naval Post Graduate School, USA

Session FL-7F—Florentine Room
FAULT TOLERANT SYSTEMS 1
Session Chairperson: Ravishankar Iyer, University of Illinois at Urbana-Champaign, USA
On Testing of Functionally Equivalent Components of Fault-Tolerant Software; Mladen A. Vouk, Michael L. Heisabella, Kue-Chung Tai and David F. McAllister, North Carolina State University, USA
Structuring Concepts for Robust Design; S. Pfleger, The University of Newcastle Upon Tyne, GREAT BRITAIN
A Design Method for Recoverable Distributed Communications Systems; Carl K. Chang and Tsang Ming Jiang, University of Illinois at Chicago, USA
12:00 p.m.-1:30 p.m. Lunch Break
1:30 p.m.-3:00 p.m. Four Parallel Sessions
Session GH-8F—Great Hall
SOFTWARE DEVELOPMENT AND MAINTENANCE
Session Chairperson: Michael Fagan, IBM Corporation, USA
An Evolution Model for Software Maintenance; Stephen S. You, Robin A. Nicholl and Jeffrey J.-P. Tsai, Northwestern University, USA
A Survey of Program Design Languages (PDLs); Brian A. Nejmeh and H. E. Dunsmore, AT&T Bell Laboratories, USA
A Review of Software Engineering Environments; Elaine Fedchak, IIT Research Institute, USA

Session WI-8F—Windsor Room
VISUAL PROGRAMMING TECHNIQUES AND APPLICATIONS
Session Chairperson: Robert Grafton, National Science Foundation, USA
The Tinkertoys Graphical Programming Environment; Mark Edel, Digital Equipment Corporation, USA
Parsing Two-Dimensional Languages; Will D. Gillett and T. D. Kimura, Washington University, USA
listof: A Pragmatic Consideration of setof; Xie Zhiliang and Ye Gang, Shanghai Jiao Tong University, CHINA

Session FL-8F—Florentine Room
FAULT TOLERANT SYSTEMS 2
Session Chairperson: Ibrahim Onyuksel, Northwestern University, USA
Reliability Analysis of a 3-Version Software System; Janet R. Dunham and Linda A. Lauterbach, Center for Digital Systems Research, USA
Routing and Scheduling File Transfers in a Network with Time Constraints; Kazuo Sugihara, University of Hawaii at Manoa, USA
Model for Execution Time Behavior of a Recovery Block; Ashish K. Deb and Amir L. Goel, Syracuse University, USA
Dan Teichrow, University of Michigan, USA—A Structured Approach
Stephanie White, Grumman Aerospace, USA—Comparison of Methods
Complete and mail your reservation to: THE AMERICANA CONGRESS HOTEL, 520 South Michigan Avenue, Chicago, IL 60605 U.S.A., (312) 427-3800. To confirm your room reservation, the American Congress must receive this coupon by September 14, 1986. Rooms will be held until 6:00 p.m. on the day of arrival unless otherwise confirmed by the hotel.

Please indicate the type of room you desire.

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<th>Type of Room</th>
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<td>Doubles/Twin</td>
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<td>Double</td>
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Arrival Date ___________ A.M. ___________ P.M. Departure Date ___________ A.M. ___________ P.M.

MAJOR CREDIT CARDS ACCEPTED: (Please print)

Card No. ____________________ Exp. Date ____________________

NAME ____________________

SHARING WITH ____________________

COMPANY NAME ____________________

ADDRESS ____________________

CITY/STATE/ZIP ____________________

COMPLETE ONE FORM FOR EACH REGISTRANT. DUPLICATE THIS FORM IF NEEDED.

REGISTRATION FORM

Complete and return this form with your check (in U.S. dollars only) payable to COMPSAC '86 or charge to your MASTERCARD or VISA using the form below.

Send to: Miriam L. Holden
COMPSAC '86
ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne IL 60439 U.S.A.
(312) 972-5558

<table>
<thead>
<tr>
<th>Registration Plan</th>
<th>Member Rate</th>
<th>Non-Member Rate</th>
<th>Student Rate</th>
<th>Member Rate</th>
<th>Non-Member Rate</th>
<th>Student Rate</th>
</tr>
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<tbody>
<tr>
<td>COMPSAC only</td>
<td>$130</td>
<td>$170</td>
<td>$45</td>
<td>$160</td>
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<td>$65</td>
</tr>
<tr>
<td>COMPSAC + 1 Tut**</td>
<td>$250</td>
<td>$325</td>
<td>$100</td>
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Students must be IEEE Student members and must show IEEE Student membership card at the door to pick-up registration package.

Tutorials must indicate which tutorial(s) for the registration.

TUTORIALS Please Check Appropriate Tutorial Numbers (only one tutorial per day)

<table>
<thead>
<tr>
<th>Tutorial Number</th>
<th>Tutorial Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Prolog &amp; Knowledge Information</td>
</tr>
<tr>
<td>2</td>
<td>2. Techniques &amp; Strategies for Restructuring Software</td>
</tr>
<tr>
<td>3</td>
<td>3. New Paradigms for Software Processing</td>
</tr>
<tr>
<td>4</td>
<td>4. Interactive Software Development Environments</td>
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</tbody>
</table>

Last Name ____________________

First Name ____________________

Company Name ____________________

Internal Address ____________________

Telephone ____________________

Street Address ____________________

City ____________________

State ____________________

Zip ____________________

Province ____________________

Country ____________________

Total fees: $ ____________

□ MASTERCHARGE

□ VISA/BANK AMERICARD

Exp. Date ____________________

Card No. ____________________

Signature (required for cards)

NOTE: Requests for refunds must be received in writing no later than September 16, 1986.

- Tutorial registration fee includes luncheon and bound text of the selected tutorial.
- COMPSAC registration fee includes a copy of the proceedings, and two complimentary beverage tickets for each of the receptions, Tuesday and Wednesday evenings. (Student registration does not include beverage tickets.)
- Limited attendance. Register early—avoid disappointment.
- The registration desk at the Americana Congress will be open according to the following hours:
  - October 5, 1986: 4:00-7:00 p.m.
  - October 6, 8, 9, 1986: 8:00 a.m.-4:00 p.m.
  - October 7, 1986: 8:00 a.m.-7:00 p.m.
  - October 10, 1986: 8:00 a.m.-2:00 p.m.