Lecture Notes in Computer Science 989
Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Advisory Board: W. Brauer D. Gries J. Stoer

Wilhelm Schäfer Pere Botella (Eds.)

Software Engineering – ESEC '95

5th European Software Engineering Conference
Sitges, Spain, September 25-28, 1995
Proceedings

Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany

Juris Hartmanis, Cornell University, NY, USA

Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Wilhelm Schäfer
Fachbereich Mathematik/Informatik, Universität-GH Paderborn
D-33095 Paderborn, Germany

Pere Botella
Facultat d'Informatica UPC
Pau Gargallo 5, E-08028 Barcelona, Spain

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Software engineering : proceedings / ESEC '95, 5th European Software Engineering Conference, Sitges, Spain, September 25 - 28, 1995 / Wilhelm Schäfter ; Pere Botella (ed.). - Berlin ; Heidelberg ; New York : Springer, 1995
(Lecture notes in computer science ; 989)
ISBN 3-540-60406-5
NE: Schäfter, Wilhelm [Hrsg.]; ESEC <5, 1995, Sitges>; GT

CR Subject Classification (1991): D.2, D.1, D.3, K.6, C.3

ISBN 3-540-60406-5 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1995
Printed in Germany

Typesetting: Camera-ready by author
SPIN 10485749 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

FOREWORD

The scope and maturity of European work in software engineering is underlined by the success of the ESEC (European Software Engineering Conference) conference series. ESEC '95 is the fifth edition of this series with the 6th coming up in 1997 in Zuerich. ESEC is supported by the major European national computer societies and is run as a CEPIS (Council of European Professional Informatics Societies) conference. It attracts submissions and attendees from around the world. This time the number of submissions again increased. The programm committee selected 29 papers out of more than 150 submissions which came from every continent in the world.

ESEC's emphasis has always been a strong technical program covering a broad scope of software engineering technology. This year's sessions are on Business Process (Re-)Engineering, Real-Time, Metrics, Concurrency, Version and Configuration Management, Formal Methods, Design Process, Program Analysis, Quality, and Object-Oriented Software Development. Another important feature of ESEC is the merge of reports on academic research and on industrial use of software engineering technology. This year, in particular ESEC presents four distinguished speakers from industry who all are very successful in transfering academic results into industrial use. We are very proud to have Francois Bancilhon (O2 Technology, F), Watts Humphrey (SEI, USA), Bertrand Meyer (ISE, USA and F), and Heinz Schwärtzel (FAST, Germany) who was formerly with Siemens Research and Development, as our keynote speakers. A panel on a currently very challenging and industrially relevant topic, namely Open Distributed Platforms, rounds up the core ESEC'95 program. ESEC'95 is preceded by a tutorial program featuring international experts who present state-of-the-art information on topics such as Domain Analysis for Reuse: A Practical Approach, Software Architecture and Iterative Development Process, Software Design and Implementation with C++ Components, An Introduction to Computer Security, The Role of Formal Specifications in Software Test.

Victor Obach (DIFINSA) and his team, especially Gloria Dedeu, Montse Obach and Joan Pena from DIFINSA, and Rosa Maria Martin and Dolors Padros from Universitat Politècnica de Catalunya did a splendid job as local organizers. We are particularly thankful to our colleagues in the program committee. Gregor Engels brought together the excellent pre-conference tutorial program. Susanne Hüppmeier and Albert Zündorf at Paderborn University helped enormously in organizing the review process.

We hope the participants enjoy ESEC'95 with us including our exciting social events, which also follow ESEC-tradition, namely to present a flavour of the local culture of the ESEC venue.

August 1995

Wilhelm Schäfer
(Universität-GH Paderborn)

Pere Botella
(Universitat Politècnica
de Catalunya)

Program Committee

Program Chair

Wilhelm Schäfer, Universität-GH Paderborn (Germany)

Executive Chair

Pere Botella, Facultat d'Informàtica UPC (Spain)

Tutorial Chair

Gregor Engels, University of Leiden (The Netherlands)

Local Arrangements Chair:

Victor Obach, DIFINSA (Spain)

Members

A. Álvarez (Spain)
N. Barghouti (USA)
R. Conradi (Norway)
E. Doberkat (Germany)
J. Ebert (Germany)
J. Favaro (Italy)
M. Franckson (France)
V. Gruhn (Germany)
M. Jazayeri (Austria)
R. Kemmerer (USA)
J. Kramer (UK)
M. Lacroix (Belgium)
G. León (Spain)
J. Martinez (Spain)
H. Mueller (Canada)
H. Obbink (NL)
W. Schäfer (Germany)
R. Welland (UK)
V. Ambriola (Italy)
P. Botella (Spain)
J.-C. Derniame (France)
V. Donzeau-Gouge (France)
G. Engels (NL)
A. Finkelstein (UK)
A. Fuggetta (Italy)
G. Kappel (Austria)
G. Koch (Spain)
P. Kroha (Germany)
A. van Lamsweerde (Belgium)
B. Magnusson (Sweden)
M. Matsumoto (Sweden)
O. Nierstrasz (Switzerland)
F. Orejas (Spain)
I. Sommerville (UK)
J. Welsh (Australia)

Table of Contents

Invited Keynotes

Demands and Perspectives for Future Software Engineers:
An Industrial Viewpoint.....1
H. Schwärtzel

Why We Need Object Databases.....3
F. Bancilhon

A Personal Commitment to Software Quality.....5
W. S. Humphrey

Business Process (Re-) Engineering

Distributed Modeling and Distributed Enaction
of Business Processes.....8
G. Graw, V. Gruhn

Improvise: Interactive Multimedia Process Visualization Environment.....28
N. S. Barghouti, E. Koutsofios and E. Cohen

Design Process Improvement Case Study Using
Process Waiver Data.....44
L. G. Votta and M. L. Zajac

Real-Time

Using a Symbolic Model Checker for Verify Safety Properties
in SA/RT Models.....59
J. Tuya, L. Sánchez, J. A. Corrales

Instrumentation of Synchronous Reactive Models for
Performance Engineering.....76
A. ValderrutenVidal, M. Vilares Ferro and J. Graña Gil

A Formal Framework for ASTRAL Inter-level Proof Obligations.....90
A. Coen-Porisini, R. A. Kemmerer, D. Mandrioli

Metrics

An Objective Reuse Metric: Model and Methodology.....109
Y.-F. Chen, B. Krishnamurthy and K.-P. Vo

Measuring Product Attributes of Object-Oriented Systems.....124
M. Hitz and B. Montazeri

Concurrency

Specifying Distributed Software Architectures.....137
J. Magee, N. Dulay, S. Eisenbach and J. Kramer

A Specification-Based Methodology for
Testing Concurrent Programs.....154
K.-C. Tai, R. H. Carver

Version and Configuration Management

Dynamic Configuration Abstraction.....173
I. Warren and I. Sommerville

Handling Version Sets Through Feature Logic.....191
A. Zeller and G. Snelting

Integrating Incremental Analysis with Version Management.....205
T. A. Wagner and S. L. Graham

Formal Methods

Graph Grammar Engineering with PROGRES.....219
A. Schürr, A. J. Winter, A. Zündorf

A Structured Analysis Formalism with Execution Semantics
to Allow Unambiguous Model Interpretation.....235
C. Gaskell and R. Phillips

An Integrated Formal Model of Scenarios
Based on Statecharts.....254
M. Glinz

Support of the Design Process

Tool Support for Formal Software Development:
A Generic Architecture....272
M. Heisel, T. Santen, D. Zimmermann

The Treatment of Non-Functional Requirements in MIKE....294
D. Landes and R. Studer

Supporting Design Rationale for System Evolution....307
S. Monk, I. Sommerville, J. M. Pendaries and B. Durin

Program Analysis

PQL: A Language for Specifying Abstract Program Views....324
S. Jarzabek....

An Exploratory Study of Program Metrics as Predictors
of Reachability Analysis Performance....343
A. T. Chamillard

An Empirical Evaluation of Three Defect-Detection Techniques....362
E. Kamsties and C. M. Lott

Quality

Assessing the Quality of Large, Software-Intensive
Systems: A Case Study....384
*A. W. Brown, D. J. Carney, P. C. Clements, B. C. Meyers, D. B. Smith,
N. H. Weiderman and W. G. Wood*

The Impact of Incremental Delivery on Maintenance
Effort: An Analytical Study....405
P. Hsia, C.-T. Hsu, D. C. Kung and A. T. Yaung

Metrics for Quality Factors in the LESD Project....423
N. Castell and O. Slavkova

Quantitative Evaluations of Software Quality
Built in with Domain-specific Disciplines....438
M. J. Matsumoto

Object-Oriented Software Development

Component Programming - a Fresh Look at Software Components.....457
M. Jazayeri

Designing a Framework by Stepwise Generalization.....479
K. Koskimies and H. Mössenböck

Object-Oriented Re-Architecturing.....498
H. Gall, R. Klösch and R. Mittermeir