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Formal Techniques in Real-Time and Fault-Tolerant Systems

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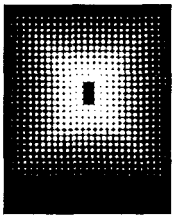

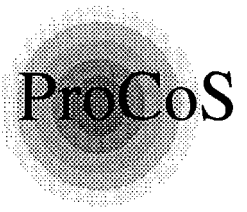

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Preface

The use of computers in safety-critical applications is increasing rapidly, as is interest in theoretical foundations for the design of reliable systems. Such systems are used in embedded applications and in interconnected networks. They are characterized both by their complexity and by the crucial need to manage this complexity using systematic principles of design.

Formal techniques constitute the foundation of a systematic design. They have beneficial applications throughout the engineering process, from the capture of requirements through specification, design, coding, and compilation, right down to the hardware that embeds the system into its environment.

This is the third in a series of international schools and symposia; the previous ones were at Warwick in 1989 and Nijmegen in 1992. The meetings during each school and symposium are devoted to considering the problems and the solutions in safe system design and to examining how well the use of formal techniques for design, analysis, and verification relates theory to practical realities.

Organization is done jointly with the CEC-supported Working Group Provably Correct Systems (ProCoS), which includes research institutions and industrial companies and is coordinated by C.A.R. Hoare, University of Oxford. Its overall objectives are to advance the state of the art of systematic design of complex heterogeneous sytems, including both software and hardware, in particular, to reduce the risk of error in the specification, design, and implementation of embedded safety-critical systems. The previous ProCoS symposium took place at Avernæs, Fyn, in 1991.

Frau Marianne Tidick, Ministerin für Wissenschaft, Forschung und Kultur des Landes Schleswig-Holstein, has kindly overtaken patronage of the international school and symposium. We organizers are indebted to her for this great honour and support. We highly appreciate that Schleswig-Holstein's government acknowledges the importance of the themes discussed at this symposium for high technology research and industry.

The lectures and tutorials at the international school are directed at practicing systems designers, safety engineers, and those who set professional standards for their work. Our highly reputed school lecturers are C. Courcoubetis, FRT, Heraklion; F. Cristian, UCSD, San Diego; R. Kurshan, AT&T / Bell Labs, New Jersey; Nancy Leveson, Univ. of Washington, Seattle; J S. Moore, Computational Logic Inc., Austin; A. Pnueli, Weizmann Inst., Rehovot; C.A.R. Hoare, Univ. of Oxford; A.P. Ravn, DTH Lyngby; E.-R. Olderog, Univ. of Oldenburg; M. Fränzle, Univ. of Kiel; Jifeng He, Univ. of Oxford. We thank these invited lecturers for their willingness to serve.

We are very fortunate to have been able to invite symposium speakers of international renown: M.O. Rabin, Harvard Univ., Cambridge, Mass., and Hebrew Univ., Jerusalem; A. Pnueli, Weizmann Inst., Rehovot; J. Hooman, Eindhoven University of Technology; L. Lamport, DEC Lab., Palo Alto; F. Schneider, Cornell Univ., Ithaca, N.Y.; A. Mok, Univ. of Texas, Austin; J. Rushby, SRI International, Stanford; Ch. Zhou, IIST, Macau. Their splendid essays are collected in these proceedings.

We are especially grateful to G. Le Lann, INRIA, Le Chesnay, who took over the task of organizing the panel "Comparative Merits of Synchronous / Partially Synchronous / Asynchronous Models in the Case of Safety / Mission Critical Real Time Systems". We also thank the panelists A. Burns, Univ. of York, UK; F. Cristian, UCSD, San Diego; J. Rushby, SRI, Stanford; F. Schneider, Cornell Univ., Ithaca, N.Y.; J. Sifakis, IMAG-LGI, Grenoble; D. Shasha, New York University, N.Y., for their fruitful contributions.

The school and symposium would not have been complete without a proper tools demonstration. This was organized by Bettina Buth and concerned the following systems: STATEMATE, PVS and PC/DC, DST-Z Tools, VDM Domain Compiler, Production Cell, IFAD VDM-SL Toolbox, CSL, SVE, ITEX-DE, SDT, Tatzelwurm, and KIV.

Our calls for papers evoked 60 contributions. The programme committee selected 32 after a careful refereeing process. The reader may enjoy them in these proceedings. We thank all contributors, all members of the programme committee, and all external referees for their much appreciated voluntary help.

Apart from the selection procedure for papers, and writing this introduction, the present volume was put together by Änne Straßner, who also took care of the e-mail correspondence regarding submissions, the calls for papers, and general inquiries. In this task she was supported by Antonio Cau and Yassine Lakhneche.

Together with Hans Langmaack, Ruben-Benjamin Reincke set up the financial plan for this school and symposium, and submitted it to the Deutsche Forschungsgemeinschaft (DFG) and the Government of Schleswig-Holstein.

Claudia Herbers assisted Hans Langmaack in contacting the sponsors and took over much of the administrative work.

We also wish to thank Mirèse Willems cordially for her assistance.

Without the help of the aforementioned, and other persons, organizing this school and symposium would not have been possible. Many, many thanks to all of them!

Kiel, FRG	Hans Langmaack (chairman organization committee)
Nijmegen, NL	Willem-Paul de Roever (chairman programme committee)
July 1994	Jan Vytopil (publicity chair)

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Report of the PC Chair

Our calls for papers for this symposium on Formal Techniques in Real Time and Fault Tolerance resulted in 60 submissions. The programme committee selected 32 of them after a careful refereeing process. Since nowadays new selection procedures for conference submissions are being tried out, because the standard way by means of a meeting of the full programme committee has become too time consuming and too expensive, it may be worthwile to describe (our experience with) the procedure followed at this symposium.

Papers were refereed using a large programme committee and many external referees to acquire as much expertise as possible. Papers were rated 0–5 (0: out of scope, 1: rejected, 2: discussable, 3: by all means discuss, 4: accepted, 5: accept by all means), with referees qualifying themselves by an A, B or C (A: a specialist sure of his opinion, B: not a specialist but still knowledgeable, C: not my field but I did my best).

In principle, a paper getting one or more "4" or "5" ratings, or getting at least three "3" ratings, was nominated for being accepted, unless it also received a "1" rating by a referee qualifying himself as an "A", in which case it should be rejected if the latter rating stood up to scrutiny. So the main problem was, in fact, to check upon the correctness of 1/A ratings for papers which also received such high ratings, since if these reports were unjustified or contained errors in their argumentation, they should be discarded. For this one needs expertise. So we asked the PC members about their opinion in these matters, using e-mail. We also formed a small rump committee consisting of Amir Pnueli and the PC chair who met over four days to propose preliminary lists of accepted and rejected papers, and to check out such 1/A ratings. As it turned out, several such 1/A reports did show inconsistencies. Other cases we investigated concerned too low ratings for good papers; also internal inconsistencies and errors of judgement were found.

In fact, in some cases I also would have liked to discard some "4" ratings. However, this would have implied disregarding favourable opinions of some quite well known reviewers; we didn't regard two specialists as enough of a critical mass for this task. A rump selection committee consisting of four or five experienced members would have had enough weight to credibly review referee reports and papers alike, in my opinion, replacing previous reports by new ones, but not one consisting of only two persons.

This leads to my conclusion that refereeing based on heavy usage of e-mail contacts alone is a dangerous course of action (there should be a group reviewing referee reports and papers alike) and should be complemented by a small rump committee of, say, four or five persons meeting for at least two full days (in our case, we needed at least three and a half days), due to the rather fluctuating quality of referee reports.

I thank Amir Pnueli for helping me out with the actual selection procedure, at short notice.

Willem-Paul de Roever Christian-Albrechts-Universität zu Kiel

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Contents

Invited Lectures

Selected Presentations

Tools Demonstration