Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

341

Sergio Bittanti (Ed.)

Software Reliability Modelling and Identification

Springer-Verlag
Berlin Heidelberg New York London Paris Tokyo

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CR Subject Classification (1987): D.2

ISBN 3-540-50695-0 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-50695-0 Springer-Verlag New York Berlin Heidelberg

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Printed in Germany

Printing and binding: Druckhaus Beltz, Hemsbach/Bergstr.
2145/3140-543210

PREFACE

Where are we in the development of applicable methods for the assessment of Software Reliability ? In the attempt to reply to this question, an intensive course on Software Reliability Modelling and Identification was held at Villa Olmo, Como (Italy) from September 2 to 4, 1987, under the aegis of the Centro di Cultura Scientifica A.Volta (Como). The lecturers were Paolo Bolzern, Carlo Ghezzi, Bev Littlewood, John Musa and Riccardo Scattolini, besides the editor of this volume.

The course, which was attended by field engineers, software managers and university researchers, was organized by the Politecnico di Milano, Dipartimento di Elettronica, Centro Ingegneria dei Sistemi per l'Elaborazione delle Informazioni of the Italian Research Council (C.N.R.) and Centro di Teoria dei Sistemi of the C.N.R..

This volume contains five tutorial papers summarizing the content of the various lectures. The purpose is to present the basic models used to forecast the reliability growth during the software testing process, and discuss the practical applicability of models in the management of the software development. Particular attention is paid to the main techniques for the model identification from data (parameter estimation, selection of complexity, validation, etc.). The general approach is to present good theory for the user, in simple and introductory terms.

The monograph organization is as follows. In Chapter 1, reliability is placed in the context of other relevant software qualities. Furthermore, the techniques which have been developed so far to produce a-priori reliable software (constructive approach) are introduced. In spite of the increasing interest for the constructive approach, debugging still takes a significant percentage of time in the life-cycle of a software product. The basic reliabilty concepts (hazard rate, mean time to failure, etc.) as well as the ideas behind the use of mathematical models for software reliability growth are the subject of Chapter 2. Then,two important models are extensively discussed in Chapter 3.

A flexible modelling approach is proposed in Chapter 4. Precisely, a model which can be used to describe a variety of different reliability trends is introduced; flexibility is achieved by allowing a variable fault exposure coefficient, and resorting to simple decision rules to simplify the model when advisable. Finally, Chapter 5 deals with the provision of tools to assist the user for the selection of an appropriate model amongst the main ones proposed in the literature. These tools are based on the analysis of the predictive capability of the various models.

The editor expresses his sincere acknowledgement to the fellow authors for their most valuable contributions, as well as their care and patience in the preparation of manuscripts. He is grateful to Professor Carlo Ghezzi, who originally brought to his attention the problem of software reliability modelling.

The support of the Ministry of Education (M.P.I.) and the C.N.R. stategic project Matematica Applicata is acknowledged.

Milano, October 7 1988

Sergio Bittanti

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