

Simulation in Engineering Sciences

J. Burger, Y. Jarny Editors

IMACS

North-Holland

TP273-53
S614
1983

8564552

SIMULATION IN ENGINEERING SCIENCES

Applications to the Automatic Control
of Mechanical and Energy Systems

Proceedings of the IMACS International Symposium
Nantes, France, 9-11 May, 1983

edited by

J. BURGER

and

Y. JARNY

Ecole Nationale Supérieure de Mécanique
Nantes, France



1983

NORTH-HOLLAND
AMSTERDAM · NEW YORK · OXFORD



E8564552

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ISBN: 0 444 86795 3

Published by:

ELSEVIER SCIENCE PUBLISHERS B.V.
P.O. Box 1991
1000 BZ Amsterdam
The Netherlands

Sole distributors for the U.S.A. and Canada:

ELSEVIER SCIENCE PUBLISHERS COMPANY, INC.
52 Vanderbilt Avenue
New York, N.Y. 10017
U.S.A.



Library of Congress Cataloging in Publication Data

Main entry under title:

Simulation in engineering sciences.

1. Automatic control--Mathematical models--Congresses. 2. Automatic control--Data processing--Congresses. 3. Computer simulation--Congresses.
I. Burger, J. (Jacques), 1942- . II. Jarny, Y. (Yvon), 1950- . III. International Association for Mathematics and Computers in Simulation.
TJ212.2.855 1983 629.8'312 83-16557
ISBN 0-444-86795-3

PRINTED IN THE NETHERLANDS

**SIMULATION IN
ENGINEERING SCIENCES**

organized by
AFCET
and
ENSM

sponsored by
IFAC
(Applications Committee)

with the financial aid of
MATRA
Electricité de France
Centre National de la Recherche Scientifique
Conseil Général de Loire Atlantique
Université de Nantes
Ville de Nantes



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PREFACE

These Proceedings contain the texts of the papers presented at the IMACS Symposium SIMULATION IN ENGINEERING SCIENCES, which was held in Nantes, France, on 9-11 May 1983.

The International Program Committee accepted about 60 papers among 120 projects that had been presented.

The various chapters of this volume take into account the topics used at the sessions of the Symposium.

The 4 invited survey papers are followed by the contributions related to simulation methods and tools, studied from both the software and the hardware points of view. Then a great number of papers are devoted to technical applications, i.e. to the simulation of actual processes. The contributions concerning mainly modelling are not separated from the others because of the strong connection between modelling and simulation.

The Committee has put particular emphasis on papers related to mechanical systems, vehicles and robots, considering the high interest of a great many people in the subject.

Distributing the communications into the various sessions proved to be rather difficult and this arrangement reflects the editors' personal opinion.

J. Burger — Y. Jarny
May '83

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INVITED PAPERS

SIMULATION SOFTWARE: TODAY AND TOMORROW

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This paper describes briefly the current situation on the simulation software market. A list of simulation software features is presented which is then graphed in tabular form versus a couple of current simulation languages and packages. In a second part, some of the major shortcomings of current simulation systems are outlined, and some perspectives for development are given.

1. INTRODUCTION

Eight years ago I have been asked already once to survey the numerical techniques used in continuous simulation together with the major software systems which existed at that time for this purpose [8]. When I was now asked once more to repeat this task, I tried to figure out whether our knowledge about simulation techniques has sufficiently advanced over the past eight years to justify a reconsideration. I then came to the conclusion that most of the "prospectives for development" mentioned in that paper had meanwhile become everyday state-of-the-art issues, while most of the software systems considered at that time are meanwhile obsolete. Moreover, I have some new ideas about future development of simulation software which were not present yet in 1975. Therefore, I considered the time come to write another survey now.

In this paper, I shall not review the basic features (such as numerical integration) dealt with in my previous survey [8]. I shall assume that the reader of this article has already acquired a basic knowledge of the functioning of simulation software. Moreover, I shall extend my view to discrete simulation as well, as it was realized in the mean time that the techniques used in these two classes of simulation systems are very much related to each other, and as there exists now a considerable number of software systems capable of performing combined continuous and discrete simulation.

There are meanwhile so many simulation software systems on the market that it has become impossible to review even the major ones within a reasonably limited number of pages. For this reason, the mentioned software systems (which are those that I know best) are meant to be representative for many other software systems showing only minor differences.

This paper shall basically consist of three parts. In a first section, I shall try to pre-

sent a crude clustering of simulation software systems based on a selection of classifying features. In a second part, I shall then list a few simulation systems which are either available on the market now or which are currently under development. The paper shall then be concluded with a list of proposals how some of the more important shortcomings of the available systems might be overcome in the future.

2. SIMULATION SOFTWARE FEATURES

In the following table, a rather large set of characterizing features of nowadays simulation software systems are listed. Altogether 15 software systems have been analysed with respect to the availability of these features. If a feature is not available in a system, this is indicated by (-). If the feature is available, this is marked by (x). In many cases however, the implementation of a feature being present in several software systems differs with respect to the degree of sophistication (e.g. comfort of usage). In such cases, the better implementation is indicated by (xx). Sometimes, a foot note is added to explain the difference. Please note that a (-) does not necessarily indicate that the respective feature is not programmable in that language. It just means that no particular provision is taken by the language for that purpose. To cite an example: it is of course possible to receive a histogram by use of SIMULA (as SIMULA is a flexible general purpose programming language). Still, the respective box in the table is marked by (-) as no particular provision is taken by SIMULA to relieve the user from writing his own program to collect statistics and get a histogram printed.

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1) By use of a separate program (AID) also provided by Pritsker & Assoc.