

Published by The Research Council of Norway

Vol 15 · Number 3 · 1994

Modeling, Identification and Control

A Norwegian Research Bulletin



**Special
15th Anniversary
Issue**

MODELING, IDENTIFICATION AND CONTROL

A Norwegian Research Bulletin

ISSN 0332-7353

Editor

JENS G. BALCHEN, PROFESSOR

University of Trondheim, The Norwegian Institute of Technology,
Department of Engineering Cybernetics, Trondheim

Associate Editors

Oddvar Hallingstad, Professor, Norwegian Defence Research Establishment, Kjeller.
Freddy Krogh, Principal Engineer, Researcher, Center for Industrial Research, Oslo.
Kjell O. Solberg, Research Manager, Institute of Energy Technology, Kjeller.
Rolf Henriksen, Professor, University of Trondheim, Norwegian Institute of Technology, Department of Engineering Cybernetics, Trondheim.
Hans-Roar Sørheim, Senior Research Engineer, Chr. Michelsen Institute, Department of Science and Technology, Bergen.
Steinar Sælid, Norsk Hydro a.s., Porsgrunn.
Nils Christophersen, Professor, University of Oslo, Department of Informatics, Oslo.

Editorial Secretary

Tor Arne Johansen, University of Trondheim, Norwegian Institute of Technology, Department of Engineering Cybernetics, Trondheim.

Sponsoring Organizations and Editorial Board Members

ABB Industry AS, Oslo—Svein I. Sagatun
Center for Industrial Research (SINTEF-SI), Oslo—Freddy Krogh, Principal Engineer.
Chr. Michelsen Institute (CMI), Department of Science and Technology, Bergen—Hans-Roar Sørheim, Senior Research Engineer.
Elkem, Oslo—Magne Fjeld.
Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology (SINTEF), Trondheim—Sverre Aam, Manager SINTEF Automatic Control.
Hydro Aluminium a.s., Oslo—Halvor Kvande, Senior Project Manager.
Institute of Energy Technology (IFE), Kjeller—Kjell O. Solberg, Research Manager.
Norsk Forsvarsteknologi A/S (NFT), Kongsberg—Tor Liaaen, Manager System Group.
Norsk Hydro a.s. Porsgrunn—Steinar Sælid.
Norwegian Defence Research Establishment (NDRE), (FFI), Kjeller—Oddvar Hallingstad, Professor.
Norwegian Marine Technology Research Institute (MARINTEK), Trondheim—Malvin Villabø, Chief Research Engineer.
Norwegian Electrical Power Research Institute (EFI), Trondheim—Arne Johannessen, Professor, Senior Research Officer.
Norwegian Society for Automatic Control (NFA), Oslo.
OCEANOR A/S, Trondheim—Ole Gunnar Houmb.
Rogaland Research Institute, Stavanger—Ansgar Kristiansen
The Research Council of Norway, Oslo.
SIMRAD ALBATROSS A/S—Sverre Gotaas, Manager.
Statoil, Trondheim—Maene Hillestad.
Telemark Ingeniørhøgskole, Porsgrunn—Bernt Lie
University of Bergen, Department of Physics—Erling A. Hammer, Professor.
University of Oslo, Department of Informatics, Oslo—Nils Christophersen, Professor.
University of Trondheim, Norwegian Institute of Technology (NTH), Department of Engineering Cybernetics, Trondheim—Rolf Henriksen, Professor.
University Studies at Kjeller (UNIK), Oddvar Hallingstad, Professor.

Publisher

The Research Council of Norway, Oslo, Norway.

Correspondence

All correspondence to: MIC, Department of Engineering Cybernetics, N-7034 Trondheim, Norway.

Publication Schedule and Subscription Information

Published quarterly. Subscriptions and previous issues available at rates stated in the rear part of MIC.

Printed by Burgess Science Press, Rankine Road, Basingstoke, Hampshire RG24 8PR, U.K.

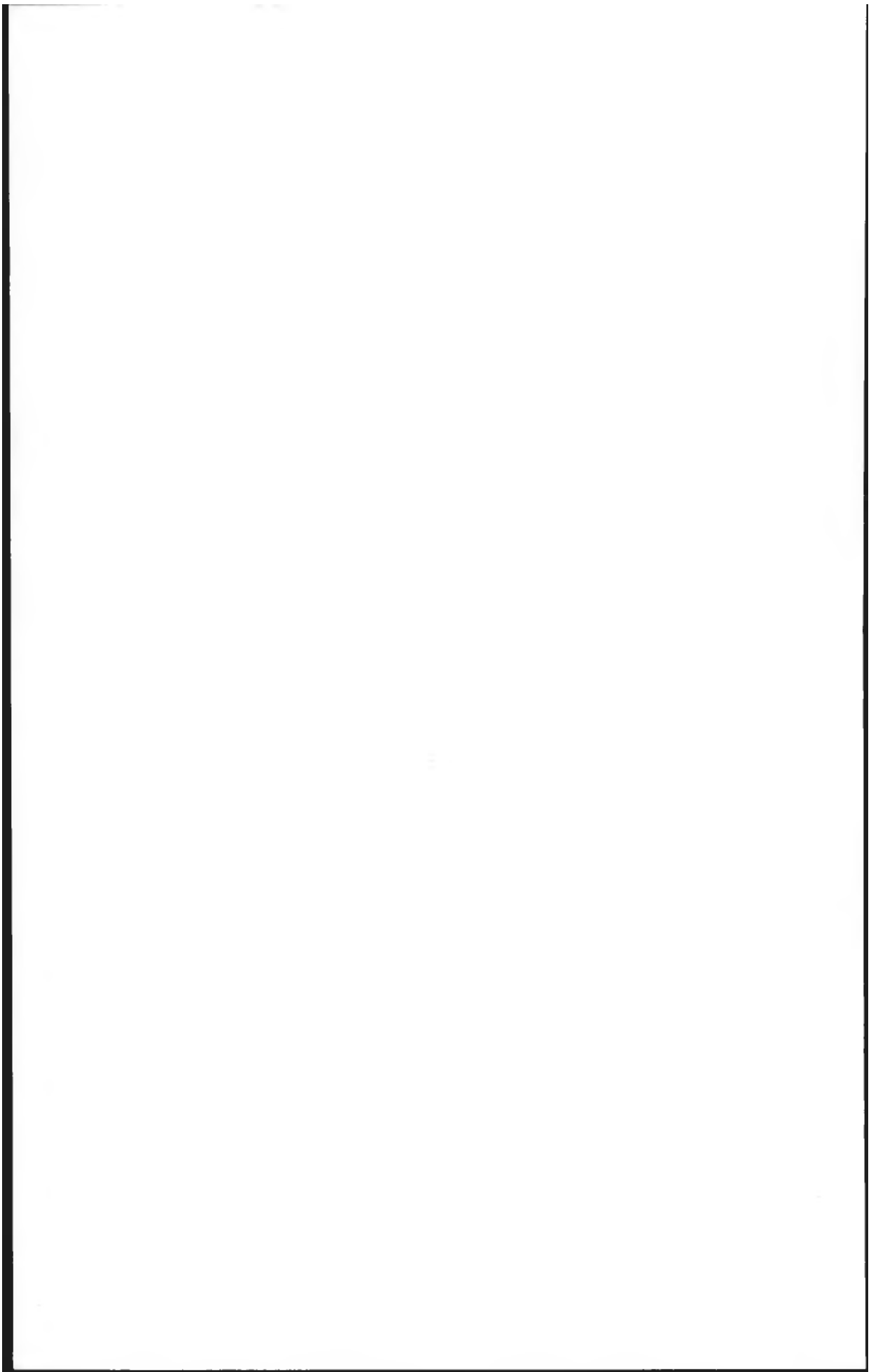
Editorial

This issue of *MIC* is special. It is composed of invited papers by nine of the most widely acclaimed international experts within the fields of Modeling, Identification and Control. They have been invited to write individual contributions expressing their opinions about the relevance, significance and future perspectives of Modeling, Identification and Control in 1994 when *MIC* celebrates its 15th anniversary.

All the authors have contributed greatly to international scientific literature and research and education within the fields of MIC. In fact, the contributions of these authors span more than four decades which is almost as long as these branches of science and engineering have existed.

It is with great pleasure and pride that the Editor presents this special anniversary issue of *MIC*. It is a rare event that so many celebrated authorities have contributed to one single issue of an international journal within the fields of Modeling, Identification and Control. The Editor hopes that the readers of *MIC* will enjoy this special issue which in time may become a valuable collectors item.

JENS G. BALCHEN
Professor
Editor of MIC



Foreword

The topics of modeling, identification, and control highlighted in this research bulletin, have been fields of high-priority research during the entire post-war period in Norway. Research groups at the Institute of Energy Research (IFE) at Kjeller, The Norwegian Institute of Technology and SINTEF in Trondheim, The Center for Industrial Research in Oslo and Christian Michelsen Research in Bergen, have actively contributed to the progress in general control theory, process control, numerical control of machine tools, robotics and computer aided design since around 1950. Since the initiation, these activities have been coordinated and continually supported by The Research Council of Norway.

In 1953 a special Steering Committee for Control and Automation Technology was established by The Research Council of Norway. In 1979 this Committee took the initiative to publish the Research Bulletin *Modeling, Identification and Control (MIC)*. The purpose was to present the results of the Norwegian research efforts to the international industrial and research communities.

The Research Council of Norway is committed to promote international exchange of information and cooperation. A large number of Norwegian researchers have been working for extended periods at research institutions abroad. Likewise, many foreign scientists have strong relations with Norway. One example of particular significance is the long lasting relationship between Professor Donald P. Campbell of MIT and the early Norwegian process control research groups. Professor Campbell is recognised as one of the founders of modern process control methodology in the US, and has been an inspiration to our research.

The Research Council of Norway is pleased to observe that the Norwegian research groups continue to contribute in a significant way to the fields of modeling, identification and control, for the benefit of Norway and the international research community. The Research Council of Norway wishes to extend its appreciation to the many contributors to *MIC*'s success at its 15 year anniversary.

REIDAR KUVÅS
Director

The Research Council of Norway/Industry and Energy