# Guide to Good Programming Practice

edited by BRIAN MEEK & PATRICIA HEATH





## GUIDE TO GOOD PROGRAMMING PRACTICE

## Editors:

B. L. MEEK, M.Sc.,

Director, Computer Unit, Queen Elizabeth College, University of London and

P. M. HEATH, B.A.,

Programming Manager, Computer Centre, Plymouth Polytechnic







ELLIS HORWOOD LIMITED
Publishers Chichester

Halsted Press: a division of JOHN WILEY & SONS New York - Chichester - Brisbane - Toronto First published in 1980 by

## **ELLIS HORWOOD LIMITED**

Market Cross House, Cooper Street, Chichester, West Sussex, PO19 1EB, England

414

The publisher's colophon is reproduced from James Gillison's drawing of the ancient Market Cross, Chichester.

## Distributors:

Australia, New Zealand, South-east Asia:
Jacaranda-Wiley Ltd., Jacaranda Press,
JOHN WILEY & SONS INC.,
G.P.O. Box 859, Brisbane, Queensland 40001, Australia.

#### Canada:

JOHN WILEY & SONS CANADA LIMITED 22 Worcester Road, Rexdale, Ontario, Canada.

Europe, Africa:
JOHN WILEY & SONS LIMITED
Baffins Lane, Chichester, West Sussex, England.
North and South America and the rest of the world:
Halsted Press, a division of
JOHN WILEY & SONS
605 Third Avenue, New York, N.Y. 10016, U.S.A.



#### British Library Cataloguing in Publication Data

Guide to good programming practice. – (Computers and their applications).

1. Electronic digital computers - Programming

I. Meek, Brian Lawrence II. Heath, P M

III. Series

001.6'42 QA76.6 79-40993

ISBN 0-85312-145-1 (Ellis Horwood Ltd., Publishers)

ISBN 0-470-26869-7 (Halsted Press)

ISBN 0-85312-152-4 (Ellis Horwood Ltd., Publishers) (Student Edition)

Typeset in Press Roman by Ellis Horwood Ltd.

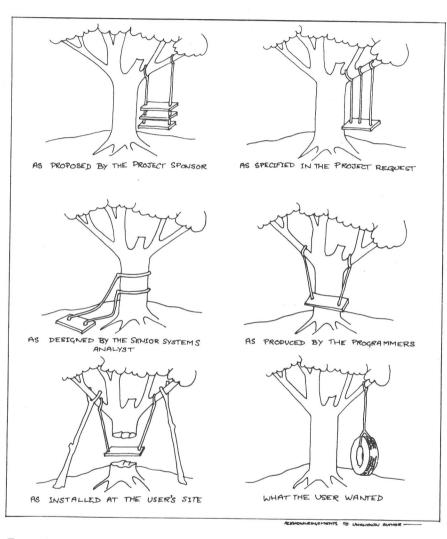
Printed and bound in Great Britain by

W & J Mackay Limited, Chatham

#### COPYRIGHT NOTICE

© Ellis Horwood Limited 1980

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the permission of Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex, England.



From the University of London Computer Centre Newsletter No. 53, March 1973

## GUIDE TO GOOD PROGRAMMING PRACTICE



## THE ELLIS HORWOOD SERIES IN COMPUTERS AND THEIR APPLICATIONS

Series Editor: Brian Meek, Director, Computer Unit, Queen Elizabeth College, University of London

The series aims to provide up-to-date and readable texts on the theory and practice of computing, with particular though not exclusive emphasis on computer applications. Preference is given in planning the series to new or developing areas, or to new approaches in established areas.

The books will usually be at the level of introductory or advanced undergraduate courses. In most cases they will be suitable as course texts, with their use in industrial and commercial fields always kept in mind. Together they will provide a valuable nucleus for a computing science library.

## Published and in active publication

## **INTRODUCTORY ALGOL 68 PROGRAMMING**

D. F. BRAILSFORD and A. N. WALKER, Department of Mathematics, University of Nottingham

## SOFTWARE ENGINEERING

K. GEWALD, G. HAAKE and W. PFADLER

## FUNDAMENTALS OF COMPUTER LOGIC

D. HUTCHISON, Department of Computer Science, University of Strathclyde

## INTERACTIVE COMPUTER GRAPHICS IN SCIENCE TEACHING

Edited by J. McKENZIE, Department of Physics and Astronomy, University College, London
L. ELTON, Head of Institute of Educational Technology, University of Surrey
and P. LEWIS, Head of Educational Computing Chalcon College, University of London

and R. LEWIS, Head of Educational Computing, Chelsea College, University of London

### SYSTEMS ANALYSIS AND DESIGN FOR COMPUTER APPLICATIONS

D. MILLINGTON, Department of Computer Science, University of Strathclyde

## RECURSIVE FUNCTIONS IN COMPUTER SCIENCE

R. PETER, Professor of Mathematics, Eotvos Lorand University of Budapest

### **AUTOREGRESSION ALGORITHMS**

L. J. SLATER, Department of Applied Economics, University of Cambridge, and H. M. PESARAN, Trinity College, Cambridge

### **CLUSTER ANALYSIS ALGORITHMS**

HELMUT SPATH, Professor of Mathematics, Oldenburg University

## 8066175

## Table of Contents

| Preface                         | 9  |
|---------------------------------|--|
| Notes o                         | n contributors   |
| Chapter                         | 1 Strategy and design  |
| 1.1<br>1.2<br>1.3               | Approaching the problem (Brian Meek)   |
| Chapter                         | 2 Program writing  |
| 2.1<br>2.2<br>2.3<br>2.4        | Choosing the language (Brian Meek)   |
| Chapter                         | 3 Program development  |
| 3.1<br>3.2<br>3.3               | Structured programming and error prevention (Nick Rushby)  |
| Chapter                         | 4 Special problems   |
| 4.1<br>4.2<br>4.3<br>4.4<br>4.5 | Heuristic programming (Michael Clarke) 101 Large quantities of data (Brian Meek) 111 Large programs (Richard Overill) 120 Programs with long run-times (Richard Overill) 126 Real-time programs (Brian Meek) 134 |

## Table of Contents

| Chapter | 5 Other people                           |
|---------|--|
| 5.1     | Program documentation (Patricia Heath)   |
| 5.2     | Seeking advice (Carol Hewlett)           |
| 5.3     | Other people's programs (Nick Rushby)    |
| 5.4     | Working as one of a team (Martin Wilson) |
| Referen | ces and further reading                  |
| Index   |  |

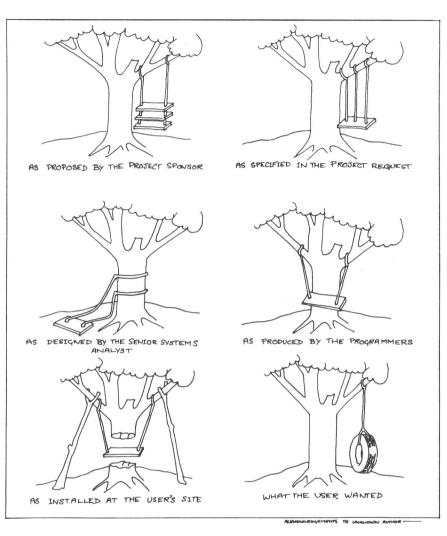
## Preface

During an introductory course on computer programming, one's concentration is usually directed towards mastering the features of the programming language used, rather than on wider aspects of the programmer's craft. Similarly, programming manuals and textbooks tend to concentrate on language features. Some do no more than present these, though the better ones also discuss good programming style and methodology. However, for quite understandable reasons they virtually never go beyond those aspects of good programming practice that are directly related to program writing. Too often, people are left to pick up the wider aspects later, by experience, learning on the job, and through informal advice rather than systematic discussion.

This book sets out to present in a straightforward and easily assimilable form all of the main aspects of good programming practice. It is not related to the use of any particular language or machine, though a few examples are given in various well-known languages for the purposes of illustration. It is therefore designed to supplement and not replace the usual kinds of introductory manuals, books, and courses, and to provide a useful source of guidance and reference later, as the newly-fledged programmer begins to put his skills to practical use. Within the space available it has not been possible to cover all techniques; for example, structured programming is discussed in terms mainly of general principles rather than the detailed methodology more appropriate to programming courses; the use of decision tables has been left to more specialized texts; and discussion of correctness proofs of programs has been omitted, reluctantly, as being still an area of research and experiment rather than of established technique. Suggestions for further reading are included as an appendix, and readers are strongly advised to use this to follow up topics of particular interest or relevance.

The authors have between them had many decades of experience of programming, in a variety of contexts; though most are now working in educational establishments, several have had experience outside in industry and commerce, and still have contacts there. As well as providing their own contributions, the authors have read and sent in comments upon the drafts of others; the editors





From the University of London Computer Centre Newsletter No. 53, March 1973

## GUIDE TO GOOD PROGRAMMING PRACTICE



## THE ELLIS HORWOOD SERIES IN COMPUTERS AND THEIR APPLICATIONS

Series Editor: Brian Meek, Director, Computer Unit, Queen Elizabeth College, University of London

The series aims to provide up-to-date and readable texts on the theory and practice of computing, with particular though not exclusive emphasis on computer applications. Preference is given in planning the series to new or developing areas, or to new approaches in established areas.

The books will usually be at the level of introductory or advanced undergraduate courses. In most cases they will be suitable as course texts, with their use in industrial and commercial fields always kept in mind. Together they will provide a valuable nucleus for a computing science library.

## Published and in active publication

### **INTRODUCTORY ALGOL 68 PROGRAMMING**

D. F. BRAILSFORD and A. N. WALKER, Department of Mathematics, University of Nottingham

## SOFTWARE ENGINEERING

K. GEWALD, G. HAAKE and W. PFADLER

## FUNDAMENTALS OF COMPUTER LOGIC

D. HUTCHISON, Department of Computer Science, University of Strathclyde

#### INTERACTIVE COMPUTER GRAPHICS IN SCIENCE TEACHING

Edited by J. McKENZIE, Department of Physics and Astronomy, University College, London L. ELTON, Head of Institute of Educational Technology, University of Surrey and R. LEWIS, Head of Educational Computing, Chelsea College, University of London

and R. Elwis, front of Educational Computing, Choisea Conege, University of London

### SYSTEMS ANALYSIS AND DESIGN FOR COMPUTER APPLICATIONS

D. MILLINGTON, Department of Computer Science, University of Strathclyde

## RECURSIVE FUNCTIONS IN COMPUTER SCIENCE

R. PETER, Professor of Mathematics, Eotvos Lorand University of Budapest

## **AUTOREGRESSION ALGORITHMS**

L. J. SLATER, Department of Applied Economics, University of Cambridge, and H. M. PESARAN, Trinity College, Cambridge

#### **CLUSTER ANALYSIS ALGORITHMS**

HELMUT SPATH, Professor of Mathematics, Oldenburg University



## GUIDE TO GOOD **PROGRAMMING PRACTICE**

## Editors:

B. L. MEEK, M.Sc.,

Director, Computer Unit, Queen Elizabeth College, University of London and

P. M. HEATH, B.A.,

Programming Manager, Computer Centre, Plymouth Polytechnic





E8066175



**ELLIS HORWOOD LIMITED** 

Publishers Chichester

Halsted Press: a division of JOHN WILEY & SONS New York - Chichester - Brisbane - Toronto First published in 1980 by

## **ELLIS HORWOOD LIMITED**

Market Cross House, Cooper Street, Chichester, West Sussex, PO19 1EB, England

4.4%

The publisher's colophon is reproduced from James Gillison's drawing of the ancient Market Cross, Chichester.

## Distributors:

Australia, New Zealand, South-east Asia:
Jacaranda-Wiley Ltd., Jacaranda Press,
JOHN WILEY & SONS INC.,
G.P.O. Box 859, Brisbane, Queensland 40001, Australia.

Canada:

JOHN WILEY & SONS CANADA LIMITED 22 Worcester Road, Rexdale, Ontario, Canada.

Europe, Africa:
JOHN WILEY & SONS LIMITED
Baffins Lane, Chichester, West Sussex, England.

North and South America and the rest of the world: Halsted Press, a division of JOHN WILEY & SONS 605 Third Avenue, New York, N.Y. 10016, U.S.A.



### British Library Cataloguing in Publication Data

Guide to good programming practice. —
(Computers and their applications).

1. Electronic digital computers — Programming
I. Meek, Brian Lawrence II. Heath, P M
III. Series

1001.6'42 QA76.6 79-40993
ISBN 0-85312-145-1 (Ellis Horwood Ltd., Publishers)
ISBN 0-470-26869-7 (Halsted Press)
ISBN 0-85312-152-4 (Ellis Horwood Ltd., Publishers) (Student Edition)
Typeset in Press Roman by Ellis Horwood Ltd.
Printed and bound in Great Britain by
W & J Mackay Limited, Chatham

## **COPYRIGHT NOTICE**

© Ellis Horwood Limited 1980

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the permission of Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex, England.

## 8066175

## Table of Contents

| Preface |  |
|---------|--|
| Notes o | on contributors  |
| Chapte  | 1 Strategy and design  |
| 1.1     | Approaching the problem (Brian Meek)14                       |
| 1.2     | Using the literature (Patricia Heath)                        |
| 1.3     | The design of algorithms (Paul Hide)21                       |
| CI .    | WH WE THE  |
| Chapter | 2 Program writing  |
| 2.1     | Choosing the language (Brian Meek)                           |
| 2.2     | Programming language standards (I. D. Hill)                  |
| 2.3     | Choice of input-output (Brian Meek)                          |
| 2.4     | Structured programming (I. D. Hill)                          |
| Chapter | 3 Program development  |
| 3.1     | Structured programming and error prevention (Nick Rushby) 73 |
| 3.2     | Testing and debugging (Nick Rushby)                          |
| 3.3     | Improving run-time performance (John Steel)                  |
|         |  |
| Chapter | 4 Special problems   |
| 4.1     | Heuristic programming (Michael Clarke)                       |
| 4.2     | Large quantities of data (Brian Meek)                        |
| 4.3     | Large programs (Richard Overill)                             |
| 4.4     | Programs with long run-times (Richard Overill)               |
| 4.5     | Real-time programs (Brian Meek)                              |

| Chapter   | 5 Other people                           |
|-----------|--|
| 5.1       | Program documentation (Patricia Heath)   |
|           | Seeking advice (Carol Hewlett)           |
|           | Other people's programs (Nick Rushby)    |
| 5.4       | Working as one of a team (Martin Wilson) |
|           |  |
| Reference | ses and further reading                  |
|           |  |
| Index .   |  |