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Translation of ALGOL 60

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Preface

Problem oriented programming languages as they have developed over the last ten years essentially serve two purposes which somewhat crudely can be described by the terms man-man communication and man-machine communication, respectively. As a carrier of information between humans, the problem oriented programming language is designed to express the essence of an algorithm in a way which is unambiguous and concise as well as independent of (and therefore meaningful without any reference to) the changing details of computing machinery. As a carrier of information from man to computer, the language permits the human programmer to express his computational needs in a compact way adapted to the general characteristics of computers, but freed from the burdening details of specific computer facilities. This presupposes the existence of algorithms, or programs, which permit the computer itself to transform efficiently programs written in the problem oriented language into machine programs. Thus the entire computing community profits from the work of the individual programmer.

The primary purpose of the Handbook is to present a set of algorithms of broad utility from the domain of numerical mathematics written in the problem oriented language ALGOL 60. Therefore, volumes Ia and Ib are in a sense supplementary as they serve to introduce this language. Volume Ia gives a description of the language proper and of its use for writing correct programs. Thus, volume Ia primarily covers the aspect of man-man communication by means of ALGOL 60. By contrast, the present volume Ib is devoted exclusively to the aspect of man-machine communications. It presents a complete model of a translator program for ALGOL 60, an outline of the general principles applied, and a description of the operation of the program.

The underlying translator philosophy is an outgrowth of experience gained within the ALCOR group (an international group of computing centers and computer manufacturers collaborating in the development and application of ALGOL translators) which, over the years, has constructed ALGOL translators for so diversified a set of computers as ERMETH-ETH Zürich, ORACLE-Oak Ridge National Laboratory, PERM-TH Munich, Zuse Z 22/23, Siemens 2002, Telefunken TR4, Control Data 1604/3400/3600, IBM 7040/7090.

A large number of ALGOL translators has been developed in the past in different places with different starting points and different basic philosophies. No attempt has been made to give an overall survey, as this would have exceeded the scope of this volume. Considering the status of the art of translation of programming languages the book addresses the uninitiated who want to obtain access to methods of compiler writing; the expert may yet find some interesting material.

Volume Ia restricts the discussion essentially to the IFIP SUBSET ALGOL 60. Volume Ib, on the other hand, is far less restricted because it addresses a different set of readers, and because the subset excludes some features of ALGOL 60 which have proven to be of particular interest to programmers.

The model translator program itself is written in a language which is a slight extension of ALGOL 60, and therefore should be intelligible to anybody acquainted with this language. The object code produced by the translator is an abstract machine code modelled as close as seemed possible to the instruction codes for, in a certain sense, "average" present-day computers.

The authors wish in particular to express their thanks to Professor K. SAMELSON for his interest in the work and his constant readiness to discuss questions which arose during the writing of the manuscript. Thanks are also due to many colleagues in Oak Ridge and Munich who gave us valuable suggestions. Last but not least we are very much indebted to the secretarial staffs of our institutions; without their capable help the preparation of the manuscript would have been impossible.

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