Book Reviews

SAMUEL J. LOMONACO, JR (ED.)
Quantum Computation: A Grand Mathematical Challenge for the Twenty-First Century and the Millennium (Proceedings of Symposia in Applied Mathematics, volume 58). American Mathematical Society (2002). ISBN 0-8218-2084-2. $69.00. 358 pp. Hardbound.

This book has emerged from an American Mathematical Society Short Course held in Washington DC, January 17–18 2000. The book contains 11 survey articles segmented into four chapters. The chapters are *I: An Invitation to Quantum Computation* (two articles), *II: Quantum Algorithms and Quantum Complexity Theory* (four articles), *III: Quantum Error Correcting Codes and Quantum Cryptography* (two articles) and *IV: More Mathematical Connections* (three articles). It is interesting to note that the editor has been very active: altogether he has written five articles in this book, some of those contributions being quite long.

The three first chapters provide a representation on quantum computation and quantum information theory in a 'mathematical' way, and the material in the last chapter contains further studies on mathematical topics related to quantum mechanics and quantum computing. For instance, physical perspectives, basic notations and concepts, basic quantum algorithms (factoring and Grover search), basics on quantum complexity theory, quantum error correction, and quantum cryptography are covered in the first three chapters; the last chapter deals with objects such as anyons, quantum topology, and relations between Lie theory and entanglement. Perhaps a survey on the lattice structure of Hilbert space projections would have been an interesting bonus for the last chapter.

The focus area of the book is clearly the mathematics behind quantum computing. For instance, many variations of quantum algorithms are not represented. On the other hand, two quantum algorithms (Shor's factoring algorithm and Grover's search algorithm) are represented in a mathematically rigorous way. This is indeed consistent with the spirit of the book, since in a strict sense it could be stated that the represented quantum algorithms are the only ones that exist!

Most articles in the book are well and clearly written. It is worth mentioning that in particular the contributions written by the editor are very easy to read, even entertaining. On the other hand, the book suffers from slightly varying notations and repetitions. This is of very typical of proceedings, making it difficult to use this book as a textbook. My opinion is that this book serves best as a handbook on very specific topics related to quantum computing. This function is supported by an extensive index and a large number of references in the articles.

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EGON BOERGER AND ROBERT STAERK
Abstract State Machines—A Method for High-Level System Design and Analysis. Springer-Verlag (2003). ISBN 3-540-00702-4. EUR49.95/$59.95/£35.00. 438 pp. Hardbound.

The aim of this book is to propose a rigorous method for the design and analysis of large software systems. The method proposed by the authors is based on the notion of Abstract State Machine (ASM), which is a further development of the notion of 'evolving algebra' first introduced by Gurevich. The peculiarity of the notion of ASM, with respect to other specification languages, is in some sense its 'genericity', which gives the user the freedom of designing a machine with the level of detail suitable for the specific problem needing to be solved. An ASM is based on an abstract notion of *state*, which is simply a mathematical structure, and it consists in a finite set of (guarded) *transition rules*. A run of an ASM is a (finite or infinite) sequence of states $S_1, \ldots, S_i, \ldots$ such that S_0 is an initial state and S_{i+1} is obtained from S_i by applying, in parallel, all the transition rules that are allowed in S_i.

The design method uses the ASM notion for defining a *ground model* of the situation to be modelled, to which appropriate *refinement steps* can be applied in order to obtain the desired system.

The notion of ASM is described formally in a mathematical setting, and its semantics is given operationally by means of a set of logical rules modelling the *step by step* run of the machine. The design method is described by examples, starting from very simple situations, such as the control of a lift, to difficult easy case studies such as the design of a microprocessor or a robot controller.

The book is written in a very efficient didactic way, since at first only the very basic ingredients of ASM are presented, and then more refined features are introduced stepwise, together with specific examples where necessary. So compositional techniques are introduced, allowing the use of ASM as structured programming language and moreover a notion of multi-agent ASM is defined, in both synchronous and asynchronous versions.

An entire chapter is dedicated to convince the reader of the 'universality' of the ASM, first stated in a precise way by Gurevich in his thesis, stating that 'every sequential algorithm can be step by step simulated by an appropriate sequential ASM'. The thesis is supported by examples, describing some well-known computational models, such as Turing machines, with an ASM. The thesis is not surprising, due to the total genericity of the ASM definition.

The author declares that the book aims 'to combine the features of a handbook and of a textbook and thus addresses the needs of hardware or software systems engineers. . .and researchers as well to students'. Clearly the aim to conquer such a very big audience had strongly influenced the authors: in fact the used approach gives the impression of a compromise between a completely mathematical treatment,

not suitable for large part of this audience, and an informal presentation 'by examples' and general discussions. Such a compromise has been certainly necessary and the result is quite interesting and the examples are pleasant to read. Some scientists, however, might find the book too verbose in some parts, in particular the last chapter dedicated to the history and survey of ASM research, where all the previous applications of ASM techniques in applicative and industrial fields are listed. Some people, on the other hand, will be only interested in practical applications and will find some mathematical formalizations boring. In any case, this book represents an interesting experiment.

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ENID MUMFORD
Redesigning Human Systems—InfoSCI 2003. IRM Press (2003). ISBN 1-59140-118-6. £59.50/$79.95. 304 pp. Hardbound.

Enid Mumford became a guru for many of us even before the concept of guru became part of our daily language. It is wonderful that she is still active in publishing since it is now 35 years ago when I read and reviewed my first book by Enid Mumford.: *Computers: Planning for People*, published in 1968.

At that time, her message broke totally new grounds with the human perspective of the development of 'EDP-systems'. For some, it was a saber-rattling eye-opener, for others her gospel fell on 'thorny ground'. But for those prepared to listen, she transplanted the socio-technical tradition of the Tavistock School to the IT area, and she rightfully became world-renowned and recognized throught the world. She took the gospel of humanization and participation (democratization) and made it relevant, practical and easily applicable. Through her writings on action research in the IT field and the easy to apply tools, she became one of the most influential researchers in IS.

The philosophy of Mumford's latest book is that 'problem solving and the management of change will be facilitated by participation' (p. 248). To document this, the book has five parts: an introduction to socio-technical design based on the principles of participation of those who are going to use the systems; designing for manual workers; designing for office workers; designing for companies; and designing for the future.

This book represents the highlights of Mumford's normative work on participation brought up to date and put into the context of modern day challenges. As such, the book is for anybody 'concerned with the choice and implementation of organizational structures that mesh with the technology and create a viable socio-technical system' (p. 249).

However, is the book new to somebody familiar with the work of Enid Mumford? I would say no. Most of the cases are old, but that should not put you off. I feel that the book serves at least two purposes. First, it provides a historic overview, which helps to bring our present day challenges into perspective. Second, it is an easy-to-read book, which over and over illustrates very aptly that history repeats itself. Maybe the accusation that IT creates routinized, demeaning and alienating jobs cannot, as many studies have shown, be sustained. But in the way that far too often we are designing (or acquiring) IT solutions without user participation. We forget or ignore that the technical costs are typically 20%, and the costs of organizational implementation are 80%.

Some of the recommendations can seem trivial. For instance, when Mumford writes on page 125: 'Good communications is essential and if it does not exist it will be replaced with rumors'. However, it is amazing how often this type of insight is neglected in spite of our experiences.

I have forgotten who said it, but one might define experience rather cynically as 'our ability to recognize our mistakes the second time we commit them'. It is so difficult for us to learn. And yet, (re-)reading the advice of Munford, she presents the case in such a nice, easy to apply way that it is a surprise why so many mistakes of a socio-technical nature are committed.

For everybody familiar with the work of Enid Mumford, this book represents an excellent collection of highlights based on the thinking and experiences of user participation in IT, which will fit nicely at the row with other books by her. For those not familiar with her work, I can strongly recommend this overview.

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MARK S. NIXON AND ALBERTO S. AGUADO
Feature Extraction and Image Processing. Newnes (2002). ISBN 0-7506-5078-8. £24.99/$47.50. 362 pp. Softbound.

Image processing, primarily concerned with the transformation of images into images, is currently a hot topic for a great number of undergraduates and professionals. Feature extraction also is a very important field with growing applications in science and engineering. The main aim of feature extraction is to extract important features from image data, from which a description, interpretation or understanding of the scene can be provided by the machine. This book focuses on feature extraction, whilst also covering issues and techniques of image processing such as image acquisition, sampling theory and point operations.

There is a certain amount of mathematics in this book. Therefore, its target audience is probably third or fourth year students on BSc/BEng/MEng courses in electrical or electronic engineering, computer science, mathematics or physics. Each chapter of the book presents a particular package of information concerning feature extraction in image processing and computer vision. Each package is developed from its origins and later referenced to more recent material that will be really interesting for a wide range of practitioners and professionals in this field.

The book provides working implementations (in Mathcad or Matlab) of most of the major techniques it describes, and