

These two books present the work done on an ESPRIT project, SEDOS (Software Environment for the Design of Distributed Open Systems). The project extended existing work on two formal description languages, LOTOS and Estelle, by producing detailed designs, case studies and implemented tools. The languages are intended to be applied to network protocols and services for open systems. They have therefore undergone ISO standardisation and have been used for some research and development, particularly in telecommunication laboratories.

It is not the purpose of this review to adjudicate between the LOTOS and Estelle factions, to relate their work to that on other network description languages (such as SDL), or to compare their work with that of other ESPRIT projects (such as RAISE and METEOR). Instead, the review concentrates on the nature and quality of the books. (Of course, sometimes the relative merits of parts of the books reflect the relative merits of their subjects.)

The books are hardbacks costing about $110 each. For this price one might reasonably expect to get books which were well designed and edited to produce consistent wholes. However, this is not so for either book. Both give the impression of being collections of reports about work in progress, connected by a general theme (LOTOS or Estelle) more than by continuity of content. The reports are clustered into sections, essentially concerning the language, specification, verification and tools. In the LOTOS book at least, there is an attempt to introduce each section; yet this makes the extra, irrelevant, papers in it all the more obvious. (Perhaps this is over-critical, for the outputs of SEDOS are more coherent than those of many collaborative projects.)

Both books would have benefited from much more editing. For example, neither presents its subject in a way uniform enough to provide a table of contents with more detail than chapter headings. The lack of internal consistency shows itself even in the type faces, which vary widely from report to report. This is particularly so for the Estelle book. Advances in formatting and printing make the standards of typography in these books much less acceptable than they would have been 10 years ago.

The section on the language in the LOTOS book mainly comprises an extensive explanation to the language which illustrates the major constituents of the language (the algebraic specification language ACT-ONE and the concurrency calculi CCS and CSP). Though LOTOS does not integrate these constituents at all, and treats
one of them (ACT-ONE) largely as an embarrassment, this explanation does at least clarify what they are.

The corresponding section in the Estelle book is less satisfactory: though it includes several approaches to the semantics of Estelle it does not succeed in conveying precisely enough the formal notions underlying the language.

If a formal description language is to meet its requirements it must have a proof system and a semantics. The proof system should be used for verifying assertions about descriptions; the semantics could be used for this, but it is suited mainly to demonstrating that the proof system is consistent and conforms with some prior intuitions about the meaning of the language. Both books recognise the need for a semantics, even if not the need for a proof system, but neither satisfies the need very well. The LOTOS book includes transition rules and discussions of notions of equivalence in the explanation of the language. These add to the clarity of the explanation but do not provide a sufficient account of the proof system; in particular, they say nothing about the algebraic structuring mechanisms. They are supplemented by a brief report with seven authors about algebraic semantics; yet this has an unfinished air to it and does not deal with the same version of the language.

The Estelle book says nothing about proof rules but provides two reports on the semantics (with a rather loose interpretation of time and without a treatment of the Pascal subset of Estelle). The absence of any proof rules makes it hard for the uninitiated reader to understand an Estelle description as precisely as a standard requires. The semantics can be of little help in this respect, because it is rather verbose and needs artifacts that are not central to the main themes of the language; in particular, it can only be made compositional by introducing several auxiliary semantic parameters.

Overall, the account of LOTOS is clearer than that of Estelle, despite the absence of a semantics from the LOTOS book, because LOTOS is more evidently related to well-established formal theories (algebraic specification and concurrency calculi); Estelle at times gives the impression of having a formal basis retrofitted to a syntax.

The LOTOS book contains several formal descriptions (including, in particular, the ISO session and transport services and protocols). In so doing it attempts to motivate and explain the description styles adopted in LOTOS, especially the so-called "constraint-oriented" style. This attempt is perhaps not entirely successful: the styles are fundamentally algorithmic, and the constraint-oriented style does not, on this showing, offer very much to mitigate this. Moreover, the descriptions are made very long-winded by the LOTOS choice of algebraic specification technique. They are also made very difficult to read by the poor (but consistent) styles of type face and layout.

The Estelle book contains fewer formal descriptions and does not try to motivate or explain why Estelle is as it is. However, its formal descriptions are generally typographically clear.

For both languages the study of verification techniques is much less advanced than the study of specification techniques. For neither language is there a "method"
giving an exposition of the proof theory and guidelines on how to specify and verify. Indeed, the sections on verification in both books are given over largely to prototype tools. It is debatable whether these sections, or those on other prototype tools, really belong in these books. If the books are just summaries of the SEDOS project, then they could stand as they are. Yet who would want to read such summaries? What users require are comprehensible and comprehensive introductions, examples and reference manuals dealing with both specification and verification. They do not need to be told about the output formats from tools which have doubtless already been superseded. The tools devised for LOTOS in particular are quite extensive, but they deserve to be treated more as stimuli to other tool producers than as products; in these books they are likely just to be lost.

To whom, then, can these books be recommended? People having some knowledge of network services and of concurrency calculi will be interested in the LOTOS book: it is the better edited and has the better subject of the two. People needing to apply either language will find more adequate guidance in these books than elsewhere. Yet if the books had been designed as unified texts, not just as collections of final ESPRIT reports, they could have been much more useful.

Robert E. MILNE

STL
Harlow, United Kingdom


The Emperor's Old Hat

Everyone knows that artificial intelligence has something to do with getting computers to think, and everyone knows that the whole enterprise is somewhat controversial. Advocates of AI claim that computers and robots will indeed one day be constructed of which it can plausibly be claimed that they have beliefs and goals and desires and intentions, perhaps even sensations and emotions; detractors disagree and say that no computer, relentlessly grinding through a list of machine instructions, could ever thereby have a mental life. The question is: how to proceed? How, given that artificial intelligence has not yet succeeded in producing a thinking computer, might we assess the likelihood that, one day, it might?

Basically, we must tackle two issues. First: what is it for a person (or anything else) to think? Second: what is it for a computer (or anything else) to run a program? Only if we can resolve these questions, will we have a clearer idea as to whether the goal of AI is a realistic prospect or just a forlorn hope. These, then are the issues that Roger Penrose addresses in his entertaining and enlightening book, The