Reviews of Books and Papers in the Computer Field

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A. COMPUTER SYSTEM DESIGN

R68-8 Language Directed Computer Design—W. M. McKeeman

It has been observed, perhaps facetiously, that "the world's best
programmer is also the world's top computer engineer." For indeed,
when designing computing systems one attempts to provide a
mechanism which permits the convenient solution of many dis-
parate problems. The design of such a system will necessarily encom-
pass both programming and engineering considerations.

The computing system that a user sees is, in general, not the
machine that the hardware craftsmen have assembled. The same
hardware machine will be looked at in different ways by two users—
one numeric analytic oriented, the other business data processing
oriented. The difference stems from the fact that the two users have
different computers: the one a computer assembled from the hard-
ware machine and a FORTRAN compiler and its associated state of
mind, the other from the same machine and a COBOL compiler and its
associated state of mind. Parenthetically, the unfortunate thing is
that the intersection (in the set sense) of these two states of mind is
all too often zero.

The important thing is that users recast the basic hardware into
that machine which seems to think the right thoughts about the
problem area the user has in mind. The modeling material used to
pad out the hardware is, of course, system software.

The great disparity between what hardware is immediately cap-
able of doing and what users want to do has required the building
of complex translators in software to bridge the gap. The size and
cost of these software systems is almost never small.

This paper argues convincingly—and it seems to me that the
examples are well chosen—that the gap between the user (more
particularly, the facilities provided in a software system) and the
machine can only be bridged effectively when the dialogue between
the software man and hardware man proceeds meaningfully from a
common basis of understanding.

That the hardware engineer should be educated to the software
world, via the experience of building a software system, as is here
advocated, is perhaps a bit of a one sided view of the gap. What really
is of concern is that the computing system be designed from its incep-
tion with a full realization of what language it is expected to be fluent
in. This can only be achieved when all involved in the design are fully
aware of all the implications of what may appear on the surface to be
minor decisions.

It is interesting to note that by and large, as evidenced by the
examples in this paper, the complications of translation and of fail-
safe operation have to do with addressing: that is, with the referencing
of pieces of data. Yet this one area has had, I suspect, fewer
fundamental hardware changes than nearly any other facet of a com-
puting machine. While index register, indirect addressing, character
addressing, etc. features abound, the application of them is all too
often bound up with the operation performed rather than with the
operand involved. And it still is nontrivial, for example, to reference
in a single step a multidimensional entity. Memories continue to be
linearly addressed and copious translation is required to map multi-
dimensional structures onto the linear array that is the hardware
memory.

These points are some of many that could be cited to support the
claim that the gap between fundamental use and basic hardware does
exist and that its bridging is nontrivial. How best to bridge it is, in
detail, probably not specifiable. Clearly, however, as this paper sug-
gests, the hardware designer will have to be totally aware of and sen-
sitive to the requirements of the users' needs as exemplified by the
language structures he constructs. At the same time, however, the
language designer will need to be aware of what hardware can reliably
and economically be produced.

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B. MAGNETIC RECORDING

R68-9 A Computer Simulation of Electrical Loss and Loading Effect
in Magnetic Recording—W. W. Chu (IEEE Trans. Electronic Com-

This paper is basically concerned with determining readback dis-
tortion in magnetic recording. This determination is obtained, not by
closed-form analysis, but by simulation of the readback system, con-
sisting of the head and load. The simulation environment allows the
author to avoid two limiting assumptions of the past. In this case,
he is able to treat a head of finite permeability and a nonzero load.
The load considered is a rather standard and adequate parallel RC
network. For the finite permeability head, an RL series equivalent
circuit is used in which the resistance and inductance are frequency
dependent and determined experimentally. The argument is made
that the open-circuit readback voltage (zero load) is linear with the
input (variation of flux in the storage medium). This fact allows
superposition to be applied, and the actual readback voltage com-
puted at the various harmonics of the input. Since R and L vary with
frequency, a different equivalent circuit of the head applies for each
harmonic. The analysis and superposition of the linear network
responses for each network is performed digitally. Finally, some
digital filtering is performed in an attempt to offset the effects of
distortion, to no avail.

To the extent that the eye can compare two time domain wave-
forms, there seems to be good agreement between experiment and the
simulation. In this writer's experience, such agreement constitutes
the beginning of a simulation study, not its conclusion. If this con-
tention can be accepted for the moment, we would conclude that
the major contribution of this paper is to demonstrate that the tech-
niques used here can provide a useful starting point for others in
studying this phenomenon. That is to say, the author has established
his model.