Letters

Natural limits on program size

While agreeing with many of Caxton Foster's observations and projections in the March/April 1972 COMPUTER ("The Next Three Generations"), I must disagree with his assumption that program size is growing slower than feasible memory size and that therefore we eventually will not need storage hierarchies. In some research areas (e.g., robotics, speech processing, natural language handline), we are beginning to see very large programs that use other very large programs as subroutines. This form of building has long been urged and it is clear that many of the capabilities we seek for computers can only come about through the aggregation of structures.

Thus, if there is a natural limit on program size, it certainly must be determined by a more complex function than just the rate at which programmers can generate instructions. A recent report (Belady and Lehman, "Programming System Dynamics," IBM Research Report RC3546, Yorktown Heights, New York, September, 1971) suggests that, like cities and bureaucracies, there may be effective limits on program size due to interaction effects. But there is no indication that a limit is close at hand, as we are only beginning to experiment with aggregation on a grand scale.

The amount of primary memory needed is more a function of processing power than of program size. Thus, it may be more profitable to phrase assumptions about memory size in terms of projected processing power than on projected program size, especially since we can predict the former much more easily than the latter.

Peter Freeman
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The utility of storage hierarchies

Professor Freeman makes a very good point about large research programs. It appears that the eventual bounds on these programs will far exceed the lifetime output of one programmer. But we were questioning the utility of storage hierarchies. It is currently fairly widely accepted that one instruction, debugged, documented, and executed costs around $10. At present (1972) prices the core required to hold such an instruction costs 1¢ per bit or say 32¢. That is, about 3% of the cost of the instruction it holds. Even if we treated core as a "throw-away" for one-time-use, this would not make a noticeable increase in the cost of research oriented (non-production type) software. It seems to me that viewed as above, the day I predicted has already arrived and the cost of sufficient storage to hold a program should be neglected and not, as is usually done, be treated as the primary expense consideration.

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Update

Information

for the computer professional

Symposium on mini-computers

The most successful one day symposium ever run by a professional society in the United States, was held at the National Bureau of Standards on March 1, 1972 by the IEEE Computer Society Eastern Area Committee and the Washington chapter. Attendance was over six-hundred with attendees from as far away as California, Texas and Florida. Only three IEEE Computer Society conferences, all of three day duration, have exceeded this attendance figure. Twenty-five new members joined the IEEE Computer Society at this symposium.

James A. Cunningham, Chairman of the Symposium, an executive from the Weather Bureau, provided the warmest welcome.

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