

8/15/73

Paul Friedl

Subject: Extending the precision of 1130 APL

1130 APL presently provides up to 6 digits of accuracy by utilizing the following data format:

M
M C

M = mantissa
C = characteristic

The precision could be increased to 11 digits by using 3 words to represent a number, with the added word used by the mantissa.

To accomplish the extended precision, revision and/or addition of code is required in the 1130 APL package, the 1130 simulator, and the 1130 emulator. A detailed description of the affected code is presented below.

I. 1130 APL

A. Floating point arithmetic package

The arithmetic package consists of a set of subroutines which support standard precision floating point arithmetic. They are derived from modules in the 1130 Subroutine Library and modified with respect to entry and exit assumptions and use of 'floating point registers.'

II. 1130 Emulator and Simulator

To facilitate modification of the 1130 APL code as described above, several new 1130 operation codes and the extension of an existing op code are desirable. A new register, designated the E register, will be used to hold the third word of a floating point number. The new op codes are as follows:

Load Triple - 1130 Load Double + load E-reg from an M-space 'shadow memory.' The latter is addressed as $\text{SHADOWMEMBASE} + ((\text{addr} - 1000)/2)$, where 'addr' is the address presented with the instruction.

Store Triple - 1130 Store Double + store E-reg to M-space shadow memory

Load E - load the E-reg

Store E - store the E-reg

Load Double - 1130 Load Double + E-reg $\leftarrow 0$

It is possible that Add Double, Subtract Double, Multiply, DIVIDE, and Shifts might need to be extended to work with the E-register.

estimates to provide extended precision
call for 2-3 months for the arithmetic package,
1 month for the conversion routines, 2 months for
the APL operators, 2 days for the miscellaneous code,
and ? for emulator and simulator. These figures
cover time to design, code, and debug to a phase-Q
level. Additional time must be allocated for documentation
and a product test of the complete package at the
level required for release. Documentation of
the APL operator code would be significantly longer
and more difficult to provide than that for the other
components. Also the lead time required to familiarize
the programmer with 1130 assembly code, 1130 APL,
and the Science Center computing environment must
be added in.

Kitty Price

to provide extended precision
for 2-3 months for the arithmetic package,
1 month for the conversion routines, 2 months for
the APL operators, 2 days for the miscellaneous code,
and ? for emulator and simulator. These figures
cover time to design, code, and debug to a phase-Q
level. Additional time must be allocated for documentation
and a product test of the complete package at the
level required for release. Documentation of
the APL operator code would be significantly longer
and more difficult to provide than that for the other
components. Also the lead time required to familiarize
the programmer with 1130 assembly code, 1130 APL,
and the Science Center computing environment must
be added in.

Kitty Price