SANE: Technical product description (1 of 2) (10/94)

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TOPIC ---

This article describes the Standard Apple Numeric Environment (SANE).

DISCUSSION --

I. Introduction

Apple supports SANE on several current products and plans to support SANE on
future products. SANE gives you access to numeric facilities unavailable on
almost any computer of the early 1980's--from microcomputers to extremely fast,
extremely expensive supercomputers. The core features of SANE are not exclusive
to Apple; rather they are taken from Draft 10.0 of Standard 754 Binary
Floating-Point Arithmetic [10] as proposed to the Institute of Electrical and
Electronics Engineers (IEEE). Thus SANE is one of the first widely available
products with the arithmetic capablities destined to be found on the computers
of the mid-1980's and beyond.

The IEEE Standard specifies standardized data types, arthmetic, and conversions,
along with tools for handling limitations and exceptions, that are sufficient
for numeric applications. SANE supports all requirements of the IEEE Standard.
SANE goes beyond the specifications of the Standard by including a data type
designed for accounting applications and by including several high-quality
library functions for financial and scientific calculations.

IEEE arithmetic was specifically designed to provide advanced features for
numerical analysts without imposing an extra burden on casual users. (This is an
admirable but rarely attainable goal: text editors and word processors, for
example, typically suffer increased complexity with added features, meaning more
hurdles for the novice to clear before completing even the simplest tasks.) The
independence of elementary and advanced features of the IEEE arithmetic was
carried over to SANE.

II. Data Types:

SANE provides three APPLICATION data types (single, double, and comp) and the
ARITHMETIC type (extended). Single, double, and extended store floating-point
values and comp stores integral values.

The EXTENDED type is called the arithmetic type because, to make expression evaluation simpler and more accurate, SANE performs all arithmetic operations in extended precision and delivers arithmetic results to the extended type. SINGLE, DOUBLE, and COMP can be thought of as space-saving storage types for the extended-precision arithmetic. (In this article, we shall use the term EXTENDED PRECISION to denote both the extended precision and the extended range of the extended type.)

All values representable in single, double, and comp (as well as 16-bit and 32-bit integers) can be represented exactly in extended. Thus values can be moved from any of these types to the extended type and back without any loss of information.

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