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NASA TECH BRIEF

Goddard Space Flight Center

Significance Arithmetic Experimental Package (SIGPAC)

The problem:

To provide a fully mechanistic "numerical procedure debugging" tool for users of conventional procedural programming languages (initially, Standard FORTRAN). This method would test actual error propagation in numerical calculations.

The solution:

A software package was developed to solve the problem stated above.

How it's done:

SIGPAC consists, in effect, of a compiler from FORTRAN source language into an artificial object language in which arithmetic operations produce, in addition to numerical results, a measure of the current significance of each result operand.

The purpose of SIGPAC is to provide to the scientific and engineering users of the IBM-360/95 computing facility a convenient, effective, and quite general means for testing and indicating the accuracy of computer calculations.

This work has two primary goals.

(a) To permit the testing and localizing of weaknesses within numerical procedures for abnormal error propagation from generated (primary truncation) errors.

(b) To provide an objective basis for determining when single precision gives adequate significance or when double precision should be used.

Notes:

1. This program is programmed in both FORTRAN IV (72%) and ASSEMBLER (28%) languages to be utilized by the IBM-360/95 computer.
2. Inquiries concerning this program should be directed to:

   COSMIC
   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: GSC-11499

Source: Isabella Cole
Goddard Space Flight Center and
Computation Planning, Inc.
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