

# NASA TECH BRIEF



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## Computer Program Determines System Stability (DIGSTA)

### The problem:

To find the stability of a system responding to a change in operating point or some form of input disturbance. This is needed for physical systems simulated by a digital computer. This should be accomplished without simulating a great many transients and reading them all out to form the stability map.

### The solution:

A computer program which implements a stability criterion that can be applied directly to the numerical solutions of systems of differential equations.

### How it's done:

The program accepts as input the time function of the system, a time to view the transient, and an acceptable amplitude boundary for any steady-state oscillation.

The time function is analyzed over the observation time and determined to be stable, unstable, or neutrally stable. If the observation time is not long enough, the time function will be conditionally stable or conditionally unstable. If a conditional situation develops in the search for a stability map, the control

logic also has the function of progressively increasing the simulation time by a time increment until an unconditional stability or instability occurs.

### Notes:

1. This program is written in Fortran IV for use on the IBM 7094 computer.
2. This program is particularly useful for highly non-linear systems and systems of great complexity. The techniques used can be applied to such tasks as process monitoring of a physical plant to maintain stability for safety or quality control purposes.
3. Inquiries concerning this program may be made to:  
COSMIC  
Computer Center  
University of Georgia  
Athens, Georgia 30601  
Reference: B68-10216

### Patent status:

No patent action is contemplated by NASA.

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