INTRODUCTION TO GASP IV

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GASP OVERVIEW

GASP is a simulation language that provides an organizational structure to build models that can be used to simulate the dynamic performance of systems on a digital computer. The organizational structure of GASP allows the variables that define system performance to be described by equations and logical conditions. System descriptions written in terms of difference or differential equations are referred to as continuous models. System descriptions written in terms of discrete changes based on logical conditions are referred to as discrete models. GASP supports the modeling of continuous and discrete models and a combination of the two.

The organizational structure of GASP specifies where and how system equations are written and the procedure for defining logical conditions that affect system variables. In GASP, an event approach is taken that specifies that discrete changes can only occur at event times. By using a defined organizational structure, GASP can perform the time advancement functions required by a simulation model and call specific user-written routines to obtain system performance updates and system performance changes.

Complete documentation for GASP IV is contained in references 1 and 2. This tutorial will present the highlights of the language and examples to illustrate the concepts described in this overview.

The philosophy underlying GASP is similar to one employed by most model and program developers. GASP presumes that there exists a commonality in simulation models and programs. Over the years, the common elements of simulation programs have been isolated, cataloged and characterized. It is these common elements written as FORTRAN or PL/I subprograms [1,3] that make up the GASP simulation language. A modeler using GASP builds a model by employing GASP routines to perform common functions. Since most modelers employ previously written routines, the process of building GASP models will not be significantly different for them. Instead of cannibalizing old programs, the GASP user takes off-the-shelf GASP routines and employs them where needed.

If all GASP did was to provide commonly used subprograms, it would be of help to the modeler. However, this would not be a significant contribution to model building. GASP's contribution to model building is imbedded in the organizational structure it imposes on the user. The organizational structure implicit in GASP is predicated on the belief that the time advance procedure or clock inherent to simulation models, can be a common, standardized subprogram. Thus, the executive routine associated with a simulation model can be precoded and provided to the GASP user. This executive routine is then used to call user-written functions in which the user models the dynamic and stochastic behavior of system variables.

When the executive routine is a common element that calls on user functions, the organization of the user functions can also be standardized. It is this standardization of user functions and the specification of the contents of user-written subprograms that provides the greatest asset to modelers when building a simulation program written in GASP.

To understand and employ GASP, one must understand the requirements placed on the modeler when developing such user functions. An explanation of the organization associated with GASP for continuous, discrete and combined models will be given in the tutorial.

APPLICATIONS

GASP IV is used extensively for both discrete modeling such as the study of inventory and queueing systems and for continuous modeling such as car and aircraft dynamic analysis. However, it is in the area of combined simulation that GASP has had its greatest impact. Specifically, applications to the process-oriented industries have been significant. For example, GASP has been used to study steel making operations [4], electroplating procedures [5], the manufacturing of plastic tubing [6] and the production of corn syrup [7]. Other areas where combined simulation is receiving attention is in crop planning and harvesting [8], environmental pollution analysis [9,10], and transportation [12]. GASP has also provided the basis for generalizing network simulation languages [13] and for a generalized crop simulation language [14].

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