NASA TECH BRIEF

Lewis Research Center

Optimizing Designs of Two-Level Factorial Experiments Given Partial Prior Information (NAMER)

The problem:

To be able to compute the utility of all possible matchings of physical variables to design variables and parameters to estimators for a specified choice of defining parameter group or groups.

The solution:

NAMER can be used to find the Bayes procedure for designing two-level fractional factorial experiments when given partial prior information. The required prior information is:

(1) A statement for each parameter giving a prior probability that it is not zero;
(2) A statement of the probability of stopping at each contemplated stopping point; and
(3) A statement of the value to the experimenter of an unbiased estimate for each parameter.

How it's done:

The steps of the design and performance of the experiment may be represented as a finite discrete game between the experimenter and nature. The decision space E, for the experimenter, consists of the choice of initial defining parameter group, the choice of the sequence or sequences of subgroups that define the telescoping, the choice of physical-design variable matching, and the choice of parameter-estimator matching. The decision space N, for nature, consists of the choice of which of the parameters are zero and the choice of the stopping point of the experiment. The Bayes procedure maximizes the expected utility over all possible distinct choices of parameter-estimator matchings, physical-design variable matchings, and defining parameter groups for an assumed strategy for nature.

This report presents an algorithm and a computer program entitled NAMER which computes the expected utility of all possible physical-design variable matchings and parameter-estimator matchings for a specified choice of defining parameter groups. The matchings which maximize the expected utilities are saved and printed out. The computational procedure utilizes the group properties of the parameters and the standard ordering. Complete program documentation is presented including sample input and output and a sample problem illustrating the usage, and a general flow diagram of the computer program.

Notes:

1. This program is written in FORTRAN IV to be utilized on the IBM-7094 computer.
2. Inquiries concerning this program should be directed to:

   COSMIC
   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: LEW-11708

Patent status:

NASA has decided not to apply for a patent.

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(LEW-11708)

Category 09