

Computer Program Descriptions

MINOPT—An Optimization Program Based on Recent Minimax Results

PURPOSE: To solve design problems in which the objective is to best satisfy a given set of design specifications or constraints in the least p th or minimax sense, assuming the availability of first partial derivatives of the functions concerned with respect to the design parameters.

LANGUAGE: Fortran IV; 512 cards, including comments.

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AVAILABILITY: ASIS/NAPS Document No. NAPS 02812. Listing and user's manual also available from J. W. Bandler at \$15.00. Source deck available for \$50.00.

DESCRIPTION: This program, called MINOPT, was used to generate some of the results presented in a recent paper [1]. The aim is to meet or exceed design specifications using the least p th approach [1]–[7], in particular, by an implementation of further results by Charalambous [7]. We assume the availability of first partial derivatives of the functions concerned with respect to the design parameters.

Essentially, a single least p th approximation with $1 < p < \infty$ can be done, or a sequence of least p th approximations with finite constant p can be carried out to produce highly accurate minimax solutions, if desired. The algorithm employs a lower bound on the minimax solution based on convexity assumptions and estimated after each least p th solution is reached. This lower bound can also be optionally used to provide a basis for successively dropping functions likely to be inactive at the solution, to reduce computational effort. Furthermore, gradient evaluations are usually not required for all the functions retained at any one time. Fletcher's quasi-Newton program [8] is used to minimize the unconstrained objective resulting from our formulation.

Restarting or rerunning the program making use of the results of a previous run with the same problem is a simple and useful feature. If the problem involves meeting certain design specifications, the first optimization will indicate whether such specifications can be satisfied [4]–[6]. An option is provided to

halt the optimization process if the specifications cannot be met. A small value of p such as 2 is recommended. If a large value of p is used, much effort will be spent in the initial optimizations which usually involve more functions.

In the documented report associated with this program [9] the algorithm is described in considerable detail, an example illustrating MINOPT's various features is included, along with the full listing. The program is readily incorporated into other automated computer-aided design packages. The organization is such that the designer can achieve minimax designs or conduct feasibility checks in an efficient and flexible way.

The program has been extensively tested on a CDC6400.

ACKNOWLEDGMENT

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FLOPT2—A Program for Least p th Optimization with Extrapolation to Minimax Solutions

PURPOSE: To solve least p th optimization problems, featuring an extrapolation procedure for minimax designs and a scheme for dropping inactive functions, assuming the availability of first partial derivatives with respect to the design parameters.

LANGUAGE: Fortran IV; 570 cards, including comments.

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