Computer Code Abstract

CUNLAP

1. Name of Program: CUNLAP
2. Computer for which program is designed: IBM-7090
   Programing system: Machine language.
3. Nature of problem solved: The three-group time-dependent neutron-diffusion equations are solved. The geometry may be (r,z), (r,θ) or (x,y); i.e. symmetry with respect to one spatial variable is assumed. The physical system is a multiregion, nonmultiplying medium. In a typical problem, the group fluxes are calculated at spatial mesh points for times between 0 and T_s during which a source exists in the fast group and for times greater than T_s when the source is turned off. The program was generated by a desire to solve the neutron die-away problem in cylindrical geometry.
4. Method of solution: The method of reducing the differential equations to algebraic equations is basically that used in the CURE code which is time-independent. The time domain is divided into steps and at each step the three sets of fluxes are determined by a variation of the Alternating Direction Implicit Method.
5. Restrictions on the complexity of the problem: Maximum number of spatial grid mesh points is about 3300. Maximum number of regions is 57. Macroscopic group parameters are input data. The source may be represented spatially by a number of mesh points having different source strengths, but it is required that all source points have the same time duration.
6. Typical running time: A problem with 500 mesh points requires approximately 20 to 30 min of IBM-7090 time to compute 75 time steps.
7. Unusual features of the program: The size of the time step may be arbitrarily preset for up to 39 time intervals beginning at time zero. After a time T_Δ specified by the user, the size of the time step is automatically adjusted to be compatible, within a predetermined accuracy, with the rate of decay of any single group flux.
8. Present status: In use.
9. References:
   1. E. L. Wachpress, "CURE: A Generalized Two-Space Dimension Multigroup Coding for the IBM-704," KAPL-1724, (April 30, 1957).
   2. E. L. Wachpress and G. J. Habetler, "An Alternating Direction Implicit Iteration Technique," *J. Soc. Indust. Appl. Math.* **8,** 403-424 (1960).
10. Source of program: Computer Usage Company, Inc., 655 Madison Avenue, New York, New York 10021.
11. Materials available to user:
    Instruction Manual
    Binary Deck

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