NASA TECH BRIEF

Manned Spacecraft Center

Program for Determination of Radiation Interchange Factors

The problem:

To devise a method for analytical and empirical determination of radiation interchange factors.

The solution:

An analytical model was devised for determination of radiation interchange factors. This model has a method of solution that is compatible with digital computer analysis. A generalized computer program was prepared to carry out these computations.

How it's done:

The program computes thermal and solar radiation interchange factors among surfaces having any combination of the following properties:

(1) diffuse emittance and reflectance
(2) diffuse emittance and specular reflectance
(3) diffuse emittance and components of diffuse and specular reflectance
(4) directional emittance and bidirectional reflectances.

Enclosures which contain only the first three types of surfaces may be simulated by a maximum of 1500 surfaces. Fully bidirectional enclosures are limited to 38 surfaces or less. The maximum number of surfaces in a mixed enclosure is governed by NM+M-N, where M is the total number of surfaces and N is the number of bidirectional surfaces.

In addition to the standard node to node matrix formulation, a mean to local approximation is available as a user's option. This method utilizes average property values for groups of surfaces, which can result in significant reductions in the size of matrices, and the time to invert them.

Input includes surface properties and geometrical data defining the shape, size, and location of each surface in the enclosure. The program printout includes input data, form factors, exchange factors, the transfer matrix and its inverse, nodal areas, and interchange factors.

Notes:

1. This program is written in FORTRAN IV for use on the IBM-360 computer.
2. Inquiries concerning this program should be directed to:

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    Reference: MSC-17563

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