

December 1967

Brief 67-10601

NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Analytical Drafting Curves Provide Exact Equations for Plotted Data

The problem:

To provide a rapid and accurate method for obtaining explicit mathematical expressions for any numerical data that appear in the form of graphical plots, i.e., thermodynamic properties of gases from a Mollier chart, physical properties of materials, etc.

Such a method would allow a considerable saving in time and effort when large quantities of tabulated data are needed in a particular computing program and there is insufficient storage space in the computer. By use of this method, an almost unlimited amount of data can be accurately represented by an exact mathematical equation and two transformation equations.

The solution:

Use analytical drafting curves each having a reference coordinate axis system indicated on the curve as well as the mathematical equation from which the curve was generated.

How it's done:

Given a set of data points that have been plotted in the coordinate system x_t-y_t . One or more of the analytical drafting curves can be so oriented as to fit the plotted data to any desired degree of accuracy. In the drafting curves coordinate system: x_r-y_r , there results an exact mathematical expression or set of expressions for the plotted data. By use of the transformation equations that involve translation and, in general, rotation, the plotted data can be represented in the primary coordinate system x_t-y_t . Therefore, the transformation equations (which are simple relations and are well known in mathematics) plus the mathematical equation of the drafting curve can be used to analytically represent all of the plotted data.

Notes:

1. It has been found from actual tests with second degree curves, that the aforementioned method can

easily provide agreement between the plotted data and the mathematical equations of better than 99 percent (where the plotted data is accurate). Experimental data, of course, would be within the accuracy with which a smooth curve represented the actual values.

2. Tabulated data from solutions of high order equations often cannot be conveniently subjected to "curve fitting" by computer. Such data in graphical form, however, can be conveniently represented by the analytical drafting curve method.
3. This method is most conveniently applied when the plotted data is single valued in both coordinate systems.
4. The use of analytical drafting curves has application to the teaching of analytic geometry since two dimensional coordinate transformations and curves that result from equations with multiple roots can be graphically demonstrated in a unique manner.
5. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia 23365
Reference: B67-10601

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Roger B. Stewart
(LaRC-285)
Category 02