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THE NASA-IGES GEOMETRY DATA VISUALIZER*

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SUMMARY

This paper describes NIGESview, an interactive software tool for reading, viewing, and translating geometry data available in the Initial Graphics Exchange Specification (IGES) format (ref. 1). NIGESview is designed to read a variety of IGES entities, translate some of the entities, graphically view the data, and output a file in a specific IGES format. The software provides a modern graphical user interface and is designed in a modular fashion so developers can utilize all or part of the code in their grid generation software for Computational Fluid Dynamics (CFD).

INTRODUCTION

The NASA Research Centers have started a coordinated effort to standardize the exchange of geometry, grid, and solution data used in the analysis of computational aerodynamics problems. The first phase of this effort is to provide rapid and accurate geometry data exchange between Computer Aided Design (CAD) systems and grid generation software. A draft Technical Specification has been written titled "NASA-IGES Geometry Data Exchange Specification" (ref. 2). The three NASA Research Centers, Ames, Langley, and Lewis are currently developing grid generation software capable of utilizing data as specified in this NASA-IGES Geometry Data Exchange Specification.

* Mr. Jasinskyj and Dr. Chou's participation is provided under NASA Contract NAS 2-12961

Personnel supporting the Numerical Aerodynamic Simulation (NAS) Systems Division at NASA Ames Research Center are developing a general NASA-IGES data visualization tool called NIGESview. The NIGESview program is designed to assist in transferring complex geometry between various software systems. The NIGESview program can read IGES files and display the geometry data from the file in a three dimensional color graphics display. The user is provided with several tools to visually inspect the geometry and perform some modification. Many advanced capabilities are planned. The intended data flow between CAD systems and grid generation programs is depicted in figure 1.

This paper describes the program design and important features as well as current and future planned capabilities.

PROGRAM DESIGN AND FEATURES

The NIGESview program is implemented with a highly interactive user friendly interface utilizing mouse and menu driven input and advanced color graphics. The program is written in the C++ language and is designed to run on a Silicon Graphics workstation.

The NIGESview program is designed to read in CAD geometry data in either IGES or NASA-IGES format, remove non-geometric entities that are not needed, translate some geometric entities to more desirable forms, display and analyze the geometry, and output IGES files with the desired set of NASA-IGES characteristics. The user is provided with visual and statistical tools to aid in verification of the data and to provide a capability for minor modifications. A key design goal is to retain the hierarchical object structure of geometry data and to be able to graphically interact with the data. The NIGESview software functionality is shown in figure 2. A list of some important features planned for the NIGESview software is presented below.

- Input capability:
 - NASA-IGES compliant files
 - Most Standard IGES files
 - Statistics provided to user on input file processing
 - Window up/down through directories to select files
- Conversion capabilities:
 - Reject non-geometric, non-NASA-IGES entities
 - All non-NASA-IGES entities converted to B-Spline based entities
 - All conversion options are individually user selectable
- Output capabilities:
 - NASA-IGES files
 - NASA-IGES NURBS only files
- Viewing and manipulation features:
 - Rotate, translate, zoom, change center of focus, etc.
 - Change color, adjust light source, wire frame or solid,
 - Select object by number or picking on screen with mouse, turn on/off objects
 - Delete an object (IGES entity)

CURRENT AND FUTURE EFFORT

Initial versions of the software will read in NASA-IGES format files, display the geometry in various ways, and output a NASA-IGES compliant file. Additional capabilities will be added incrementally.

An Alpha version of the software is currently available. This version can read in and display most NASA-IGES entities and write out a NASA-IGES data file. Version 1 of the software will be completed in late summer of 1992 and will include a robust NASA-IGES file input and output capability as well as several object viewing options and file information displays. Most of the remaining planned capabilities should be available by early 1993, including complete IGES input and conversion to NASA-IGES format.

NIGESview should provide an excellent base program for developing grid generation capabilities. Some potential enhancements include surface grid generation and domain decomposition, display and processing of solid models, and different output formats. In addition to the complete NIGESview program, many of the individual modules should be of use to surface modeling and grid generation developers.

Both the executable software and the individual modules will be made available to U. S. government, industry, and academia through normal NASA channels. This will provide developers with the option of utilizing all or part of this software in their specific grid generation application.

REFERENCES

1. Initial Graphics Exchange Specification (IGES) Version 5.1, distributed by the National Computer Graphics Association (NCGA) Technical Services and Standards, IPO Administrator, 2722 Merrilee Drive, Suite 200, Fairfax, VA 22031, telephone 703-698-9600 extension 325
2. Blake, Matthew W.; Chou, Jin J.; Kerr, Patricia A.; Thorp, Scott A.: The NASA-IGES Geometry Data Exchange Standard. *NASA Workshop on Software Systems for Surface Modeling and Grid Generation*, NASA CP-3143, April 1992.

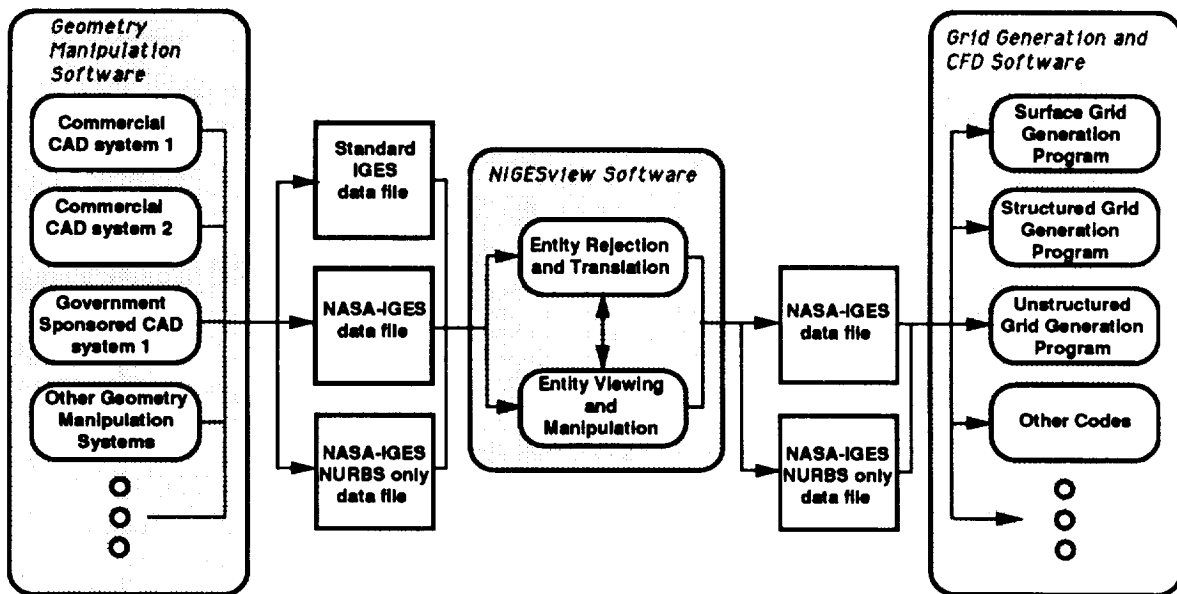


figure 1. NASA-IGES Data Flow

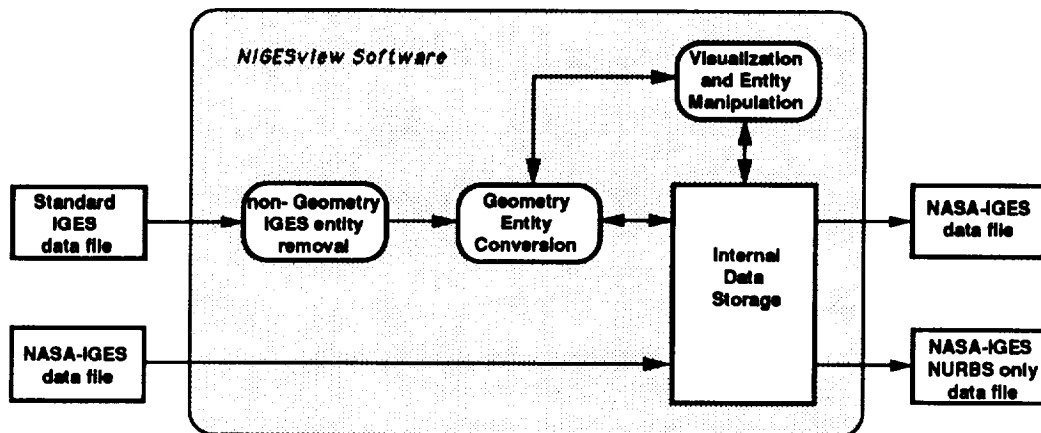


figure 2. NIGESview Software Functionality