APPLIED INTELLIGENCE

I-CASE Encyclopedia Brings Consistency to IS

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In this, the third of six columns on I-CASE technology, James Martin discusses the heart on an I-CASE tool: the encyclopedia, a high-level knowledge base that stores sufficient detail about a procedure so that code for the procedure can be generated automatically.

Rapid advances in PC technology are ushering in a new generation of front-end software-development systems based on computer-aided systems engineering (CASE) techniques. As discussed in the first article in this series on CASE tools, the most advanced integrated CASE, or I-CASE, tools incorporate front-end features such as graphical design aids for the planning, analysis and design phases of the life-cycle process, rule-based design validation, local knowledge coordinators and local encyclopedias. These PC-based, front-end functions are tightly integrated with mainframe-based, back-end code generators, database generators, documentation generators and project management aids.

I-CASE tools are oriented toward the support of systems analysts, system designers, application developers, programmers, engineers and system builders. Fully integrated CASE tools will fundamentally alter the way systems are specified, designed, implemented and maintained.

A CASE workbench should implement a complete software development environment that supports the entire life-cycle process, customization for each workstation user, powerful graphics, project-level coordination, automatic documentation and intelligent operation.

Centralized repository: The heart of a well-designed I-CASE system is an encyclopedia that is used as a knowledge base to store information about the organization, including its structure, enterprise model, functions, procedures, data models, data entities, entity relationships and process models. Sufficient detail is maintained about the design of a procedure so that program code for that procedure can be generated automatically.

The meaning represented by diagrams and their detail windows is stored in the encyclopedia. The encyclopedia steadily accumulates information relating to the planning, analysis, design, construction and, later, maintenance of systems. In short, the encyclopedia is the heart of a CASE system.

Two types of repositories of design information have been used in CASE software—a dictionary and an encyclopedia: A dictionary contains names and descriptions of data items, processes, variables, and so on.

An encyclopedia contains this dictionary information and a complete, coded representation of plans, models and designs, with tools for cross-checking, correlation analysis and validation. The encyclopedia stores the meanings represented in diagrams and enforces consistency within this representation. The encyclopedia "understands" the design, whereas a simple dictionary does not. It is an intelligent facility, not merely a passive database.

Use of an encyclopedia: The encyclopedia stores the meaning represented in diagrams and enforces consistency within this representation. Graphic representations are derived from the encyclopedia and are used to update it. The encyclopedia contains many rules relating to the knowledge it stores and may employ rule-processing, an artificial-intelligence technique, to help achieve accuracy, integrity and completeness of the plans, models and designs. The encyclopedia is thus a knowledge base, which not only stores development information but helps control its accuracy and validity.

Any one diagram on a CASE screen is a facet of a broader set of knowledge that may reside in the encyclopedia. The encyclopedia normally contains far more detail than is on the diagram. This detail can be displayed in windows by mouse-navigation around a hyperdiagram (See Jan. 9 column for a description.)

The knowledge coordinator: In an I-CASE tool, the goal of the design workbench is to collect sufficient information so that code for the system can be generated automatically.

As shown in the figure below, completed design specifications from multiple PC workbenches are fed to a central knowledge coordinator and encyclopedia.

The knowledge coordinator ensures consistency among the different pieces of knowledge that reside in the encyclopedia. It applies AI rules to the information that is checked into the encyclopedia.

The function of the central knowledge coordinator is to provide a global analysis of the design specifications from all workbenches in order to detect inconsistencies, ambiguities and incompleteness. Successfully analyzed specifications are then automatically converted into code. The generator should also generate database-description code and job-control language. In addition, it should generate a comprehensive set of documentation so that designers and maintenance staff can understand the system clearly.

Structured code is usually not as efficient as highly optimized code. Generated code may, therefore, be fed into an optimizer to make it as machine-efficient as possible.

In a complex enterprise using I-CASE development techniques, the central encyclopedia will grow, steadily accumulating information about such areas as the enterprise and its systems, its data models, data flows, process models, rules, specifications and screen designs.

Views and hyperviews: A common term in database technology is "view." A view of a database is a representation of data that is perceived by one person or program. The structure of the database may be far more complex than the structure of the view. The view shows only those fields in which the user is interested at the time.

Many views may be logically linked to form a hyperview, just as many diagrams are logically linked to form a hyperdiagram. A hyperview is a collection of knowledge about an activity or group of activities and the data these activities use. It can be represented with multiple, logically related screen displays. A hyperview is given an identification number and is one of the formal objects tracked by the encyclopedia.

The central encyclopedia contains many hyperviews. The different hyperviews overlap; in other words, they use common objects and employ data derived from a common data model.

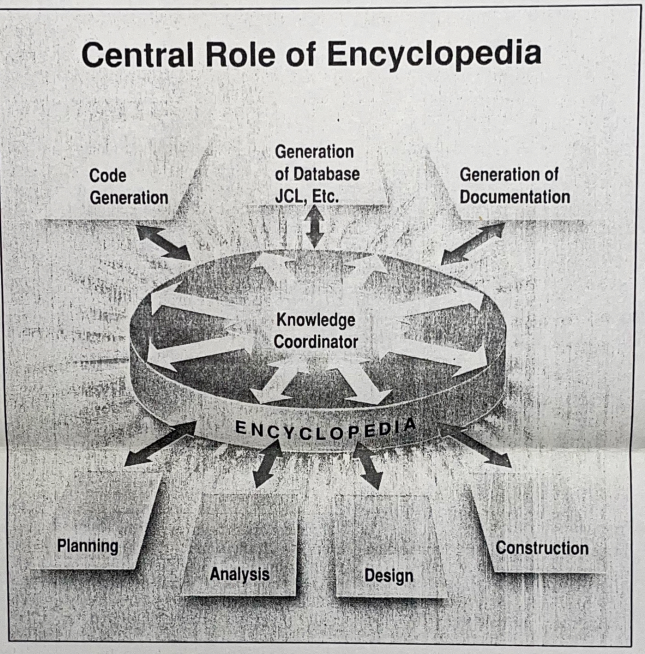
Consistency among diagrams: Different types of diagrams show different manifestations of the same information. These diagrams are linked together into hyperviews. Data may be entered in one type of diagram and displayed with a different type of diagram. The encyclopedia ensures that the different diagrams reflect a consistent meaning.

A person using a CASE workstation builds his own model or design. This is represented in a local hyperview. The local knowledge coordinator enforces consistency within that hyperview. The local hyperview is built with objects that are extracted from a central encyclopedia and use the detail that is centrally stored. There is, thus, consistency between the local hyperview and the central representation.

Two implementors may create two separate hyperviews. The central knowledge coordinator has the task of examining them in combination to ensure complete consistency between them. In this way, consistency is achieved even in a multiperson project or in a multiproject environment.

A computer with CASE representations can enforce absolute consistency in work among many implementors. Achieving consistency becomes a human problem of resolving different opinions. The computerized corporation of the future could not be built without computerized enforcement of consistency among its many information systems.

In next week's article, we will discuss the use of a distributed architecture for CASE tools. ■



David Hannum

The encyclopedia accumulates information relating to the planning, analysis, construction and, later, maintenance of systems.

The James Martin Productivity Series, an information service updated quarterly, is available through High Productivity Software Inc., of Marblehead, Mass. 1-800-242-1240. For information on seminars, please contact (in the United States and Canada) Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402 (213) 394-8305. In Europe, contact Savant, 2 New St., Carnforth, Lancs., LA5 9BX United Kingdom (0524) 734 505.