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RIVT:
Knowledge-Based Requirements and Integration Verification Tool

The Laboratory for Intelligent Processes and Systems at the University of Texas at Austin has developed a knowledge-based application called Requirements and Integration Verification Tool (RIVT) with Allegro CL. Engineers responsible for designing systems can use RIVT to "define, modify, and evaluate system component designs and then integrate respective components into an overall system design," according to Dr. Suzanne Barber, Director of The Laboratory for Intelligent Processes and Systems and program lead for the RIVT project. RIVT is particularly useful in industries such as automobile, aircraft, missile design, semiconductor manufacturing, and healthcare where designing and evaluating system architectures are critical. The knowledge representation capabilities of Allegro CL were key to building the requirements-driven system design of RIVT.

Knowledge Storage and Retrieval

According to Dr. Barber, RIVT conducts evaluations to determine if components meet performance requirements, if required system functionality is delivered from integrated components, and if integration of system components is viable. Dr. Barber explains that prior implementations of designs, both component designs and system designs composed of integrated components, are stored in a knowledge base. The designer can then look at which implementations are the best match for his or her requirements. "Humans can only deal with about a few constraints at a

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time, approximately five to seven," says Barber. "When working with several complex modules at once, the more you bring into the design, it begins to wreak havoc with the process. RIVT helps the designer figure out which are the best implementations given all of the requirements and constraints."

RIVT is specialized according to each domain in which it works. For example, if used in the missile design industry, RIVT must possess information in its knowledge base about the core components of missile design. In this case, the engineer queries the knowledge base by inputting a set of requirements and asking which component will best fit those given constraints. The engineer then states a second requirement and selects another best component and so on in the same fashion. As the designer uses RIVT to search for appropriate components and subsequently to select components, each one must integrate with the others. Additionally, RIVT will inform the designer when components will not integrate with each other, listing the reasons why, and offering suggestions for correcting those problems.

"We chose Allegro CL because of the reasoning capabilities we were able to develop in Lisp," says Barber. "RIVT performs a significant amount of reasoning across a symbolic representation of the component specifications, and for this symbolic representation, Lisp is ideal." RIVT's representation and reasoning requirements were instrumental in the decision to select Lisp as a programming language.

Marketability of Software Reuse

"Leveraging past experience — deciding how previous requirements were addressed in prior designs — can be key to efficient development of system architectures and designs," emphasizes Barber. "Leveraging prior designs may be just a case of having to make some modifications rather than developing a new design from scratch." In this case, the engineer is able to use the characteristics of a previous design, leveraging prior work, to fulfill requirements for a new product. The modification of a prior design is called a notional component. Barber explains that the ability to reuse designs makes RIVT a highly marketable application: "architecture compliance and software reuse are extremely hot software topics. Additionally, the importance of compliant, reusable components has risen dramatically with the acceptance of downloadable components through the World Wide Web."

For further information on RIVT, please visit their web site at http://www-lips.ece.utexas.edu.