The Sixth Annual Knowledge-Based Software Engineering Conference

Peter G. Selfridge

■ *The Sixth Annual Knowledge-Based Software Engineering Conference (KBSE-91) was held at the Sheraton University Inn and Conference Center in Syracuse, New York, from Sunday afternoon, 22 September, through midday Wednesday, 25 September. The KBSE field is concerned with applying knowledge-based AI techniques to the problems of creating, understanding, and maintaining very large software systems.*

The Sixth Annual Knowledge-Based Software Engineering Conference (KBSE-91) was held at the Sheraton University Inn and Conference Center in Syracuse, New York, from Sunday afternoon, 22 September, through midday Wednesday, 25 September. This conference was sponsored by Rome Laboratory (previously Rome Air Development Center) and was held in cooperation with the Association for Computing Machinery and the American Association for Artificial Intelligence.

The origin of KBSE-91 is as follows: In 1983, Rome Air Development Center published a report calling for the development of a knowledge-based software assistant (KBSA) that would use AI techniques to support all phases of the software development process (Green et al. 1986). This report led to a series of funding initiatives complemented by an annual meeting of those providing funds, researchers, and other interested parties, which then evolved into the KBSA conference. The conference grew in scope to include a variety of presentations of both KBSA-funded and other research, panel presentations, and demonstrations of both commercial and prototype systems. Finally, the name was changed from KBSA to knowledge-based software engineering (KBSE) to formalize the broadened scope of the conference.

The KBSE field is still being developed and defined. The main thrust of KBSE is to investigate the application of knowledge-based representation and reasoning technology to problems in software engineering and to use the results of this investigation to direct future research. A major component of this thrust is to develop technology relevant to the idea of an intelligent software assistant, capable of facilitating the various stages of software development. This latter emphasis on the software process originated in the 1983 report and is reflected in much of the work in the KBSE community. Issues such as requirement acquisition, specification, design, documentation, software understanding, reuse, evolution, testing and maintenance, and development environments are all of

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interest to the KBSE community. The annual KBSE conferences are certain to contribute to the development and definition of this field.

KBSE-91 was held in pleasant, compact surroundings in the Sheraton Inn and Conference Center adjacent to Syracuse University. Attendance grew by 20 percent over last year to total about 140 people from nine countries. Twenty-five papers, three panels, two plenary addresses, and about 10 demonstrations were presented.

The conference began with an optional tutorial session on Sunday afternoon that was intended for rela-

tive newcomers to the KBSE community. Over 60 people attended this session, which included three presentations. The first, given by Doug White of Rome Laboratory, was a summary of Rome Laboratory's Knowledge-Based Software Assistant Program. He stated that the primary goal of the program is to develop a knowledge-based software development environment with the following features: First, design should take place at a higher level of abstraction than current practice. Second, knowledge-based assistance should mediate the design activities, coordinate the software development process, and assist in the translation from informal domain representations to formal executable specifications. Third, the environment should maintain a repository of artifacts that can be used to maintain consistency and support evolution. The primary techniques for achieving these goals, some of the work already completed, and the status of the KBSA effort were described. The second presentation was a videotape by Elaine Kant of Schlumberger Laboratory for Computer Science entitled "Automated Program Synthesis." This tape described the use of application-domain models, very high-level specification languages, and reusable transformations to bridge the gap between what is easy for people to describe and what computers need to execute a program. The third presentation was a talk by Penny Chase of MITRE Corporation comparing and contrasting KBSE and current computer-aided software engineering technology.

The core of the conference began with a presentation by Barry Boehm, previously at TRW and now at the Defense Advanced Research Projects Agency. Boehm described, among other things, the Department of Defense's (DoD's) Software Technology Plan (SWTP), the goal of which is to map a strategy for reducing DoD's expenditures for software, which currently stands at about 24 billion dollars a year. The plan includes developing technology for "work avoidance" (through reuse), "working smarter" (through improvements in software process), and "working faster" (through advanced tools). It also includes the strategic themes of metaprogramming; high-level reengineering; process support and technology-management synergy; leverage of commercial technology; and, finally,

integrating AI and software engineering, a main goal of the KBSE community. After describing a success story from the Gulf War (the use of the dynamic analytic replanning tool [DART]), Boehm concluded with a description of the KBSE challenges. These challenges include knowledge capture (acquisition) for adding real value to intelligent systems, knowledge updating, knowledge representation choice guidelines to help spread the technology, and knowledge base–project database interoperability. The biggest challenge of all, according to Boehm, is the scalability challenge: making sure our techniques and technology can truly scale up to large, real-world problems.

During the rest of the conference, 25 papers were presented in nine sessions: General Design Issues, Requirements, Automatic Programming, Reuse, KBSA, Debugging, Reverse Engineering, Learning, and Process Support. These papers were selected from 56 that were submitted to the conference and reflected the state of the field as follows: First, there is a lot of activity in the support of requirement and specification activity. Second, domain modeling and domain knowledge are increasingly viewed as important (this fact was revealed in a panel presentation as well). Third, although the lack of maturity of the field is reflected in the "toyness" of many of the problems, there are now some significant success stories. Rather than report on some or all of these presentations in detail, the reader is invited to examine the proceedings (Proceedings 1992).

Panels and demonstrations were also part of the conference. The three panels were "Domain Modeling," moderated by Neil Iscoe of EDS, Incorporated; "Encouraging Adaptation of KBSA and KBSE Technology," moderated by Bill Sasso of Andersen Consulting; and "Knowledge-Based Design," moderated by Michael Lowry of the Kestrel Institute. The panels were a combination of presentations by the panel members and questions from the audience. Demonstrations included both academic prototypes and commercially available systems.

The final day of the conference featured a plenary address by Thomas Cheatham of Software Options and Harvard University. Cheatham, one of the authors of the original KBSA report, described computing in the 1990s as being characterized by networks of workstations, with an occa-

sional supercomputer; multiple simultaneous users; life-cycle support; and, finally, activity coordination or process support. He then described an artifact-based software engineering environment being developed at Software Options called the E-L (environment language) system. The E-L system is based on the management of small typed artifacts, which, along with a coarse structure of relations of reference, predecessor, and successor, can describe both a software system and the process and environment used to generate it. The E-L system coordinates activity by multiple users over a large, interrelated base of artifacts and projects to provide activity distribution, communication, persistence, modularity, viewing, and extensibility.

KBSE-91 ended with an open discussion of the conference and the goals and status of the KBSE community. A number of suggestions were raised, from generating better publicity and getting wider European participation to having more formal tutorials and thinking hard about the education issues in generating and using KBSE technology. The primary technical concern was the maturing of KBSE work into more realistic domains so that knowledge-based techniques and technology could be evaluated properly.

Planning, organization, and implementation of future KBSE conferences will be facilitated by the formation of a permanent KBSE steering committee. Lewis Johnson of USC Information Sciences Institute is both next year's conference chair and program chair. Donald Yu of UNISYS will serve as local arrangement chair. The conference will be held in the Washington, D.C., area in mid- to late September 1992. For more information about this conference, send electronic mail to kbse7-request@cs.rpi.edu.

IEEE Expert started a special track on KBSE. This special track should appear early in 1992 with a number of the best papers from KBSE-91; subsequently, the track will be open to general submissions. For more information, contact Peter G. Selfridge, AT&T Bell Laboratories, Murray Hill NJ 07974, pgs@research.att.com.

References

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Peter G. Selfridge received his Ph.D. in computer science from the University of Rochester in 1982. Since then, he has been at AT&T Bell Laboratories and is currently in the AI Principles Research Department. Selfridge's main interest is in the application of knowledge representation technology to problems in large-scale software development, maintenance, and understanding.

Advances in Interfacing...

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Processing Declarative Knowledge

restaurant where the conference banquet took place.

Proceeding preprints were available at the workshop, and book proceedings will be published as part of Springer-Verlag's Lecture Notes on Artificial Intelligence (Boley, H., and Richter, M. M., eds. 1992. *Processing Declarative Knowledge International Workshop (PDK '91)*. Berlin: Springer-Verlag. Forthcoming.

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