Configuration

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HENRY FORD REPORTEDLY SAID THAT HIS CUSTOMERS could have their cars in any color as long as it was black. Today, no car company could survive with such a narrow range of choices. Although products are still being mass-produced, customers increasingly demand adaptation to their own requirements. This of course applies to large investments, such as machinery or buildings, but also to consumer products ranging from cars and personal computers to watches and shoes.

Producing a specific design for each customer is not economical. Instead, producers use standardized sets of parts that can be configured into products satisfying a wide range of requirements. Computing such configurations is now critical to an enterprise’s success:

- Configurations must be correct, or a company will not be able to deliver the promised products.
- Configurations must be produced quickly, or a customer will go to the competition.
- Configurations must be optimal, or an offer might not be attractive enough to convince the customer.

These requirements strongly favor automating the configuration process. This pressure is amplified by the advent of electronic commerce, where configurations have to be produced online through Web servers.

At the same time, configuration often requires a lot of intelligence. The constraints on what parts can be configured together are often very complex. Customers might express their wishes in very different ways, thus requiring flexible problem-solving strategies. Products change, and the configuration systems must be continuously updated to reflect this. These factors make configuration a “killer application” for intelligent systems.

The strategic importance of configuration in future sales processes also makes it an ideal benchmark problem for many AI techniques. The articles in this issue give a good overview of the techniques used in currently deployed or developed configuration systems. Bei Yu and Hans Skovgaard, and Albert Haag, describe configuration systems sold by the two main suppliers of enterprise integration software, Baan and SAP. These systems use constraint- and model-based reasoning and represent the state of the art in commercial software. Deborah McGuiness and Jon Wright describe an alternative technique, description logic, that Lucent has used in a number of in-house applications. This approach has not yet become widely distributed in commercial tools, but its elegance makes it an attractive alternative that might have a wider impact in the future.

Although using standard AI reasoning techniques to construct configuration systems is possible, this would require models to be handcrafted for every application. Research in configuration systems has therefore focused on providing general and powerful paradigms for modeling configuration problems. Werner Juengst and Michael Heinrich discuss resource-oriented configuration, which greatly simplifies the modeling issue in configuration problems. Gerhard Fleischdaler, Gerhard Friederich, Alois Haselböck, Herwig Schreiner, and Markus Stumptner present a new framework for modeling and solving configuration problems with generative constraint satisfaction.

A survey by Daniel Sabin and Rainer Weigel provides a more extensive introduction to the subject, and “The Role of Configuration Knowledge in the Business Process,” by Eugene Freuder, Bruce Ambler, David Franke, Daniel Mailharro, Jean-Francois Puget, and Bob Phillips, presents several views from industry.

SO FAR, CONFIGURATION TOOLS HAVE FOCUSED ON basic problem-solving abilities. As configuration systems evolve toward full-fledged “automated salespeople,” they will require many other capabilities, such as learning or reasoning with uncertainty. This should provide many opportunities for AI researchers. We hope that this special issue contributes to an awareness of such opportunities as well as of their commercial significance.

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Book Reviews Web site

In this issue of Intelligent Systems, we are skipping the Book Reviews column to give our reviewers some breathing room over the summer. But we would like to announce a new Web site associated with this column: http://islnotes.cse.msu.edu/domsite/other/IntSystems/bookreviews.nsf.

The Intelligent Systems Book Reviews Web site will include reviews that have already appeared in Intelligent Systems and a list of all books currently received. The site will also let readers suggest books they would like to see reviewed and volunteer for “reviewer duty” by listing their areas of expertise and uploading a vita.

Perhaps uniquely, visitors to the site will be able to comment on past reviews—in essence, reviewing the reviews. All comments within the bounds of normal scholarly civility will be accepted.