

Finding the decisive factor

Can't make your mind up? A research group led by Prof Gene Freuder is developing technology that delves into how we make important decisions, writes **Dick Ahlstrom**

Those having difficulty choosing this year's summer holiday might consider talking to a research group at University College Cork where computers with artificial intelligence are making important decisions.

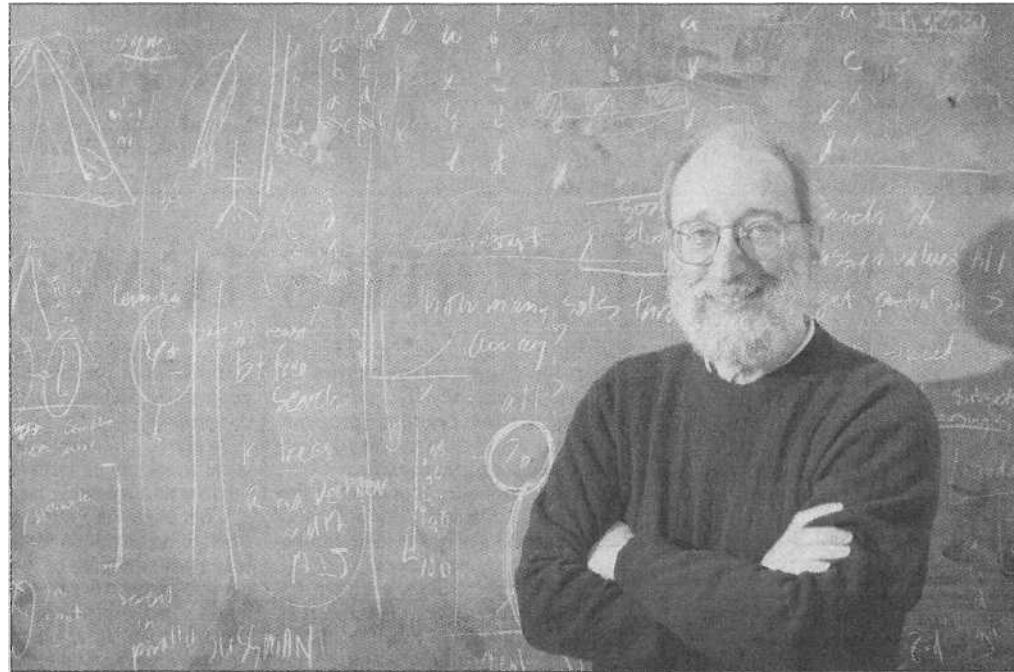
The Cork Constraint Computation Centre (4C) develops computer software and the underlying science to help businesses and individuals make good decisions, explains 4C director Prof Gene Freuder.

"Our motto is 'making hard decisions easier' and that is what we try to do," he says. The idea is to solve complex decision-making problems using computers "taught" to weigh up the pros and cons while including the constraints operating on any given decision.

Freuder came to Ireland in 2001 from the University of New Hampshire and is a professor in UCC's Computer Science Department. He holds a €7.5 million research fellow grant from Science Foundation Ireland and leads a research team at 4C that involves up to 50 people.

The centre has also attracted support from Enterprise Ireland, the Irish Research Council for Science, Engineering and Technology and from industrial partners.

In late October Freuder was elected as a Fellow of the American Association for the Advancement of Science (AAAS). He was one of only 14 new Fellows elected in 2005 for the information, computing and communications section out of a total of



Decisions, decisions: Prof Gene Freuder, director of the Cork Constraint Computation Centre (4C)

376 new AAAS Fellows.

"I was very pleased and pleased for the centre and hope it reflects well on Science Foundation Ireland and its choices," he says of the distinction.

The award certainly arose as a result of the work he has done for some years in artificial intelligence (AI) and constraint computation. "I come from an AI background so I use inference and other AI techniques. One of the active research areas is integrating AI and OR [operations research] techniques to solve problems."

We make hard decisions every day but don't really think about what goes into making a decision. "There are all sorts of choices we have to make with lots of decision variables and constraints," says Freuder.

"It is difficult to make decisions under these circumstances. We work on the underlying science and the applications needed to help people make better choices. Constraint computation allows you to do that sort of thing but on a much more sophisticated level."

As an example, he described the decision-making involved with a person shopping for a digital camera. "At the most basic level you might want to know what is possible," he says. Can you buy a digital camera for less than €20? Or can you get a moderately good camera for under €100? Are you satisfied with a one-megapixel camera or do you need five-megapixel resolution? If so, how much are you willing to pay if it is more than €100?

The computer weighs up the options while looking at what Freuder describes as the "hard" and "soft" constraints. His researchers develop mathematical algorithms that allow a problem to be solved in a computational way.

4C conducts extensive research but has also established links with companies here to work on real-world problems. Projects have included work on supply logistics with Cork University Hospital and on the optimisation of floor plans at Bausch & Lomb in Waterford.

"We want to make it easier to use so it will have more of an impact," says Freuder. Some software is specifically designed for a specific company problem, but many of the algorithms can be applied in other situations so there is the potential for "off the shelf" computer software in support of easier decision-making.

Freuder's research team has grown quickly and includes academics, post-doctoral researchers and graduate students. It also has a strong international dimension.

"We have brought in people from all around the world and I think we are building something nice here."