A human approach to computer processing

December 2 2008

A more human approach to processing raw data could change the way that computers deal with information, according to academics at The University of Nottingham.

Researchers in the School of Computer Science at the University's Malaysia Campus are exploring 'granular computing' — a computer paradigm that looks at groups or sets of information, called information granules, rather than the high level of detail at which data is currently processed.

By looking at data in this way, new patterns and relationships emerge — which could potentially give us access to new types of computer modelling in a range of fields, including process control and optimisation, resource scheduling and bioinformatics.

The concept of a granular approach to computing is inspired by human thought processes, according to Professor Andrzej Bargiela, Director of Computer Science at Malaysia Campus.

"Creating abstractions from detailed information is essential to human knowledge, interaction and reasoning," said Professor Bargiela. "The human brain filters the flood of information and distils knowledge subconsciously."

"We can observe such an information processing pattern not only in scientific domains but also in fine arts and in natural language conversation. When an artist paints a picture they are not focussing on

photographic accuracy, they focus on the artistic message — and use brushstrokes to simplify the reality in a way that is conducive to conveying that message. We remember conversations, but we don't remember every word — the raw data — we remember the meaning, gist and nuance in other words the abstractions of the conversation. That is the basis for distilling human knowledge and understanding.

"We process a huge amount of information second by second. If we were aware of every single thing, our minds would be overloaded. The flood of information would choke us. The human mind uses the method of information abstraction to cope with the sensory overload of everyday life."

It is thought that the granular computing approach to information processing may capture this essential characteristic of human information processing and offer a breakthrough in dealing with information overload in a broad spectrum of application domains. Several PhD projects supervised by Professor Bargiela test this hypothesis in the context of varied applications, including urban traffic monitoring and control, job scheduling, timetabling and protein classification. Other applications that will be explored in the near future include environmental modelling and assessment of potential of under-utilised crops.

"Technology allows us to capture an enormous amount of information, but making most of that information represents a significant challenge," Professor Bargiela explained. "Over the last decade granular computing research has been gradually developing mathematical foundations for information granulation and granular modelling of systems. We have been part of this research development from the very nascent stages of granular computing. It is extremely exciting to see that the age-old paradigm of human information processing only just starts to be formalised as a well-founded method in computer science."

Source: University of Nottingham