Computers may need patterns to think better

July 31 2012

(Phys.org) -- Patterns needed to help computers think better have been investigated by an international research group including a Charles Sturt University (CSU) expert, with the results reported in the latest issue of the international journal *Nature Scientific Reports*.

The results come from ten years of collaboration between the Director of CSU's Centre for Research in Complex Systems, Professor Terry Bossomaier, and colleagues at the University of Sydney lead by Professor Allen Snyder.

"We want to understand how shifts in paradigm occur in human thinking. These shifts occur in individuals when they reach their performance in such areas as mathematics or finance. In societies they occur as knowledge grows and attitudes change," Professor Bossomaier said.

"One challenge we faced was to find ways of measuring these shifts. We decided to use the ancient oriental game of Go and study how experts in Go use patterns to remember strategies for the game, and how these might be simulated in a computer program.

"Computers are currently quite good at face recognition, but voice and speech processing still have some way to go. In areas of what we call 'thinking', particularly common sense, computers are still quite weak," Professor Bossomaier said.

"One big difference between human thinking and current computational

intelligence is that we use a big library of patterns we build up over the years to give us a fast intuitive grasp of a situation.

“The great cognitive scientist Herbert Simon, who won the Nobel Prize for Economics, recognized this as needing to build up chunks of little patterns, and needing at least 50 000 of these to reach expert level at anything. We now think it is more than 100,000 patterns.”

The research project aimed to develop a deeper understanding of how these chunks are gained and how they change with experience.

“We also wanted to capture decisions made in the real world, without the restrictive effects of being in an artificial experiment. We decided to do this by capturing the moves made in high level games played online, such as Go,” Professor Bossomaier said.

Chess was the domain of study for human expertise, but after the Deep Blue computer defeated then World Champion Gary Kasparov in 1997, interest has turned to other games of skill.

“Go is as old as Chess and is played extensively in Asia, especially in Japan and Korea. Human players are still much better than computers. This is an excellent game to study to learn more about what humans do really well,” he said.

The first phase of the research showed that people's knowledge undergoes dramatic reorganisation when they move from amateur to professional rank.

“The change takes place not just in the areas of ‘deep strategy’, where one would expect the big gains to be, but also there is a radical reorganization at the perceptual level,” Professor Bossomaier said.

“It's a bit like acquiring a good accent in a foreign language. At quite a young age, the sounds of one's first language get set and are very difficult to change later.

“The perceptual templates we found for Go are akin to the ‘phonemes’ or sounds of a language. But unlike language, we found that these low-level templates do change with many years of practice.”

Professor Bossomaier believes this also has major implications for education. “Getting the building blocks right is the key to developing expertise. If we can find these blocks, the templates used by the superstars, we might be able to build them into the early training of professionals.

“Computer games are also being increasingly used in education and training. Insights from studying the most difficult games such as Go can also be fed back into more serious games,” he said.

More information: www.nature.com/srep/2012/12071 … /full/srep00502.html

Provided by Charles Sturt University