Artificial intelligence: Is it an impossible dream?

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Most students' only direct contact with computers is to use them as glorified typewriters. But how many students have entertained the possibility that, one day, the computers will be writing their term papers for them?

Since the 1950s, when the mythical term Artificial Intelligence (AI) was first coined, the possibility of creating thinking machines has fascinated researchers and the public alike.

> *"Things like common sense, intuition, reasoning and general problem solving are hard nuts to crack."* — Anil Nair

It also raised questions as to whether computers would ever be able to feel emotions and be creative. And if computers ever possessed these traits, what would that make humans? Machines? *Computo, ergo sum.*

Three decades and loads of money (mostly from the Pentagon) later, the same questions remain unresolved. Although many computer programs are good at carrying out specialized tasks, they still cannot think in a human sense.

Perhaps the AI researchers have not had enough time to vindicate their more optimistic claims. Or it may be that trying to build a thinking machine is theoretically impossible.

One of the more successful AI programs, called MYCIN, was developed at Stanford University by Edward Shortcliffe. This program has the ability to diagnose bacterial blood infections after details of the patient's case history have been typed in. It works using heuristic if-then rules — educated hunches. An example of such a rule would be, "If organisms were not seen in the test culture and if the patient was badly burned then the infection may be *P. aeruginosa*."

MYCIN can suggest medical tests to fine-tune the patient's diagnosis, as well as recommend a course of treatment. Its predictions have been shown to be on a par with those of a medical practitioner, and the program has been marketed successfully as a reference tool.

MYCIN is known as an expert system. Other expert systems have been developed to simulate weather systems, design cars, play chess (to a very high standard) and predict the outcome of wars. They all operate very well within their own spheres of knowledge, but they have limitations that deny them any claim to real human intelligence.

The most important limitation is that these programs are unable to adapt themselves to different conditions; they are "brittle."

One of the main reasons for that is the difficulty in creating a knowledge base large enough to deal with aspects outside the program's own narrowly defined area. All of us carry in our minds huge amounts of general knowledge and common sense, which we take for granted. This base allows us to get around on a day-to-day basis and to cope with any unexpected situations. Programming even a fraction of this knowledge into a computer is a very difficult task, and that explains why expert systems have remained idiot savants.

Apart from the practical limitations of these programs, AI has also been under philosophical attack. John Searle, a philosopher at Berkeley and a leading expert in this area, supports the claim that AI could be used as a *tool* to simulate aspects of mental processing. But he does not believe that AI could ever think intelligently in a human fashion. Searle argues that a program which uses formal rules to manipulate symbols can never think or be aware because the symbols do not *mean* anything to the computer.

Herbert Dreyfuss, a colleague of Searle, also denies that AI could ever attain a deep level of thinking. He argues that perception, understanding and learning are not just a matter of rules to be entered into a program. Rather, they are holistic processes, impossible to pin down with formal axioms.

Recent research of the 1980s may yet prove the armchair philosophers wrong. At present, the new fields of "parallel computers" and "neuronal networks" are blossoming.

Parallel computers are designed so the many components that carry out the information processing can operate simultaneously. That is in contrast to most of today's computers, which only operate sequentially, one task after another. The improvement is equivalent to having an extra nine workers on a job, rather than making one worker labor 10 times more quickly to get the same job done. Just as a worker reaches a limit in productivity, so a serial computer reaches a limit in speed of processing. Parallel computers will be faster and more efficient.

The rationale behind the neuronal network approach is that if the brain of a living organism is good at thinking, why not model the hardware of a computer on the structure of the nervous system?

One UNC professor of philosophy, Stan Munsat, is especially optimistic about the potential of neural networks. "None of the objections of Searle and Dreyfuss apply to neural networks," he said. "They don't apply because neuronal systems aren't rule followers."

The most promising aspect of the neuronal networks is their ability to learn, albeit at a rudimentary level, from their past experience. Because they lack a rigid structure of connections, they have a "slippery" quality that enables them to cope with new information and unforeseen situations.

But the ultimate success of these new developments remains to be seen. Anil Nair, a UNC computer science graduate who now works in Silicon Valley, Calif., is not confident about the more ambitious claims of AI. "Things like common sense, intuition, reasoning and general problem solving are hard nuts to crack," Nair said. "And I don't think it's worthwhile to pursue solutions for these problems."

Will computers be replacing students in their scholastic research? We need not worry for the time being. It will be many years, if ever, before the artificial intelligence of computers replaces the natural intelligence of humans.

Creative

from page 8

manuscript paper method.

"In a way, it's made quite a contribution to musical illiteracy, and made inferior music instantly available in the performance arena."

In addition, although computers are helpful in score-writing, Hannay said, "by 'composing' right into the computer, the mystical quality of individuality in notation is lost. From this point on, libraries are going to be collecting disks, and you won't find the infinitely variable calligraphic idiosyncrasies of a Stravinsky manuscript or a Brahms manuscript. Everyone's manuscript will look exactly the same. It is similar to the effect on writers when the typewriter came into general use, I think. It resulted in a definite change in writing styles."