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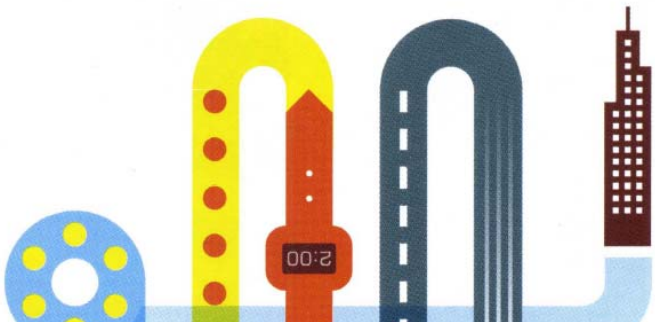

Search engines quicken with a quantum touch

QUANTUM theory has a reputation for obscuring things as much as for pinning them down. But its underlying mathematics could help internet search engines to assess web pages more efficiently.

One reason for Google's enormous success is PageRank, an algorithm that measures the importance of a web page by examining the other web pages that link to it. To calculate a page's ranking, Google's software bots crawl the web, gathering information on which pages are linked to each other. It then performs a demanding computation to get the PageRank. The process is repeated frequently to keep it up to date.

Now a team of physicists led by Nicola Perra at the University of Cagliari in Italy may have found a better way to calculate a page's rank. They say PageRank's mathematical basis bears an uncanny similarity to the Schrödinger equation of quantum theory, meaning that mathematical short-cuts used in quantum physics can also be applied to the web (www.arXiv.org/abs/0807.4325).

In physics, solutions to the Schrödinger equation yield "wave functions" linked to the probability of a quantum object – an electron, for example – being found in various places. Interactions with other particles influence the properties of the wave function and where the particle is likely to be found.

Perra and her colleagues argue that links between web pages play a role akin to particle interactions. And since web surfers are more likely to be found on the most highly ranked pages, they claim that PageRank can be expressed in terms of a wave function.

> "Links between web pages play a role akin to particle interactions"

The team reckons the analogy has practical uses. In quantum physics, it is often easiest to calculate the wave-function solution for one problem by thinking of it as a small correction to a solution already known for a similar problem. Similarly, today's PageRank can be calculated by making a small correction to yesterday's value, based on changes in the web's structure reported by the web-crawling bots. Sample calculations carried out by the researchers show that this can be significantly faster than redoing the entire calculation from scratch.

Andrei Broder of Yahoo Research in Burbank, California, offers qualified support. "It seems they can compute some approximations faster than by traditional methods," he says. But he warns that further tests are needed to see if the technique offers genuine practical advantages, and notes that it only provides a partial solution in any case. "Analyses like PageRank are now just one of maybe hundreds of factors used to rank pages," he says. Mark Buchanan ●