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Quantum Physics, PageRank & the Schrödinger equation

by PATRICK ALTOFT *on* AUGUST 8, 2008

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The original PageRank equation described the importance of a web-page as a function of the number of other web pages linking to it. The theory was based on a modified random walk model whereby if a random web surfer visited a page the probability they click on any given link is governed by the number of links on the page and a damping factor to take into account the probability they don't click on any links.

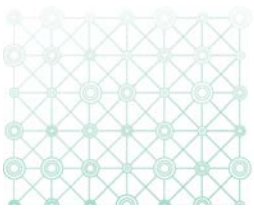
$$PR(p_i) = \frac{1-d}{N} + d \sum_{p_j \in M(p_i)} \frac{PR(p_j)}{L(p_j)}$$

The basic result of this formula is that the pages that have the most links (citations) are visited by the random surfer more times and are deemed to be of greater importance and are given higher PageRank.

Since the PageRank equation is iterative it requires quite a lot of computational power to calculate, something which Google has no doubt been addressing ever since they devised the algorithm in the late 90's. A host of other papers have explored linear methods of improving the PageRank calculation process.

A new paper released last month describes how the PageRank algorithm can be compared to a Schrödinger type wave equation making calculations much faster.

> For a single particle in three dimensions:
>
> $$i\hbar\frac{\partial}{\partial t}\psi = -\frac{\hbar^2}{2m}\nabla^2\psi + V(x,y,z)\psi$$
>
> where
>
> - ψ is the wavefunction, which is the amplitude for the particle
> - m is the mass of the particle.



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