Re: Schrodinger Equation Reversibility and Additivity

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From: Osher Doctorow (*mdoctorow_at_comcast.net*)
Date: 01/08/05

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On 7 Jan 05 15:53:48 −0500 (EST), Osher Doctorow wrote:
>In my recent thread on the Schrodinger Equation, I outlined a
>derivation of the equation by dimensional analysis with and
>without a probability dimension for the wave function.
>Miguel A. Martin−Delgado in "The Schrodinger equation, reversibil−
>ity, and the Grover algorithm," arXiv:quant−ph/0412130 v1 16
>Dec 2004 (he's at U. Complutense, Madrid) has independently shown
>how the Schrodinger equation is importantly related to reversibil−
>ity and additivity−subtractivity rather than multiplication−
>division. It is of course desirable to use addition and subtrac−

Martin−Delgado points out that quantum computation is a class of reversible computation and that quantum programming harnesses this reversibility, and that entanglement results from combining QM (Quantum Mechanical) Supersition Principle with single−particle tensor products to store many classical registers simultaneously in quantum paarallelism. Unlike some other researchers, Martin−Delgado points out that QM is probabilistic and this implies that Quantum Computation is also and that the object of quantum prog−ramming is to make this probability as close to 1 as possible with a pattern of constructive interference of amplitudes as in the Shor (factoring) algorithm and the Grover (item search in disordered database) algorithm.

With reversibility, we can compute backwards exactly by saving only the number of steps and the final conditions, unlike current standard irreversible computers. Quantum computers (QC) operate with finiteness by putting the Schrodinger equation on a space−time lattice which is discrete. There are two types of finite difference schemes which work, the asymmetric difference scheme and the symmetric difference scheme, the former leading to approximate but not exact reversibility, the latter to exact reversibility, with respective approximations to derivatives:

1) (d/dz)F(z) = [F(z_i+1) − F(z_i)]/e + 0(e)
2) (d/dz)F(z) = (1/(2e))[F(z_i+1) − F(z_i−1)] + 0(e^2)

for a given function F(z).

Osher Doctorow