ARTIFICIAL INTELLIGENCE LABORATORY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PHYSICS OF COMPUTATION
THEORY OF COMPUTATION
JOINT SEMINAR

Date: Friday, September 27, 1996
Time: Refreshments at 3:15pm
Talk at **3:30pm**
Place: NE43-518

Quantum mechanical searches are faster than classical searches

Lov K. Grover
AT&T Bell Labs

An unsorted database contains N records, of which just one satisfies a particular property. The problem is to identify that one record. Since the database is completely unsorted, any classical algorithm, deterministic or probabilistic, will need to look at a minimum of $N/2$ records to have a 50% chance of success. Quantum mechanical systems can be in a superposition of states and simultaneously do multiple operations. By properly adjusting the phases of these operations, successful computations reinforce each other while others interfere randomly. As a result the desired record can be identified in only sqrt(N) operations. It is similarly possible to obtain statistics (e.g. the median) much faster by a quantum mechanical algorithm than by any classical algorithm. This talk will describe the database search algorithm and other recent work at an elementary level.

Hosts: Norm Margolus and Ron Rivest

This talk is part of a seminar series on adapting computers and computations to the constraints of, and opportunities afforded by, microphysics; and on the development and application of the physical theory of computation and information. This seminar series is supported by the MIT AI Lab's Reversible Computing Project. If you would like to receive electronic notice of these seminars, send email to "poc@im.lcs.mit.edu."

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