ARTIFICIAL INTELLIGENCE LABORATORY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PHYSICS OF COMPUTATION SEMINAR

Date: Friday, March 20, 1998
Time: Talk at **4pm**
Refreshments after the talk
Place: NE43, 8th-floor AI Playroom

Quantum error correction: what is it, and will it work?

Andrew Steane
Oxford University

Quantum error correction (QEC) comes from the union of classical information and quantum mechanics. It is a very powerful method to counteract noise in a quantum system whose state is subject to detailed (but imperfect) experimental control, for example a few-qubit quantum processor or, one day, a quantum computer. The talk will have two aims, first to introduce the principles of quantum error correction to people unfamiliar with the field, and secondly to address questions of practicality. Large scale (ie. more than 1000 qubit) quantum computing is probably impossible without QEC, yet QEC itself involves complicated networks of operations, and will introduce more noise than it removes unless the conditions are right. It turns out that QEC comes into its own when it is used on a large scale (ie. thousands of qubits), and it thus makes us cautiously optimistic about the future of quantum computing. Also, methods designed around specific physical systems are powerful even for 'modest' experimental requirements such as a few qubits on each end of a noisy communication channel. Nevertheless, such experiments are at the edge of what is currently technologically feasible.

Host: Norm Margolus

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. If you would like to receive electronic notice of these seminars, send email to "poc@mit.edu."

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