ARTIFICIAL INTELLIGENCE LABORATORY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PHYSICS OF COMPUTATION SEMINAR

Date: Monday, October 6, 1997
Time: Talk at **4:00pm**
Refreshments after the talk
Place: NE43, 8th-floor AI Playroom

Quantum Computation and Decision Trees

Edward Farhi
Massachusetts Institute of Technology

Many interesting computational problems can be reformulated in terms of decision trees. A natural classical algorithm is to then run a random walk on the tree, starting at the root, to see if the tree contains a node n levels from the root. We devise a quantum mechanical algorithm that evolves a state, initially localized at the root, through the tree. We prove that if the classical strategy succeeds in reaching level n in time polynomial in n, then so does the quantum algorithm. Moreover, we find examples of trees for which the classical algorithm requires time exponential in n, but for which the quantum algorithm succeeds in polynomial time. The examples we have so far, however, could also be solved in polynomial time by different classical algorithms.

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."