ARTIFICIAL INTELLIGENCE LABORATORY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PHYSICS OF COMPUTATION SEMINAR

Date: Tuesday, May 20, 1997
Time: Talk at **3:30pm**
Refreshments after the talk
Place: NE43, 8th-floor AI Playroom

Imperfect Computers

Phil Kuekes and Bruce Culbertson
HP Laboratories

We have built a reconfigurable computer with 0.22 square meters of CMOS silicon in 864 chips, three quarters of which have known defects. The Teramac custom computer can be thought of as a giant programmable gate array with half a billion configuration bits. The large number of configuration bits and the two million wires available for routing make it very easy to place and route logic designs onto the physical network without depending on an unbroken symmetry in the physical network.

Teramac is big enough to let us begin to explore some of the issues which will be faced by architects of the first nanoscale computers. How do we make a computer with nanometer scale components? To make a computer we need not only small components but a method of connecting them in a reasonably arbitrary way, chosen by the computer designer. Most self assembling strategies at the molecular scale create very regular structures which lack the complexity required of a computer. More elaborate assembly strategies are likely to be very imperfect. The topology of the Teramac interconnect is regular only in its fractal dimensionality. The place and route software does not depend on significant symmetry. If you have enough wires and switches you can first build an imperfect machine and then design a perfect one.

Hosts: Norm Margolus and Tom Knight

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."