CAM-8: Moving Towards Ultimate Computation

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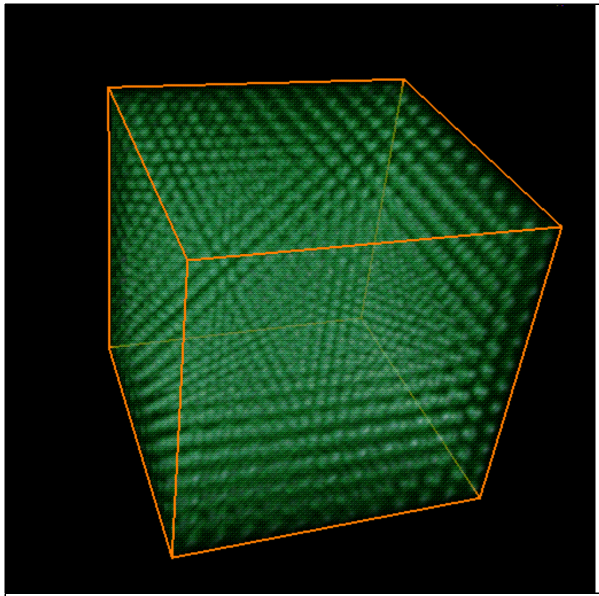

U. S. Air Force 3-D elastic solid simulation developed on CAM-8.

NEW IDEAS

- **Spatial Computation** Embedding computation into space is traditionally the province of a computer architect; but one can gain tremendous hardware efficiency by building a uniform computing space, and making programmers themselves directly responsible for embedding their algorithms into a uniform spatial matrix.
- **Virtual-Space Algorithms** Current technological and economic considerations recommend a virtual-processing implementation of spatial computation, in which relatively few processors simulate a much larger number: this leads to new possibilities for algorithms that organize data spatially, and schedule the processing spatially.
- **RAM and VLSI Implementations** These kinds of regular fine-grained computations on large spaces can make optimal use of modern high-bandwidth DRAMs and pipelined SRAMs, and have natural spinoffs into more specialized VLSI implementations.

IMPACT

- **Towards Ultimate Computation** CAM-8 machines provide an intermediate platform that can stimulate and support the development of models and modeling techniques that begin to exploit the astronomical computational power available in micro-physics only in a spatially organized, fine-grained format.
- **New Modeling Techniques** Thousands of research papers have been written about lattice-gas models of fluids, a field whose genesis was stimulated by models developed on the earlier, much more specialized, CAM-6 machine.
- **Air Force Collaboration** CAM-8 has stimulated a fruitful collaboration with the U. S. Air Force's Phillips Laboratory, in which several revolutionary new materials simulation techniques have already been developed.

SCHEDULE

- `Oct 94` A dozen collaborating groups have CAM-8 machines.
- `Jan 95` Release public domain version of CAM-8 software & simulator.
- `Apr 95` Begin supporting 4 graduate students in collaborating groups.
- `Jan 96` Release first version of high-level software environment.
- `Aug 96` U. S. Air Force begins using its large CAM-8 machine.
- `Jan 97` Publish book on CAM-8 modeling.

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