Real-time dose computation and display allows an experienced planner to improve 3D radiation therapy plans efficiently. Previous work has used transputer arrays and shared-memory multiprocessors to compute 3D isodose surfaces and dose-volume statistics near real time. Our current strategy is to use relatively inexpensive graphics workstations as clients of a distributed system. The client would have enough power to make a crude dose calculation and update its local display in a fraction of a second. An Internet-accessible remote server would calculate a much more accurate dose in seconds. Thus the user could manipulate beam configurations in 3D and see a crude dose surface "instantly," and then get a more accurate update from the server in seconds. We have successfully split our recent implementation, which ran on a single high-end multiprocessor graphic workstation, into two parts. The client workstation (located anywhere in the world) includes a graphic display, control panels, and crude dose calculation. The server (currently an 8-processor IBM SMP located at the Maui High Performance Computing Center), which already has a CT-based model of the patient, needs only an update of plan parameters to do a more accurate dose calculation. This real-time tool is expected to encourage improved clinical quality by enabling treatment planners to calculate and compare a series of refined plans in a timely manner. Such networked real-time 3D planning systems also suggest the potential for centralized planning centers that may improve quality control and yield cost benefits.

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