

Archived Material

Historical Purposes Only

Archive - Potential NGI Applications

Radiology Consultation Workstation: sponsored by The National Institutes of Health

Categories

Medicine, Collaboration

Vision

Provide remote consultation opportunities for radiation oncologists and radiologists through the use of interactive image analysis over ATM telemedicine networks.

Why NGI?

Patient data sets needed for radiologic diagnosis may be as large as 50 Mbits. Often as many as three additional reference data sets are needed. In order to have true interactivities between radiological consultants, network speeds envisioned by the NGI program are necessary.

Description

The Radiology Consultation Workstation (RCWS) is a multimedia medical imaging workstation being developed by NIH for use in an electronic radiology environment, utilizing a prototype Asynchronous Transfer Mode (ATM) telemedicine network, in support of radiotherapy treatment planning. Radiation oncologist and radiologists will be able to consult, utilizing high-quality audio/video channels and high-resolution medical image displays, prior to the design of a treatment plan. Organ and lesion contouring is performed via a shared-cursor feature, allowing medical specialists to fully interact during the identification and delineation of lesions and other features.

Rationale

The mission of the National Institutes of Health is to provide for advances in medical care. Many of these advances will be dependent on the presence of a high speed, low latency, secure digital information infrastructure as represented in the NGI program. Medical advances discovered by the NIH have traditionally been transitioned to the private sector for further development.

Requirements

Bandwidth:

Shared OC3 ATM links (155 Mbits/sec) work today but dedicated OC3 ATM links will be required in the future. The bandwidth requirements of the RCWS fall into two main categories. First, the bandwidth required to transmit the shared image set used in the consultation session; second, the sustained bandwidth required to carry the real-time voice and video streams and the synchronization that controls the shared cursor and contouring on the high-resolution view- boxes.

Latency:

A maximum latency of 100 to 250 msec round trip time is required. Latency is critical in a multimedia conferencing application. This latency specification is derived from telephony studies that have demonstrated that at somewhere between a 100 and 250 msec delay, two-way interaction becomes annoying. A computer network used for multimedia collaboration should have a low enough latency to support natural conversations. However, in this application a high latency would only make the conversation "annoying," not unusable. In addition, sliding-window protocols such as TCP/IP perform significantly worse on networks with very large bandwidth-delay products, so the need for low latencies on high speed links is important for the bulk data transfer of the image sets, not just the audio and video streams.

Security:

Any computer network used for the RCWS must have appropriate security safeguards such as authentication, strong encryption, and auditing to insure the privacy and confidentiality of patient data.

Reliability:

This application does not require a 100% reliable network as a prerequisite for its use. Our project supports shared conferencing, not telesurgery. While a network failure during the use of a telesurgery application could conceivably endanger lives, a network failure during an RCWS conference will do nothing but delay the conference. Reliability should certainly be an objective, but for our application it is not mission-critical.

Scalability:

As the number of concurrent conference participants in an RCWS session increases (as might be the case in a distance-learning project), it is important that the network has features allowing the size of the conference to scale efficiently. In particular, the network should support scalable, efficient multi casting that can be used to minimize

the total bandwidth required to transmit the audio and video streams to all conference participants. There are existing examples of such multi casting used in the support of multimedia teleconferencing: for example, the MBONE virtual network currently running on the Internet. The ATM network currently used by the RCWS supports scalable video distribution via multicast routing, and any future network should have similar features.

Partners and Potential Partners

Academic and private sector medicine.

URLs

<http://www.nlm.nih.gov/research/telfront.html>