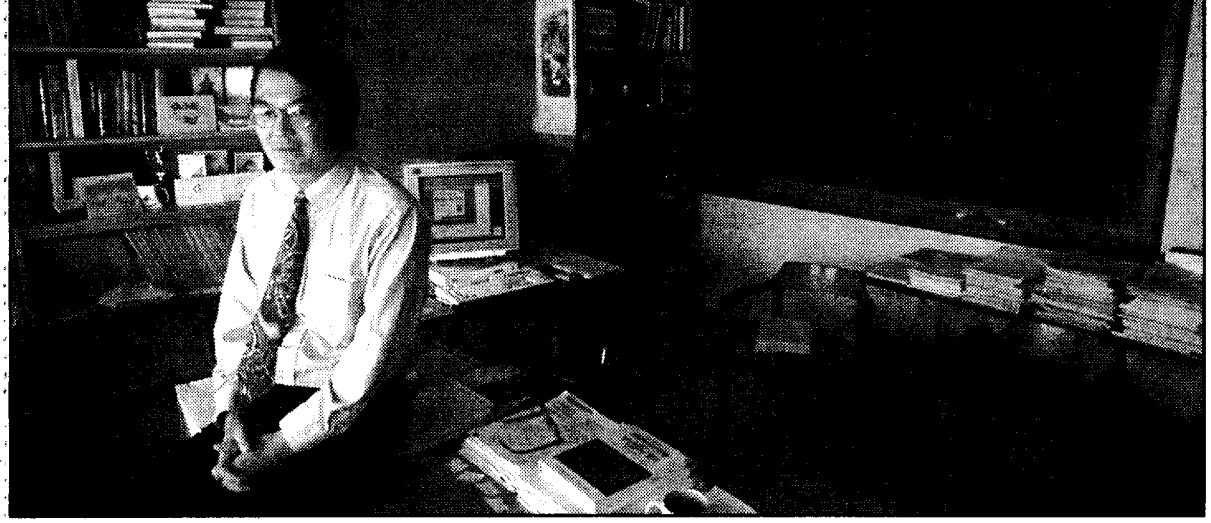

David Kennedy/AA-S

Simon Lam, a UT computer science professor, has spent three years working on the technical challenges of adapting Internet transmission to handle smooth reception of continuous video between computers.

UT computer scientists working to improve Net's video capacity

Continued from A1

rate part of the optical cable for e-mail and transfer of data files.

"You can send audio clips and videoconferencing (on the Net) now, but not very well," Lam said. "All this entertainment stuff takes a lot of (data) capacity."

Lam, whose research is paid for by the National Science Foundation, AT&T and Lockheed, recently joined forces with Roy Jenevein Jr., a UT computer research scientist. With a new $154,000 grant from the state to add to their other support, Lam and Jenevein are working on a solution to a basic part of the puzzle: The way the Net now dispatches data files, e-mail and other text isn't suited to continuous audio and video transmission.

"You want every picture to arrive in one second," Lam said. "Right now it can be one, or two or three seconds. The packet switching needs to be faster."

Packet switching is the method computer scientists chose in 1969, when the Net's first computer link was installed at the University of California at Los Angeles, to provide what the government wanted: a way for networked computer communications to survive a nuclear attack.

At the time, Lam was a UCLA graduate student in computer science. One of his classmates was Vinton Cerf, known as the father of the Internet. Cerf's contribution was TCP/IP, a type of software, called a protocol, that makes packet switching work.

Always sending data on the same path, the Net's designers decided, wouldn't survive partial destruction of the network. The system had to be flexible. So data was broken into small chunks called packets. Each packet was routed separately over the Net through special computers called switching boxes — at first — in a loop that came back to UCLA.

Out of sequence

As more universities joined the Net and it went international, the protocol began sending packets of data off to navigate a maze of electronic pathways. Packets arrived at their destinations out of sequence, like pieces of a jigsaw puzzle, but they had labels to aid in their reassembly, however slowly.

"They arrive at different times, not as a continuous stream," Lam said. "That's the problem I'm working on — to redesign the switches and the packet stream to go smoothly, without a lot of delay and (for video) a lot of jitter."

The current system works well enough for text, but as most Net users are aware, it takes extra time to transfer the photos, cartoons, animations and audio and video increasingly found on the World Wide Web portion of the Net.

Smoothing the flow

Lam is writing algorithms, or computer code, for a protocol to replace TCP/IP that gives the Net priorities for data packets, like making reservations at a restaurant, to smooth out the packet flow and make transfers of such data as video more reliable.

Because hardware has speed advantages over software, he plans for his protocol to be installed as a chip in new computers or to be available on software to rewrite the basic input-output system, or BIOS, of chips on older computers.

Jenevein, who holds a patent on a means of packet transfer and switching on fiber optic cable, is handling the switching technology for Lam's packet protocol.

"At this stage it's still a research problem," said James Kurose, a computer science professor at the University of Massachusetts and a colleague of Lam's who is working on similar problems for audio transmissions on the Net.

"It's much more likely you'll be able to throw out your phone than your TV first," said Kurose, referring to fledgling software that allows Net users to transmit and receive audio on their computers.

"Audio requires less communications capacity than video," Kurose said. "It's true the voice sounds lousy at times, but we're getting closer."

Until solutions to the Net's video clunkiness are ready, however, users will have to put up with delayed transfers for things like computer games — which use a lot of audio and video — with uncertain results.

"My son spent five hours (recently) downloading a game demo, and he got a demo that didn't work," Lam said.

So don't toss your TV yet. The future is still a ways off.

William not keep

■ Influx of new resi extra work and stre municipal workers

Continued from A1

services are requested and req

In Cedar Park, O'Loughlin a shuffle 700 more bills than th bringing the total to 6,600 a mo

"It can get pretty hectic ar "It's certainly more stressful."

In Round Rock's building i where no new employees have the same five inspectors have s crease from 1,697 new buildir 1995.

Carol Turner, a senior clerk entering those building permit her nerves are frazzled at the

"When I started here in '89, I she said. "Not anymore, not ev work just keeps coming and t hook."

While Round Rock and C workers every year, growth those resources. Cedar Park 126 residents, compared with t 1 employee per 100 residents. bly larger than just three yea employed one worker for ever

"We need more planners, building inspectors," said Wes nance director. "We're a grow

Other cities struggle with ages. Leander, for example, ha ery 207 residents. Leander us for many tasks, such as utility neering plans, but city officials staff is about 60 percent of wh

"Do I need to hire more pe Brenda Wilson, Leander's cit fortunately, we simply don't h

Growth, Craven said, doesn Cities can wait up to a year b tax revenue from new resident to fill positions, they do so firs departments.

Craven said possible cost-eff derstaffing in other departmen private contractors or sharing

Another option is to simply k levels.

Round Rock City Manager city's goal is to remain 20 perce time. That means the city woul ee for every 120 residents. Ri employs 349 workers, or one e residents.

"It means money saved for t "We've never had to go throug vate industries, because we'v Being efficient works. Someti lot of work, you find ways to cu and work with a lot less."

Citizens become impatien that's too bureaucratic, Benne

Austin, which doesn't have ees, has a total of 9,052 full-time