

TECHNOLOGY REPORT

Let your phones do the talking

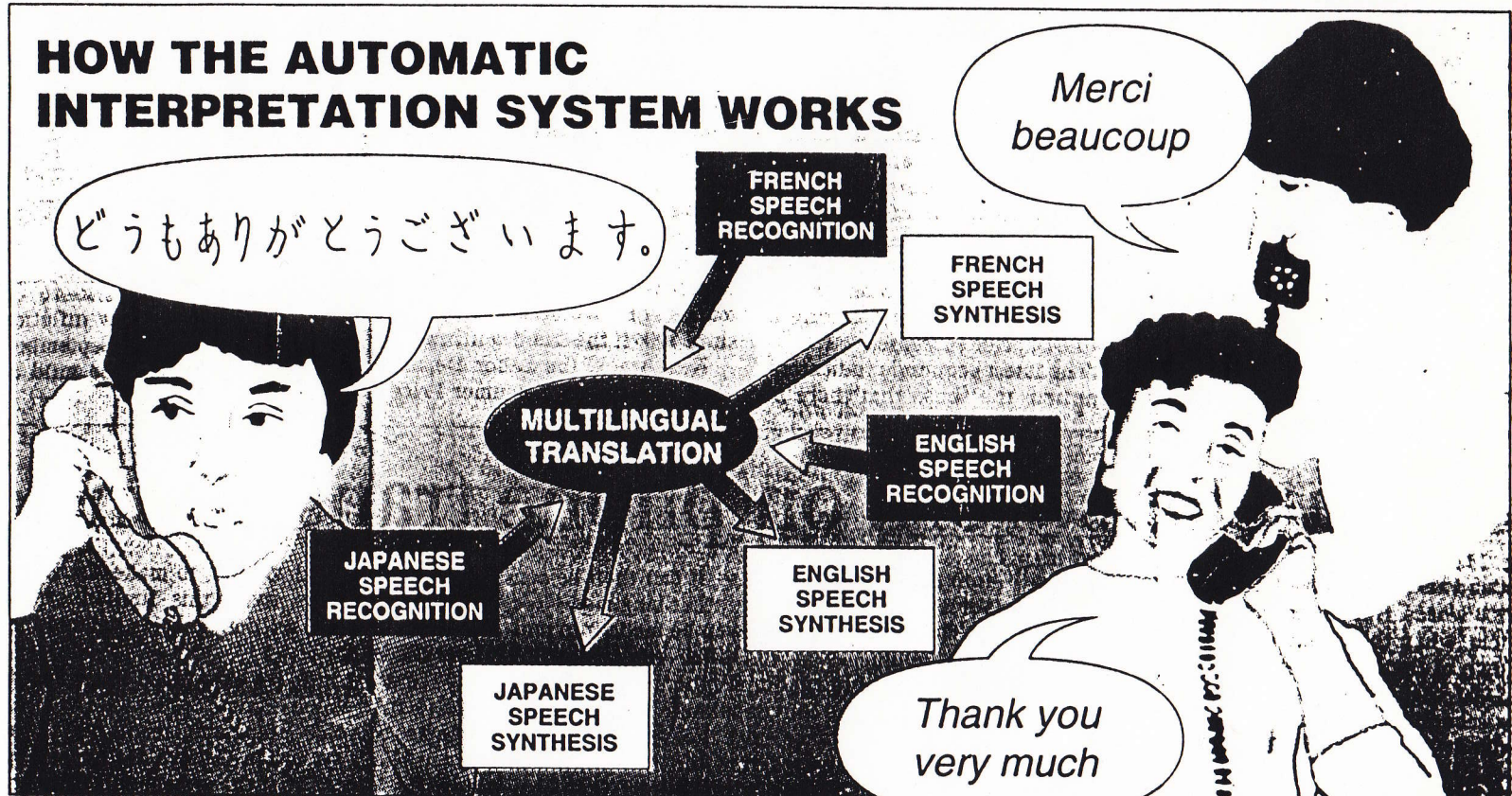
Researchers work on instant translations

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When it comes to talking on the telephone, language barriers are falling.

Researchers in Europe, Japan and the United States are stepping up efforts to create systems that translate languages instantly, as a phone caller speaks.

At this week's World Telecommunications Forum '91 in Geneva, Switzerland, research scientists from NEC Corp. demonstrated an early version of such an automatic translation system that converts sentences from one language to another in



five seconds or less. When perfected, instant translation could be a boon to international phone calling. Right now, for instance, only one-

tenth of 1 percent of all telephone calls placed in the United States travel internationally, according to American Telephone & Telegraph Co.

"Yes, it would be wonderful for international traffic," said David Roe, supervisor of AT&T Bell Laboratories' speech systems research group.

NEC's Automatic Interpretation System right now only converts relatively simple sentences from a vocabulary of ✓ Please see RESEARCHERS on Page 2F.

The Dallas Morning News: Carol Zuber-Mallison

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200 words. But commercial versions of the system, when they come into use shortly after the turn of the century, will cover a vocabulary of 5,000 words and translate dialogue in less than a second, said Masao Watari, a research scientist at NEC's Central Research Laboratories in Tokyo.

"If we don't have a machine that can (interpret) within a second, we can't sell" the system to users, he said.

To work that effectively, the systems still must overcome obstacles that have bedeviled speech scientists for decades. At the start of the list is the ability to recognize words spoken by anyone who dials into a phone system and after that the ability to recognize those words as they run together in fast-paced everyday conversation. Beyond that, grammar and linguistics come into play, as scientists must find ways to allow for different sentence structures in different languages, contexts in which words have different meanings, and idioms in languages that vary by region of a country or even by the latest developments in pop culture, such as "Cowabunga, dude" in "American" English.

To surmount such hurdles, NEC's scientists have broken the process into two main components.

The first component is recognizing speech. In Japanese, for instance, their technology focuses on each half-syllable of a Japanese word. Each such unit is compared against a registry of 250 half-syllables, before choosing the one that is right. At this point, the process has a 95 percent accuracy, NEC claims.

The second component is translating the speech, once "recognized," into a sort of artificial universal language that a computer can deal with. Once a caller's speech is converted

into this digital Esperanto, it can then be converted into just about any other language.

The conversion can even be made into multiple languages at the same time, allowing callers on international phone conferences each to hear the conversation in their own languages. For instance, once the Japanese caller's words are converted into this universal language, which NEC calls Interlingua, then computers immediately can translate that core language into a library of other languages, such as English, French and Spanish.

Interlingua keeps track of major components of the original sentences, such as subjects, objects and actions (instead of "verbs"). Then, rules established for the structure of other languages can be used to convert those pieces into sentences that the listener can understand.

In addition, adding another language to the system is a matter of setting up relationships only between those standardized parts in Interlingua and the new language, said Mr. Watari. The other half, the conversion from the original language, is already done.

"Any language can translate into the Interlingua and then we translate into the target language," said Mr. Watari.

The ideal one-second response machine that Mr. Watari and colleagues are shooting for has great appeal to long-distance operators such as MCI Communications Corp. Group executive Richard T. Liebhaber, who oversees the firm's network development efforts in Richardson, warns though that the "processing power" needed to make such systems work is far more massive than can be affordably installed today.

Indeed, the 200-word, four-language system that NEC showed off this week in Geneva only used 50 million characters of storage, which is about as much as is found on a typical desktop

computer these days. But, to make the necessary conversions, even this limited system must execute 800 million complex calculations every second.

"For what it is, it's okay," said Peter Foster, president of Voice Control Systems, a Dallas developer of voice processing technology, who tested NEC's system in Geneva. He expects, as does Mr. Watari, that the system will first find uses in providing callers with information on local countries or in making purchases over the phone, internationally.

"It's real helpful that way. It's kind of like having a phrase book when you travel," he said.

There are other approaches under development, at AT&T's Bell Laboratories and at Carnegie Mellon University in Pittsburgh.

Carnegie Mellon, for instance, is the center point of a speech-to-speech translation effort that includes research partners at the University of Karlsruhe in Germany and the Advanced Telecommunications Research laboratories of Japan's Ministry of Posts and Telecommunications.

Carnegie Mellon's Janus project, named after a mythological god with two opposing faces, relies on a variety of approaches to processing speech, including neural networks, which are patterned after the way human brains work. Such neural nets can teach themselves the structures of different languages, rather than being force-fed structures, said senior research scientist Alex Waibel. Currently, its systems claim to work properly 87 percent of the time they convert conversations between Japanese, English and German.

AT&T's effort only got under way a year ago, said Mr. Roe. "The system in our lab certainly hasn't had as much work or polishing as other systems," he said.