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By Michael Kanellos

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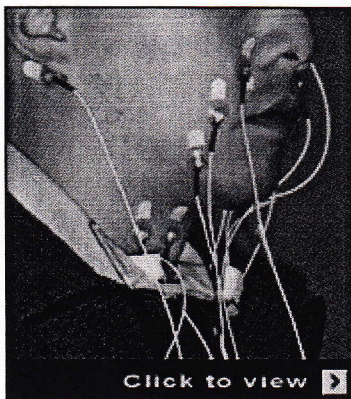
## **In a few years, you might be able to speak Spanish, French and English--and all at the same time.**

Alex Waibel, a professor of computer science at Carnegie Mellon University and Germany's University of Karlsruhe, plans to demonstrate a host of software and hardware on Thursday at CMU's Pittsburgh campus. The technology could make it far easier for people who speak different languages to understand each other.

One application, informally called Lecture Translation, translates a speech from one language into another on the fly and without restrictions. Current translation technologies typically circumscribe speakers to certain topics or a limited vocabulary and require them to train on the application.

Another prototype, which hadn't been given a name, uses directional speakers to beam translations of a speech to specific listeners in a variety of languages.

"It is like having a simultaneous translator right next to you but without disturbing the person next to you," Waibel said.



Prefer to read? So-called Translation Glasses transcribe those translated oral streams into subtitles that appear on a tiny LCD (liquid-crystal display) screen.

Then there's the Muscle Translator. Electrodes capture the electrical signals from facial muscle movements naturally made when a person is mouthing words. The signals are then translated into speech. Hypothetically, one could make phone calls in the middle of a movie theater without making a sound.

Conceivably, the electrodes could be replaced with wireless chips implanted in a person's face.

"It sounds unusual, but who would have thought that people would put earrings into their cheeks," Waibel joked. The experiment used eight attachable electrodes, "but with three or four you get almost all of the information," he added.

Although machine translation sometimes reads like its own language, technological advances and market demands in recent years have rekindled interest in the idea of having computers navigate the linguistic jungle.

Language Analysis Systems, for instance, has come up with a [search engine for foreign names](#), while Language Weaver has developed a software engine that can simultaneously translate between English and a few select languages (Chinese, Arabic) that are of particular interest to intelligence analysts.

The idea behind the university's prototypes is to create "good enough" bridges for

cross-cultural exchanges that are becoming more common in the world, Waibel said.

With spontaneous translators, foreign drivers in Germany could listen to traffic warnings on the radio. Under another CMU project involves PDAs (personal digital assistants) that can translate between Thai and English or English and Arabic. These PDAs are being used by drug enforcement officials and the military.

Progress in machine translation is due, in large part, to a philosophical shift in the field. In the past, researchers tried to construct programs that would allow a computer to "understand" a language through its own semantics. The internal logic and numerous exceptions, however, proved too complex.

In the past few years, however, researchers have switched to using statistical analysis to get the job done.

"It doesn't go through a deep understanding of the meaning of a sentence. It maps one word to another," Waibel said. "Increases in computer speed and power and databases have made this a winning approach...We essentially gave up trying to do the full semantics of this thing.

"We will see some tremendous advances in the next three to four years," he added.

The success of the statistical approach can be seen in a recent victory by Google in a computerized translation contest sponsored by the National Institute of Science and Technology. In the statistical approach, the larger number of translation samples a computer can examine, the more smooth and accurate the translation will be. Google has several terabytes of data in many languages.

Statistics do have limitations. Because of shared similarities between certain languages, Waibel's prototypes work better when translating between, for instance, English and Spanish than between English and German. And German's fondness for compound words also throws off the system.

Although the Lecture Translator "maps" words, the final translation alters the word order so it sounds like Spanish and not just transliterated English.

"The Spanish you can follow but the German has choppy moments," Waibel said. Translating between western and Asian languages will follow in the future. Although the databases probably exist to make an English-Japanese spontaneous voice translator possible, some translations will be tough because the data just doesn't exist.

"What about Catalan to Korean? I challenge you to find a database for that," Waibel said. "We may have to use an intermediate language."

Waibel's interest in the field is somewhat personal.

"I was born German and spent my childhood in Spain and I speak German, English, Spanish, French and Latin," he said. "My wife is Japanese so I am sort of culturally messed up."