MACHINES ARE MASTERING THE LANGUAGE OF MULTINATIONAL BUSINESS

COMPUTERS' MARKS IN TRANSLATION IMPROVE—AND RATES REACH 100,000 WORDS AN HOUR

During the Vietnam war, an American television correspondent asked a farmer in the Mekong Delta what he thought about the recent election of President Nguyen Van'Thieu. The government translator with him said to the farmer in Vietnamese: "When I give the signal, count to 20." After the farmer finished counting, the interpreter turned to the camera and said: "He thinks Thieu is brilliant." The TV network didn't realize it had been duped until people who understood Vietnamese began calling in after the interview was broadcast.

Talking across a language gap has always been fraught with misunderstanding. Although most slips are unintentional, the cost can be high, if only in terms of acute personal or corporate embarrassment. But when diplo--mats or NATO commanders communicate in different languages, there may be far less room for innocent gaffes.

By the turn of the century, precise translations may be as routinely foolproof as flipping on a TV set is today. "In 20 years, you will have [an interpreting] machine that you can put in your pocket," says Yasuo Kato, general manager of systems research at Japan's NEC Corp. "The system will recognize your voice, translate what you say, and read it out in another language. That is what we are aiming for."

Several other companies have similar ambitions, which now seem much less improbable than they would have just a few years ago. Indeed, the incredible advance of microelectronics technology over the past decade is already yielding computers that are increasingly facile at translating written words from one language into another. These machine-aided translation (MT) systems, while still far from perfect, are rapidly gaining adherents in business and government circles.

For now, MT technology "is not a replacement for translators," says Neyil Garrett, president of Weidner Communications Corp., a pioneer in computer-aided translation. "It's a translator's tool. It makes a translator more productive by a factor of 4 to 8."

EASTERN GIANTS. Given the long-standing American aversion to learning foreign languages, it's hardly surprising that the current MT leaders are all in the U. S. They are Automated Language Processing Systems (ALPS), of Provo, Utah; Logos, of Wellesley, Mass.; World Translation Center (WTC), of La Jolla, Calif.; and Weidner, of Northbrook, Ill. All are relatively small companies. Coming up fast, however, are three Japanese giants—Fujitsu, Toshiba, and NEC—as well as Bravice International.

The battleground is a worldwide

translation market pegged as high as $20 billion and growing by 15% a year *as business* becomes increasingly international. Only recently have computers been able to cut off a slice of that business. Back in 1966 the National Science Foundation issued a report concluding that machine-aided translation couldn't be done. Most computer companies dropped out of the race at that point.

The NSF, of course, then had no way of knowing that a single, fingernail-size integrated circuit would one day contain as much computing power as a 1966-vintage mainframe. Twenty years hence, the same may hold true for 2005 chips vs. 1985 computers. So today's MT systems are just the beginning. "Machine-aided translation is the wave of the future," declares Timothy J. Rowe, translation coordinator at the National Aeronautics & Space Administration. **EASILY FOOLED.** Riding that wave will be bumpy, however. The biggest challenge will be improving a system's ability to deal with nuance and subtlety. Now, MT is most effective on simple texts, such as service manuals. Computers are still fooled by complicated sentences and words with more than one meaning, and no machine can really cope with a joke.

An often-quoted example: One machine translator took the saying, "The spirit is willing, but the flesh is weak" and rendered it in Russian as, "The vodka is strong, but the meat is rotten." The computer used by a translation service that works for NASA turned "injection molding" into "ejaculation making."

The main breakthrough that has propelled MT systems from a laboratory curiosity to a commercial reality is software that can analyze sentences and translate individual words according to the context in which they are used. Machines that do elementary word-for-word substitutions rarely render more than half of a document into an accurate translation. So-called parsing systems often attain accuracy levels of 80% or more. With some pre-editing to simplify complicated sentences, accuracies of 90% and higher can be achieved.

So even though people still must pre-edit the material to be translated or correct the final text, MT systems are slashing the time and expense of translations. Companies that are realizing these machine-wrought savings include Xerox, ITT, Hewlett-Packard, Wang Laboratories, Aerospatiale of France, and General Motors of Canada. Among the government agencies that have come to rely on machines are the European Community, the Canadian Employment & Immigration Ministry, the U. S. Air Force, the Federal Bureau of Investigation, and the Central Intelligence Agency.

Xerox Corp. was one or the first companies to lease such a system. In 1979 it signed up for WTC's Systran system. It says it has had good results with Systran because it has adapted the system to its own needs, building a special-purpose six-language dictionary and drawing up rules for simplifying original English texts. Still, J. Richard Ruffino, a linguist at Xerox's Webster (N. Y.) facility, calls Systran "cumbersome." It runs only on a mainframe and "requires a lot of linguistic knowledge" to use.

Systran's dependence on mainframes has caused it to fall out of favor compared with newer rivals. One such contender is ALPS, which supplies translation software for both personal computers and minicomputers. The five-year-old company's main product is a $3,000 multilingual word processor. ALPS also offers advanced translating systems that "learn" as users correct the machine's French, German, Spanish, or Italian renditions of English. These cost $15,000 per terminal. This year ALPS expects to post its first profit, on revenues of $2 million.

ALPS is a spinoff of research done at Mormon-run Brigham Young University in Utah. "The Mormons were undaunted by the NSF report," recalls Michael Anobile, ALPS'S European marketing manager. "They wanted machine translation to spread the Word of God" and continued to back MT research.

Weidner also is an offshoot of Brigham Young's research. Founded in 1977, the Illinois company has invested $20 million to develop both microcomputer- and minicomputer-based systems. The desktop machines translate 1,500 to 2,000 words an hour and cost $10,000 and up. Its $50,000 minis churn out from 6,000 to 8,000 words, making as few as three or four errors pec page. Weidner President Garrett says sales will total $7.5 million this year, and he terms the company "highly profitable."

CHALLENGER. Last year, Weidner was acquired by Bravice, one of Japan's larger translation companies and an early Weidner customer. Bravice is now modifying the Weidner system to handle Japanese-English translations with a personal computer. The software will be priced at $2,500, and Bravice President Takehiko Yamamoto hopes to sell 10,000 of these packages by April. Another challenger is Logos Corp., which started out in 1969 with U.S. Army grants to translate English into Vietnamese. It now offers German-English, English-German, and English-French software to run on anything from a home computer to a mainframe. CEO William H. Hohenstein says Logos allows the translation of 15 to 30 pages a day vs. 5 to 8 pages without a computer. The company licenses its software for fees ranging upward of $1,000 a month.

Meanwhile, users have been improving Systran. For example, the European Community, which works in seven official languages, in 1975 bought a Systran system for $300,000 and has since spent $4.5 million on improvements. Now used for English-French, French-English, and English-Italian translations, the system will soon get English-German and French-German software, as well.

Although the system can churn out 1 million words an hour, Systran so far handles only a small fraction of the EC's needs. Partly that's because many skilled translators don't like being relegated to correcting a machine's occasional errors. The EC expects Systran's output to grow rapidly as more departments add word processors that can communicate directly with the IBM mainframe that does the translating. **SPEED VS. PRECISION.** With Systran, the EC estimates "that translating costs are halved. But cost-cutting turns out not to be the main benefit. "We are finding that it is speed that's important," says Loll Rolling, head of the European Commission's multilingual program. "People are willing to accept a rougher translation if it can be done in a hurry."

Translating machines will grow even

more proficient as artificial intelligence (AI) technology blossoms over the next few years. A principal goal of AI research is natural language processing—computers that can understand human communications as readily as another person. Nippon Telegraph & Telephone Public Corp., for example, is even working on a computer that will do instantaneous interpretation, so two people can carry on a phone conversation in two different languages.

The Holy Grail of natural language processing is a "perfectly logical interlingua," says Jonathan Slocum, who heads natural language research at Microelectronics & Computer Technology Corp., a computer industry R&D co-op in Austin, Tex. This would be an artificial language that would contain rules for reducing any human language to logic symbols. These symbols and rules could then regenerate texts in all other human languages. For now, though, Slocum says that "no one knows enough about any one language, let alone all languages, to develop an interlingua."

WRITING THE RULES. Fujitsu, NEC, and Toshiba are nonetheless pursuing limited versions, which they call neutral languages, for translating between Japanese and English. Logos has developed a similar approach, dubbed Semantic Abstraction Language. The Japanese systems will analyze the grammatical structure of, say, an entire English sentence, transform the sentence into symbolic expressions, juggle the order of the symbols to fit the syntax of the Japanese language, then generate the proper words. NEC estimates that perhaps 100 complex algorithms, or inference rules, will be needed to guide the process. So far it has developed 30.

Still, all three companies already market MT systems that analyze words in context to produce more precise translations. For example, "nose" and "flower" are the same word in Japanese—*hana*—but Fujitsu claims its system wouldn't confuse them in sentences. Fujitsu says its most sophisticated software, which rents for about $2,500 a month, is 90% accurate with pre-editing and can translate 60,000 words an hour.

NEC's system, introduced in May, costs $20,000 a month and can translate up to 100,000 words an hour. NEC says that 80% of the computer translation is understandable without reference to the original text. The company expects the machine, which speeds translation time by a factor of 10, to cut its own annual translation bill by 80%, to $2 million. Toshiba's computer system sells for $80,000 and can run 5,000 words an hour.

Although Europe has the biggest translation market, Continental companies trail in MT technology, Dutch electronics giant Philips has an MT research program but no commercial plans as yet. One of Europe's most innovative software companies, the Netherlands' BSO, is working on an interlingua-based system and aims to have a prototype ready by 1990.

The French government seems to be furthest along. It expects to unveil a commercial system, for French-English aerospace industry applications, in September. Development over the past three years was funded to the tune of $10 million by the National Information Agency, and the work was carried out by a multidisciplinary team of 25 researchers under the auspices of the Societe Generale de Service & de Gestion. The system is based on MT research done at Grenoble University.

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Since it's politically unlikely that any European tongue will be designated as a common language for business or government, Europe's politicians are plowing $18 million into a five-year program called Eurotra. The objective is a next-generation MT system capable of simultaneously translating all of the EC'S official languages—nine next year, when Spain and Portugal join. If the project is successful, the EC will decide after 1988 on the commercial value of Eurotra. But the project is already fueling the emergence of an active MT research community in Europe.

One fast-growing area where neither Eurotra nor any other translation service is likely to find a large market is Southeast Asia. English is widely spoken from Kuala Lumpur to Hong Kong, and it's an official language of Singapore and the Philippines. Indeed, when Tool Products Co., a Minneapolis maker of precision die-cast parts, decided to do some offshore manufacturing, it picked Singapore because of the absence of language barriers. "We have more language problems at our Chicago plant, where we employ a large number of Spanish-speaking Americans," says President Bruce W. McFadzean.

When it comes to language, at least, the sun will never set on the English empire.

By Joyce Heard in Brussels, with Leslie Helm in Tokyo and bureau reports