

# Spoken automation

Emerging factory applications of voice technology are pushing the systems beyond previous limits

By Philip Burgert

**M**oving between rows of machinery, the worker is often alone in a world of clanking and clattering noise, an arena of flowing movement that is rhythmical but at the same time often alien.

This lone worker, however, has a connection to the other workers and managers in the plant. A microphone

yet exist, but the technologies that will allow for these kinds of real-time voice communications are already moving into factories in several industries including automotive, heavy equipment and aerospace manufacturing. Recent developments that have allowed this factory push include new technologies for voice recognition and synthesis.

Synthesis and recognition, along with voice storage and forwarding, make up the core of a voice technology market

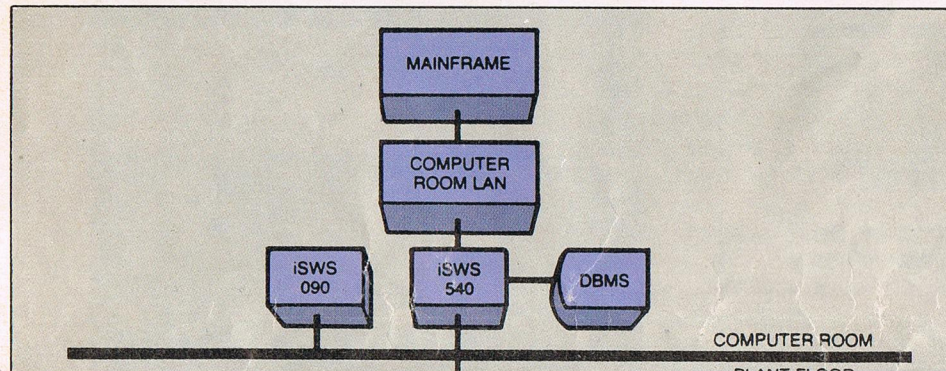
development level after more than 15 years of testing. And the recent successes of initial production installations at such companies as General Motors Corp., Ford Motor Co. and Caterpillar Inc. have added to that momentum.

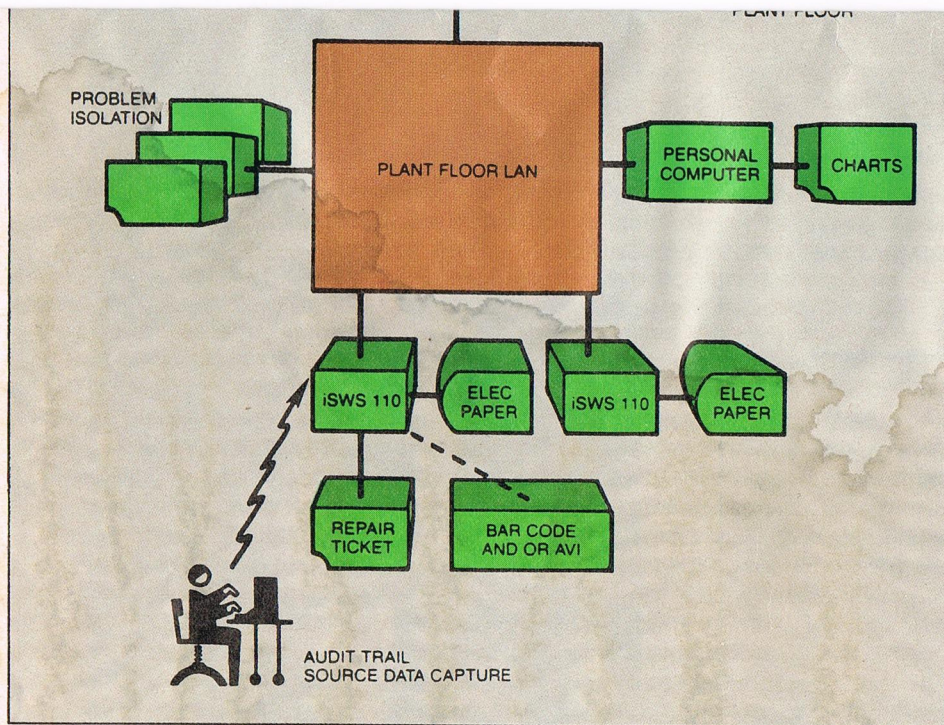
Most of the installations so far have involved quality control operations — eliminating the need for inspectors to write notes on clipboards or move their eyes from the objects being inspected — and this is an area seen by most vendors as the largest opportunity for voice systems. But other industrial applications have been found in such areas as shipping and receiving, tool crib management, and computer-aided design, while future applications are seen in such areas as machine control and computer-integrated manufacturing. “Eventually you’re going to have everybody wired up with a microphone,” says one consultant.

toward the installation of the company’s initial voice-based quality control production system in 1984 with company officials involving themselves in the installation from the start. The company’s officials insisted on knowing how all the elements of the system could be expected to work. “What works in the laboratory or showroom isn’t necessarily going to work in the plant,” Howie says.

The first tests were conducted at the company’s Lorraine, Ohio, assembly plant in the summer of 1984. When results showed that the system was essentially compatible with paint-shop operations a decision was made to go ahead with a full-scale test in a semi-permanent installation working with hourly employees at the company’s Wayne, Mich., plant near Detroit.

The installation required about 40 hours of training per inspector and included developing vocabularies for





Local area network (LAN) allows Intel's system to interact with other computer devices.

and real-time communications link carry every utterance he makes to a central computer for storage of data or transmission of information to others in the plant who will act on or use that information immediately. Simultaneously, the computer and voice synthesis are carrying instructions and messages to the worker through earphones.

Such a sophisticated system may not

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that analysts, vendors and a growing core of manufacturing officials see blossoming in factory applications in the next few years. Though estimates of the size of the market vary widely, some analysts see demand for voice systems in factories topping \$1 billion annually in the next decade, up from a market estimated to total less than \$50 million this year.

The recent entry of such companies as Westinghouse Electric Corp., Intel Corp., Texas Instruments Inc., NEC Corp. and International Business Machines Corp. into sales of voice systems has given credibility to the technology's



Volkswagen voice system allows inspector to work with hands and eyes free.

Voice is seen as an alternative or supplement to other input and output technologies such as bar code entry or keyboard entry. Voice system vendors say that users have been shown to be capable of entering data three to four times faster using voice than if they were to type it. Even faster have been tests showing that 11-digit numbers could be recorded in less than a second using a voice system, compared to a requirement of five to 10 seconds with key entry. The voice entry also eliminates the need to key in data after it has been initially written down.

Officials at the companies that have already installed the systems say they are looking for more applications. "I feel the future of voice recognition as a data processing input will continue to expand," says Matthew S. Godek, data processing operations manager for Volkswagen of America Inc., New Stanton, Pa., where a voice system for final vehicle inspection began production operation earlier this year (see story on page 5).

"I'm confident there will be applications outside of quality control," says Jerome H. Howie, division quality control engineer in Ford Motor Co.'s Body and Assembly quality control office, Allen Park, Mich. Ford started working

use of the system, classroom introduction to the system and one-on-one introductions. Initial on-line practice involved one inspector at a time on the factory floor and debugging of the system was done off the floor with the operator involved.

In operation, the company evaluated the output from the system as well as operator acceptance. As a result of the tests, the company completed the installation earlier this year and officials are planning installations in other locations. "I think it will be quite rapid because of the evaluation of the acceptance tests," Howie says. Advantages of the voice systems, he says, have included labor savings, productivity improvement and quality improvement.

Because of such successes, speech is seen by Daniel F. Fink, marketing manager for speech products in Intel's Integrated Systems Operations, Portland, Ore., as having the potential to become a cornerstone technology — along with robotics, vision and computer communications — for factory automation. "Speech is the technology that provides the connection between the smartest sensor of all on the factory floor, the human being, and the quality control system," Fink says.

The reason voice systems are necessary, he says, are that they allow the