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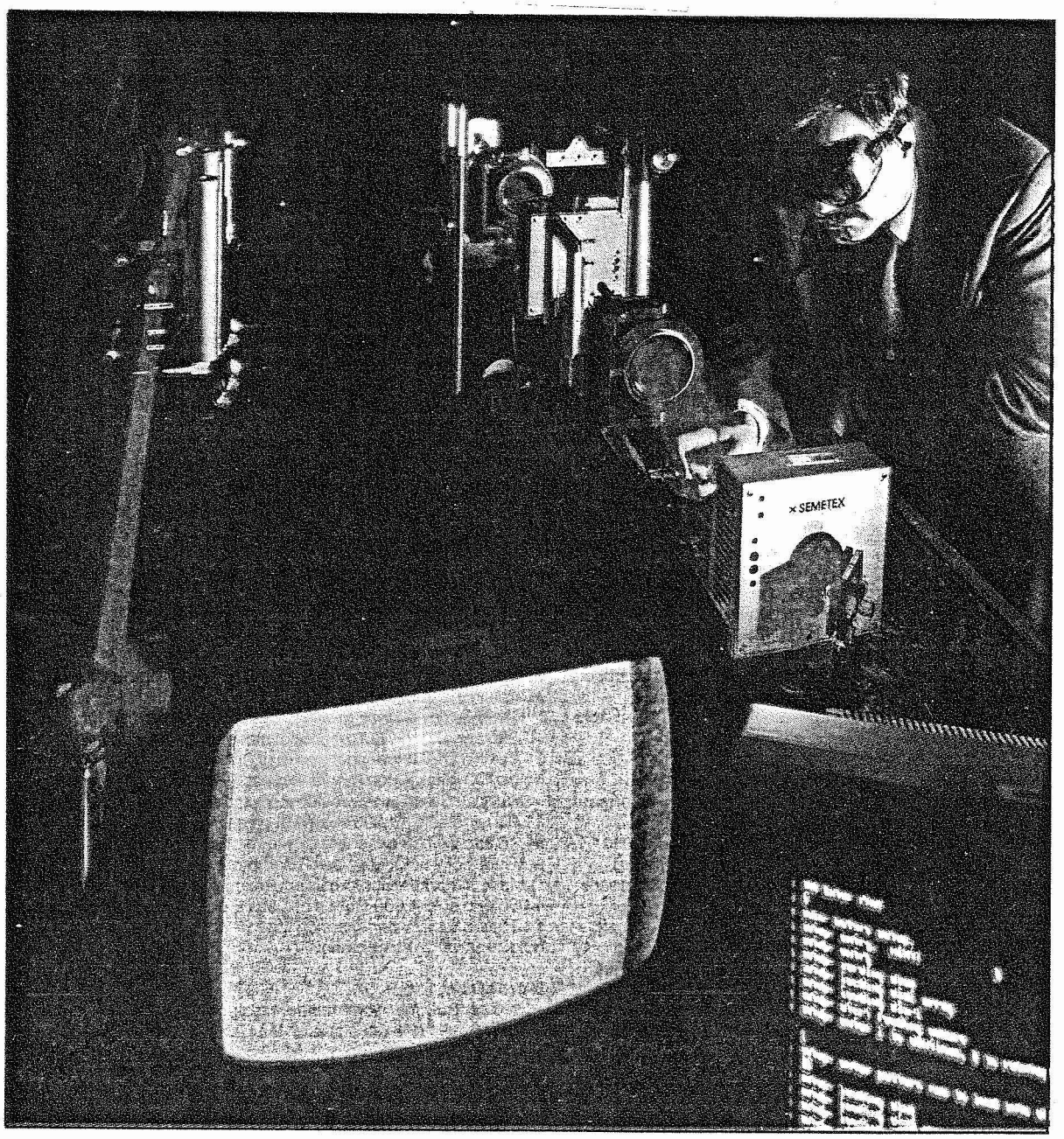

Photo courtesy of Boeing Computer Services

Donald Wunsch, an artificial intelligence specialist at Boeing Computer Services, operates an optical computer. The machine uses laser light to simultaneously measure similarities between many different images, similar to the way a new technology called neural networks works. Researchers at Boeing and elsewhere believe neural networks someday will be used in many different commercial applications.

Computer learning shapes up

By John Swenson
Journal American Business Writer

BELLEVUE – Researchers at Boeing Computer Services say an emerging technology called neural networks may help them save a substantial amount of money on each new commercial aircraft part made by Boeing engineers.

The key lies in training computers to recognize and compare parts according to their shape.

Commercial airplanes are made from many different parts, and over the years, Boeing engineers have designed and fabricated tens of thousands of different aircraft parts.

Neural networking

Scientists and experts from around the world will gather in Seattle early next month for a week-long conference on neural networks. The Joint Conference on Neural Networks will be held at the Washington State Convention and Trade Center from July 8-12.

Keeping track of all these parts is a big job: Traditionally, Boeing has done so by assigning each part a number.

Whenever Boeing engineers are asked to design a new part, such as a small metal piece for inside an aircraft door, they search to see if a similar part has been made before. If they can find something close enough, the engineers may be able to reconfigure the same software, tools and other items that went into making that part.

The alternative is to do everything from scratch, from writing new software to creating new manufacturing tools.

"There's a huge amount of cost every time you create a new part," said Scott Smith, an artifical intelligence specialist at Boeing Computer Services.

Smith is a task leader for a BCS team working to find a

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Networks: *Brain imitation*

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less expensive way to make new parts.

His team is creating new software that promises to give Boeing engineers a better method of searching the company's vast parts database — a method based on shape. A companion team at BCS is developing new computer hardware.

There are so many parts in Boeing's database that it's tough for engineers to conduct a thorough search, even with Boeing's advanced computer systems, Smith said. As a result, engineers may design a new part from scratch without ever knowing a similar part already exists.

"The best way to describe a part is by the shape of the part itself," Smith said, "but traditional computers aren't very good at that sort of thing."

The solution lies with neural networks, a computer technology that tries to imitate the human brain. The strength of neural networks is that they're able to learn — much like an animal or a human can learn — by recognizing patterns.

At BCS, Smith and his team have developed neural network software able to run on conventional computers, in this case Sun desktop workstations. They've programmed a system that can recognize about 50 different aircraft parts and compare them by shape, matching similar parts.

The software is capable of examining simple, two-dimensional line drawings of small parts. Eventually, with better software and special neural-network computers, the system could compare thousands of complex three-dimensional images stored in computer memory.

The system would call up similar parts and display them on a computer screen. Engineers could visually check for similarities between their new designs and existing parts.

Boeing engineers already are able to create 3-D color images of parts using computer-aided design technology, but as of yet, they have no way of searching the computer for similarly-shaped parts.

The neural network software BCS researchers are using now is fine for limited use. But to become truly useful on a large scale, the software eventually must be teamed with neural network computers.

"The real gee-whiz, Buck Rogers stuff requires the hardware," said Donald Wunsch, an artificial intelligence specialist at BCS who is leading the hardware team.

The neural network computers Wunsch's team are developing are the opposite of traditional computers, he said. Traditional computers are good at performing tasks such as crunching huge amounts of data but poor at jobs that require learning from experience, the sort of thing a neural network is designed for.

The key to a neural network is in its connections, Wunsch said. Such a system has many processors that all work simultaneously, comparing information that allows the network to learn.

Neural networks are similar to artifical intelligence, but with a key difference. Robert Marks, professor of electrical engineering at the University of Washington and president of a neural-network engineering group, explained the difference between the two technologies with this example:

To teach a neural network to distinguish between a bush and a tree, one would show it a bush and a tree and another bush and another tree and so on until it learned the difference.

To teach a so-called "expert system" using artifical intelligence, one would feed it a set of rules describing a bush and a tree, such as, "A bush is a small squatty thing which ..." and so on.