KURZWEIL
COMPUTER
PRODUCTS
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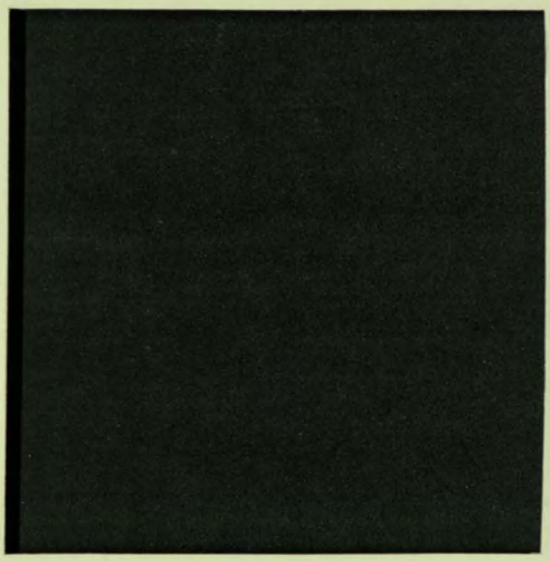

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Kurzweil
Intelligent Scanning Technology

KURZWEIL COMPUTER PRODUCTS
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For documents conventional OCR can't handle, Kurzweil offers a better approach: ICR.

For almost two decades, optical character recognition systems have been widely used to provide automated text entry into computerized systems.

Yet in all this time, conventional OCR systems have never overcome their inability to read more than a handful of type fonts and page formats. Proportionally spaced type (which includes virtually all typeset copy), laser printer fonts, and even many non-proportional typewriter fonts, have remained beyond the reach of these systems. And as a result, conventional OCR has never achieved more than a marginal impact on the total number of documents needing conversion into digital form.

Kurzweil overcame these limitations 10 years ago with its development of ICR — Intelligent Character Recognition — the unique combination of artificial intelligence and optical scanning technologies.

With ICR, you can enter reports, manuscripts, technical documents, books and magazines — the full range of everyday printed materials — up to 10 times faster than human keyboard operators. You can enter line art graphics. You can enter material containing multiple type fonts and complex page formats. And you can enter all of this faster, more accurately and cost-effectively than ever before.

Available and affordable now.

For 10 years, organizations with large and diverse data conversion needs have relied on Kurzweil ICR technology. And now, with new generations of systems on-line, the cost of ICR has been reduced by over 50% — bringing its benefits within the reach of virtually any organization seeking to cut the time and cost of text or data entry.

The decision to implement Kurzweil ICR makes sense. No other approach can input the full range of printed materials. None offers multiple solutions to meet specialized entry requirements. None offers the experience or reputation for reliability gained in hundreds of end-user installations. And none even comes close to our nationwide support and service organization.

(Left) Kurzweil's proprietary artificial intelligence software "reads" each character by analyzing its shape. It can learn to recognize virtually any type font in sizes ranging from 6 to 24 point, including multiple fonts within a single document.

(Center) For the first time, both large and small organizations can afford the benefits of ICR. Documents that took days or weeks to manually keyboard can now be entered in hours.

***(Right) Office networks:** entry of previously printed material from varied source documents directly into mainframe computer systems.*

For diverse text or data entry requirements, ICR saves time and money.

As organizations increasingly rely on automated systems as productivity tools, ICR can make a vital contribution by enabling users to enter virtually any printed material into on-line files without manual keyboarding.

For years, Kurzweil systems have been used by printing and publishing houses to minimize input time, while eliminating much of the proofreading and labor cost of re-inputting and converting previously printed materials.

This same capability has proved equally valuable in other fields as well. Corporations, government agencies, universities, financial institutions, law firms, service bureaus, and research groups have all found Kurzweil systems to be essential tools for the timely entry of existing documents into data bases.

And now, with ICR's new affordability, virtually any organization can take advantage of its potential to cut costs while speeding the input of complex documents.

Applications include:

- *Data base services:* Scanning vast quantities of in-house records for integration into on-line files for universities, government operations and customer records.
- *Technical publications departments:* Digitizing technical and operations manuals for easy revision and reproduction.
- *Commercial typesetters:* Scanning previously printed materials for input into typesetting and page makeup systems.
- *Commercial printers:* Scanning manuscripts, updating old editions, converting hardcover to softcover books.
- *Financial printers:* Scanning time-critical documents such as a prospectus for overnight typesetting and telecommunications.
- *Law firms and legal departments:* Scanning contracts, creating data bases of reports, depositions, court decisions, and government regulations.
- *Word processing services:* Inputting previously printed materials into office computer systems, digitizing reference materials and manuscript drafts.
- *Information services:* Scanning daily newspapers, court rulings, and legislative actions for subscribers.
- *Government agencies:* Computer storage of records, regulations and legal code.

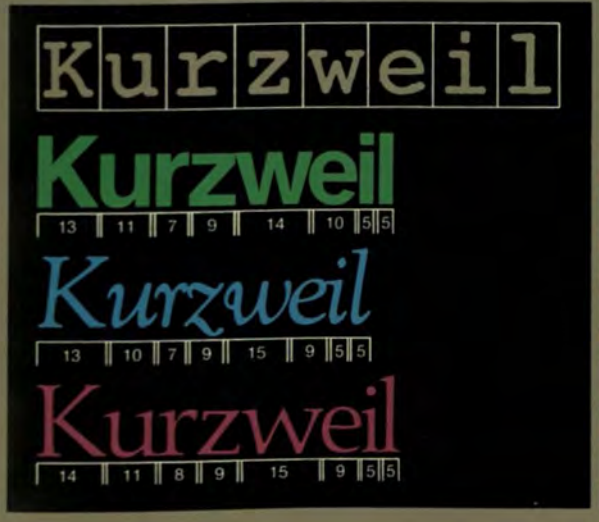
For these and other applications, ICR offers the best hope yet for control over the cost and time of data entry. And now, it's more affordable than ever. Ask for a demonstration of the system best suited to your application today.

(Left) Conventional OCR is severely limited in the number and variety of type fonts and formats it can handle. ICR technology accepts the entire range of type styles and formats including proportionally spaced type as well as conventional typewritten copy — radically enlarging the possibilities for automated text entry.

***(Center, Top) Commercial printers:** scanning time-critical documents, converting old materials.*

***(Center, Bottom) Law firms:** updating contracts, recording decisions and regulations.*

***(Right) Technical publications departments:** scanning and digitizing technical documentation for direct input to typesetting systems.*



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Kurzweil.
The intelligent choice.

Kurzweil invented ICR technology in the 1970's and is the acknowledged leader in direct entry of existing printed material.

No other company can match Kurzweil's capability, reliability and solid experience in Intelligent Character Recognition.

No company can match the performance of Kurzweil systems to quickly scan virtually any typeset or typewritten material, including graphics.

No company offers as versatile a technology with benefits to meet specialized industry requirements.

No other company has hundreds of successful users in applications from prepress imaging to database development.

And no other company in this industry offers the same commitment to your present and future needs as Kurzweil, a Xerox company.

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The New York Times

NEW YORK, SUNDAY, AUGUST 19, 1984

'Intelligent' Computer Reads Many Typefaces

By COLIN CAMPBELL
Special to The New York Times

CAMBRIDGE, Mass., Aug. 17 — A computer whose makers say it marks an advance in artificial intelligence is gaining wide use among publishers, linguists, legislators and others who put it to work "reading" documents and storing large amounts of information.

What sets the machine apart from other computers is its ability to recognize letters and numbers in a great variety of typefaces, according to users of the machine as well as its developers. This task, which comes easily to literate people, is more than conventional computers can muster.

The computer optically examines all sorts of letters for their pattern before recording them at a rate of up to 70 characters a second. The device, developed by Kurzweil Computer Products Inc. of Cambridge, has been available since 1978, but it has come into wider use since February, when a smaller and more efficient model was released.

The new model costs $35,000, a third of the 1983 price, and has encouraged its developers to think that they are ahead in one part of the worldwide competition to produce computers that can behave like thinking people.

A Variety of Uses

Essentially, the Kurzweil Data Entry Machine performs a clerical task that can be done fairly inexpensively by typists. But as more companies and researchers have decided that they need larger banks of computerized texts, the appeal of the machine has grown.

In South Carolina, one Kurzweil machine is reading and storing a flood of typewritten speeches at the State Legislature. The University of Texas Law School uses one to record cases and make them available to students who search for precedents at computer terminals.

A Boston publisher, G. K. Hall, is using a Kurzweil scanner to record the contents of books that it reprints by computer in large-type editions for the visually impaired.

General Motors and a number of technical consulting concerns use the machines for constant revision of technical manuals. Still others are scanning newspapers and magazines and feeding material to the computerized Nexis news information network.

Machine Reads Azerbaijani

At an experimental project at the University of Pennsylvania financed by the Defense Department, a special machine that has been programmed to recognize more exotic symbols than the Latin alphabet is reading Azerbaijani-language newspapers printed in a nonstandard version of the Cyrillic alphabet. Azerbaijaini is a Turkic dialect spoken by several million people in Soviet Azerbaijan and adjacent areas of Iran and Afghanistan.

Three years ago the Defense Department got Kurzweil to develop programs for reading the Cyrillic alphabet, in which Russian and a few other languages are written. Several such machines are believed by Kurzweil's officers to be scanning Soviet documents for the Federal Government.

A spokesman for the National Security Agency said by telephone from Washington that the intelligence-gathering agency possessed "at least one" Kurzweil scanner but declined to give further details.

Spokesmen for the Central Intelligence Agency and the Defense Intelligence Agency refused to say whether their agencies used the machines. The C.I.A. spokesman added, however, that its technical staff knew about Kurzweil's computers and found them "interesting."

Expanding Linguistic Studies

The machine at the University of Pennsylvania is being used to read and store in its memory texts in several languages besides Azerbaijaini, according to John Fought, the associate professor of linguistics who heads the project.

"So far as I know, this is the first application of sophisticated optical scanning to the study of linguistics," Dr. Fought said in a telephone interview. Other languages that the project is scanning include Somali, Slovenian and a Mayan Indian language, Chorti, which is spoken in parts of Guatemala, Honduras and El Salvador.

The project's aims are to develop computer programs with which to create large computerized language files as quickly as possible, to write other programs that will help analyze languages and help create grammars and dictionaries, and to expand computer-based language instruction.

Key to 'Reading' Machines

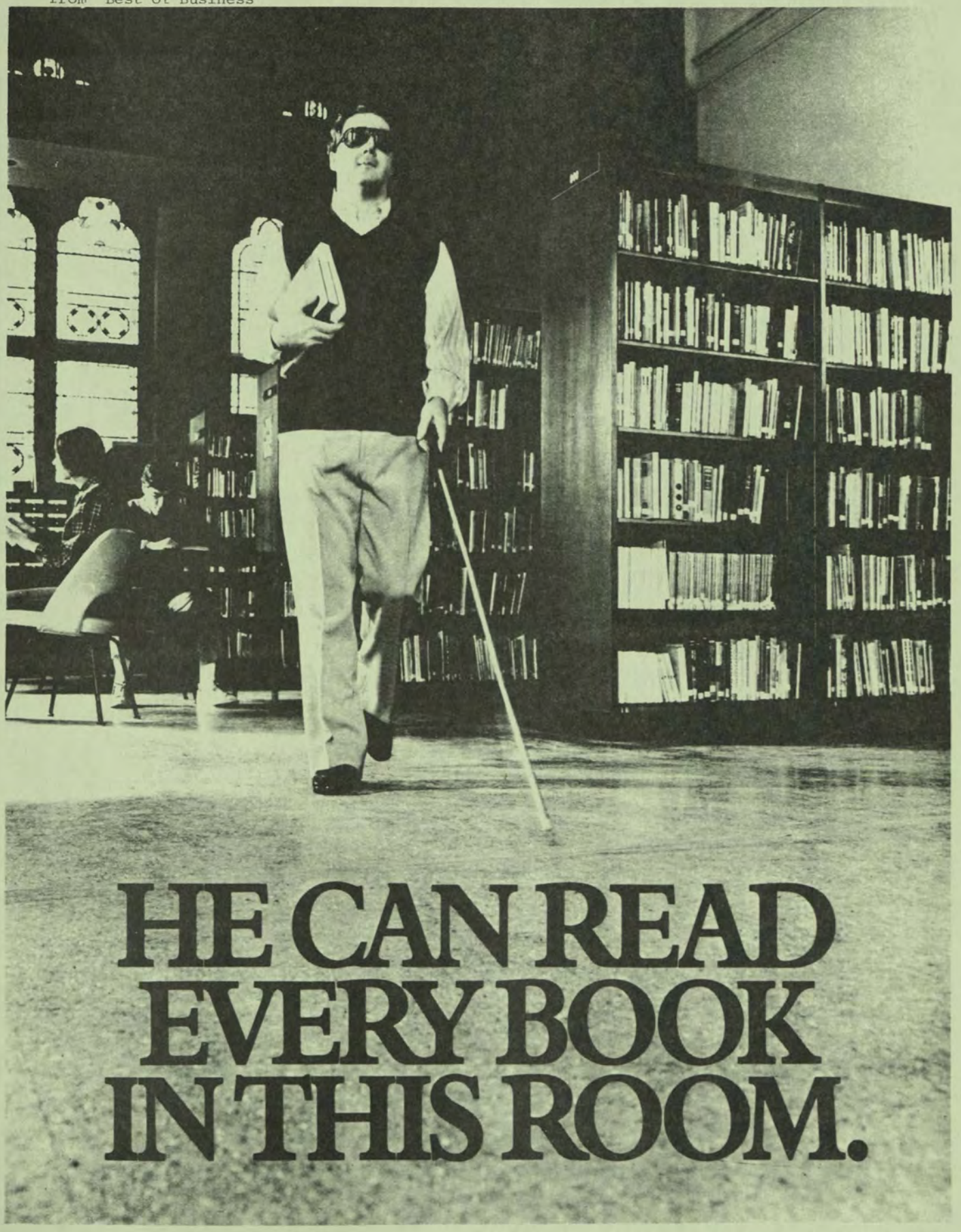
The intellectual key to machines that "read," according to Raymond C. Kurzweil, the company's founder, is "to abstract the properties of letters" and to describe them mathematically. This task is quite different from programming simpler optical computers to recognize particular typefaces or the precise lines drawn on food packages at supermarkets.

The letter A, no matter what type style it is printed in, has a hole near the top, a northwest wing, a northeast wing and a crossbar. "It has a southern concavity and there are no northeast or northwest concavities," said Mr Kurzweil, a 36-year-old graduate of the Massachusetts Institute of Technology who grew up in Queens.

The operator sits at an ordinary-looking computer terminal and places the document to be read on the glass top of a metal box about the size of an office refrigerator. A moving camera under the glass begins tracking several lines at a time from right to left as well as left to right.

Words start popping up on the screen in front of the operator, who then trains the computer to recognize the type face being scanned. When something looks garbled, or if the computer indicates it has little confidence in its decision to call something an E, say, the operator tells the computer to display an enlarged photographic image of the doubtful letter on the screen. The operator then types an instruction on the computer keyboard that tells the computer whether or not it should consider such letters E's.

from "Best of Business"



Jeff Vogel is completely blind.

But that can't stop him from reading virtually any book printed in English. Not since the development of the Kurzweil Reading Machine.

It scans books, page by page, converting each word into spoken English.

So through a simple pair of headphones, the blind are reading things they never could before.

The Kurzweil Reading Machine is being used in libraries and reading rooms throughout the country. Helping blind people finish graduate school, further their careers in law and teaching, or simply enjoy the latest best seller.

Similar technology is also being used to help computers. By translating the printed word into their language, other Kurzweil machines help make computers more productive.

Of course, a person doesn't have to be blind to learn from the Kurzweil Reading Machine.

We learn from it every day.

It helps us see just how much the blind have to offer.

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POPULAR COMPUTING®

JUNE 1984 $2.50 in USA
A McGraw-Hill Publication
£1.85 in U.K.

Converting Russian Documents into Computer Databases

As this 1984 election year heats up, President Ronald Reagan might have a way of beating down the charge that he doesn't understand the Soviet Union. He can get the U.S. State Department to order some data processing machines that *read* Russian.

This is the latest application of the Kurzweil Data Entry Machine that recognizes text and sends it to a computer. Kurzweil Computer Products, a Cambridge, Massachusetts, firm, now has a scanning and processing system that converts printed Cyrillic documents into computer-compatible form.

The Russian project is the collective effort of a dozen Kurzweil people working in the Optical Character Recognition (OCR) Division of the company. Lee Kamentsky, a senior development programmer in the division, said that, surprisingly, developing the Cyrillic system wasn't as difficult as it might sound, despite what seems to Americans, at least, the odd optical structure of the Russian alphabet.

The Kurzweil Data Processing Machine can read almost any typeset or typewritten font in sizes from 6 to 24 points, in proportionally or uniformly spaced type.

Its scanners can also recognize and code several fonts at once—headings, boldface, and italics, for instance—which are common in most typeset documents.

"Our data processing machine was already working with European special characters," Kamentsky said, "and very little deviation was encountered when we undertook the Russian project. It didn't present any really unusual problems. In fact, it was a lot more straightforward to develop than scanning English text for data transmission. Russian books have less variation in type styles."

Kurzweil developed the Russian project at the request of an American company under contract to the U.S. government to translate Russian into English. He sees the project as having many applications in publishing, government, universities and libraries, and databases.

Kamentsky takes the future a step further: "If a computer can someday be programmed to translate Russian into English, Russian-to-English books can become available by simply hooking our Russian data processing machine into the system."

The Data Processing Machine is a spinoff from Kurzweil's Reading Machine, which first came on the market in 1974. Designed by Raymond Kurzweil, the reading machine scans everything from newspapers to books and original manuscripts. It uses an electronic scanner with a speech synthesizer to read the printed page aloud.

The Kurzweil Reading Machine can read aloud hundreds of different typefaces and up to 255 words per minute. The machine is programmed for 1000 linguistic rules and 2000 exceptions.

Hundreds of libraries and universities in the United States now have Kurzweil Reading Machines. As would be expected, the Kurzweil Reading Machine can also be found in the homes and offices of the visually impaired.

Currently, the machine reads only English, but the company is working on programs to have it read several European languages. □

GM Expands Applications With OCR System

By Lynn Haber
CW Staff

WARREN, Mich. — Utilizing an optical character recognition (OCR) system, which can read both typewritten and typeset material, the staff at the technical center of a major automobile manufacturer here says it has expanded applications to degrees never before thought possible.

"We had applications in this organization and in this corporation which have been identified for years, but because of the massive amounts of manpower required to create the data base, we never did it," said Michael Flynn, manager of Environmental Activities Staff for General Motors Corp. (GM). "The scanning and processing system have allowed us to develop applications that before we just couldn't conceive of doing."

The Kurzweil Scanning and Processing System developed by Kurzweil Computer Products, Inc. in Cambridge, Mass., is used primarily for three applications. "The first application is taking old file copy, say from the 1960s to the present, and scanning it and then sending it to a data base for search and retrieval purposes," said Barbara Sullivan, assistant coordinator of operations at the technical center. "This department works with the government and has to make proposals to certain standards, and these old files represent all the copy [it has] had for these standards.

Electronic Communications

"Another application has to do with a department that works with overseas regulations. [It is] sending all copy to us, we're scanning it and electronically communicating it back to [the department], and it is formatting it for production of a manual."

The third application of the scanning system is in the production of GM reference manuals, previously produced by the company's photographic department.

The Kurzweil system utilizes artificial intelligence for inputting material directly to local-area networks or capturing text for editing on word processing systems. According to Michael Backler, a Kurzweil vice-president, the difference between his firm's OCR system and conventional OCRs is its ability to read typeset as well as typewritten material.

"The company was founded in 1974 with the idea to create first a product to convert printed text to speech — and not just typewritten material but typeset as well — and then at some future point expand to a commmercial version of the product," Backler said.

Originally, Kurzweil developed a system to convert text to speech for the blind. Today, the scanning and processing system converts printed information to computer-compatible form without rekeyboarding. Omnifont recognition software and specially designed hardware enable the company's system to read both typeset or typewritten material.

According to Flynn, it was not until 2½ years after first seeing a demonstration of Kurzweil's OCR system that GM bought the system. "While doing some consulting work, I read an article that this system existed, and I and a couple of other people went to Chicago to see one of the first applications of the scanning system. We concluded that it provided a real solution to a very large problem — capturing archival files," Flynn said. "About 2½ years later, I found a problem that this system was the solution for.

"When we were specifying the office system requirements for this organization, we recognized that we were going to be creating, storing, retrieving and manipulating text and documents in an electronic medium for all of our internal activities, but that we would have to interface with the outside world, which essentially was still being driven by paper," Flynn said.

"We decided then to provide an interface such that we could take all of this paper from the external world and convert it into the electronic media so that we could have a singular system."

The New York Times

Sunday, March 26, 1978

NEW LIBRARY DEVICE READS TO THE BLIND

Optical Scanner Machine Is Called Most Valuable Rehabilitation Aid Since Invention of Braille

Frank Perino had never read "The Midnight Ride of Paul Revere." But as he sat in an orange chair in a quiet room at the New York Public Library's Mid-Manhattan Branch, he went over the poem line by line, repeating several passages and spelling out some of the words along the way.

Frank Perino is blind, but he "read" the poem with the help of a blue machine that read the printed material aloud in a nasal, computer-generated voice that he was sure was Swedish.

For two million Americans who are blind or visually impaired, the 80-pound machine may be the most important invention since Louis Braille developed a system of raised-dot fingertip reading in 1829. Officials of the National Federation of the Blind, who tested the device before it was delivered to the library last week, predict that it will change the nature of rehabilitation and vocational training for blind people.

The library's machine is one of 15 in existence, and the only one in a public library. The others have been installed in hospitals and rehabilitation centers around the country.

Optical Scanner Used

The machine contains an optical scanner that shoots a beam of fine white light across the printed page and converts it into a stream of digital data to be analyzed by its built-in computer and transformed into speech.

The machine began as an undergraduate computer science project at the Massachusetts Institute of Technology. But not until after graduation did Ray Kurzweil, who has normal vision, realize that his work could help blind people to read.

The machine has controls to make it speak faster or slower, repeat phrases or spell out words. There is also a master control button to make the 33 others on the keyboard tell the user what functions they will make the machine perform, eliminating the need to mark them in Braille.

It's kind of hard to understand," Mr. Perino said of the voice. He said it stretched some vowel sounds and accentuated the wrong syllables.

And then there was the Swedish accent—or maybe it was German. "You have to get used to that accent," Mr. Perino said.

But he said the machine was so simple to use that he would soon progress from poetry to legal research, for he hopes eventually to have a law practice of his own. James R. Gashel of the National Federation of the Blind said the device would make pleasure reading possible for people whose literary diets had long been limited to Braille textbooks, some newspapers and phonograph recordings of written materials.

Training Course Planned

"It opens up the libraries, and rapidly," said Mr. Gashel, who taught library staff members to use the machine.

Mr. Gashel estimated that a blind reader could learn to operate the machine in 20 hours. But Armand Isip, a library staff member, is planning a training course of only six hours. "It took me 12 hours, using blindfolds, to master this thing," he said. "But I'm pretty slow."

Mr. Gashel said, however, that 12 hours was far less than the "half a lifetime" it takes to master Braille, which does not offer the range of titles the machine can read. Only about 350 of the 40,000 books printed each year are issued in Braille editions, he said, and there are often delays in the preparation of Braille volumes. The Kurzweil machine could read all 40,000 new books as soon as they are published.

"It's not that Braille isn't useful—the problem is the system of teaching Braille has not been successful," Mr. Gashel said. "It's complex and time-consuming and sometimes the teachers don't seem to believe a blind student can learn."

But Mr. Perino mastered the machine in a few minutes.

1,000 Rules Programmed

With Mr. Isip's help, he slipped a copy of the poem under the machine's clear glass cover and punched a button. The machine beeped loudly, and then Mr. Perino listened and heard of the midnight ride of Paul Revere.

The machine "read" the poem by consulting 1,000 pronunciation rules and 2,000 exceptions to them, all of which have been programmed into the computer. It recognizes each letter by measuring its geometric shape, and Mr. Kurzweil, who has founded a company in Cambridge, Mass., to produce the machines, is working to improve its ability to recognize characters and speak clearly.

The inventor said last week that by summer, one machine would be manufactured each week. Mass production will help lower the price from the current $50,000 to between $5,000 and $10,000, he said.

For Mr. Gashel and Mr. Perino, however, money matters little. "Our major barrier in life has always been the print barrier," Mr. Gashel said. "Setting this thing in the New York Library is significant because until it arrived, most of the books in the world's largest public library were off-limits to blind people."

TALKING BOOK

RAY KURZWEIL'S READING MACHINE OPENS BOOKS TO THE BLIND

Ray Kurzweil may not be a great musician, but Stevie Wonder doesn't mind. Stevie thinks Ray makes some of the most beautiful sounds around.

Ray doesn't play an instrument or sing. In fact, the sounds he helps create have nothing to do with music. Ray's sounds come from the Kurzweil Reading Machine (KRM), a computer that scans any printed text and then reads it aloud. For Stevie Wonder and other blind people, that's just about the most wonderful sound in the world.

AN OPEN BOOK

With its ability to read almost any typeface—even ones as small as a phone book's or as fuzzy as a newspaper's—the KRM opens up a whole new world to the blind. It's a world of magazines, libraries, bookstores and newspapers that most of us take for granted. Before the KRM, Stevie had to depend on braille and recorded tapes to get his reading material. Now he can read any book he chooses.

When Stevie learned about the KRM, he traveled to Ray's Massachusetts factory to check it out for himself.

Ray, 34, recalls the visit with a smile: "He was very excited about it and wanted one right away, so we actually turned the factory upside down and produced a unit that day.

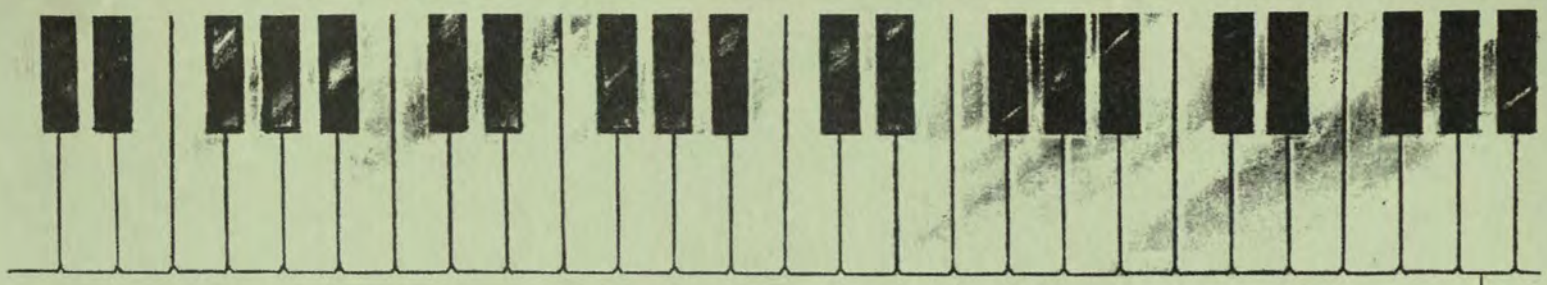
© MARTHA STEWART

Using KRM is easy: by pressing the keys you control what it reads.

We showed him how to hook it up himself. He left with it practically under his arm. I understand he took it straight to his hotel room, set it up and read all night."

Stevie did that and a lot more. He had special cases built so he could carry the KRM with him when he traveled. He carefully studied the machine's operation and suggested improvements. Some of Stevie's ideas have become standard features of the KRM. For example, Stevie suggested adding a feature that would allow the reader to leave up to ten different "bookmarks" on a page of text. It's now a part of the KRM. This feature lets those using the machine skip around and then find their way back to the chapter and page they want.

Stevie has used the KRM to teach himself how to use other computers. And he is having the machine interfaced with his digital musical instruments so he can program those instruments without the help of assistants.



Ray Kurzweil's Reading Machine scans texts and reads to the blind.

RAY KURZWEIL, COMPUTER PRODIGY

Just as Stevie Wonder has been making astounding music since he was a young boy, Ray Kurzweil has been creating computer breakthroughs since his teens.

When he was 13 years old, Ray designed an award-winning electronic memory system that could store and sort 4,000 facts. And when he was 16, Ray built a computer that could analyze classical music and produce original melodies.

These feats eventually led him to the Massachusetts Institute of Technology, where he began studying Artificial Intelligence (AI). Research in AI is directed towards creating machines that can "think" and learn to improve their own performance. It was while conducting such research that Ray got the ideas that made the KRM possible.

"Getting a machine to recognize letters and words on a page is a classic problem in AI research," says Ray. "I had a technique I thought would work, so I decided to develop it. A reading machine for the blind seemed the most promising application to begin with."

Ray was 27 when he built the first KRM. It was the most advanced machine of its type then—seven years ago—and is still the most advanced today. But Ray hasn't stopped making breakthroughs. In the past few years, he's created a version of the KRM that can read books and store them as data at a rate as high as 1,000 words a minute. And he's invented a computer keyboard that's so sophisticated it can perfectly synthesize the sound of a grand piano.

SOUND ALL AROUND

Ray's new keyboard, the Kurzweil 250, is already on its way to joining Stevie Wonder's musical instrument collection.

Someday, perhaps, Stevie will be able to use that keyboard and his vast musical talent to overcome the one problem that stands between the blind and the use of a machine like the KRM—cost. At $30,000 each, only a relatively few KRMs are available.

If Stevie has his way, this problem won't last long. "My wish," he says, "is that all of this equipment could be available to the average blind person. I would love to do a benefit to raise money for that." —*Freff*

velopments, it's a frustration he won't be having for long.

"I've got some software and hardware folks working right now on a very high-memory synthesizer/computer interface to hook up my different systems," he explains. "Then I'll be able to do all this stuff completely by myself. I'll have the freedom and flexibility to do what I like, instead of having to depend on an operator all the time."

The other "systems" Stevie is talking about are two of the many new computer products designed specifically to aid the blind. One is the Kurzweil Reading Machine (KRM). The other is the Versabraille.

The KRM is really two machines in one: a computer that can scan the words on a printed page and interpret them, and a speech synthesizer that can speak those words out loud, at speeds of up to 250 words a minute. Stevie was one of the first private owners of a KRM. He uses it to read everything from popular novels like Frank Herbert's *Dune* books—he has loved science fiction since he was a teenager—to manuals for his synthesizers.

The KRM also helps Stevie work with his computers. It can read what's on another computer's screen. This allows Stevie to teach himself. When, for example, he got a portable Osborne computer to use on the road, Stevie was able to learn all about it himself by hooking the KRM up to the Osborne. The Osborne company had put their instruction manual on a floppy disk for Stevie, so all he had to do was put the disk in the Osborne and turn it, and the KRM, on. Then he listened as the KRM read everything to him straight off the disk! *(For more on the KRM, see the following story, "Talking Book.")*

Stevie's other system, the Versabraille, is a lap-sized computer designed specifically to use braille, a language for the blind that consists of patterns of raised dots representing different letters. Nearly all blind people know braille, but until computers came along, braille information wasn't very portable. A braille book could weight as much as ten pounds. But the Versabraille can store tens of thousands of braille characters on a lightweight data cassette. It can then use this information in a variety of ways. The data can be sent via modem to another Versabraille, for example. Or the Versabraille can be connected to a KRM, so that the braille characters will be instantly translated into speech. The information can even be read back to the user by the Versabraille itself, one line at a time, using a special plastic readout strip on the machine's top. This strip has many tiny holes, with small plastic pinpoints that extend and retract to create different braille characters. Someone experienced with braille can very easily read these by simply passing his or her fingertips along the strip.

Right now, Stevie uses his Versabraille on and off the road as a kind of portable electronic notebook. It helps him do business, take notes, write letters and song lyrics, and keep track of addresses. But Stevie is building a complete integrated system, and soon the Versabraille will do a lot more.

When the Versabraille, KRM, and his instruments are all hooked to-

Money

OCTOBER 1981 $2

LIBERATING THE BLIND

In more ways than one,
Ray Kurzweil is a man of vision.

Ray Kurzweil at 33 is a distinguished inventor and wealthy businessman. He is also an accomplished pianist, a talented painter and a published poet. It is almost as if he had been assembled by computer from his antecedents. His father was a brilliant musician, his mother is an illustrator. His grandmother was one of the first women Ph.D. chemists in Europe, a great-grandfather was a decorated weapons engineer in Austria, and an uncle was a pioneering automation scientist in the U.S. Says Kurzweil, "There's a tradition of excellence in my family."

Kurzweil himself designed the first of several award-winning computer systems when he was 13. He beat out 60,000 competing high school students to win the 1965 International Science Fair Award. His project was a computer program that composed Mozartean music ("only it was second-rate Mozart"). At 19, while still at MIT, he devised a program called Select, aimed at helping students choose a suitable college. For that program, a publishing company in 1968 paid him $100,000 plus $20,000 in royalties.

AMONG HIS EARLY CUSTOMERS: STEVIE WONDER

But it's another device, known as KRM, that will almost certainly lodge Kurzweil's name in the encyclopedias of the future. They will note that the Kurzweil Reading Machine has done more to liberate the blind than any invention since Louis Braille perfected raised-dot fingertip reading in 1829. The KRM, which went into production in 1976, is a minicomputer costing $25,000 to $30,000 that uses an optical scanner to recognize sequences of letters and turn them into synthesized speech. All a sightless person has to do is place any typed or printed page facedown in the machine, as in a photocopier, and *hark!*, out come the spoken words.

A '72 Buick

The inventor founded Kurzweil Computer Products Inc., in Cambridge, Mass., to market the KRM. Among his early customers: Pop musician Stevie Wonder. Kurzweil went on to create an even more sophisticated device, the Kurzweil Data Entry Machine (KDEM), which enables a computer to scan a printed document and enter its contents instantly in a memory bank, eliminating countless hours of tedious work by computer typists. Mainly because of the potential of KDEM, Xerox Corp. bought Kurzweil's company for $6 million last year. The inventor remains head of the firm, draws a six-figure salary, and continues to do research into new projects that serve "worthwhile social goals." One that he has in mind is a computerized diagnostic system to improve medical care in poor societies.

Success has had little effect on Kurzweil's life; he has invested his profits from the Xerox sale in the stock market. He still drives a 1972 Buick Skylark and with his wife and two-year-old son occupies an old house that looks as if it were furnished with undergraduate hand-me-downs. The real benefit of riches, Kurzweil feels, is that "you don't have to hustle." Among other things, he has more time to polish his Mozart. $

"The device," says inventor Raymond Kurzweil, "enables blind people to read anything that's printed."

When Raymond Kurzweil was growing up in Queens, N.Y., his best friend was a computer. Now 27 and still wild about electronic brains, he has developed what may be the greatest boon to the blind since the invention of braille. It is a device that scans a page and then reads the contents aloud at nearly 200 clearly enunciated words per minute. The voice is a nasal monotone, and the accent has been likened to that of a middle-aged Swede speaking English. It is 10 times faster than any comparable invention.

According to Kurzweil, who heads a Cambridge, Mass. computer firm, an electronic camera sends an image of the printed page to a tiny computer. "The computer locates the letters and analyzes each for its geometric properties—loops, concavities, line segments," he explains. Once the computer recognizes the letters, it uses some 1,000 phonetic rules programmed into its memory bank to turn the letters into sounds. Finally electronic circuits produce speech.

If that sounds complicated, it is—to most people. But not to Kurzweil. At 13 he designed an award-winning electronic memory system capable of storing 4,000 facts. A New York think tank was so impressed with Kurzweil that it hired him to analyze data. Three years later Kurzweil taught a computer to direct an electronic mouse through a maze and copy and compose classical music. This invention would have intrigued his late father, Fredric, a pianist-conductor who taught Ray to play piano at the age of 6.

At MIT, Kurzweil devised a computerized service to match high school students with appropriate colleges and sold it to a publisher for $100,000. By the time he earned his degree in computer science and literature in 1970, Kurzweil was developing computers to run factories. His versatility may help explain his great admiration for Thomas Edison. "He was a remarkable man. He did so many different things at the same time."

Away from his computers, Kurzweil plays classical piano and writes poetry. He lives in suburban Chestnut Hill with his wife, Sonya, 29, a psychologist specializing in reading disabilities at Massachusetts General Hospital. Her patients may someday benefit from his new invention. It will be tested for a year, then sold to institutions for no more than $25,000. Mass production may lower the cost to $5,000.

In spite of his reliance on computers, Kurzweil never forgets who is boss. "Computers have no imagination," he says. "You must tell them every last detail. They're exasperating!" □

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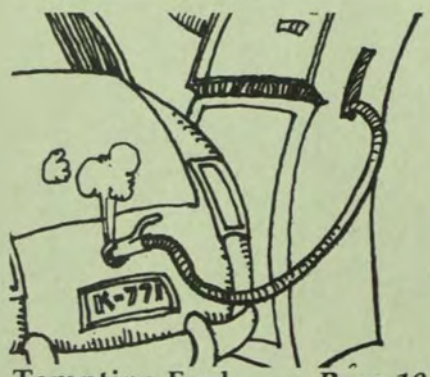

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Raymond Kurzweil
Giving "Sight" to the Blind

It will read this article at over 200 words a minute—as fast as you are reading it now. It will read perfectly, since it will skip nothing. Moreover, it will read aloud, not silently. To be sure, its voice has an eerie, space-age quality, but the people who depend on it say they soon get used to it and even develop a certain affection for it. Kay Chase, a specialist in programs for the blind at the Bureau of Education for the Handicapped in Washington, D.C., sees it as "sort of like having a friend with a foreign accent."

The Kurzweil Reading Machine is named after its inventor, Raymond Kurzweil, who is, at age 32, one of the most talented young minds in the field of artificial intelligence. Boyish, even cherubic-looking, Kurzweil is engagingly circumspect in his claims for his accomplishments. "People have sometimes ascribed too much to artificial intelligence. But if you can actually simulate intelligence in a machine, you've got something very effective."

Kurzweil has been progressing toward that goal since the age of 12 when he spent the summer at the Institute for Developmental Studies (then an independent psychological research organization, but now associated with New York University). There he simplified a complicated computational process called "an analysis of variants," designing a program capable of doing in a few days what had formerly taken five people several weeks. At 13 he designed and got an award for an electronic memory system capable of storing 4000 facts. At 16 he built an award-winning computer that he programmed to analyze melodies and produce others with the same patterns. "They were very simple melodies, like you might find in a Mozart sonatina. You wouldn't get Mozart, but you'd get melodies that sounded like they came from the 18th century," he smiles, "by some second-rate composer."

Kurzweil's reading machine has not been called second-rate. In speeches by government figures, through reports in the *New York Times* and elsewhere, the machine has been called the greatest advance in technology for the blind since Louis Braille invented the raised-dot sys-

". . . if you can actually simulate intelligence in a machine, you've got something very effective . . . . You are combining the clarity and satisfaction of computation, which is extremely precise, with something that's very elusive, almost poetic – human intelligence."

tem of fingertip reading in 1829. It will read anything you give it—"War and Peace," the latest journal article you might need for your research, a child's textbook. The day I stood beside it, it read to me only the preamble to the Declaration of Independence. But listening to the lower depths of its baritone was electrifying—something like what hearing the radio for the first time must have been like for its early audiences.

When one of the earliest machines was installed three years ago in the New York Public Library, James R. Gashel of the National Federation for the Blind told a *New York Times* reporter, "Our major barrier in life has always been the print barrier. Setting this thing up in the New York Public Library is significant because until it arrived, most of the books in the world's largest public library were off limits to blind people." Since then, over 200 machines have been installed in schools, libraries and other institutions around the U.S., as well as in Canada, Australia and England. (The $19,000 price tag is too expensive for most private use, though one can now rent the machine for $98 a week on a lease-purchase plan).

"The major barrier was recognizing print as it actually exists in the world, that is, in hundreds of different type fonts."

Kurzweil's brainchild, which made its first public appearance in 1976, is an unpretentious four-part assembly weighing only 20 kg. The first module, looking like a desktop copying machine, rests on a minicomputer that attaches to a hand control set—a rectangular box no larger than a telephone. The voice emanates from the fourth part—a small speaker.

It's simplicity itself to work the machine. Place a book face down on the glass top of the copy-machine-like box, then press or turn the controls on the hand set, which instructs the machine in a myriad of reading tasks. It will skip ahead in the text if you want, search around the page for information, return to an earlier passage, speed up, slow down—in brief, it will do everything you would do yourself.

But what looks so simple is actually a miracle of intricate engineering. From beneath the glass panel, light is beamed at a thin strip of print on the page, and a camera, or "scanning head," moves systematically up and down, recording the strip at the rate of 500 images a second. On the camera's back is a device that converts each image into electronic signals. The computer translates these into characters, which it then proceeds to group into words and sentences. At this point the second part of the process begins—the computation of the pronunciation and the final articulation. The whole operation is the work of a second.

No one quite knows how *people* learn to recognize letters and put them together or form words, phrases and sentences. But computer scientists before Kurzweil had tried at least to approximate the process. They had foundered on the reef of what, in the field, is called "character recognition." "The major barrier," explains Kurzweil, "was recognizing print as it actually exists in the world, that is, in hundreds of different type fonts." Reading machines existed before this one, but they were limited to understanding only a few typefaces, and they could hardly begin to approximate what the human mind does in reading. Knowing just what makes an *A* an *A*, an *F* an *F*, and so on, no matter what the typeface, is part of the mystery of human understanding of the printed word. Kurzweil's genius was to invent a way that a machine could do this. His interest in the problem started in 1965, when he was an undergraduate at the Massachusetts Institute of Technology, and he finally found the solution after founding his own firm in 1973.

"Basically," he explains, "it is a matter of breaking each letter down into invariant features—features that tend not to change across different type styles." The invariant features are geometric ones. Illustrating, Kurzweil traces an *A* on a sheet of paper. "The top of the *A*," he says, following it with his pencil, "is a loop, a completely enclosed portion of white." Then, running the pencil down one side of the *A*: "It has loop extensions, at what we call the 'west' and the 'east sides' of the letter. Then, at the bottom, there is a 'southern concavity.' "

Once the biggest problem was solved, Kurzweil says the others were minor. One advance, for instance, was to teach the machine to correct other machines' errors. If letters are broken or imperfect because of poor printing or bad paper grain, the machine will still recognize the basic characters and "forget" the defects. The machine can also "learn" since it can be continuously updated—for example, to do work in foreign languages—simply by being fed the most recent set of taped instructions.

While Kurzweil's machines reside in some of the nation's greatest libraries, the man himself works out of a rather modest office overlooking the Charles River. A small telescope stands in one corner. On a bookshelf rest two little stones etched with fossils. On one wall hangs a large, framed collage of press clips and concert bills,

a graphic record of the accomplishments of his father, the late Frederick Kurzweil, a well-known conductor of the Bell Symphony Orchestra and the Mobil Opera, and faculty member of the Queensboro College of Music in New York. To the right of this hangs a painting by Kurzweil's mother, Hannah, an artist and fashion illustrator who has exhibited at the New York Society for Illustration. Next to this hangs another painting, Chagall-like in style—by Kurzweil himself.

He might have been an artist or a musician; he began playing the piano at age six and still plays. He admits that a certain artistic sensitivity to the shape and structure of things aids his work.

Did he ever make a conscious choice between art and science? The answer comes instantly. "No. There was never a choice. I always wanted to be in science." Then, reflectively, he reaches for a slender volume—Norbert Weiner's "Cybernetics," the book that launched the field of artificial intelligence: "He wrote this in 1948." A pause, as he gazes at the flyleaf . . . "That was the year I was born."

Twenty-five years later, in 1973, Kurzweil was ready to advance his university interest in pattern recognition through practical experiment. In a small building near MIT he founded Kurzweil Computer Products with $200,000 that he drummed up from friends, family, colleagues and his own savings. "I wanted to be able to show the government a machine that worked," he told a *Boston Globe* writer two years ago, "before I went looking for any funding." A little later, he opened a small factory in the nearby town of Haverhill, where the machine is still produced.

Most of the linguistic work on the machine, says Kurzweil, was done by his colleagues, Richard Brown and Steve Pelletier. Other computer scientists had tried to teach speech to computers by programming the machines with the 100,000 or more words in English, but this proved awkward and tedious. The machine had to search for the words in its bank while the listener waited. The Cambridge group sidestepped that process, feeding the machine directly with 1000 rules and 1500 exceptions that govern English. Recreating human speech was a matter of breaking the written text down into its basic sounds, or "phonemes," then teaching the computer to put them into syntactical order with appropriate stresses and pauses. The result is a "voice" all listeners agree is male ("It turned out to be harder to simulate a female voice," says Kurzweil), slightly accented, and sing-songy. The voice sounds more natural in 1981 than it did in 1976, because of certain advances in the programming. For instance, it now distinguishes between sounds that seem the same but are really different. In the words "reed" and "red," for example, the final *D*s actually sound different in human speech, even though they're considered the same phoneme, and the machine now understands the subtle distinction.

Within the rambling labyrinth of offices and labs at the firm's headquarters on the Charles River, work has expanded into other areas. The machine's use has been extended to children handicapped by dyslexia, a reading disorder studied by Kurzweil's wife, Sonya, a psychological research intern at Children's Hospital in Boston. "For dyslexics," Kurzweil simplifies, "reading is really a problem of motivation, and the machine seems to provide that. For one thing it's a toy, sort of a gadget, and there's a lot of enthusiasm. They also have control and mastery over the situation. Reading has always been very frustrating to them, painful, because they failed and got criticized. Now, all of a sudden, they can do it."

Kurzweil spends roughly 50 percent of his time now on the company's business, which he talks about with entrepreneurial zeal. "I want to make this company as successful as it can be," he says, adding that he is optimistic about Xerox Corporation's recent acquisition of the firm. "They're putting a lot of money in, but keeping hands off, trying to keep the original management philosophy." But success hasn't dulled Kurzweil's passion for his field. Sitting in a straight chair in his office, the painting and the concert bill collage behind him, he explains what is still most compelling for him. "You are combining the clarity and satisfaction of computation, which is extremely precise, with something that's very elusive, almost poetic—human intelligence." **by Ellen Cantarow**

Ellen Cantarow *is a freelance writer based in Cambridge, Mass.*

Newsweek

May 24, 1976

MEDICINE

The third device described at the seminar is a machine with a mechanical voice that will permit the blind to read virtually any book or typewritten material. Developed by Raymond Kurzweil of Cambridge, Mass., the machine consists of a desk-top reading unit and a small keyboard. The user places the printed page face down on the glass top of the unit and a camera scans it line by line, converting light into electronic signals—much like a photocopier. A miniaturized computer groups letters into words, figures out how they should be pronounced according to a preset program, then produces speech sounds. The result is an eerie but easily understandable metallic voice that can read up to 160 words a minute. Should the printed material have been placed upside down, the machine utters gibberish and the user can quickly correct his mistake.

Spell It Out: The machine is programed to read most common type styles, and at the push of a button, the user can repeat or skip passages, or mark a point on the page he wants to return to later. Confronted by an unfamiliar word, he can ask the machine to spell it for him letter by letter. Since only about 300 new books are put into Braille and 900 transcribed on tape each year, this equipment will permit the blind a far wider choice of reading material than they now have.

Eleven of the machines are now being built for testing with grants from the Department of Health, Education and Welfare and the National Federation of the Blind. While the bulky prototype costs $50,000, Kurzweil expects the machine to sell for about $5,000 within a few years. It will eventually be as portable as a briefcase.

—MATT CLARK

Kurzweil Reading Machine Series 400

Specifications for the KRM Series 400 including peripherals, software and training

Kurzweil Reading Machine Series 400

The Kurzweil Reading Machine (KRM) is used by blind and print-handicapped people to convert printed materials into easily understood synthetic speech. The KRM also functions as a talking calculator and can serve as a full-word, voice output computer terminal. Additionally, it can be used to convert printed documents into the electronic signals required to drive Braille printers.

Basic hardware:

The reading machine consists of two principal units:

Automatic scanning system with integrated electronic control unit:

The electro-optical system automatically scans any document up to 11" x 14", using a linear scanning array, camera, and X-Y mover. The system will read everyday typeset or typewritten materials from 6 to 24 point. The electronic control unit (ECU) contains all electronics required to perform scanning, character recognition, and speech production functions. The ECU also includes a floppy disk drive that loads system software.

Dimensions:	30.3" high
Area:	22" x 24"
Weight:	Approximately 300 pounds
Power:	110-240 Volts/50-60 Hz. Current rated at 15 Amperes. Actual use is less than 10 Amperes.

Control panel:

A separate push button control panel activates and directs the system. With the touch of a finger, words or lines can be repeated, spelled out, or marked for later reference; punctuation and capitalization can be announced if desired; and the voice itself can be varied in volume, speed and pitch. The speaker system is contained in the control panel. The approximate dimensions are 10 x 9 x 2 inches.

Standard peripherals:

Direct audio recording of material can be made from the control panel. Attachments include an audio signal attenuator, patch cord and adapter. Also included is a headphone set which plugs directly into the control panel for private listening.

Communications interface:

The Series 400 can serve as an input or output device for a wide range of electronic, data processing and Braille systems. An RS-232-C serial port is included. Users can control Baud rate and parity, as well as the number of data and stop bits. (RS-232-C cable not included.)

Software:

All software required for KRM operation is provided under a 'software use license'. Software comes on a floppy disk and is self-loading. Updates are provided free of charge to customers who are covered by our one year warranty or to those who have purchased a KCP service contract (a minimal handling fee charged). Customers without warranty coverage or a service contract may purchase software updates separately. Each software disk will contain the complete Series 400 software with incorporated improvements and will replace all previous disks.

Languages:

The Series 400 is available in six languages: English, French, German, Italian, Spanish and Swedish. First language is included in list price. A total of three languages can be installed at an additional cost.

Instructional materials:

A credit for up to three instructional manuals is included with the purchase of a KRM. Customers may elect to receive their manuals in print, Braille, audio cassette or a combination of all three. Each describes procedures associated with operation of the Series 400.

Training:

Training for one person at the Kurzweil Computer Products (KCP) Training Center in Cambridge, Mass. is included in the purchase or lease agreement. Travel and living expenses are paid by the customer. Training for additional individuals or on-site training is available at extra cost.

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KURZWEIL READING MACHINE UPDATE

Number Eight **Spring 1986**

IN THIS ISSUE: Legislation...Library News...Special Education Plus...International News...Training Credits...and more

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Reading Machine Legislation Passes in Texas

Texas legislators passed House Bill 387 in the fall of 1985 which calls for the placement of reading machines in public libraries of all Texas cities with populations of 50,000 or more. More than 30 Texas cities qualify under this legislation. The bill also provides for placement of KRMs in academic libraries of state colleges and universities where two or more blind students are enrolled.

The Texas State Library for the Blind is coordinating this program. Last year, the State Library instituted the Research/Reading Center as a pilot project to demonstrate successful applications using technology in a library setting. The State Library will administer the legislation by purchasing machines, writing guidelines for placement and use, providing training, and offering consultation based on findings at the Research/Reading Center.

For more information, contact Larry Hutchison at the Division for the Blind and Physically Handicapped, Austin, TX at 512-463-5549.

Library Happenings

The Suffolk Cooperative Library System in New York has developed an active Reading for the Handicapped Program. Several libraries in the system have Kurzweil Reading Machines which are used in conjunction with other computer equipment in computer resource rooms in the library. The library system produces a large-print quarterly newsletter which contains announcements and information regarding special services they offer to disabled library patrons.

The KRM at Centennial High School, Pueblo, Colorado

Pueblo School District has been actively involved with the Kurzweil Reading Machine for some time now. They recently purchased their second KRM with English and Spanish speech for their Spanish speaking students.

Kathy Gallina, Special Education teacher at Centennial High, is very enthusiastic about the new KRM which is located in the visually handicapped resource room. She finds the KRM a great reading device for her students that have a variety of reading problems. And she emphasizes the independence it gives them.

One student is aphasic and unable to read print visually as a result of a head injury. This presents many obstacles at the high school level because students have a lot of reading assignments and are expected to write papers. The KRM is working beautifully for this student. He can comprehend material that is read aloud independently. In this case, the student gives a report orally instead of writing a paper.

Cassie Coyle, a senior at Centennial, is visually impaired. She uses the KRM, interfaced with other computer devices, as a work station to read, store notes, write, and edit her own papers. "She can do all this independently now", says Kathy, who trained Cassie on the KRM and other devices in the resource room.

Cassie uses the school library, and with the assistance of a librarian, is able to get books and encyclopedia articles for school reports. She brings these materials to the resource room and reads them on the KRM. If Cassie reads something she wants to save for future use, she puts the KRM in Text Output Mode and sends the information through a communications cable to the Apple IIe. The information is stored on a floppy disk so she can reference it again later. (The staff is working on sending output directly from Kurzweil to a VersaBraille, so the student will be able to read through the text in Braille.)

The Centennial High resource room is a wonderful example of how computers can be tied in together for optimal use. Cassie uses a VersaBraille at home to write some of her reports, and then when she gets to school she sends the information from the VersaBraille to the Apple IIe. The Apple IIe is equipped with an Echo speech synthesizer and Braille-Edit software so Cassie can write and edit her own work. Finally, her paper can be printed out for the teacher to read, and Cassie can listen to the finished product read out loud by the KRM.

Cassie plans to attend the University of Southern Colorado next year as a pre-law student. She will continue to use a variety of computer devices to access information and to complete her assignments. We congratulate her on her success and wish her the best of luck as she continues her education!

KRM on the Job

We spoke with John Marocco about how he uses his Kurzweil Reading Machine on the job. John is a Curriculum Specialist in NBC's innovative Technical Training Center in New York City. "This is a new career for me, and it is quite a challenge," says John. He applied and received his KRM through the Veterans Administration in February, 1985.

His Series 400 Reading Machine sits conveniently beside his desk, and John explains that he reads memos, newsletters, and other work-related materials that come across his desk. He also has a nice arrangement with his co-workers; they type messages which can be read on the KRM so that John gets the messages promptly. He is also able to read product manuals and course related materials. John plans to interface the KRM with other computer equipment that he received from the New York State Commission for the Visually Impaired.

The NBC Technical Training Center is designed to update and train NBC employees on state-of-the-art broadcast technology. John says he often gives demonstrations to people who have never heard or seen the Kurzweil Reading Machine. The KRM is yet another example of state-of-the-art technology at the NBC Training Center.

New KRM Program for Government Agencies Offers Discounts

Federal, State and Municipal agencies can now purchase KRMs for their visually impaired or blind employees and clients at a considerable discount. As the result of a government agency program initiated last year, the cost of the KRM is now $20,860 which represents a 30% discount. Bernice Broyde, National Marketing Manager for the KRM, says this program will make the KRM available to many more working blind people than ever before. Please contact the KRM Marketing Department at 1-800-343-0311 for further details about this program.

Bits 'n' Pieces

Do you know where there is a machine that reads out loud? Undoubtedly, there is one in your area. Many cities and towns have Kurzweil Reading Machines in their local public library. These libraries have worked hard to produce programs that offer visually impaired people access and independence to reading material at their own convenience. If you or someone you know would like to make use of this service, Kurzweil Computer Products can put you in touch with a library in your locality.

The following article was written by Edward C. Sullivan, and appeared in the September, 1985 issue of STATE LEGISLATURES:

Aiding the Blind with New Technology

People who are blind can do many of the things sighted people can. But they can't read this article for themselves, or walk into a library and read a book - any book - off the shelves.

Books, primarily those for leisure reading, are often available in Braille, in large print, or on tape. But most blind people are at a great disadvantage without independent access to information available only in print.

In 1979, New York passed legislation appropriating $550,000 to put Kurzweil Reading Machines (KRMs) for the blind in each of New York's 22 library systems. New Jersey followed suit two years later. The machine uses a sophisticated optical scanner and computer to convert printed text into understandable, synthesized speech. It can "read" books printed in almost any typeface, magazines, journals, and typewritten material.

In New York, the Assembly subcommittee on libraries believed that the KRM's potential to increase opportunity for the blind made the state's investment worthwhile, especially since the $28,000 cost per machine puts it out of reach of most individuals. The logical location appeared to be regional public libraries.

Approximately five years' experience has shown that availability of appropriate technology is not, in and of itself, a solution to the problems faced by handicapped individuals.

Some libraries have attracted new and frequent KRM users on a regular basis, and have developed a range of additional special services to augment the library access that the KRM offers blind patrons. Library staff are enthusiastic, and in several cases additional staff have been hired specifically to coordinate KRM services. These libraries are mostly in urban areas, where there is a large community of potential users, and where public transportation to the library is available.

Not all libraries have been able to create and sustain an active KRM program, however. Building a relationship between libraries and a blind community unaccustomed to using them requires a serious investment of administrative commitment and staff energy. In order to do the job well, a librarian must be willing and able to commit a significant amount of time to the program; otherwise, a staff person needs to be hired specifically for that purpose. Some libraries may require additional funding for staff, KRM maintenance costs, and the development of outreach and support services, in order for their programs to work.

Transportation difficulties lower KRM usage in smaller, more rural library systems. States considering the purchase of KRMs should balance the desirability of distributing the machines as widely as possible with the need to place them where they will be used most. Public libraries are not the only appropriate sites. College campuses, public schools, and rehabilitation centers, among others, are possible alternatives.

New York's experience suggests that a statewide program coordinator whose primary responsibility is the KRM program and other library services to the disabled would speed the dissemination of information and make service more readily available to those who need it.

The experience of New York and New Jersey indicates that the KRM will attract new users and be the focus for sustained library outreach to the blind and visually disabled community as long as there is adequate administrative, financial, and staff support. As this advanced technology achieves greater acceptability, the popularity of the reaching machine is likely to increase.

User Network and Evaluation Center Needs Your Help

The National Technology Center of the American Foundation for the Blind is looking for users of computer equipment and aids that are useful to blind and visually impaired persons. If you are interested in serving as a resource person and/or a possible evaluator for the Center, please contact them by phone or mail.

Information will be stored in their Data Base about the equipment you use, experience with it, training and employment. You may be contacted by other users of the Data Base in order to share your experiences. You will be an invaluable resource to consumers, educators, and employers.

As an evaluator, you may be requested to evaluate new and existing devices. Reports of results will be published. All personal data will be kept confidential.

The National Data Base will be the nationwide source of information about commercially available products for blind and visually impaired persons - ranging from canes and Braille watches, to sophisticated computer systems, courses available, training centers, names of users, funding sources, and previous product evaluations performed.

Please contact: National Technology Center
American Foundation for the Blind
15 West 16th Street
New York, New York 10011
Tel: (212) 620-2080

KRM Internationally

Kurzweil is in the final stages of making arrangements to have distributorships for the Reading Machine in Sweden, France, Germany, and Italy. These distributors will not only be knowledgeable in the area of selling, but they will be of service to their customers by being extensively trained in maintaining and servicing the machine. We will announce their names at the appropriate time.

John Martin, President of Repromac, Ltd., in Hong Kong has been working hard to get our Reading Machine into the Far East and other Southeast Asian markets. He has made us aware of two exciting sales possibilities to take place before this newsletter goes to print. Mr. Martin's expertise as a distributor of the Kurzweil Reading Machine is an asset to Kurzweil Computer Products.

KRM's distributor in Canada is Betacom, Inc., Quebec. They have been doing very well in distributing bilingual machines throughout Canada. Brian McCarthy is President of the company, and he heads a well-trained sales and service staff. If you know of anyone who would like a demonstration of the Kurzweil Reading Machine, please give them a call at 514-335-1058.

Town Raises Funds - Black Tie Affair

Bradburn Computer Systems, Ltd., London, is a distributor for the Kurzweil Reading Machine. They sent us the following piece of interesting information for raising funds.

"The 400th anniversary of the City of Westminster is in 1986, and as far back as 1984, the various departments started planning many events and celebrations.

The Libraries Department decided on a dual purpose function: A charity performance of the opera 'Orpheus and the Underworld' which would raise money for a Kurzweil Reading Machine.

It was decided to look for sponsorship to avoid risk to the taxpayer. The principal is similar to a company floating shares on the market with an underwriter obliged to take any surplus.

After approaching a number of companies, the Chemical Bank of America agreed to underwrite the event up to the value of a KRM and an Index Continuous Braille printer.

Westminster City Council organized the event and succeeded in getting Her Royal Highness Princess Alexandra as Guest of Honor.

The event raised all but 3,000 pounds sterling toward the cost of a KRM, together with an Index Continuous Braille printer. The bank, as promised, met the 3,000 pound shortfall and the machine was duly ordered.

The machine is now actually installed and staff have been trained.

There was an office champagne handover on Monday, March 17, almost exactly 18 months after the idea was first born."

A lot of work went into this fund-raising activity, and Kurzweil congratulates everyone involved. It is hoped that similar events could be organized in the U. S., as well as in other countries.

KRM's International Marketing Manager, Dr. David Ticchi, was invited, and did attend this festive black-tie affair. He came back to work with glowing reports of the occasion.

Unused Training Credits

Reminder - If you have an annual service contract for your Reading Machine, it entitles you to send one person to a KRM training seminar in our Cambridge, Massachusetts office. The success of your Kurzweil Reading Machine program depends heavily on your instructor/coordinator, and the training seminar is valuable because:

* It provides comprehensive, individualized training.
* It is an opportunity for your person to meet other KRM trainers, and to share ideas and resources.
* It updates trainees about the newest developments with the KRM.
* Topics such as program development techniques, interfacing, and suggestions for instruction are covered.

We highly recommend that you take advantage of this benefit of having an annual service contract. Lynn Enos of our Contract Department can help you with obtaining a service contract. Mary Harrington, Systems Analyst, will be glad to arrange a training session for whomever you wish to send. Our telephone number is 864-4700 from within Massachusetts. If you are calling from outside the state, please call the toll free number: 800-343-0311.

KRM Demonstration? - Be a Star!

If you are planning to give a KRM demonstration, give us a call. We may be able to offer suggestions, and we will be glad to provide you with our product information. We may also know of other interested people in your area who would like to attend.

Upcoming Conferences - KRM

May 21: Massachusetts Commission for the Blind, Worcester State College, Worcester, MA

May 25-29: American Association of Advancement of Science, Philadelphia, PA

June 23-25: Rehabilitative Engineering Society National Association, Minneapolis, Minnesota

June 27-July 3: American Council for the Blind, Knoxville, Tennessee

July 7-10: Association for Education & Rehabilitation of the Blind, Chicago, Illinois

July 23-26: Association on Handicapped Student Service Programs in Post Secondary Education, San Diego, California

August 3-6: National Conference of State Legislatures, New Orleans, Louisiana

The **KRM Update** is published by Kurzweil Computer Products. The KRM is in use by thousands of people in over 500 locations worldwide. The **Update** is intended to bring the widespread community of those working with the KRM closer together.

The **KRM Update** is sent free to individuals and organizations interested in ensuring equal and independent access to information by blind and print handicapped people.

KURZWEIL COMPUTER PRODUCTS
A Xerox Company

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Cambridge, Massachusetts 02139
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(800) 343-0311 (outside Massachusetts)

Kurzweil Reading Machine Series 400

The latest refinement in Kurzweil technology for converting printed material into easily understood speech.

Kurzweil's Series 400 opens new avenues of opportunity for the blind by providing direct access to printed materials.

For the blind and the visually impaired, access to information is a constant challenge. It was to help meet this challenge that the first Kurzweil Reading Machine was developed back in the mid-1970s. This unique product used advanced electronic technology to provide direct speech output from printed text.

As Kurzweil technology has continued to evolve over the years, updated versions of the KRM have been released at regular intervals. Each new model has represented a significant step forward in the Reading Machine's capabilities and ease of use.

Now, with the Series 400, the Kurzweil Reading Machine promises to serve more users than ever before. Improved hardware and software, plus more versatile communications capability, will enable KRM users to increase their productivity, their employment opportunities, and, most of all, their independence.

Career benefits for the handicapped.

The ability to access everything from professional literature to business correspondence — directly and independently — has revolutionary implications for all blind and print-handicapped adults. The KRM not only helps these people become more productive, but actively enhances their working relationships with other people.

At the same time, the KRM makes it possible for schools and libraries to make information available to a wider range of people than before, yet with a minimum of specially trained staff. The Reading Machine's simplicity and ease of use enable virtually anyone to master it in short order.

Special features ensure smoother operation.

The Series 400 offers all the benefits of previous versions of the Kurzweil Reading Machine, plus several new features and technical improvements that enable users to get information faster and more reliably than before.

These features include:

- a larger memory to provide improved processing of incoming text;
- an automatic contrast control, which enables the KRM to adjust itself to varying degrees of contrast in printed materials, reducing the likelihood of errors;
- improved tools for format analysis, which help guide users through multicolumn documents or text interspersed with graphics;
- multilingual capability for text in any of several languages;
- and communications interfaces which allow the KRM to serve as an input or output device with other data or text processing equipment.

The result is a more powerful Kurzweil Reading Machine than previous versions, yet one that is also easier to use. For this reason the Series 400 promises to open more doors for the blind and print-handicapped than any previous system.

The Kurzweil Reading Machine provides direct, easy access to a wide range of printed materials, including many not normally available in Braille.


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The Series 400 incorporates a unique approach to optical character recognition — an approach based on artificial intelligence.

Anyone who has ever experienced the KRM knows the magical feeling that comes from placing a page of text on the scanner, then almost immediately hearing it converted into natural-sounding, lifelike speech.

This revolutionary development reflects years of research into the application of artificial intelligence (AI) to the problem of optical character recognition (OCR).

This exclusive Kurzweil technology enables the KRM to scan a page of text and identify characters in almost any type style by their unique size and shape. Knowledge about page, line, and sentence structure is then used to translate that information into words, sentences, and paragraphs, which are then "spoken" by a synthesized speech module. The result sounds remarkably like a human voice (though in fact it is not).

It was Kurzweil's unique achievement back in the 1970s to use artificial intelligence to expand the capabilities of optical character recognition systems.

The Series 400 represents the latest version of that achievement — a system unparalleled in its versatility and ease of use.

Using the Series 400: easier than ever.

To use the Kurzweil Reading Machine, the operator first places the text face down on the glass surface of the scanner. The text can be typewritten or typeset — such as a book, professional journal, letter or memorandum.

Through a series of fingertip controls on a separate, movable control panel, the user then activates the system. The control panel provides an unusual degree of flexibility in determining the manner in which the material is read. Words or lines can be repeated, spelled out, or marked for later reference; punctuation and capitalization can be announced if desired; and the voice itself can be varied in volume, speed, and pitch.

This flexibility serves two purposes. First, it helps ensure maximum intelligibility of the text — essential for accurate transmission of information. And secondly, it saves time and tedium. With the Series 400, text can be read at speeds of up to 250 words per minute — considerably faster than that of a human reader.

Specific improvements in the Series 400 heighten both its reliability and its ease of use:

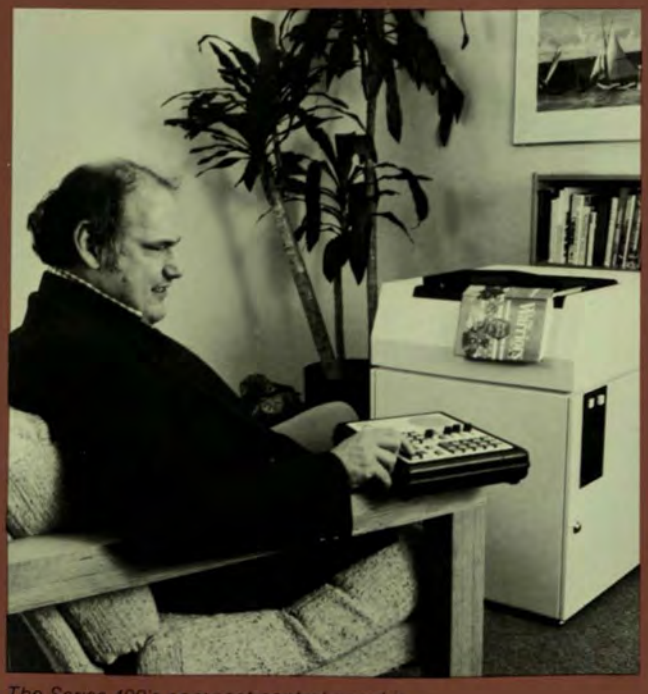
- improved OCR makes it possible to identify a wider variety of text, including multiple column formats;
- automatic contrast control reduces character-recognition errors to provide smoother readings of difficult text;
- and command keys offer a quick overview of text formats to help direct the scanner to desired items within a page.

Includes talking calculator, multilingual capability.

The Series 400 also incorporates several innovative features for users in a variety of specialized environments. Notable among these is the system's talking calculator, which provides a full range of algebraic, trigonometric, and logarithmic functions in addition to everyday calculator functions. With the KRM, scientists, engineers, students and others have rapid, easy access to the results of numerical calculations.

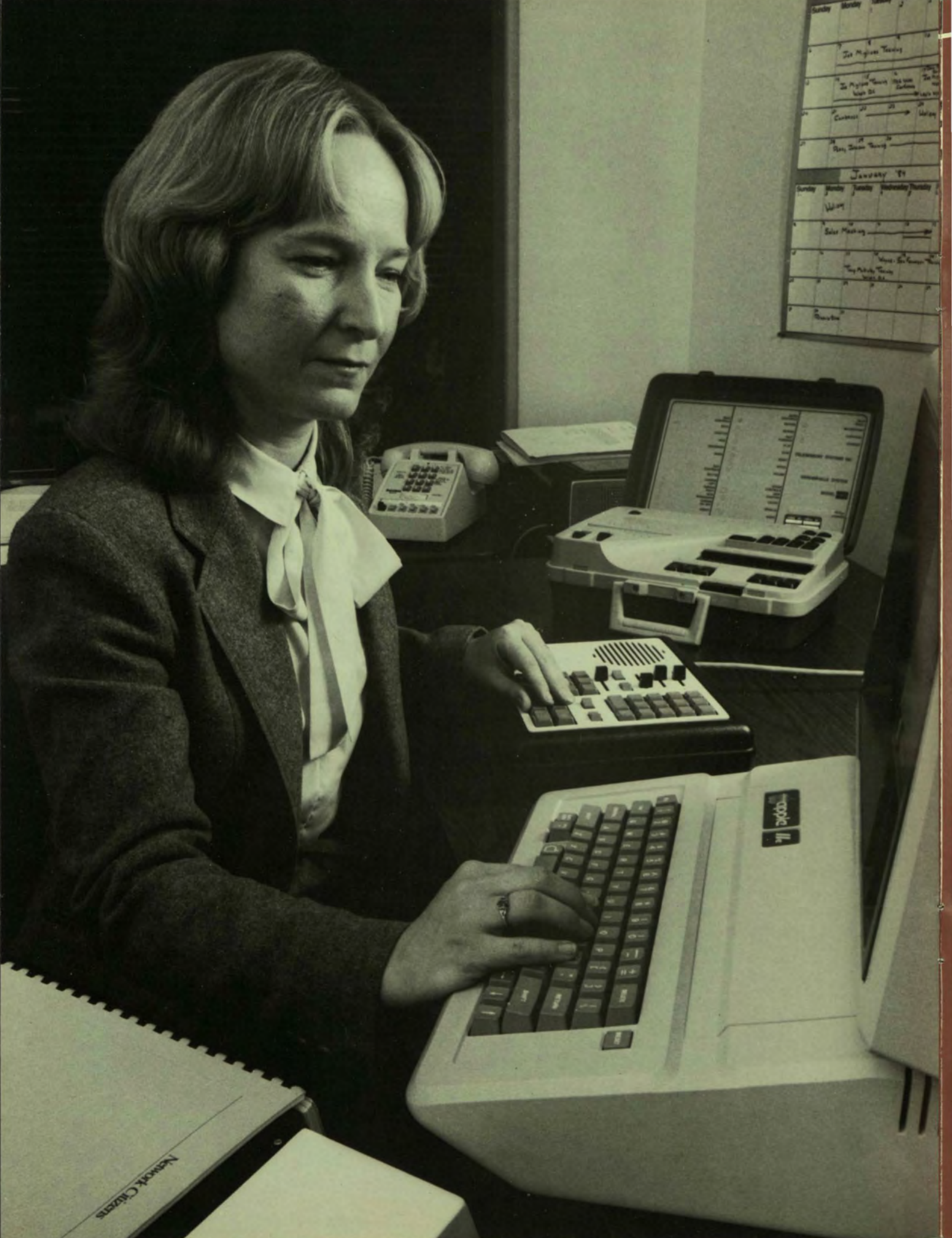
Also, with the release of the Series 400 the KRM will become available in foreign-language versions to serve overseas users as well as those in multinational corporations or agencies.

Finally, communications interfaces enable the Series 400 to work as an input or output device in association with a wide range of other electronic data and text processing systems, including Braille systems.



The Series 400's compact control panel is separate from the rest of the system, allowing users to select the listening position most comfortable for them.

The control panel provides extensive tools for text and speech manipulation, with an audible description of each key if needed. The panel also doubles as a scientific calculator.


Network Citizens

The KRM's versatility benefits entire organizations as well as individuals.

For the blind or print-handicapped individual, the Kurzweil Reading Machine is a breakthrough in ease of access to printed information. For organizations serving visually handicapped constituencies, the KRM is an effective means of providing enhanced services. And for organizations employing handicapped workers, the Reading Machine is at once a productivity tool, an aid in employee relations, and a genuine improvement in quality of life in the workplace.

Current KRM users range from lawyers and judges to writers and entertainers. Others include administrators, computer programmers, editors, engineers, instructors, musicians, psychologists, scientists, students, and many more. And the organizations served by these users span an equally wide spectrum — from government to private sector, local to international.

This broad user base is not only a tribute to the KRM's versatility, but also a source of unmatched insight into the problems blind people have in obtaining direct access to printed information. Through the growing knowledge and experience of its worldwide users, the KRM continues to evolve to meet new needs.

This open-endedness also assures new users of a product that will hold its value well into the future. Many of the earliest KRMs are still in use today — and through Kurzweil software updates, generally provide far greater capability than they provided at the time of their original purchase. With the Series 400, this evolution continues into a new generation.

The KRM is designed for ease of use by business and professional personnel as well as students, teachers, and others.

Children quickly master the KRM's controls. A headphone option permits them to use the system without disturbing others.

Sample text for Kurzweil Reading Machine demonstration

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we cannot dedicate — we cannot consecrate — we cannot hallow — this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us — that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion; that we here highly resolve that these dead shall not have died in vain; that this nation, under God, shall have a new birth of freedom; and that government of the people, by the people, for the people, shall not perish from the earth.

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Kurzweil
Intelligent Scanning System

Intelligence:
The essential difference in text and data entry.

Kurzweil 4000: the only system that can enter virtually any typed or printed material into computerized files, without manual keyboarding.

Using Intelligent Character Recognition (ICR) technology developed by Kurzweil, the 4000 overcomes the scanning limitations of conventional OCR systems. It can scan virtually any typeset or typewritten document, including proportionally spaced copy. It reads mathematical, foreign language and scientific symbols. It differentiates between multiple fonts within a single document. And through the use of the system's electronic tablet, portions of text can be separated from surrounding material for selective automatic entry.

In addition, specialized features make the 4000 uniquely suited to the demanding needs of printing and publishing firms. These features include the ability to identify and code font changes, and distinguish such characters as left and right quotation marks, hyphens and dashes, and horizontal spacing. Taken together, they provide a decisive edge for the 4000 over any other system.

A price/performance breakthrough.

Now virtually any organization can afford the benefits of intelligent scanning. The 4000's purchase price is less than half that of previous systems, yet its performance is significantly enhanced. It includes a higher-speed processor. It can train itself in the recognition of simple formats and type fonts. Operator prompts and menus reduce training and minimize human error. And it's more compact size enables the 4000 to fit easily into office environments.

And yet, for all of this, the 4000 uses the same design approach that has stood the test of time in over 700 user installations. Even in high-volume, high-demand production environments, the 4000 can be depended on for round-the-clock performance. And it's backed by Kurzweil's nationwide network of support professionals and service technicians.

How the 4000 works.

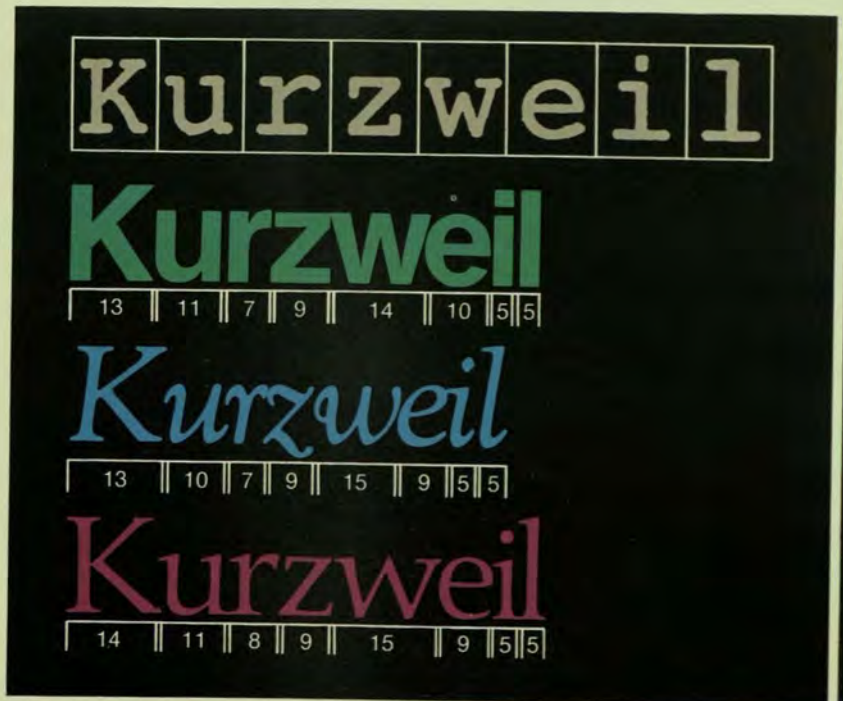
The 4000 uses Kurzweil's exclusive artificial intelligence software to recognize and read copy. As it scans a document, the 4000's artificial intelligence analyzes the shape of each printed character, and using feature extractions, identifies it as a letter, number, or other symbol. This process — Intelligent Character Recognition — enables the 4000 to enter text up to 10 times faster than the best human keyboard operators.

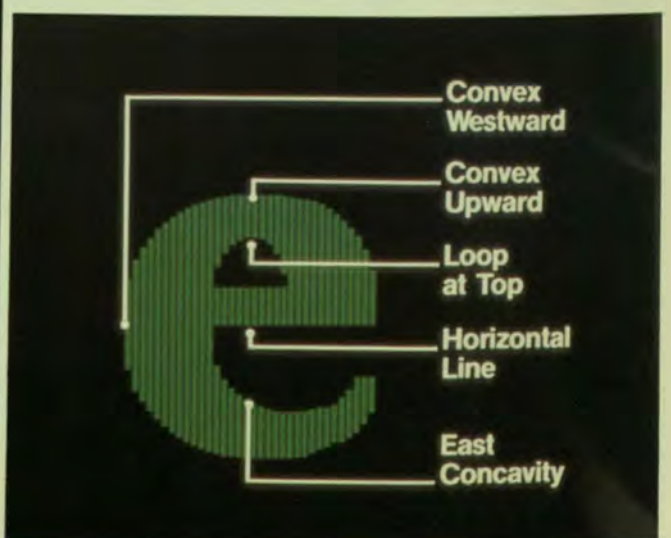
Operation is simple and straightforward. The system's ergonomically designed workstation includes an adjustable screen which minimizes eye fatigue and enhances productivity. And the 4000's powerful software includes a comprehensive set of menus and prompts that guide the user through each operation.

System startup is accomplished quickly, as the 4000 scans the first few lines of a new document and — together with the operator — establishes guidelines for the interpretation of specific characters.

(Left) Conventional OCR is severely limited in the number and variety of type fonts and formats it can handle. ICR technology "reads" virtually all type styles and formats, including proportionally spaced type — radically enlarging the possibilities for automated text entry.

(Right) Kurzweil's proprietary artificial intelligence software enables the 4000 to "read" each character by analyzing its shape. The 4000 can recognize any type font in sizes ranging from 6 to 24 point, including multiple fonts within a single document.





When broken characters, smudged type, or other problems make recognition uncertain, the system flags the character for operator assistance, displays an enlarged version of the character and asks for an identification decision.

With reasonably clean copy, this training process is completed in a matter of minutes — at which point production scanning begins. During the production phase, operator intervention is far less frequent, and mostly concerned with guiding the system through columns of text or other graphic formats.

The 4000 enables you to scan the thousands of inevitable variations that occur in most documents. For example, the 4000 "knows" to split two characters that are touching, or combine the parts of a broken character. It can make decisions, in context, between numbers and letters, opening and closing quotes, hyphens and dashes, and many other ambiguities.

Options

A wide range of peripheral and software options assure maximum throughput and adaptability to specific text or data entry applications. Standard or customized output communications provide links to typesetting and publishing systems, word processing systems, office automation networks, information retrieval systems, and other computer-based systems.

- Bisynchronous communications controller.
- Second programmable asynchronous communication port.
- Electronic tablet — For specifying material to be scanned on a document. Available in U.S. and international document size.
- Automatic document feeder — Handles up to one-half inch stack of pages in one feeding, document size of 8½" wide and up to 14" long, and paper stock from 20 to 50 lbs.
- License for custom format interfaces — Automatically translates and transmits format codes for paragraph, page, underline, superscript and subscript, margins, and tabs (indent, left/right, and decimal), centered lines, "soft hyphens," page headers and footers. Custom interfaces available for word processing system, office network systems, and front-end typesetting systems.
- License for additional language packages — To facilitate proofreading of text during production and to decrease actual training time. Language packages are available in English, German, Dutch, Swedish, Italian, Norwegian and Danish.
- Magnetic tape drive — Dual density (800/1600 bpi) 9-track magnetic tape drive with 45 ips mechanical arm transport.

(Left, Top) Optional foreign language packages enable the 4000 to read most languages using the Roman alphabet.

(Left, Center) Broken or irregularly formed characters are highlighted on the system's screen to assist the operator in verifying identification. Users can also edit text as it scrolls on the screen.

(Left, Bottom) Ligatures, or joined images, can be split to output the individual characters quickly and easily.

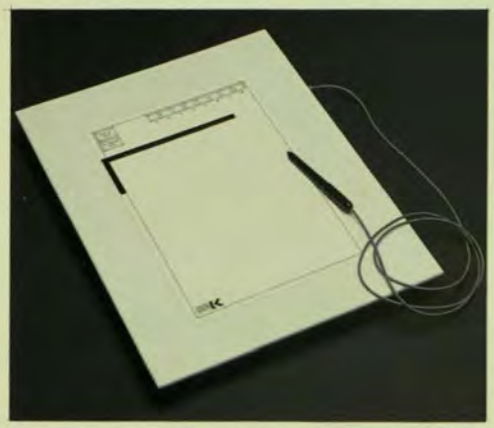
(Right) The Kurzweil 4000 features an ergonomically designed workstation for maximum operator efficiency and productivity.

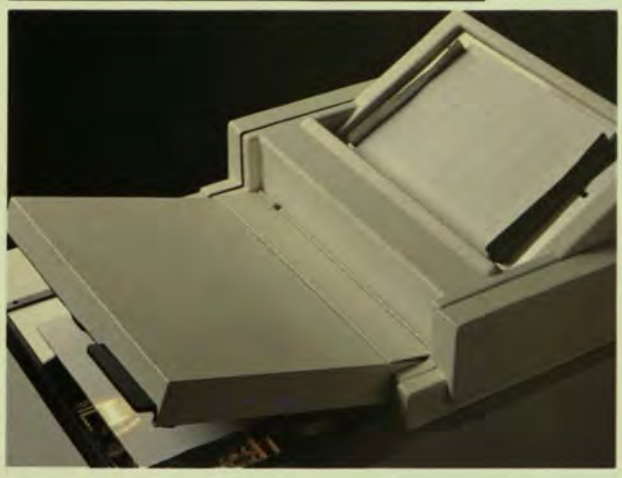
Kurzweil 4000
Product description

(Left, Top) With optional electronic tablet, portions of text can be separated from surrounding material for selective automatic entry.

(Left, Bottom) Optional automatic document feeder handles sheets up to 8½" × 14"

(Right) Optional tape drive enables additional flexibility in communication with mainframes.





Recognition capability

- Most serif and sans-serif fonts (script excluded) 6–24 point* including Roman and italic.
- Uniformly or proportionally spaced material (typed or typeset).
- Any line spacing providing lines do not touch.
- Diacritical marks (accents), multi-part characters and ligatures.
- Letter quality dot-matrix (9 × 14 dots per character).*

**Recognition of various point sizes is dependent upon character quality and spacing of material being scanned.*

Input

- Light-colored paper of any weight.
- Pages up to 11″ wide by 14″ long.
- Black printing ink or carbon-based colors.
- Bound books, manuals, publications.
- Clean photocopies.
- Maximum skew of ⅜″ over 7″ on 10 point type.
- Multi-column or complex page formats (with electronic tablet option).

Operational features

- Flags questionable characters for operator attention.
- Learns most fonts in most document formats.
- Preserves horizontal and vertical spacing on uniformly and proportionally spaced material.
- Automatically learns fonts in single-font document.
- Operates in production mode while learning.
- Learns on horizontally fragmented characters.
- Recognizes true superscripts and subscripts.
- Allows user-defined 2-3 character mnemonics for special symbols.

On-Line editing features

- Highlighting of questionable characters.
- Scanner image display for operator verification.
- Insertion, deletion, and replacement of characters, words, lines.

Special Features

- On-line storage of multiple training sets.
- Over 400 unique character definitions per training set.
- Editing of character definitions within training set.
- Library of training sets can be saved off-line on floppy disk.
- Operator adjustable contrast and background control.
- Ambiguous character analysis.
- On-line lexicon to reduce training time and manual editing.
- File management system for creating, copying, editing, appending, and deleting files, with throughput log, back-up utilities, and help feature.

Standard communications/ output tailoring

- Operator-generated character tables (ASCII, EBCDIC, TTS tables supplied with system).
- Character string translations/replacements.
- On-line storage of output tailors.
- Optional flagging of paragraphs.
- Protocols supported:
  - –IBM 2780 standard (bisynchronous) — transmit only, point-to-point (transparent or non-transparent)
  - –Asynchronous — TTY/Echoplex
  - –800/1600 bpi magnetic tape
- Ability to review text file on CRT prior to output.
- Automatic transmission of prefix and suffix files.
- Character count at output.
- Transmission of single files or batch mode.
- Tape output options include: variable or fixed length records, block size options and provision for IBM standard labels.
- Optional flagging of questionable characters.
- Maintains or suppresses line and page breaks.
- Optional flagging of indentations.

Standard system components

- Workstation including high-performance 384K processor scanner subsystem, 10mb hard disk drive and floppy disk drive.
- Operator terminal.
- License for use of recognition operating system.
- License for use of English language package.
- Programmable asynchronous communications port.
- Text editor — Enables operators to inspect and edit text on the 4000 before it is communicated to another device.

Environmental specifications

- Electrical requirements: 120 VAC, 60Hz, 12A
- Dimensions: 24″ × 22″ × 29⅜″
- Weight: 375 pounds
- Temperature: 32-95°F
- Humidity: 50%–80%

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Kurzweil 4000
Intelligent Scanning Systems

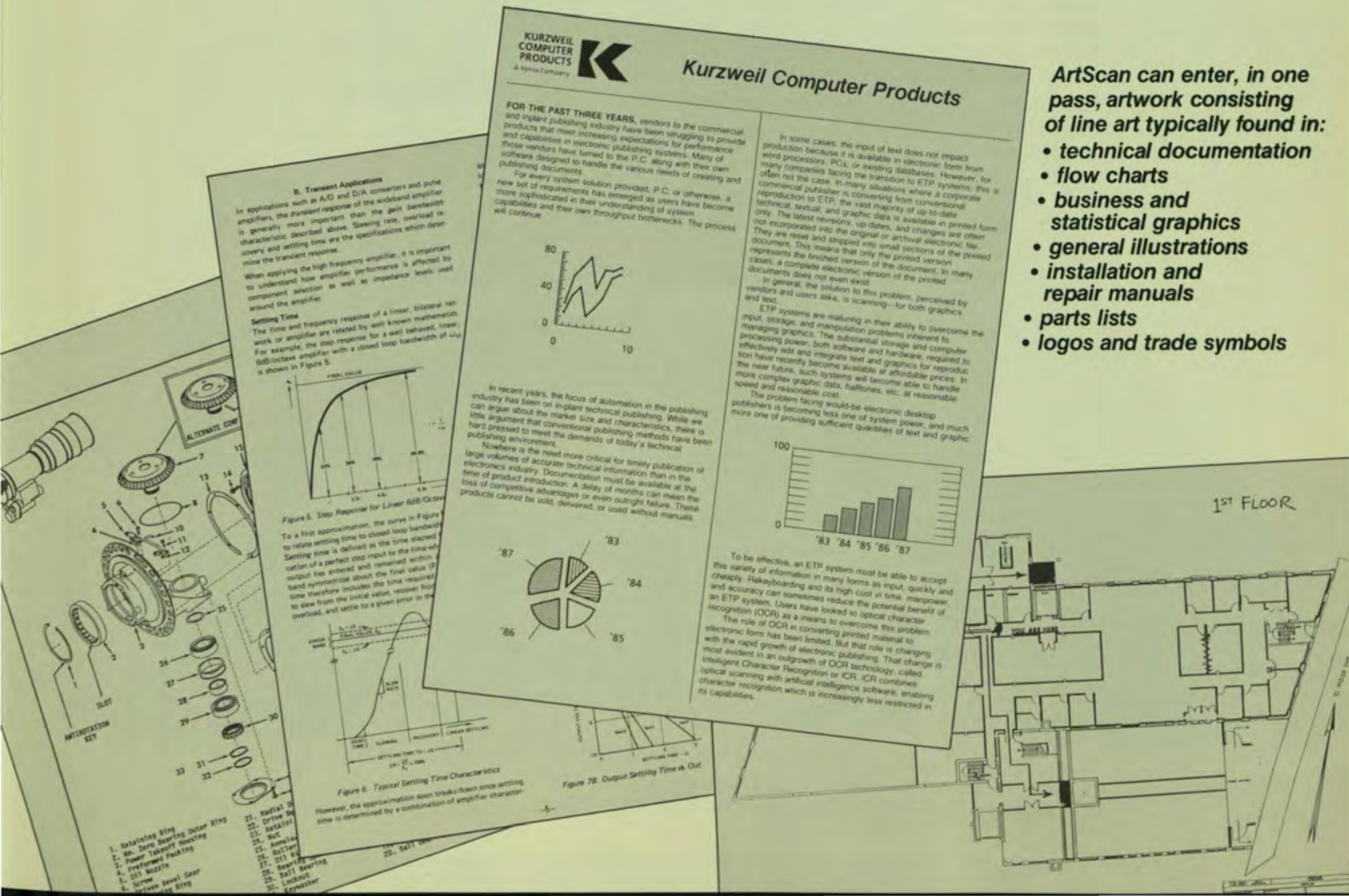
Introducing Kurzweil's new option for entering both text and line art in a single pass:

ART/SCAN

The Problem:
Until now, scanners were only capable of providing you with either text or graphics from a page, never both. Though this two step operation was an improvement over manual entry, it required more equipment, manpower, time and organization to insure that the text could be re-linked to the graphics.

The Solution:
ArtScan from Kurzweil provides you with both. Finally, you can simultaneously capture text and graphics in one pass. The text can then be edited and paginated on your electronic publishing systems with your edited graphics re-inserted.

ArtScan provides you with:
- one system for both tasks
- one operator for both tasks
- filename integrity for easier retrieval
- fast and organized throughput for your scanning needs.



ArtScan can enter, in one pass, artwork consisting of line art typically found in:
- ***technical documentation***
- ***flow charts***
- ***business and statistical graphics***
- ***general illustrations***
- ***installation and repair manuals***
- ***parts lists***
- ***logos and trade symbols***

ART/SCAN

Operation:

As with text scanning, you begin by giving a name to the file(s) you will create from scanning. The system automatically names the graphics file after you give a name to the text file ensuring ease of retrieval of associated files at output. Graphics files are given a filename extension of .SI for easy reference when viewing the file directory on the 4000.

Place the document with the graphics on a tablet. With the electronic stylus, mark off the top and bottom corners of the graphics area and touch the graphics box on the tablet. Do the same with any text area which needs to be read and output as an editable file.

Place the document on the scanner face down. The scanner will automatically read both the text and graphics areas on the page and store them as separate files. Just as in text only scanning, the operator can still be training the system on any special characters or fonts, etc., to provide highest possible accuracy on the text scanning.

Just as you are provided with a wide variety of choices with text output formats, you have a choice of graphics output formats. Simply choose the one which is appropriate to your system and communicate the file to your electronic publishing system.

Files can be output as:
Bit-mapped (raster image)
CCITT Group 3 compressed
.RES files (for Xerox Viewpoint)
Selectable resolution up to 364 s.p.i.

Availability:

ArtScan is a product enhancement to the Kurzweil Model 4000 Intelligent Scanner. It is available on any new Model 4000 as well as a field upgrade to presently installed Kurzweil Model 4000 Intelligent Scanners.

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