This Date in History - 1964 World's Fair

Fraida Fund

> Inserting information into a computer from handwritten documents - such as inventory lists, sales slips and scientific laboratory data - has always been one of the slowest steps in automatic information processing. The usual method has been to convert the handwritten data into computer "language" by typing it on a coding machine or punching it on cards. Eventually, machines that can interpret handwriting directly will shorten the time it takes to process information, and will help man take fuller advantage of the electronic speed of computing systems.
>
> *~ Excerpt from "The IBM Pavilion" booklet, available at the 1964 World's fair in New York.*

A classic example of a problem that has traditionally been easy for humans, but difficult for computers, is handwritten digit recognition. Because of the many variations in human handwriting, early attempts to "read" handwritten digits into a computer were very limited.

Figure 1: These sample digits in MNIST dataset show the variations in human handwriting.

It therefore seemed almost "magical" when, at the 1964 World's Fair in New York, IBM unveiled an amazing computer system that *read handwritten dates* off a small card. Visitors to the "This Date in History" exhibit would write down a date on a card and feed it into the machine.

Then, the computer converted the handwritten date into digital form, look up the date in a database of New York Times headlines, and show a headline from that day on an overhead display. Watch the first minute of this video to see a demonstration!

The results were also printed on a card that you could keep as a souvenir.

And on the back of the card, visitors could read some details about the character recognition system:

In 1964, handwritten digit recognition was a cutting edge research problem - so much so that IBM ran an ad featuring character recognition in science and mathematics publications, to try and recruit engineers

Figure 2: Visitors entering date on a card. Source: Computer History Museum.

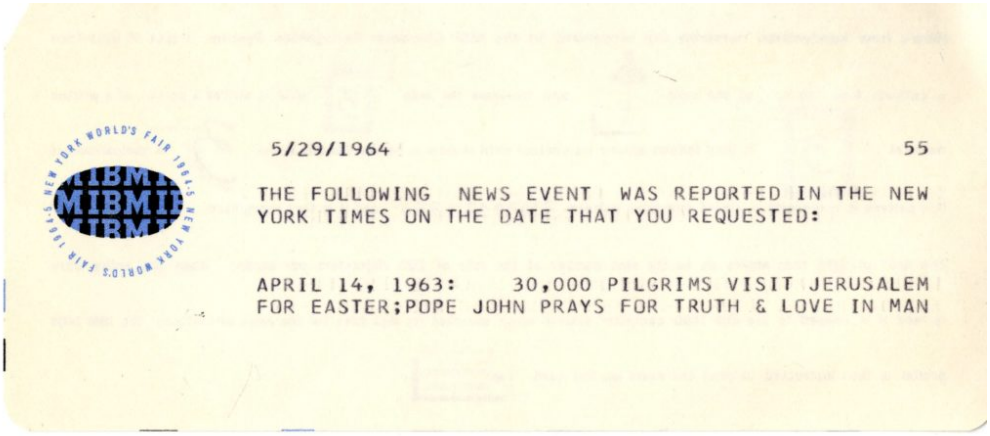


Figure 3: Keepsake card from This Date in History. Source: Computer History Museum.

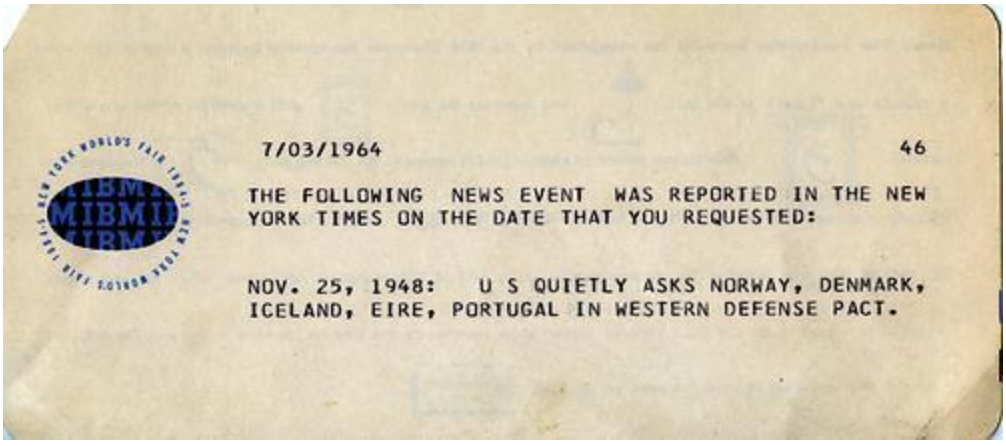


Figure 4: Another card from This Date in History. Source: Queens Public Library.

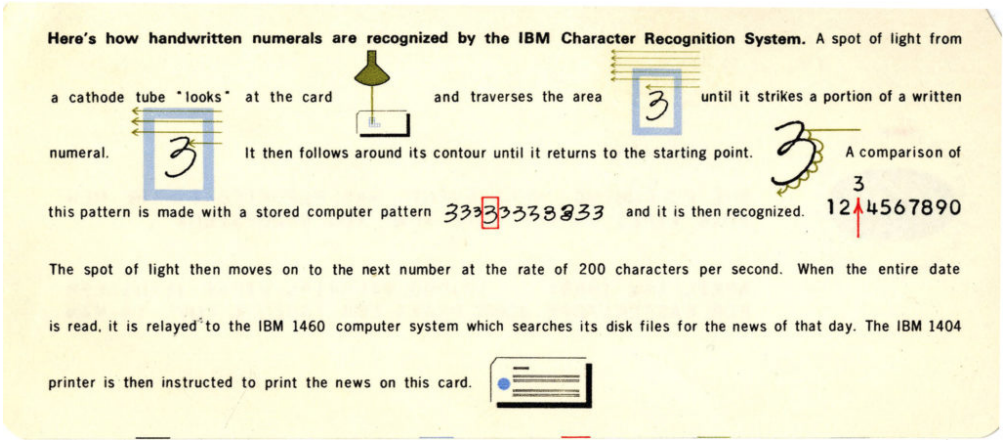


Figure 5: Back of the keepsake card. Source: Computer History Museum.

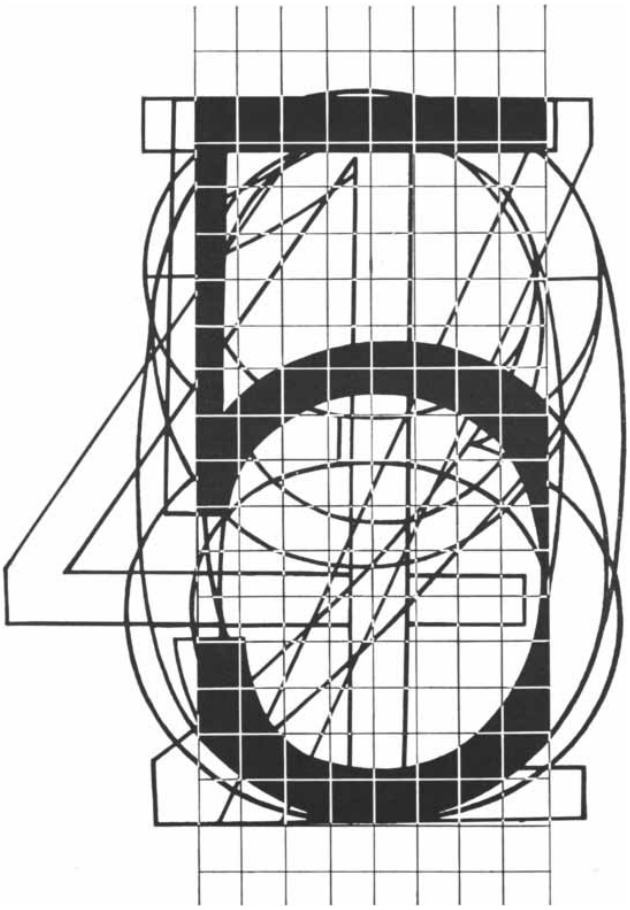
to their team!

How was this achieved? This astounding result grew out of the work of E. C. Greanias, a researcher at IBM Thomas J. Watson Research Center in New York. In a January 1963 article in the IBM Journal of Research and Development titled "The Recognition of andwritten Numerals by Contour Analysis," he explains.

The scanner would attempt to recognize certain *features* in various parts of the image: strokes (straight lines), line ends, lakes (round interior areas such as in 0, 6, or 9), bays (concave areas)

References

- "IBM and the 1964 World's Fair", Dag Spicer, April 2014, Computer History Museum. URL



What tells the machine, "I am a 5"?

Designing recognition logic is a key to developing systems for recognizing handwriting, multifont printing, or magnetic-ink characters. Engineers face the questions: What minimum information must the scanner sense from a character, and what measurements are necessary to ensure accurate recognition?

There are a number of aspects of character recognition you might work on: computer simulation of new recognition logic, investigation of the probability of accurate recognition for different styles of writing or printing, or development of new methods of scanning the characters.

The field of character recognition and associated areas such as document handling could be of great potential for you at IBM. Write to Manager of Employment, Dept. 658A, IBM Corporate Headquarters, Armonk, New York 10504,

Figure 6: This IBM ad is from a 1964 issue of Scientific American. Similar ads were featured in other science and math publications around that time.

Table 1 **Shape features identified for each character.**

Significant Feature	*Location*	*Use**
long N, NE or NW strokes	right side	0 1 7
long S, SW or SE strokes	left side	0 1 7
horizontal line end	top left	2 3 7
horizontal line end	top right	5 6
horizontal line end	bottom left	3 5
horizontal line end	bottom right	2
loop	bottom	2
west bay	bottom left	3 5
north bay	top center	4
northeast bay	top right	9 8
short arc	top left	9
NE stroke	top left	4
horizontal line end	right center	4
east bay	top right	6 5
notches	left	8
notches	right	8
southwest bay	bottom left	4 9
short arc	bottom right	6 5
large lake	center	0
small lake	top center	8 9
small lake	bottom center	8 6

* Note: Many of these features are also used as inhibit conditions in other characters.

Figure 7: Shape "features" for each digit.