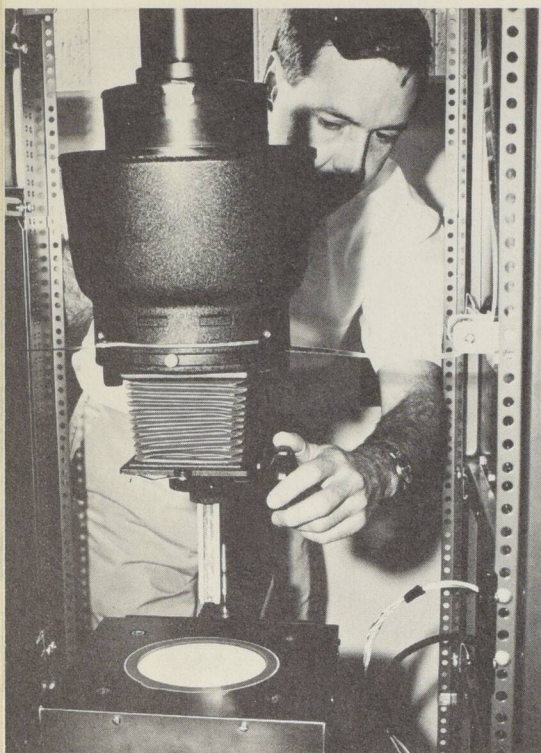# The little-known world of pattern recognition

Teaching computers to see

David Isnor of the Control Systems Laboratory adjusts the flying spot scanner used in the pattern recognition studies.

David Isnor, du Laboratoire des Systèmes de commandes, règle le lecteur ponctuel.

Man's ability to see and recognize what he sees is based on a complicated biological information system, the end product of some ten billion years of evolution. Determining how this system operates is difficult. The study of the detailed behavior of the neural networks in the eye and the brain, for example, poses almost insurmountable obstacles since there are about 100,000,000 light receptors in each eye interconnected through several layers of equally numerous nerve cells. Even if one could record from all the cells without damaging them, the sheer amount of data would be enough to overwhelm the project.

Additionally, even though man is born with the ability to see color and depth, his recognition of objects is acquired during infancy and is not an inborn capability. There are recorded medical case histories of babies who were born with normal eyes except for the lenses which were non-transparent. When the lenses were replaced with transparent ones during adolescence or later, it was found that the recipients were not able to recognize everyday objects for what they actually were.

Because human processes for interpreting visual information are almost totally unknown, attempts to build machines that can perform functions similar to human vision — thereby enabling the machine to "see" and react meaningfully to what it sees — pose complex problems. Scientists and engineers at the National Research Council of Canada and elsewhere working in this field call it "pattern recognition."

Pattern recognition dates back to the 1930s when the first attempts were made to build specialized machines to perform limited functions. It took the advent of the computer with its insatiable appetite for all kinds of data to provide impetus to research. It has been found easier and more economical to program a set of logical rules into the computer than to build a specialized machine based on the same logical rules. When a satisfactory set of rules for a pattern recognition problem has been found, only then will it be practical to build a specialized machine based on these rules, thereby gaining better speeds.

The present state of mechanized pattern recognition falls into three divergent categories: Print readers, specialized techniques for handling specific non-print pattern recognition tasks and "picture languages."

Many specialized machines for print reading have been developed and made commercially available. Their design has been greatly simplified by having highly precise character styles, sizes, positions, shapes, etc. When the precision cannot be maintained (for example when trying to read addresses on envelopes) these machines become impractical. The techniques are not sufficiently sophisticated to be easily extendable to poorly printed characters, hand printed lettering or to handwriting.

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