TECHNOLOGY

Automation Surge

Riding high on the crest of the onrushing wave of scientific and technological advances are the clever idiots known as analog and digital computers—By Walter Wingo

(Second in a series of five)

➤ BACK IN 1952 an 83-year-old Baltimore man was fed up with all those dollar-sized IBM cards that were arriving with his monthly bills. He made it a point to fold, spindle and otherwise mutilate every such card before returning it.

"I don't consider myself just so many holes in a punch card," he said indignantly, urging others to join his campaign to stamp out automation.

Obviously the movement did not catch on, for the cards remain, appearing in more and more places, and seem to have more holes than ever. With modern checks it is sometimes hard to find enough solid card on which to sign your name.

The increase in the use of machine cards has paralleled an overwhelming increase in the volume of transactions. A vast new $1.5 billion-a-year electronic computer industry has sprung up to meet this demand for greater automation in business, government and research.

When the Baltimorean began his protest, American corporations were using only 10 general-purpose computers. Today they use 10,000.

A typical modern computer system in a big firm looks like a row of colorful metal wardrobe cabinets. The only motions are the syncopated spinning of tape reels and the blinking of lights on a control board.

Occasionally a man will feed the machine a bundle of punch cards, and the computer will gobble them up. At times the soft hum of the machine is shattered by an automatic typewriter clattering out the computer's "solution" to a problem.

No Computer Thinks

Actually, no computer thinks; its actions are limited to the orders men give it. But it can "read," "write," do basic arithmetic and compare. In a day, it can settle problems that would take a thousand men their lifetimes to solve.

By electric impulses, it translates instructions into "yes"-and-"no" combinations. "Yes" corresponds to the presence of an electric charge; "no" to its absence. In millionths of a second, the combinations interact logically, giving new combinations.

The main difference between the electronic computer and earlier automated machines is that the modern computer has a memory device in which to store and retrieve specific instructions to itself and an assortment of other information.

This makes for highbrow and lowbrow computers. The highbrow has a large memory unit and a small arithmetic department. It is used to solve intricate scientific problems. The lowbrow is mainly for calculating and filing.

Analog Computers

Some computers, called analogs, do little computing. An analog tries to reconstruct an actual situation under study. Your wrist watch, for example, is a nonelectronic analog of time.

The analog computer builds an analogy between the mechanical properties of the system it wishes to predict and its own electrical currents, resistors and capacitors. It is designed usually to tackle a specific, recurring problem.

The digital computer, on the other hand, is essentially a machine for comparing. Any problem it must solve must first be converted into a set of directions, or a program. This is a progression of yes or no questions designed to cover all possible ramifications of the problem.

The development of "libraries" of routine instructions and programs for use in many fields, miniaturization of electronic devices and circuits, and the inventions of the transistor and the metal core make the first computer, the 30-ton ENIAC, with its 18,000 vacuum tubes, seem a cumbersome monster.

Computer developments are coming so fast, in fact, many firms prefer to rent the machines rather than buy them.

Recent Developments

Recently developed are electrical tachometers and transducers that convert mechanical movements into electronic pulses, take measurements and transmit the results to offices thousands of miles away.

Among the latest inventions in molecular electronics is a pea-sized sensor that can handle data like a computer. The Air Force hopes to use it in satellites in order to relay more information to earth.

Computer-makers are also exploring the use of lasers, fiber optics, systems of pattern detection, cryogenic (very low temperature) devices, thin film circuits and silicon oxide insulating films.

Research has increased the speed of computers phenomenally. International Business Machines Corporation's latest 7094 Model II is 30% faster than the still-young Model I. In one second the Model II can do 357,000 additions or subtractions, 178,500 multiplications or 102,000 divisions.

It is expected to go on sale next year for $3.2 million. If you do not have that much handy, you can rent one for about $76,000 a month.

U.S. Army

TRANSITION TO TRANSISTORS—As the use of computers grows, the size of them shrinks. The young lady at the far left is holding a giant unit from the electronic computer ENIAC, which was built in 1945 for the U.S. Army's Aberdeen (Md.) Proving Ground. The next lady holds an equivalent part from the 1949 EDVAC computer. Next is a part from the 1952 ORDVAC parallel adder. The lady on the far right is holding a printed circuit for a computer installed last year at Aberdeen. Tiny transistors replace the hot, bulky tubes of old.