MATHEMATICS

Machine Takes A Chance

Mathematicians confronted by complicated problems are using a kind of coin tossing method to get their answer. It is called the Monte Carlo Method of Solution.

➤ WHEN decision of life's little problems becomes just too overwhelming, if you can't decide whether to go home to the wife or to stay out just a little longer with the boys, tossing a coin to decide now puts you in the class with the best high-brow mathematicians who are using the new Monte Carlo Method of Solution.

But if you cheat and don't follow the advice of your coin, then you lose the full advantage of the Method, since it would otherwise guarantee that you would not make the same wrong decision all the time.

The mathematical decisions of what to do next in the midst of calculating a problem in nuclear fission, aerodynamics, or differential equations—especially when set up on a large high-speed computing machine—sometimes become just too complicated for even the skilled mathematician. In cases like this, S. M. Ulam of the Los Alamos Scientific Laboratory, told the Symposium on Large-Scale Digital Calculating Machinery, which met in Cambridge, Mass., a powerful method of procedure is to put the decision up to chance alone, hence the name "the Monte Carlo Method."

The mathematician knows that his mathematical procedure will correct itself and give the right answer if even a few of the decisions are wholly accurate. He makes the machine use random numbers to make the chance step-by-step decisions. By this procedure, he is assured that his own human failings do not enter into baffling decisions inadvertently to weight the direction of the solution in a consistently wrong direction.

Random numbers, required in profusion by the Monte Carlo Method, aren't so easy to come by, D. H. Lehmer of the University of California emphasized. Systems for computing random numbers may either fall into a repetitive pattern, giving numbers in cycles or the numbers vanish and all zeros appear in their place.

Numbers that you might dream up by yourself aren't good enough either. They might have too many odd numbers, or threes and sevens to give an unbiased Monte Carlo choice. Machine generation of pseudo-random numbers—numbers that however are random enough to use—can be accomplished, he reported.

Science News Letter, September 24, 1949

PHYSIOLOGY-MATHEMATICS

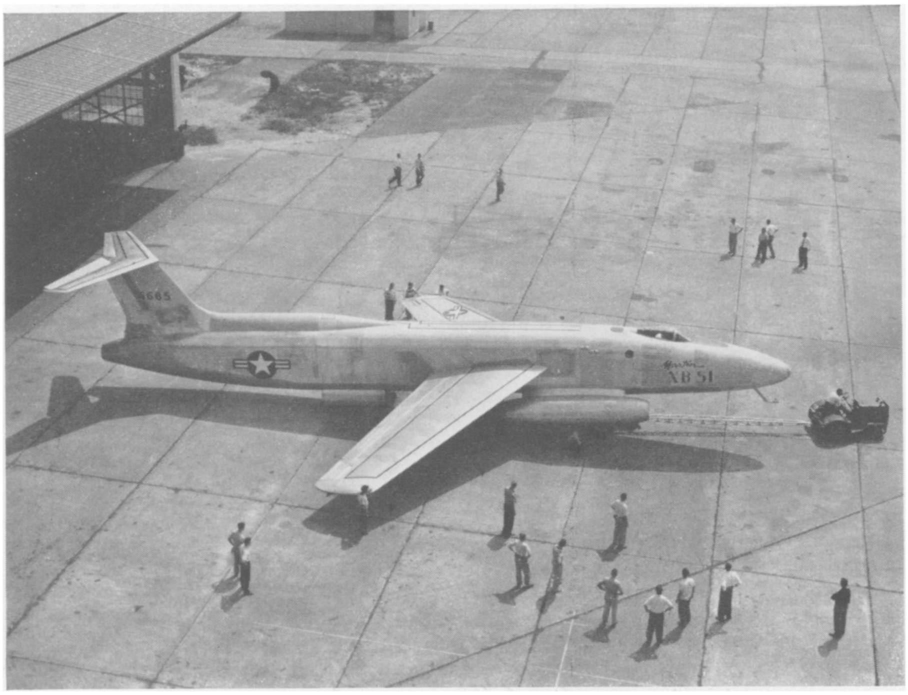
Duplicating Human Brain

➤ MAKING a real mechanical brain may be possible, but even if it is able to solve useful problems, it won't be able to think them up. Dr. William F. Crozier, professor of general physiology at Harvard University, speaking at the Harvard Symposium on Large-Scale Calculating Machinery, Cambridge, Mass., warned, however, that we don't know enough about what actually goes on in the human brain to be sure that we can duplicate it. The very simplest type of judgment, such as deciding whether one noise is louder than another, has been analyzed. This kind of mechanism in the human brain seems to work the same way as man-made devices that measure noise or make the millions of "decisions" in one of the giant electronic calculators.

But if we can build a non-living brain from purely mechanical components which seems to duplicate human thought, we still cannot be sure that it is actually going through the same processes as the human mind, Dr. Crozier stated. He said that it might turn out to be like a "push button" production line which does the same job as a production line run by men but uses very different means. Such a machine would occupy a great deal of space and require a lot of attention, he added.

Therefore, although the electronic brains will be useful to physiologists and psychologists in solving many problems, the scientists will be cautious about taking them as models of mental processes. However complex the machines are, Dr. Crozier told the meeting, they will not begin to think up new ideas all by themselves but "will function solely in terms of effects actually (even if sometimes unwittingly) built into them at the start."

Science News Letter, September 24, 1949



SPEEDY GROUND-SUPPORT PLANE—This shows the new U. S. Air Force Martin XB-51 with wings that sweep back 35 degrees and three turbo-jet engines for power, two mounted on pylons on the lower sides of the fuselage, the third in the rear of the fuselage.

AERONAUTICS

New Three-Jet Plane Will Destroy Ground Targets

➤ THE U. S. Air Force will support the Army Ground Forces with the use of a new plane, the first postwar airplane specifically designed for the destruction of surface targets in cooperation with ground troops, it was revealed by the Glenn L. Martin Company of Baltimore, Md., builder of the craft.

The new plane, XB-51, now undergoing ground and taxi tests, is powered by three turbo-jet engines, two mounted on pylons on the lower sides of the fuselage near the cockpit, with the third in the rear of the fuselage. It is the Air Force's first three-jet plane.

The craft, a two-man affair, is about 80 feet long with a wing span of 55 feet. Noteworthy are its thin, high-speed wings, which are swept back at an angle of 35 degrees. The horizontal tail surfaces are likewise swept back at 35 degrees, and are mounted on top of the vertical tail surface. Speed, range and other data are not yet announced.

Science News Letter, September 24, 1949

MATHEMATICS

Giant Electronic Brains

➤ A HALF dozen giant electronic brains are being used to attempt the solution of some of civilization's major problems, ranging from supersonic flight to the economics of prosperity. Others are being built.

Harvard's third large computing machine, called Mark III, was on display at a Harvard symposium just held, attended by 500 scientists. All-electronic works and magnetic memory are used in this machine. There are, however, many more large scale digital calculators, as they are called.

One of them is actually called the MANIAC, which is a word made of initials like other computers called: EDVAC, ORDSAC, BINAC, ENIAC. Other computers built or building are the Bell Laboratories Model VI, the Raytheon computer, the General Electric computer, the National Bureau of Standards computer as well as a Zephyr computer planned for the west coast by the National Bureau of Standards. There are two earlier Harvard machines, Mark I which is an electro-mechanical automatic sequence controlled calculator and the Mark II now solving complicated mathematical problems for the Navy at Dahlgren, Va.

Stubborn problems in mathematical physics, involving atomic energy, cosmic rays, and the nature of matter itself, are being tackled by the new machines. Rocket motors, jet engines and their combustion problems are being solved by the computers. Man's search for oil is being aided. Aeronautical experts are desperately waiting for the electronic brains to untangle the complexities of shock waves and compressibility effects on wings and airplane structures.

Sociological and economic problems will be fed into the giant computers. Dynamic problems of our economic system can be treated by much the same mathematical equations that so safely predict the performance of an aircraft in flight. How economic equilibrium can be attained can be analyzed.

While the United States is leading in the building of giant brains, England has the EDSAC working and a machine called the ACE under construction, and there are machines under construction in Holland, Sweden and Germany.

Science News Letter, September 24, 1949

MATHEMATICS

Computer Has "Memory"

See Front Cover

➤ DETAILS of an improved high-speed calculating or computing machine were revealed in Cambridge, Mass., its outstanding feature being a "memory system" capable of storing 64,000 digits. It is Harvard University's Mark III, shown on this week's cover of the SCIENCE NEWS LETTER, and will be used by the U. S. Navy Bureau of Ordnance.

The novel memory system combines mechanical, relay and electronic systems. It enables the Mark III to operate 20 times faster than the Mark II, which was completed only two years ago.

The memory system, as explained by a Harvard scientist, consists of eight storage drums and a sequencing drum. Difficult mathematical problems are solved by feeding information on a magnetic tape to the sequencing drum which in turn "commands" the computing section to accomplish the desired operations with the numbers in the storage drums. Both the information for carrying out operations and the numbers with which the operations are performed are represented by small magnetic spots on the surface of the rapidly rotating drums.

More than 4,000 16-digit numbers, plus 4,000 "commands" for carrying out the various operations of the machine, can be put on these nine drums. They revolve at speeds up to 120 revolutions per second, and the magnetic spots move by the recording and play-back heads at speeds greater than 150 miles per hour.

The computing section of the machine can multiply two 16-digit numbers in a fraction over 12 thousandths of a second. It can add the same two numbers in one-third that time.

Mark III is a bakelite and steel instrument about 30 feet long and 15 feet wide. It weighs close to 10 tons. It utilizes 100 miles of wire, 4,500 vacuum tubes, 3,000 relays and 2,500 magnetic heads and playbacks to carry the information to and from the storage drums. It was constructed under the general supervision of Dr. Howard Aiken, co-inventor of the original Harvard Mark I calculating machine.

Science News Letter, September 24, 1949

PSYCHOLOGY

Baby Learning to Talk Follows Development Law

➤ BABIES learning to talk begin to pronounce the vowels, that is, the a, e, i, o, u letters, beginning with those formed with the front part of the mouth and proceeding to those made at the back of the mouth, Dr. Dorothea McCarthy, of Fordham University, has found.

Pronunciation of the other letters of the alphabet, she observed, proceeds in the opposite direction, from the sounds made with the back of the mouth made first and those made with the lips, tongue-tip and teeth last.

These sounds represent increasing control of the tongue and lips and the development of brain control which follows a law of development from the center of the body to the periphery.

Science News Letter, September 24, 1949

PHYSICS

Electronic Brains Must Be Told What To Think

➤ COMPUTING machines, popularly known as electronic brains, have to be told what to think.

Building a giant electronic machine doesn't end the work of the busy mathematician, the scientists who met in Cambridge, Mass., to discuss large-scale digital calculating machinery, were told.

The machines, though highly accurate in doing grade school arithmetic and as fast as an electron in operation, are very stupid when it comes to knowing what to do next. Before the button is pressed to start the operation of the machine on solving a problem, every step has to be worked out in advance in a "program."

What a tricky job "programming" is was stressed by D. H. Lehmer of the mathematics department of the University of California.

Because the machine uses its program instructions in sequence, like the freight cars on a railroad track, harassed mathematicians are learning by hard experience some of the rules of shuffling and switching that have been known for a long time in the Kansas City freight yards.

The meeting was sponsored jointly by the U. S. Navy and Harvard University.

Science News Letter, September 24, 1949