Some Far-out Thoughts on Computers

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A Jules Verne look at intelligence processes in a coming generation.

Question: What does the size of the next coffee crop, bullfight attendance figures, local newspaper coverage of UN matters, the birth rate, the mean daily temperatures or refrigerator sales across the country have to do with who will next be elected president of Guatemala?

Answer: Perhaps nothing. But the question is not a frivolous one. There must be a cause behind each vote cast in an election. It may be a rational, emotional, superstitious, or accidental cause. The choice may derive from months of conscious effort to weigh the pros and cons of the aspirants to office. It may be an automatic, tradition-bound action that requires not even a cursory exercise of the thought process. Or the voter himself may not recognize why he decides as he does. But something will motivate him, and it may be closely correlative with one or more of the quantitative factors suggested in the opening question.

To learn just what the factors are, how to measure them, how to weight them, and how to keep them flowing into a computing center for continual analysis will some day become a matter of great concern to all of us in the intelligence community. I say "will" rather than "may" because it seems to me that this type of election analysis will be only the first faltering step by an infant quantified behavioral science that is going to be forced on us for its upbringing like a doorstep baby—and soon.

Instant Estimates

For elections offer a fairly simple starting point. They deal in tangible, discrete, measurable data—ballots. Ideally they reflect the attitudes of a populace, not just toward a handful of candidates but toward a host of related issues. Although in practice we have to compensate for incomplete voter participation, ballot-box stuffing, and other imperfections, means will be found to make such compensations and we will still wind up with good readings on popular attitudes at a given moment in history. Elections are in a sense history's benchmarks to which we can, and do, refer back when preparing estimates of public opinion in the long periods between them. They are also buoys to keep the analyst on course, a regular means of validating his estimates. When his prediction of an election outcome turns out to be way off target, he can find solace in that old Cape Canaveral philosophy, "We learn more from our failures than we do from our successes."

Note that what is proposed is to bypass the voter himself in this analytic process, looking beyond him for the reasons underlying his decisions. As the pollsters have discovered, even in an enlightened, democratic society it is not a simple matter to develop accurate election predictions from a sampling of the electorate. In an underdeveloped or overpoliced state of the type that we in intelligence are so often concerned with, the additional problems of obtaining a valid sample of opinion through direct interviews are so immense as to force us to more subtle methods. Isolating the factors that influence popular attitudes in a given area at election time would be one approach.

Once we had succeeded in isolating these factors, could we not then begin to watch the key phenomena continuously, gathering them in and collating them so that at any instant we could read from them the temper of the populace under study? Ten years ago, the answer would have been negative. Today, because of the tremendous strides that our technologists have made in electronic data processing, it is decidedly affirmative. The required mathematical computations and sophisticated statistical analysis are well within the present state of the computer art.

Molecules and People

Where we lag is not in processing technology, but in the behavioral science "laboratories," where only the faintest of beginnings have been made in the application of physical science techniques to the study of societies. We are doubtless years away from the knowledge of causes and effects that will permit us to predict mass human behavior with real confidence. Yet there is rising optimism among scholars that we will some day be able to foretell the behavior of large groups of people within reasonable limits, given accurate and timely measurements of certain telltale factors. A single person, they submit, follows an erratic course, just as a single gas molecule does. But when you put enough people together many of the individual erratic actions will cancel each other out and there will emerge a collective behavior that can be formulized. To be sure, what comes out is not likely to be so simple and aesthetically satisfying as Boyle's law for the isothermal pressure-volume relation of an ideal body of gas. Mass cause-and-effect relationships are more elusive for people than for molecules. But they must be there, somewhere, and scholars are looking for them.

The impact of new breakthroughs in this area upon the intelligence business is interesting to contemplate. Possibly some American discoveries in mass human behavior patterns could be kept secret for long periods to permit our unilateral exploitation of them. Let's imagine, for example, that we discover an extremely high correlation between Tito's popularity among the Yugoslavs and the consumption of slivovitz in that country: when per capita absorption goes up, his stock goes down. As long as we are aware of this and he is not, we will find it profitable to collect precise data on boozing among the Yugoslavs. To keep our interest undetected, we resort to clandestine collection techniques, because once he learns of it and knows the reason why, he can adopt countermeasures, for instance doctored consumption figures. The variations in this game are endless.

What Makes Sukarno Run?

While one group of researchers, largely sociologists and political scientists, pursues the gas molecule analogy, a more visionary one will be exploring possibilities with certain individual molecules. Can scientists ever simulate the behavior pattern of a Mao Tse-tung or a Sekou Touré? Theoretically, if a man's importance warrants it, they should be able to reduce to mathematical terms and store in an electronic memory most of his salient experiences and observed reactions to varying situations. Subjecting this stand-in brain to a hypothetical set of circumstances, they could then read out his probable reaction to the event hypothesized. Here the storage problem alone would be tremendous. Even greater would be the task of teaching the computer to ignore certain stimuli while responding to others. As you read this article, you are able to disregard the noise of the air conditioner nearby. It will be some time before a machine can be taught to distinguish between the relevant and the irrelevant in even this elementary fashion. Still, by say the year 2000, I wouldn't bet against it.

On another level, at any rate, much can be learned through comparisons of what national leaders say in their public pronouncements and what they subsequently do. The more sophisticated our techniques for content analysis become, the more we will be obliged to turn to electronic data processing for help in correlating statements with actions. This could be made an operationally practical method pending the hoped-for development of a stand-in brain: virtually *all* of the research data for content analysis can be obtained with relative ease, and the fact that content analysis deals with objective observations obviates the monumental task of synthesizing someone's subjective thought processes.

Your Move

Another application of computers to the intelligence business lies in the field of gaming. The Air Force has been experimenting for years with a mock-up of the strategic air battle, using a computer to simulate the clash between a surprise intercontinental air and space assault force and the defensive and counter-strike resources of this country. Not only are the planned aspects of both contending operations simulated; so are the unexpected or accidental factors such as weather, faulty intelligence, weapons and guidance imperfections. While these games are of great value as instructional aids, they are far more than that. With the computer alternate strategies are subjected to realistic tests, and aerospace doctrine emerges. And the time is not too remote when fresh intelligence on a potential enemy's capabilities and order of battle, fed into a computer as it is received, will turn out constantly changing designs for an optimum counter-strategy.

Still pretty much in the concept stage are similar gaming ideas for students and formulators of foreign policy. Whereas military games involve factors readily susceptible of quantitative measurement, international political games by and large do not. Thus a great deal of quantifying needs to be done to instill sufficient realism into foreign policy games. Among those who have suggested an approach to the problem are the husband-and-wife team of George and Charlotte Dyer, who proposed a foreign policy game in which batteries of colored lights would represent the actual and potential strengths of the nations under study and foreign policy measures taken would be scored, by changes in the light pattern, according to whether judges ruled them beneficial or harmful. Photo-electric cells measuring light intensities would provide constant readings on the progress of the game.

Two aspects of the Dyers' game are especially interesting. First, it makes a beginning toward quantification by breaking down the factors affecting foreign policy; and the diversity of these factors immediately suggests that nothing less than a high-speed computer could keep simultaneous track of all of them and their interrelationships. For example, each nation's resources, in order to be rated on a numerical scale, are broken into ten broad areas—geography, sociology, politics, foreign affairs, economy, industry, transportation, science, armed forces, and history. Then each one of these ten is resolved into its components, with sociology, for example, embracing race, population, language, temperament of people, education, health and welfare, recreation and amusements, institutions and national culture, religion and philosophy. Then each of these is sub-divided, population, for instance, into eighteen groups and sub-groups.

Second, it would score moves in the ten major areas separately rather than keep a single comprehensive score. Thus if the United States and Communist China were the combatants, no effort would be made to compare a Chinese gain in industry with a U.S. gain in science, but ten different running scores would be kept, so that comparisons could be made at any moment of the relative positions of the contending powers in any of the ten areas. To assign meaningful numerical quantities to the starting positions of the competitors and to each of their subsequent moves, the Dyers suggest that an operational research team be employed. (This and other gainful intelligence employment for operations research might be a good subject for a future issue of this journal.)

From air battle and foreign policy games to intelligence games with computers does not appear to be a very broad jump. Intelligence operations certainly have diplomatic and military parallels. With the beginnings made in these fields we could take it from there. Intelligence games, like the others, might vastly assist not only in training but in testing operational proposals and in developing doctrine.

All A is Not B and So Forth

There will arise problems, or parts of problems, that cannot be solved by arithmetic operations, no matter how ingenious the quantifiers and their systems or how swift the computers. There will be points at which a "yes" or "no" is what the user needs from the machine. But here again, the people who construct computers have made a good start on the task of attacking non-mathematical—i.e., logical—problems. Logic machines date back, in fact, to the thirteenth century, when a Spanish theologian and visionary named Ramon Lull was the first to embark on such gadgetry. Others after him invented improved devices to prove whether a certain major premise and a certain minor premise led to a certain conclusion and to solve other more complex problems. It was not until the advent of electronic computers in the twentieth century, however, that a really spectacular advance in logic machine principles could be made. If life is a lot more complicated these days than it was in Lull's, at least we have some pretty sophisticated hardware to help in simplifying it.

The principles involved in translating into machine language such ideas as "A is either B or not B" are, after all, much like those of translating numbers from the decimal system to the computer's binary system, wherein all numbers are expressed as a series of ones and zeros. Computers can therefore tackle either arithmetic or logic problems by making use of the basic fact of electronic life that any part of a circuit has to be in one of two states—on or off. This characteristic permits comparisons and tests which essentially guide the computer through the logical decision-making process.

What the limitations on computer capabilities really are is anybody's guess. The late John Von Neumann speculated on this question from a novel angle a few years back. He set out, in preparation for a lecture series at Yale, to draw comparisons between the most advanced computers of the day and the human brain, but drew them not on the basis of relative problem-solving capabilities or memories or any other aspect of performance but rather on the basis of structure as complexes of divisible parts. He looked at how these parts were assembled, how large they were, what their circuitry was, how fast they operated. Despite having worked at maximum capacity right up until his death in 1956, Von Neumann was unable to finish his study, and mankind was the loser. It may be surmised from what he did complete, though, that he might in the end have reached the conclusion that there were no significant qualitative differences between the computer and the brain and that scientific advances would inevitably narrow the quantitative gaps.

What and Whom Do You Know?

Backing away for a moment from what computers will some day be able to do, let's concern ourselves with their well-known current capabilities for storing and indexing information.

One day recently, some months after a certain operation involving a piece of real estate in a remote area, a case officer unconnected with the operation commented to a colleague, "I probably know that area better than anyone in the government; I've been duck-hunting there many times." Could this officer's knowledge of the area have been of use to those planning the operation? Very probably. Would they have had any rapid way of finding out except by sheer accident whether anyone in the organization had such knowledge? No, they would not. Until the past few years, there has been no practical way to index all of the experience and talents of all of our personnel.

We have made a start, it is true, using IBM cards. It is possible to learn through machine runs how many married, German-speaking men between 33 and 35 years old with civil engineering degrees and naval service there are in the Central Intelligence Agency. But to record even this basic data taxes the capacities of the card systems in current use. Should we decide to do so, we could, over a span of a few years, index personnel knowledge and skills to a degree never before dreamed of, using more advanced forms of electronic data processing.

In a television drama a few months back, a private organization was supposed to have compiled just such data on millions of U.S. citizens. The story concerned the search by a federal agency for a man who (1) was a barber, (2) knew a lot about stamp-collecting, and (3) could pick locks. The company found the man, the agency put his talents to use, and by the end of the program Yankee ingenuity had triumphed over a slick international narcotics ring. The real hero of the story was the computer—they must have used one—that pinpointed the right man for the job. It may be less than reckless to suggest that a comparable capability to match backgrounds to job requirements might be helpful in intelligence operations.

Or take the matter of acquaintances. It is our suspicion that in many cases where someone in an intelligence organization has an interest in someone outside of it, American or foreign, there may well be sitting down the hall and two floors up from him someone who knows the object of his interest personally. If he doesn't know him directly, he knows someone who *is* directly acquainted with him. Let's just consider American citizens. Suppose that each employee of an organization knows 1000 Americans outside of the organization. Then for every 1000 employees there are 1,000,000 Americans who are known directly. Allowing for a 50% duplication rate, there remain 500,000 Americans who are known to at least one employee of the organization. These half million in turn know 1000 each, or a total of 500,000,000 people. Cutting again for duplications we are left with 250,000,000 people.

Maybe these figures are high, but they at least suggest that very few of our 180,000,000 American citizens are more than one step removed from direct acquaintance with someone in an organization of several thousand people.

Some interesting conclusions could be drawn from a similar approach to the question of what foreign citizens have ties of acquaintance, direct or indirect, to the staff of an intelligence organization. Would it be worth the expense to collect such information and keep it current? That is not for us to decide, but we can say that without the vast and infallible memory of a computer such an undertaking would be unthinkable.

Political Weather Forecasts

Among the many publications issued in the intelligence community is the rather recent "Weekly Survey of Cold War Crisis Situations." Among other kinds of crisis, it calls the attention of its readers to those countries of the world where things seem to be going not too well for the governments in power. The judgments on which countries belong where on the weekly list are made by competent, seasoned political analysts. Without for a moment questioning their qualifications for the job, we wonder if their work could not be effectively improved, say by around 1975, with electronic data processing.

More specifically, there might first be established a numerical scale called the "stability index" or something similar. Each country around the globe would initially be given a rating along this scale. A number near the maximum would describe a highly stable government, e.g., Switzerland's, while one near zero would denote a tottering regime. Once this rating had been assigned, every intelligence report affecting that country thereafter would be assigned a number, plus or minus or zero, reflecting the impact of the events reported upon the country's stability. These figures would be fed into a computer as fast as they were received. As often as necessary, the net result of the input could be recovered, perhaps printed out in the form of a "daily world political weather map."

Would this form of automation sell short the political wisdom of the analyst? No, it would not. In the first place, the index could not replace the written analysis but only supplement it. In the second place, any such system would acknowledgedly have plenty of bugs in it which the experts would take months or years to work out. And in the third place, the assignment of numerical values to the reports would be an exacting job, involving several levels of rechecking by highly knowledgeable people.

The system would have advantages beyond the instant production of concentrated political judgment: It would provide a basis for quantitative comparison of a given situation with other regions and other times that would be more revealing than verbal description. By drawing more people into the appraisal process, it would also reduce the effect that any single analyst's biases, permanent or temporary, conscious or subconscious, might otherwise have on the final product. Finally, it would automatically insure that all of the available intelligence is taken into consideration and would guard against the inadvertent omission of pertinent data by a harassed senior analyst under pressure.

The Electronica Britannica

IBM has developed for public use a computer-based system called the "Selective Disseminator of Information." Intended for large organizations dealing with heterogeneous masses of information, it scans all incoming material and delivers those items that are of interest to specific officers in accordance with "profiles" of their needs which are continuously updated by a feed-back device. Any comment here on the potential of the SDI for an intelligence agency would be superfluous; Air Intelligence has in fact been experimenting with such a mechanized dissemination system for some years.

As a final thought, how about a machine that would send via closed-circuit television visual and oral information needed immediately at high-level conferences or briefings? Let's say that a group of senior officers are contemplating a covert action program for Afghanistan. Things go well until someone asks, "Well, just how many schools are there in the country, and what is the literacy rate?" No one in the room knows.

(Remember, this is an imaginary situation.) So the junior member present dials a code number into a device at one end of the table. Thirty seconds later, on the screen overhead, a teletype printer begins to hammer out the required data. Before the meeting is over, the group has been given through the same method the names of countries that have airlines into Afghanistan, a biographical profile of the Soviet ambassador there, and the Pakistani order of battle along the Afghanistan frontier. Neat, no?

If and when computers begin to perform these and other functions, the effects will be felt fairly rapidly by every one of us, or, more likely, by the next generation of intelligence officers. Since all intelligence information will be processed by the computers, we (or they) will need to know the fundamentals of their construction and operation. Formats will change. So will collection requirements. Nearly everyone will have to go through new training. Many operational decisions formerly based on some research and a lot of educated guesswork will be reached only after consultation with the computer. A new language will be spoken; words like "digital," "analog," "programming," "game theory," "Boolean algebra," "Monte Carlo method," "stochastic process" will be commonplace. And "the monster" (as it is sure to be known) will provide a convenient target for almost all grievances, including many that no one has thought up yet.

Why do we need the computer? Partly, because of the staggering tasks and the shrinking time limits imposed on us by the space-age cold war, we need to delegate to it routine, repetitive arithmetical and logical calculations, thereby permitting fuller application of human skills to problems of judgment. But we also need it because it is available to us, because with it we can do jobs that we could never have done without it, "because," as the inveterate Alpinist explained, "it's there."

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