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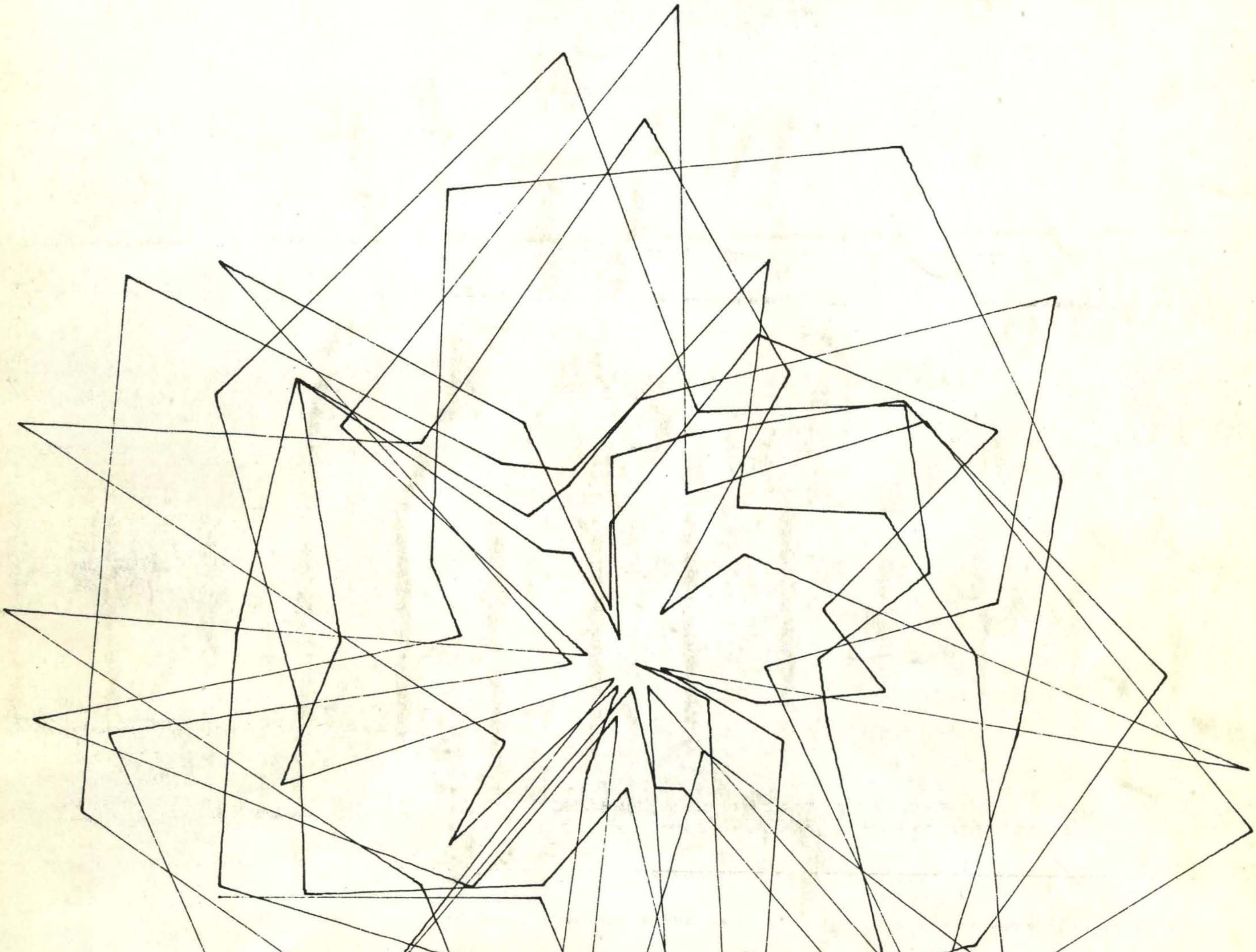
Vol. 19, No. 11

computers and automation



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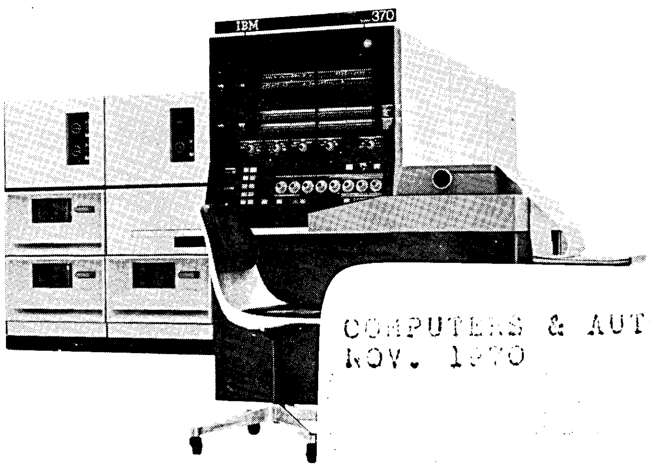

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Vol. 19, No. 11
November, 1970

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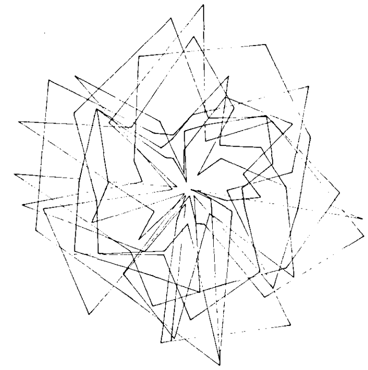

Front Cover Picture

The drawing on the front cover is another of the entries in the Eighth Annual Computer Art Contest of **Computers and Automation** (see the August, 1970 issue). The artist is A. B. Sperry, Applications Manager, Hewlett Packard Calculator Products Div., P.O. Box 301, Loveland, Colo. 80537.

The drawing was made using a Hewlett-Packard Model 9100B Calculator and a Model 9125A Calculator Plotter, which form a desk-top computing system. "Random Polar Vectors" was programmed using a random number generator to select X and Y coordinates for vectors. The vectors were then converted to polar form, and their ends connected.

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Letters To The Editor

In Fundamental Disagreement

I have just noticed that in the June, July, and August 1970 issues you listed my name as a "Contributing Editor". At no time did I give you permission to do so. In our conversation on the subject I suggested you write to me about this and I would consider it. However, you never did so. I do not feel that the publication by you of an annual "Roster of Programming Languages" prepared by me for your annual directory automatically makes me a contributing editor. Normally I would not care, but since I am in fundamental and personal disagreement with many of your editorial views I would not like to appear to be supporting your magazine by being listed as a "Contributing Editor".

Please note that this is a personal view and has no connections with any views which might be held by my employer.

JEAN E. SAMMET
545 Technology Sq.
Cambridge, Mass. 02139

Ed. Note – We regret the misunderstanding that led to our listing of your name as a Contributing Editor, without your permission or approval. Your name has been removed from the list effective with the first possible issue following receipt of your request.

C &A always welcomes arguments and disagreements. Whenever you have an opportunity and desire to state your position more fully (in the clear and cogent fashion that we always associate with you), we would like to publish your views. Many of our readers would, I am sure, cheer you on for your side of the argument.

"Instant Insanity"

With mild amusement I have followed your series on the "Instant Insanity" puzzle [see " 'Instant Insanity' Fails to Frustrate Computer – Comments", Aug. issue, page 10]. I have concluded that the computer approaches to the problem are more insane than the toy itself.

First, a special award should go to anyone who can rotate a cube 64 different ways. Even calling each position a rotational iteration with respect to a 3-axis orientation doesn't seem to help. I know. I tried it with a perfect ice cube and couldn't exceed 24 no matter what nomenclature system I employed. However, it was a hot day and the cube was appreciably distorted by the time I got in the teens, so in all fairness, this was probably not an ideal test environment. Perhaps it could be done with an eight-sided cube – I honestly don't know.

Second, since it is a simple matter to consider the 192 related answers as a single solution, why not eliminate these redundancies from the computer iterations? This yields 41,472 unique combinations of which only one satisfies the problem requirements.

I tried solving the puzzle using a PL/1 program with close to a dozen nested DO-loops, which was compiled and run in a matter of seconds on a 360/65 computer. But turn-around time was so great that my seven-year-old son had solved the puzzle twice by the time I returned home!

HARVEY ALTER
1159 Bloomdale Rd.
Philadelphia, Pa. 19115

I was interested in the comments made regarding the game "Instant Insanity" in your August issue. I partly agree with the comments of John Bieler about the number of possible independent combinations, to the extent that he reaches the figure of 7,962,624 divided by 192 = 41,472. This figure can be obtained in the following manner: (a) take any of the cubes as a space reference; (b) decide to stack the other cubes perpendicular to any of the three face orientations of the first cube (three possibilities); and (c) position each of the other three cubes in the stack according to one of its 24 axes positions. This then gives:

3 x 24 x 24 = 41,472 combinations.

I don't doubt that it is possible to explore systematically by FORTRAN programming the total number of solutions, whether its 40,000 or 16 million. But reaching the solution and demonstrating that it is unique among the 41,472 possible combinations is also perfectly possible with conventional reasoning. I have some handwritten notes showing the detailed reasoning I used to reach a "human" solution, and I would be glad to forward them if any of your readers are interested.

In any case, the main difficulty of the problem is the abstraction of the phenomenon through a proper codification, which is a problem for both humans and computers.

I might also point out that it is probably not difficult to extend this puzzle by using higher degree polyhedra instead of cubes, with more solids and more colors so as to rebuke the most powerful computer in the world in the task of exploring systematically all possible combinations. In such a case, the use of some algorithm similar to that I used in my "human" solution would become compulsory. This is a very simple example of the kind of reasoning which is used in certain areas of the theory of games.

M. R. Le COCQ
13 bis, rue Joseph Bertrand
78 Viroflay, France

"Postage Stamps Designed by Computer in the Netherlands" – Correction

Your June issue contained a story about the Netherlands Summer Stamps which were designed by a computer [page 22]. The information given beside the reproductions contains an error. Mr. R. D. E. Oxenaar is not a member of the Department for Numeric Control of the Technical University of Eindhoven; he is the vice aesthetic advisor of the Netherlands Postal and Telecommunications administration.

Any of your readers who would like more information about the stamps are invited to write to me.

H. van HAAREN, Head
Aesthetical Branch
Netherlands Postal and Telecommunications
Kortenaerkade 12
The Hague, Netherlands

Ed. Note – Thank you for this correction.

C&A: Helpful

I would like to express my appreciation for the excellent work you have done in compiling your "Computer Directory and Buyers' Guide, 1969". It has been of great help to me in my work.

And your issues of *Computers and Automation*, too, have been very useful on a number of occasions.

RICHARD H. COOPER
37 West Harrison St.
Oak Park, Ill. 60304

c.a EDITORIAL

Responsible Journalism

At the meeting of the National Convention of the Association for Computing Machinery in New York on September 1, I heard for the first time the name of Clark Squire, and the assertions that:

- He was a computer professional;
- He was black and a member of the Panthers;
- While he was a programmer earning $17,000 a year, he had been arrested by the New York police and charged with holding up a subway change booth;
- He had been held first in $100,000 bail, then $50,000 bail for more than a year awaiting trial.

Was this true? Could this possibly be true in the United States – which is a democracy and not a dictatorship?

The person making these assertions was obviously excited and obviously interested in attracting attention to what he thought was outrageous injustice. But, of course, the first question always is "What are the facts?"

So we asked a well-known free-lance reporter in the computer field, Joe Hanlon, to look into the situation, and give us an article for us to publish in the next issue. That article and some supplementary information is published in this issue of our magazine – basically, as a first installment in trying to report on "the facts."

After reading the article, I still do not know all of "the facts" nor even some of the important facts. For example, I do not know to what extent Clark Squire may have been involved in any plans that might have been made by Panthers in New York City for placing bombs here and there. In view of the Panther trial now proceeding in New York City, it seems to me doubtful that this question will be answered adequately for some time.

But I am convinced, at this time, from the weight of the evidence so far reaching me, that:

- Clark Squire is a computer professional and a good programmer and systems analyst;
- He was earning $17,000 a year when he was charged by New York authorities with robbing a subway booth, a charge which was effectively dismissed two weeks later;
- The bail of $50,000 on which he is still being held as a result of another arrest on April 2, 1969, is most unreasonably high; the bail is high undoubtedly because he is black and not white – in other words, a political reason;
- Serious injustice is being done to Clark Squire; what is currently happening to him is morally wrong, legally wrong, and constitutionally wrong;
- A pattern of conspiracy by elements of the federal and city governments in the United States against the Panthers is being further confirmed by the account of what has happened to Clark Squire, who should be treated as innocent until proved guilty.

Before publication, I showed the article to a colleague in the computer field who made some important comments, which follow:

- "The article is very political and very one-sided. In fact, the article does not fall within my definition of responsible journalism.
- The story may be true, but it is presented with such lack of objectivity and with so little documentation that I do not believe it. An article like this should present the reader with facts and allow him to draw his own conclusions.
- I'm almost amused at the tie-in with computers – and dismayed at the neglect of an opportunity to explore how computers might lead us closer to justice."

These comments imply important questions and deserve careful answers.

Question: As editors of *Computers and Automation*, should we make positive that every part of an article is true and objective before we publish it?

Answer: Since 1952 the policy of *Computers and Automation* has been that we should not censor or distort what is written by any author who signs his name to an article and stands back of what he is saying. There are many aspects to truth: "Truth is not shaped in such a fashion that it can fit into any one person's hand." If an article contains a fair amount of significant information reasonably backed up by a fair amount of significant evidence, that should be enough on this score. If we can publish a one-sided article all of which attacks, for example, time-shared computing, we ought to be able to publish a one-sided article all of which attacks a system of justice or injustice.

Question: Is the tie-in with computers in the case of this article sufficient so that the subject should be dealt with in a computer magazine?

Answer: Since 1957, the policy of *Computers and Automation* has been to deal with the social responsibilities of computer people, as one of the topics that computer people need to be concerned with. By 1970 this view had percolated so far that the annual convention of the Association for Computing Machinery in September 1970 was devoted essentially to the theme of computers and society. It is in accordance with this policy to consider in our pages the difficulties of a black computer professional who also is entitled to his rights as a citizen and a human being. In the case of Clark Squire, his efforts to fulfill his social responsibilities were not directly related to his work as a computer person; that is, he was not, for example, using his skills to produce computer programs for guided missile bombs. But his story clearly points out how acceptance of social responsibility may affect one's professional life.

(Please turn to page 14)

READERS' FORUM

COMPUTER PERIPHERAL MANUFACTURERS ASSOCIATION URGES MAXIMUM COMPETITION IN THE COMPUTER INDUSTRY

L. Caveney, President
Computer Peripheral Manufacturers Association
P.O. Box 30367
Washington, D.C. 20014

Computer Peripheral Manufacturers Association (C.P.M.A.) is vitally concerned about the program that IBM, the dominant computer manufacturer, appears to be adopting in its design of new systems and computer peripheral products. It appears that IBM's program will eventually eliminate the small peripheral manufacturers. Because of the near monopolistic position IBM holds in the computer marketplace, peripheral equipment manufacturers desiring to compete in this marketplace are required to interface and design so as to be compatible with the IBM Systems.

Difficulty in Obtaining Information

IBM holds the commanding position in computer sales, and it is difficult to gain information concerning the various interfaces within the computer system unless IBM chooses to publish such information. Thus it has long been recognized that IBM can, by the design of the central processors and the related channels, controllers and peripheral equipment, severely limit competition by refusing to publish the information necessary for others to design compatible peripheral equipment. This association believes that IBM has embarked on this path for the purpose of further increasing their hold on the market, to the obvious detriment of peripheral equipment manufacturers and, therefore, to computer users.

The removable disc product line is one illustration of this change in philosophy on the part of IBM. Removable disc storage equipment is recognized by everyone as one of the most significant reasons why computers are becoming so widely used today. The use of this vital data storage media gives the user the ability to store and immediately use vast quantities of data. Naturally, this equipment represents a very significant sales volume to IBM. With the announcement of the earlier disc storage equipment, namely the IBM 1311 and IBM 2311, IBM made available to potential equipment manufacturers specifications defining the requirements for interfacing with IBM central processors and controllers. However, when IBM announced the later Model 2314 disc storage unit, only the channel to controller interface was published. Thus, it was necessary that any peripheral manufacturer interested in offering a disc drive in competition with IBM must also develop a controller for use with the drives since he could not design for operation with the IBM controller.

Native attachment of peripheral equipment is another way that this design strategy is being implemented by IBM. In the IBM System 360/25, the disc controller is bundled with the channel and central processor. If IBM is, in fact, adopting the design strategy of bundling peripherals with controllers with channels, it is conceivable that future advances in technology will allow the complete integration of the peripherals into the computer. This would virtually prevent any peripheral manufacturer desiring to compete with IBM from offering any peripheral device as an alternate to the IBM equipment.

In the opinion of the Computer Peripheral Manufacturers Association, this design strategy can only result in greatly reducing or eliminating the competition in the peripheral equipment marketplace. Whether or not this result is being sought intentionally by IBM, the ultimate effect can only be detrimental to the computer user and the American public in general.

Policy Proposed

The Computer Peripheral Manufacturers Association asks all computer manufacturing companies, the United States Government and IBM, as a reassertion of their belief in freely competitive systems, to adopt and support the following policy governing the design and manufacture of computer systems.

> That all future computer systems be architected so as to clearly define both the electrical and mechanical connecting interfaces between the peripheral equipment and the controller, the controller and the channel, and the channel and the central processing unit. And that these interfaces be defined and published in detail at the time a new product is announced.

It is the firm belief of the C.P.M.A. that the adoption of such a policy will allow smaller, more specialized companies to independently concentrate their resources and their talents toward developing such competing equipment as they desire in the furtherance of our free enterprise way of life. This Association feels strongly that the adoption of such a policy is absolutely necessary to maintain the confidence of the computer users, and the American people in general, in the computer industry.

If the computer industry is unable to allow such competition to persist, the C.P.M.A. will move for legislation setting forth the proper standards necessary to assure maximum competition and allow the end user to be provided with the best possible equipment at the lowest possible price, and with the current technological state of the art emanating from the entire computer industry.

During the interim, the C.P.M.A. will negotiate with the government to require computer manufacturers to interface their computers to accept the peripheral equipment produced by peripheral manufacturers other than the manufacturers of the computer. □

"PATTERNS OF POLITICAL ASSASSINATION" — COMMENTS

I. David Deitch
The Boston Globe
Boston, Mass.

(Column as published in the Boston Globe, Sept. 21, 1970, title: CONSPIRACY IN OUR MIDST)

It isn't necessary, as a rule, to blame conspiracy for major developments in the society. The tenacious existence say, of a military-industrial complex is no conspiracy; neither is the exploitation of black people, nor is the oppression of women.

The way in which a system of political and economic institutions operates, and the nature of its ruling class, goes far toward explaining why things happen or don't happen. In other words, the system itself is the conspiracy, and one particular form that the conspiracy might take is a conspiracy of silence in which a communality of interest dictates a command not to upset the established order.

Control has been institutionalized, and as long as control can be effectively exercised through the institutions it isn't necessary to oppress through planned treachery. Thus, we know that attempts to cause profound social change have been invariably co-opted. In line with this, attempts by sincere people to change their personal behavior are made difficult by the institutional roadblocks which are designed to maintain existing values.

We get psychological hangups.

We get personal contradictions analogous to the contradictions we find in the political economy: Not only does the society have, say, unemployment and poverty, but it also has lots of paranoia and hostility.

It is said that the incidence of paranoia among black people is very high, but this is understandable in light of the systematic discrimination they are faced with. What this means is that a lot of what passes for paranoid behavior may be rational responses to a truly hostile environment. In any case, what is real and what is manufactured aggravate each other, but it's important that the two be separated if a person is not to be made to "adjust" to what is oppressing him.

The contradictions in the society work ultimately to upset the controlling institutions. Direct coercion may be required. Political assassinations occur, but this is not to say that all are perpetrated by the ruling class by any means: We have assassinations and confidence is shaken.

John F. Kennedy . . . Martin Luther King . . . Robert F. Kennedy . . . Medgar Evers . . . more than a score of Black Panthers . . . How can confidence be restored? By finding out the facts once and for all, by dignifying the possibility of conspiracy because conspiracy has permeated the brains of the people who are not satisfied with the answers given them.

To this end a number of researchers have established in Washington a National Committee to Investigate Assassinations (NCTIA). A project is already underway to organize and store in computer-based form all significant factual evidence pertaining to the John F. Kennedy assassination, to make the evidence available to researchers, to index material now located in all parts of the United States and, ultimately, to reconstruct part of the planning for the crime.

One of the principals in the project, Richard E. Sprague, president of Personal Data Services, Hartsdale, N.Y. is author of an extensive analysis in the Newtonville-based magazine *Computers and Automation,* which asserts that at least four gunmen firing from four locations, none of them Oswald, were involved in the JFK slaying.

Providing a new forum for the conspiracy theory is the *Computers and Automation* editor, Edmund C. Berkeley, a mathematician and actuary. On the basis of probability theory and tell-tale facts, Berkeley asserts conspiracy on the killings of JFK and King, and "evidence which points toward conspiracy" in the killing of Robert Kennedy.

But even if the conspiracy theory is ultimately proven wrong, the need for a NCTIA stems from the rational perception that there are too many unanswered questions, as well as a basic distrust of those who provide the answers.

"Nowhere in the United States can concerned Americans apply to have their questions about political assassinations answered reasonably," says Berkeley. "Only a few agencies, such as courts and congressional committees, have the power to issue subpoenas, compel the appearance of witnesses, and ask direct questions. The rights of the people to know are defective."

II. From Ron Freeman, Mgr.
Advance Data Analysis
P.O. Box 733
Jonesboro, Ark. 72401

I have just finished studying the article, "Patterns of Political Assassination: How Many Coincidences Make a Plot?", in the September issue of *Computers and Automation* [page 39]. Any educated person would be engrossed by the "coincidences" reported in the article, and the information it contains, I believe, is of interest to every American. Therefore, I would implore you to reprint the article verbatim in a publicly distributed magazine, such as *Readers Digest, Life,* etc., if at all possible.

I am very much interested in why this "could" or "could not" be accomplished.

III. From the Editor

Thank you for your enthusiastic letter.

Of course, I would like very much to see an article like "Patterns of Political Assassination" published more widely in the United States. But there has long been both a conscious and an unconscious effort in the United States to suppress certain kinds of information. I will predict that my article is too much of a threat to some important individuals and groups in the United States for it to be published widely at any time soon.

If you discover any way in which it can be published widely in a magazine like *Readers Digest* or *Life,* please let me know. In the meantime, I believe the only way we can get additional readership for the article is by selling reprints.

If you have not yet read the material on political assassinations in the United States that *Computers and Automation* has published in the May, July, August and October issues, I am sure it will be of interest to you. □

SECURITY IN THE COMPUTER COMPLEX

Louis Scoma, Jr., Pres.
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Many business and industrial companies, as well as leading colleges and universities, are being caught with their computer and data processing security down. And it will take more than king's horses, accountants and auditors to put the pieces back together again. Sabotage and theft of computer files and data have already ruined one major company, while countless others have been victimized by fraud, student unrest, accidents and poor personnel management.

The siege against computer centers of business, industry, education, and even government, is only beginning. Sabotage instructions for computers are published with regularity in "underground" student newspapers, and the attackers are switching from the use of sledge hammers and axes to more sophisticated methods of destruction.

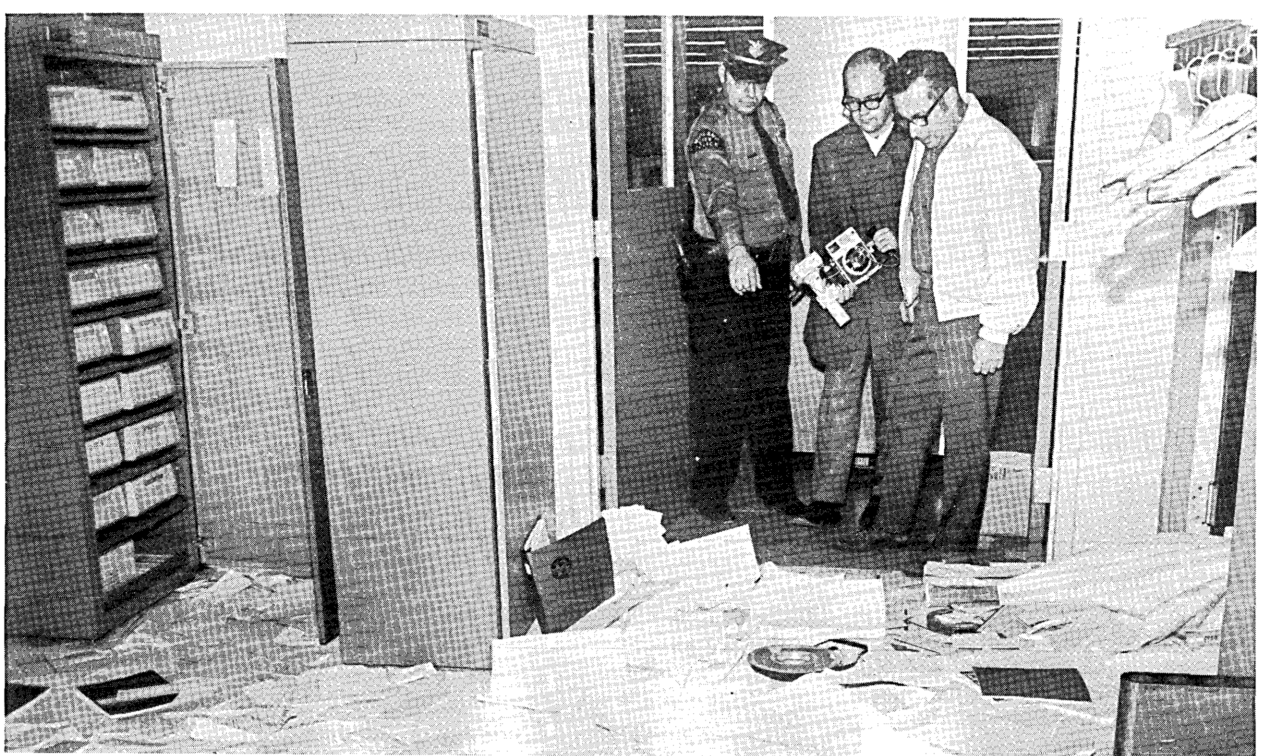
A magnet, the size of a quarter can destroy a magnetic tape data library of anywhere from one to 50,000 tape reels in a matter of minutes. Students studying engineering, computer sciences, and even chemistry know this.

Some recent occurrences of "computercide" include the following: (1) SDS members invaded the control center of a major chemical firm, used small magnets throughout the tape files, and caused damage estimated at $100,000. (2) Campus dissidents in California tore through the offices of a prominent banking and financial organization. Their illegal entry caused the bank to lose many thousands of customer files. (3) A disgruntled employee of a major encyclopedia publishing and distribution company stole a magnetic tape file of customer records and sold the information to a direct mail sales company. (4) An Army officer, dissatisfied with his assignment and pending retirement, erased the purchasing data recorded on tape. (5) A computer service engineer carried a magnet in his tool box. While performing computer repairs, he unknowingly scrambled the records of 80,000 credit firm customers which were filed on a disk pack. The accident cost the firm $10,000 to re-create these files. (6) Student rioters broke into the computer center of a major university and held the computer "hostage." When they were ejected, officials found a number of fire bombs placed strategically near the computer, ready to destruct.

There is no single procedure which can be followed in setting up a secure computer complex. However, there are some basic guidelines that should be followed in setting up a data processing installation. These include:

1. Take time to adequately plan your facility and review your existing facility regularly for possible improvement.
2. Plan your computer complex to meet the needs of your company. What may be good for a competitor or a neighbor may not be good for your company. Determine your needs and plan a computer complex to meet those needs.
3. Train all operating personnel in fire reporting procedures as well as fire fighting procedures.
4. Be prepared for a disgruntled employee who will try to interrupt, if not destroy, your computer complex.
5. Security check all new personnel hired in the data processing area.
6. Provide adequate back-up power and air-conditioning to your computer complex for the necessary hardware that is needed to keep your company from a major business interruption.

Safety and security must be given careful consideration and top priority when planning your data processing center. Today, data processing installations have become the heartbeat in many corporations. They literally cannot operate for long periods of time without the output from their data processing departments. The facilities housing computers must be as safe and secure as we can make them to protect our companies from a major business interruption. □



USER'S GROUP FOR GENERAL ELECTRIC MARK II TIME SHARING SERVICE

I. From Heinz Dinter, Pres.
Computer Management Corp.
1105 W. Univ. Ave.
Gainesville, Fla. 32601

As a user of the Mark II time-sharing service, we have in the past very frequently engaged in the wishful thinking that it would be of great benefit to us if we were able to share the experiences of other users in coping with Mark II.

For this reason, I would like to explore the feasibility of forming a Mark II Users' Group. The objective of this group should be to maintain communication between users relating to Mark II problems and opportunities. There is, of course, no point in forming such a group if the demand is non-existent. The purpose of my addressing this letter to you is to determine if such a need exists.

I would appreciate your publishing this letter and inviting interested readers to express their desire for participating in this undertaking by writing to me at the address above. My telephone number is (904)378-1615.

Thank you very much for your cooperation.

II. From the Editor

Thank you for your letter. Would you please tell me which Mark II machine or system you refer to, and who is the maker?

The only Mark II I can think of as I write to you is the second automatic digital computer which I worked on in Professor Howard Aiken's laboratory at Harvard in 1945-46 – and I am sure you do not mean that!

III. From Heinz Dinter

I wish it were Professor Aiken's Mark II, because I do not think that this machine of early EDP fame caused as much misery and did as much damage as the Mark II that I was referring to. Our frustrations are caused by the third generation which is supposedly characterized by high reliability and computing power. My interest in joining users together in an association stems from my unsuccessful battle against the giant called General Electric Mark II Time Sharing Service, and which consists of a G.E. 635 and a conglomeration of people. It is, using G.E.'s own words, "the world's largest T/S Complex!".

Thank you for reminding me that there was once an atmosphere of honesty, integrity, and the spirit to succeed with a new technology and computer people were then dedicated to achieving successes and fostering progress. Most probably I am fighting a losing battle because I seem to be asking for the impossible: computing service from people who back up their promises with sound integrity.

By the way, you have a very fine magazine. I enjoy reading it.

IV. From the Editor

Will those who are interested in forming a Users' Group to deal with General Electric's Mark II Time-Sharing Service please get in touch with Mr. Heinz Dinter? □

FOR COMPUTER ART, WHICH WAY IS UP?

I. From George F. Way
570 Lexington Ave.
New York, N.Y.

Evidently computer-assisted magazine makeup has yet to be debugged. I cannot comment on the mathematical elegance of the computer art in your August issue, but "Mask" and "Landscape" on page 21 certainly would make more sense aesthetically if they had been printed right-side-up.

Try rotating each of them counter-clockwise by 90° to put the present lefthand sides at the bottom.

II. From the Editor

We agree that the two drawings to which you refer seem to make more aesthetic sense when they are rotated as you suggest. They were published as they appeared in the August issue because the artist had written the title of the drawing across what we assumed to be the top.

Incidentally, for a small organization like ours at least, computer-assisted magazine makeup is a long way off. In the meantime, our human staff bears the responsibility for any errors that are made. □

ERROR IN CORRECTION FOR "AN ARTIST VIEWS DISCOVERY THROUGH COMPUTER-AIDED GRAPHICS"

One of the corrections published on page 10 of the October issue contained an obvious error. The last two lines of the correction read: "In paragraph 4, line 11 – Replace 'Radiograph' with 'Radiograph'." The second "Radiograph" should be replaced with "Rapidograph". The correction was for the article "An Artist Views Discovery Through Computer-Aided Graphics" by Grace C. Hertlein which was published in the August, 1970 issue. The editors are indeed sorry for this oversight. □

THE COUNTER CONFERENCE — CALL FOR PAPERS

David E. Burmaster
M.I.T. Project MAC
545 Main St.
Cambridge, Mass. 02139

The Counter-Conference will be a technical meeting devoted to recent advances in computer science and the impact of computers on society. [See "ACM Counter Conference – Statement of Purpose", Aug. issue, p. 8.] The meeting will be held on August 3-5, 1971, at the Harvest House Motel in Boulder, Colorado. The conference will consist of contributed papers and of special invited papers. Papers describing significant progress in any of the following areas are solicited: programming language design and implementation, operating systems, computer hardware including I/O and terminals (e.g., graphics), systems organization, applications of computers in education, medicine, process control, and management; theory of computing, numerical analysis, artificial intelligence, computers and society with emphasis on the issues of privacy and data banks, professional education and the role of the professional in society.

Authors should submit a preliminary version of their papers by February 1, 1971. Papers should be sent (in triplicate) to Program Committee, Counter-Conference, Department of Computer Science, University of California, Berkeley, California 94720. □

EDITORIAL

(Continued from page 7)

Question: Is an opportunity being neglected in this article to discuss how computers might lead us closer to justice?

Answer: No. We believe the subject matter of this article is significant and that it should stand by itself. However, we do believe that the application of computers to improved administration of an improved judicial system is important, and we do hope to deal with that subject in our pages in later issues.

Question: Is publishing this article responsible journalism?

Answer: Responsible journalism, we believe, is the publication of important, factual, and useful information, regardless of who likes it and who does not. It is easy enough to display what is recognized as "responsible journalism" when dealing with a topic that is noncontroversial, or when the topic has erupted through the layer of "outside of our professional field" – such as the topic of data banks and personal privacy. But the crucial test of responsible journalism is the publishing of *uncomfortable* information – real news and controversial ideas that the establishment does not consider to be in their interest. Accordingly, the publishing of this article is in our opinion an act of responsible journalism.

Edmund C. Berkeley
EDITOR

PUNCH LINES . . .

Unbundling of computer services in July, 1969, has cost corporate data processing operations untold millions of dollars. Unbundling, together with the general downturn of business, has probably set back data processing computer utilization at least two years, because companies have been hard pressed to afford the cost of unbundled services made mandatory by some computer manufacturers. Consequently, they have not been able to expand their computer capabilities.

– Paul W. Williams, Pres.
Boothe Computer Corp.
3435 Wilshire Blvd.
Los Angeles, Calif. 90005

As the securities industry becomes more dependent upon the computer, we must be careful to fully understand the economics of stock brokerage data processing. **We must develop new techniques of surveillance, safeguards against manipulation, protection against failure, and most of all, we must retain the flexibility to deal with new situations as they arise.**

– Hamer H. Budge, Chairman
Securities and Exchange Commission
Washington, D.C. 20549

The full importance of the United States Metric Study cannot be understated. The United States is the only industrialized nation in the world which has not adopted the metric system as its basic system of measurement. Metrication affects all facets of our society – manufacturing, marketing, exports, athletics, education, consumer habits, and interaction of engineering with science, for example. It significantly affects our relations with other nations of the world. **In conducting the United States Metric Study, we want to get maximum participation by the private sector.**

– Maurice H. Stans, Secretary of Commerce
U.S. Dept. of Commerce
Washington, D.C. 20230

accounting, engineering, and other special skills. Increasingly, the focus will be on the kinds of broad problems that concern top management – objectives, policies, strategies, and organizational development. To help management meet and solve these problems, **the effective management consulting organization will have to become increasingly creative and entrepreneurial.**

– Allan Harvey, Pres.
Fry Consultants, Inc.
6 E. 43rd St.
New York, N.Y. 10017

Although events in America during these past months have been viewed with apprehension, general business conditions in Europe are good. In fact, Germany and Switzerland are trying to dampen the boom. **European countries are all cautiously looking at the United States these days, and want to avoid similar conditions by all means.** The word 'rationalization' is used a lot. Enterprises must be made more efficient – rationalized – but not helter-skelter. Only when thorough economic study shows that a computer, for example, is needed, will it be included in many company projections. Of course American business also relies on economic evaluation, but the European approach is more thorough, more conservative.

– Christopher Buff, Vice Pres.
of European Operations
Berglund Associates, Inc.
Suite 212, 1060 N. Kings Hwy.
Cherry Hill, N.J. 08034

The requirement for computer equipment maintenance across the country has created demands that exceed the capabilities of practically every maintenance firm in existence today. The three primary requisites necessary to meet maintenance needs of computing equipment users are: financial strength, hardware independence, and a qualified managerial and technical staff. **There is no reason today to have a manufacturer maintain equipment.** Maintenance is not complicated. Good people, good control, and a responsive and well-funded organization will enable the computer user to obtain better service from an independent firm than that delivered by a manufacturer. In addition, the user can obtain the maintenance of all computer equipment from one source, and thus eliminate lost time in attempting to identify the equipment that has caused a system failure.

– Edward F. Kearns, Pres.
University Computing Co.
1300 Frito-Lay Tower
Dallas, Tex. 75235

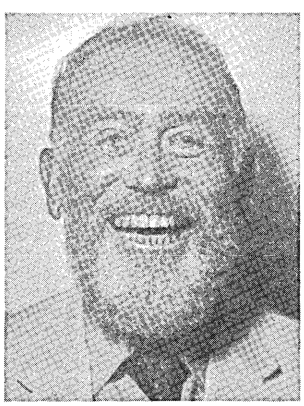
Men who have taken courses in data processing while they are in prison are succeeding when they pursue careers in data processing after their release. They are succeeding not only because their salaries are good, but also because they are working in a field which removes them from past associates and former environment. They are doing prestige work in which they can and do take considerable pride. This ties in with recent thinking that more prison vocational training should be at the white collar level for those who can absorb it.

– Joe McKinley
Supervisor of Education
U.S. Penitentiary
Leavenworth, Kansas

THE COMPUTER AND THE JOB UNDONE

Abe Gottlieb
State Planning Board
Commonwealth of Pennsylvania
Governor's Office
Harrisburg, Pa. 17120

"It is indeed regrettable that during the past two decades, the most sophisticated machines we possess have been working almost exclusively and incessantly on hundreds, perhaps thousands, of military applications, ranging from simple weapons inventory to the games that men play around national survival possibilities in the event of a nuclear holocaust."



As a senior staff member of the Pennsylvania State Planning Board, Abe Gottlieb conducts economic and social research studies and formulates the objectives, design, and data base of management and environmental information systems. For the past several years, he has directed the planning and research programs for state and regional planning agencies in New Jersey and Pennsylvania.

His academic activities include a Ford Foundation Urban Fellowship at Rutgers University, and he has lectured and taught at Fairleigh Dickinson University, Pennsylvania State University, and Elizabethtown College.

If the computer can be considered a machine, we should then ask: Why isn't it being used, or used more effectively, in the struggle for a better social environment? The machine and the factory did, after all, transform most of our societies in the 19th century and, for better or for worse, revolutionize every aspect of human thought and conduct. Can we and should we control the computer more skillfully, more purposefully than our ancestors controlled their factories, mills and machinery of production?

It might be argued that our industrial and post-industrial societies are a fortuitous by-product of non-control, sobered or addled (depending on your point of view) by ad hoc incursions of government into the social and economic affairs of man. But beyond the theorizing around this subject, present day advocates of major social changes in our cities are demanding, in a cumulative more insistent manner, that all resources (human, money and technological) be harnessed for tangible improvements in housing, health, quality of air and water, education and economic opportunities. This should begin to define the computer and its uses as an important agent of social change.

A Transforming Agent

We may be too locked into our time frame to see it, but it is probable that the computer is the same kind of transforming agent that the mill and its machinery was in the early 1800's in England, and later on in the rest of the Western world. Direct analogies cannot be spun out too finely because a century and a half of social, economic, intellectual and institutional changes separates the primitive machines then from the newly fashioned computers now. Nevertheless, the parallels are real and provoking.

The computer today occupies a central position in American life and makes strong claims to even greater

"The House is on Fire" —

THE PROFESSION OF INFORMATION ENGINEER AND HIS BRIDGES TO SOCIETY

Computers and Automation believes that the profession of information engineer includes not only competence in handling information using computers and other means, but also a broad responsibility, in a professional and engineering sense, for:

- The reliability and social significance of pertinent input data;
- The social value of the output results.

In the same way, a bridge engineer takes a professional responsibility for the reliability and significance of the data he uses, and the safety and efficiency of the bridge he builds, for human beings to risk their lives on.

Accordingly, this department of *Computers and Automation* will publish from time to time articles and other information related to socially useful input and output of data systems in a broad sense. To this end we shall seek to publish here what is unsettling, disturbing, critical — but productive of thought and an improved and safer "house" for all humanity, an earth in which our children and later generations may have a future, instead of facing extinction.

The professional information engineer needs to relate his engineering to the most important and most serious problems in the world today: war, nuclear weapons, pollution, the population explosion, and many more.

centrality in the coming decades. We now have about 90,000 machines installed or working for business, government, science, making war, reporting fires, catching criminals and expediting gambling ventures. These represent an approximate investment of $10 billion not counting the currently elitist work force that tend them and the direct spin-off congeries that are closely dependent on their constant operations.

Impact

Even if we continue to squander this burgeoning resource on useless and dangerous operations, its impact on individual, corporate and intellectual life in the U.S. will be enormous. Unlike the machines of the early 1800's, no "dark, satanic mills" have sprung up to feed its insatiable demands; a few glimpses inside our research installations prove quite the contrary. Nor will computer technology organize and set into motion the warring economic classes that accompanied the industrial revolution. Clearly, it is not that kind of revolutionary agent.

It, nevertheless, presages fundamental changes and adjustments. For one thing, its data manipulation and problem solving capabilities have already and will continue to induce far reaching adjustments in management structure and policy at almost all levels in government, industry and university life. Its range, depth, flexibility and (hopefully) ability to explore and clarify program options will probably call into being new bureaucracies staffed by people with new and generally powerful ties to the decision makers. The "deciders" themselves might be somewhat transformed in the process and, if they cannot make other accommodations, would conceivably drop themselves out.

Computer technology is also inevitably re-shaping the less esoteric patterns of our lives and the structures that fashion them. Without indulging in the "gee whiz" technology that accurately and foolishly talks about microseconds of output, it is possible to see what lies ahead. For example, the individual's daily, monthly and yearly accounts with local and national government and with the retail and personal services he utilizes, is undergoing significant shifts. As a consumer, his accounts with everyone who has a claim on them is moving into a new pattern. In the process, our money economy may, at least, partially disappear or become unrecognizably changed.

We may also expect a vastly different kind of educational process to surface as television is linked to home computers in a form of "network" instruction especially for younger children. In these and other areas of human interaction, the computer and its applications will induce far reaching changes in American life and will probably do so with a minimum of institutional intervention.

A Reordering of Priorities

For a nation that has re-discovered its vulnerable poor, aged, ill and unprotected people, these kinds of present and contemplated uses are not enough. However, to move the capabilities of the computer squarely into the urban social arena, all kinds of "interventions" will be necessary, first and foremost of which is a fundamental reappraisal of our international policies and priorities. This would be a transformation of the first magnitude and one should not minimize the political, military and bureaucratic obduracy that must be overcome for this shift to take place. With or without Vietnam, the cart cannot come before the horse, and it would be idle to expect a significant mobilization of research and technology into these fields without a major reordering of national and worldwide programs and priorities.

"To move the capabilities of the computer squarely into the urban social arena, all kinds of 'interventions' will be necessary, first and foremost of which is a fundamental reappraisal of our international policies and priorities."

It is indeed regrettable that during the past two decades, the most sophisticated machines we possess have been, for a while, working almost exclusively and incessantly on hundreds, perhaps thousands of military applications ranging from simple weapons inventory to the games that men play around the national survival possibilities in the event of a nuclear holocaust. More lately, computer applications to space technology and communications have begun to preempt these funds and resources. Even when the Federal government began to open a trickle of research funds to the urban areas in the early and mid 1950's, the programs to enlist the greatest computer support were for origin and destination studies and traffic computations. These transportation and related land use explorations still buy a very substantial portion of all machine use in our states, cities and metropolitan areas.

A Very Deep Gap

The gap between what the computer might contribute towards altering our social environment and what it actually has been doing is very deep indeed. This does not mean that our Federal agencies are blind to its possibilities. The computerized Censuses of 1960 and 1970, the Social Security System, the Internal Revenue Service and a number of other formidable inventories are now locked into the computer and ready for use. But nothing approaching the imaginative interplay between man and machine that has been possible in military and space research has begun to unfold in the areas of social and urban concern. Slowly, and at a pace that suggests forever, our machine technology has barely been considered for the evaluation and choice of social programs or for the coordination and delivery of health and welfare services.

But even if our sense of priorities were to shift appreciably, we would nevertheless be faced with important obstacles. A very pervasive lack of data that measures or characterizes the conditions of the ill, aged, low income and other deprived groups seriously inhibits the initiation of machine use towards programs in these areas. Furthermore, the traditional orientation of cities and municipalities around extremely narrow housekeeping functions has accumulated for them the kind of data inventories that describe buildings, structures, land parcels, tax records, police and fire records and other information, all basically object rather than people focused. Computer applications, even in the largest cities, are more at home with these inventories, and what little success has been achieved in metropolitan problem solving and policy or program research has been with these "hard" data and subject areas. The generally uncertain or weak state of the art seems to be reinforcing the desire of urban management specialists to avoid the human resources complexities of their cities and ghettos. Unfortunately, new H.U.D. aid programs for computerized municipal information systems are not likely to encourage experimentation in anything but the "safe" areas.

Is the Computer Necessary?

We should reaffirm at this point that the computer will remain, for some time to come, a device used by mortals to aid in problem solving and process control. It would be patent nonsense to assume that its use and application could lead to push button solutions to the social tinder boxes that have so explosively disrupted our urban lives in the past decade. We need merely to examine the elaborate and finely tooled economic defense mechanisms that were incorporated into our economy in the 1930's, almost entirely without computer aid, to understand this fact. For that matter, the entire social, financial and economic reformation of the New Deal in that decade unfolded without "computer support". Clearly, the alchemy of social change (progress?) needs more than merely the blessings of the computer industry.

Nevertheless, when we look back we are somewhat amazed that it happened the way it did. Are we likely to duplicate this bravura performance in the coming decades? Is our structure too complicated to move ahead without the computer? The only thing we can be sure of is that the major style with which we approach complex social issues in the 1970's will be different from the preceding decades. We have, it seems, amply demonstrated our increasing attachment to the unique capabilities of the computer, even though its performance in both the "hard" and "soft" areas of urban policy and program research has been very lean indeed. So be it then. If we must live with the device, let's define the pre-conditions that will allow it to perform for the weakest groups in our midst.

Three Levels of Penetration

By now, we ought to expect substantial computer assistance in three levels of penetration, namely: data management and organization; problem solving; and process control. Stated in the context of a substantive social objective such as the need for vastly improved health services, we may translate these terms as follows:

Data management and organization: A body of knowledge identifying the health status and characteristics of the population.

Problem solving: The anticipation of health needs and facilities for the future; the impact of current and proposed programs on the client population and on related social welfare programs; the measurement of effectiveness of existing and proposed health programs; the choice of "best" or maximum benefit programs

Process control and delivery of services: Systems for the delivery of preventive, diagnostic and treatment assistance to all segments of the population; formulation of community health information and referral systems; data networks among hospitals, laboratories and other intake centers.

"Clearly, the alchemy of social change (progress?) needs more than merely the blessings of the computer industry."

It need not be difficult to define these levels of computer application to other than health problems and solutions. For example, public assistance and all the interrelated aspects of crime (detection, detention, community-police relations and possibly prevention) could be susceptible to this tripartite approach. As a matter of fact, progress in each of the stages would add measurably to our ability to probe the area of concern and then deliver the program or service associated with it. While research with computers may be and frequently is undertaken separately at each level indicated above, this need not be the only scheme. Indeed, for many problems that are more than logistic in nature, it would seem that all three stages are conceptually and in many instances sequentially related.

Our Knowledge Vacuum

Let us assume that we want to run our machines full tilt ahead, i.e. we will enlist the maximum support of the computer in the social arena and seek to exploit its full potentialities in data management and organization, problem solving and process control. Yet, by some continuing myopic tropism, we have shut ourselves off from the inventory and intelligence that makes much of this possible. In "Towards a Social Report" of the Department of Health, Education and Welfare, we are made painfully aware of the

"A general expansion of statistical efforts is not enough; we need to define new ideas about what kinds of data and information ought to be collected."

fact that "the nation has no comprehensive set of statistics reflecting social progress or retrogression. There is no government procedure for stock taking of the social health of the nation." Yet, if the machine can do nothing else, it is uniquely qualified to accept, store, organize and manipulate information.[1]

Our knowledge vacuum is truly an anomalous situation. For it is with us despite the fact (and sometimes even because of the fact) that the federal, state and local governments have amassed and computerized a vast body of statistical knowledge. Paradoxically, while we are inundated in a sea of paper, ink and print-outs, we cannot measure the human toll of illness, the pollution of the environment, the quality of our education and the nature of the alienation expressed in burning and looting in the ghetto, strife on the campus and crime in the city streets. This paradox suggests that a general expansion of statistical efforts is not enough, but that we need to define new ideas about what kinds of data and information ought to be collected.

This point was graphically made in recent testimony before the Senate Labor Committee by Joseph A. Califano, formerly President Johnson's chief advisor for domestic affairs. He commented on the fact that it took the Administration nearly two years merely to find out who were the 7 million people then receiving about $4 billion annually in welfare payments. No real study of welfare recipients, at least nationally, had ever been made. Similarly, after the eruption at Watts in 1965, a Federal team of investigators could not develop a coherent picture of life and its conditions there based on the data available on the community and its people.

At the national and local levels, the socially based information necessary for understanding, evaluation and decision is lacking, and this gap all too often paralyzes action or prevents the most useful and appropriate programs from being defined. As stated by Mr. Califano:

> The disturbing truth is that the basis of recommendations by the American Cabinet officer on whether to begin, eliminate or expand vast social programs more nearly resembles the intuitive judgment of a benevolent tribal chief in remote Africa than the elaborate, sophisticated data with which the Secretary of Defense supports a major new weapons system.

Generating Social Statistics

Programs to generate social statistics or indicators have been and continue to be endemic in Washington, but no serious assessment of their success, partial success or failure is ever made. For example, a tentative first step towards the organization of a network of State Centers for Health Statistics was initiated about a year and a half ago. At that time, the National Center for Health Statistics of the Department of Health, Education and Welfare proposed a very substantial intensification of efforts to obtain coordinated and reliable information on health conditions, services and resources in each state. Recognizing the fact that the planning, evaluation and delivery of programs and services require a major qualitative and quantitative addition to our present meager intelligence, the National Center drew up a blue print (the more acceptable term is guide) for the organization, data coverage and administration of the proposed State Centers. Like many other forays that sought to extend our grasp of social data, this may be a mere pious wish if the states are not geared financially, ideologically and operationally to undertake the task.

A similar program, but with much more administrative underpinning is now proceeding in another segment of the far flung Department of H.E.W. This demonstration program, funded by the Federal and State governments, seeks to develop a computer based system that will integrate the often conflicting and even contradictory public assistance programs and data efforts of all the states. Again, if this program moves in the direction of a nationwide expansion of basic information about the environment of poverty (and this seems likely), it would represent a significant advance in the use of computers to manage and prepare a basic national inventory.

Prospects for Problem Solving

When we consider the prospects of machine use for problem solving, we move into a somewhat different realm. In an operational sense, data organization can be achieved with relatively little human intervention; i.e., the computer needs somewhat simple instructions to organize, process and "deliver" large and complex inventories. This is generally not true when we expect it to aid in problem solving such as projections, cost effectiveness studies and other kinds of program evaluations. For this purpose, the man and machine relationships must be closer and the "instructions" are of a considerably higher order. Consequently, a shift in emphasis away from the computer and towards the state of the art (the ability of the researcher to formulate the problems and derive the solutions) becomes important.

"At the level of problem solving, we have to inquire into the limits and possibilities of man-machine effectiveness, rather than the role of the computer alone."

At the level of problem solving, we have to assess the responsibility somewhat differently than we have done heretofore and inquire into the limits and possibilities of man-machine effectiveness rather than the role of the computer alone.

The Linking of Knowledge and Policy

In a recent article in *The New York Times,* Daniel Moynihan wrote that: "The attempted solution of a (political) problem leads to the creation of a knowledge problem

[1]We might turn this socio-technological lag to our benefit by playing the game called "How to Use the Machine by Not Using It." I am suggesting that we ought to keep accumulating machine capacity, not use it for a period of time, let our deep fear of "unused capacity" take hold and then proceed to generate the finest set of social indicators we are capable of assembling. This would not displease the computer manufacturers and may hasten a socially desirable goal.

. . . but the linkage of knowledge with policy is an extraordinarily complex process central to modern society."

This linkage has been even more baffling and elusive in the areas of health, education, crime and welfare than in the harder disciplines of economics and transportation. The avenues of research and computer applications during the past several years have veered towards the planning, programming and budgeting process. They center around the need to understand the impact of existing social programs on the populations they profess to serve and on the ability to measure the comparative effectiveness of these programs. Yet the ability to first conceptualize and then quantify program costs and benefits, so that policy options become available above the level of a mere hunch, lies at the core of the man-machine interplay required at the problem solving level.

Very little has been attempted thus far either in data organization for the broad study of social characteristics or in the more focused schemes for program evaluations. It is, therefore, of some value to look at what might be considered the more significant recent explorations at the state and national levels and then assess the degree to which these attempts have yielded satisfactory results or even hold promise of doing so.

The New York Study

New York State has approached what it calls a central social environment study very gingerly. It nevertheless hopes, during the next few years, to mount a computer based research program that will make it possible to develop an adequate social data base for the state and its communities. From this vantage point, it looks forward to delineating the social characteristics of its cities and the changes in the conditions of its population, and then surfacing such information about the "sub-groups" that will portray their interactions with each other and with the institutions that affect them. Much of the thrust of this program is towards the development of a body of social indicators that will identify the health, housing, education, training and welfare status of the population. Together with its objective to measure and monitor critical shifts in social composition, the state's efforts might yield a significant addition to the management, organization and analysis of social information. If it were to accomplish this, it would fill some of the major data gaps that obscure and inhibit subsequent action for the programming and delivery of social services.

But the New York study proposes to move somewhat beyond that point and will address itself specifically to tracing and measuring the effects of government programs on separate and distinct groups such as the unskilled; the educational progress of children from poor families; welfare recipients and delinquent youth. These explorations should encounter the rough terrain that Mr. Moynihan has termed the linking of policy and knowledge. Much depends on the direction in which the impact analysis moves. If the state is willing to relate the effects of current and proposed programs to some definable standards or quality of health, independence and well being, it will be treading new ground albeit conceptually firm enough. However, if the emphasis is on seeking the most effective patterns of state resource allocations among health, welfare, housing and training functions, it will quickly come face to face with the severe limitations that have begun to surface in the planning, programming, budgeting process.

For what seems eminently feasible in the application of computer technology to the management of social data and the analysis of the urban environment with that information, becomes beset with major pitfalls when men and machines are asked to solve problems of program effectiveness for the purpose of choosing among the most useful course of action in and among health, welfare, education and similar programs.

Program Evaluation

Almost five years have passed since Pres. Johnson directed that program evaluation that had shown promising results in the Defense Department be instituted in all other executive agencies. The Department of Health, Education and Welfare responded with a modest but concentrated attempt to evaluate the costs and benefits of achieving defined social objectives. It soon became apparent and has since percolated down to all levels of government that operations researchers, with or without computers, are not about to take over the decision-making functions or replace the political processes and value judgments that constitute the fabric within which they are made. Nevertheless, some significant conclusions about the consequences of choices emerged from these studies.

Health, Education and Welfare examined four program areas to test impacts and evaluations. These included selected health programs, i.e., cancer, arthritis, syphilis, tuberculosis and auto injury prevention; human investment programs such as vocational rehabilitation, adult education and Title I of the Elementary and Secondary Education Act; programs for improving maternal and child health care; and options for income maintenance such as increasing Social Security, expanding welfare programs or a negative income tax.

Perhaps because the health data were more available and usable or because the researchers were willing to move further along with it in this area than in the others, it was possible to ultimately measure the effectiveness of 22 program alternatives in the five major health areas mentioned above. For each of the alternatives, the following estimates were made:

Total program costs
Estimated program savings (i.e., dollars that would have been spent on all forms of medical care plus earnings saved because the patient did not die or was not incapacitated due to illness or injury)
The ratio of costs to savings (benefit-cost ratio)
Number of deaths averted
Cost per death averted

As one would expect, the lack of relevant data in all four areas (health, human investment, child care and income maintenance) was monumental. We quote from a principal participant in these studies:

> Those who picture Washington as one mass of files and computers containing more information than they would like will be comforted by the experiences of program-planners in attempting to evaluate ongoing programs. Whatever the files and computers do contain, there is precious little in them about how many and whom the programs are reaching, and

whether they are doing what they are supposed to do. If the purpose of an adult basic education program is to teach people how to read and write, the Office of Education might reasonably be expected to know how many people thereby actually learned how to read and write but it does not . . . The Public Health Service might be expected to know whether its various health services are in fact making people healthier, but it does not. The study of disease control was to have encompassed more diseases, but so little was known about the effective treatment of alcoholism and heart disease that these components had to be dropped. Those working on the income maintenance study found that the Welfare Administration could not tell them very much about the public assistance caseload – who was on welfare, where did they come from, why were they on it, what they needed in order to get off."[2]

Defining Benefits

But lack of data was just one impediment. How to define and measure benefits posed conceptual problems that were not easily resolved then and are major stumbling blocks today. For example, which of the following benefits should be measured to evaluate the effectiveness of a single educational program: increased reading comprehension, growth in confidence, decline in school dropouts, increased movement on to college or higher earnings? And if measurements within a single program were not sufficiently opaque, what then of the possibilities of comparing benefits among two or more different programs where improvements accrue to different individuals or groups in the population? How does one assign "weights" to improvements that have varying impacts on the lives of the recipients? Especially in the social programs, little progress has been made to identify, measure and weigh the costs and benefits.

"Thus far, the assistance of the computer has not significantly improved the program planners' ability to make choices among health, education and welfare programs."

Thus far, the assistance of the computer has not significantly improved the program planners' ability to make choices among health, education and welfare programs. Such "big" choices are not yet possible even though the H.E.W. studies did indicate that existing or proposed programs with common objectives within a single area such as health or income maintenance could be compared with each other in a systematic and measurable fashion. Even these narrower choices are exceedingly difficult to derive and there remains, at this time, a frontier field that has done little more than focus attention on the objectives of government programs and the range of choices in an explicit way.

[2] "H.E.W. Grapples with PPBS", Elizabeth B. Drew, The Public Interest, Summer 1967

Control of Systems

The third level of computer application deals with the control of systems or processes. Both in private and public enterprises, inventory control and payroll disbursement were among the first kind of processes to be handled by the computer. But new applications became more appropriate in the light of the increasing complexity of the urban structure, the size of the population, and the immense number of transactions and interactions between people and institutions. A few of the larger cities and even some of the middle sized ones are now beginning to direct their computer capabilities to the control of urban processes and to the improvement and rationalization of the services they perform. While none of the "global" strategies necessary for program evaluations are needed here, it is at this level of machine application that something directly and immediately affecting the lives of people could be achieved.

Municipal Operations

Unfortunately, the use of computer technology is not likely to be oriented around the urban systems for delivering health, legal, welfare and similar aid to the people who need them most. As we have indicated earlier, the accumulated data inventories of cities and, even more importantly, their basic frame of reference is geared towards the most efficient use of buildings, streets, fire fighting equipment and traffic movements. More recently, there has been added an intense pre-occupation with the instantaneous reporting of criminal and driving violations so that every arm of the law becomes part of a network of intelligence from the Governor of the state down to the local dog-catcher.

This strong partiality for the physical life and operations of the city was reflected in the subject matter that occupied several days of the 1969 Annual Symposium on the Application of Computers to Urban Society. On this occasion, some of the major current programs in New York and elsewhere were discussed. It was revealing to learn that they dealt with:

- An Application of Incidence Analysis to the Deployment of Fire Companies in New York City
- An Information System for Solid Waste Operations – Wichita Falls, Texas
- Systems Analysis of New York City's Primary Water Distribution Network
- Los Angeles Police Department Operations Simulation
- A Dynamic Land Use Allocation Model
- Creation of a Geographic Information System – New York City
- Computerized Community Shelter Plan for New York City
- Computers and Public Transportation – M.I.T.
- Determining Air Pollution Emissions from Transportation Systems

Relevance, like much else, is in the eyes of the beholder, but it is evident that computer applications to urban life is defined very strangely indeed. It does suggest that the hardware and software fraternity and the public administrators who not only bless these operations but buy and install them as well, really want, above all else, a set of smoothly and efficiently run municipal operations. Perhaps we ought not to look a gift horse in the mouth. Perhaps well placed fire stations, effective police forces and computerized air raid shelters are what we have all been breathlessly waiting for in the past decade, especially since Watts, Newark, Washington, D.C. and others. If not, we should feel troubled by this turn of events since much of the logic and thrust of these kinds of applications is emanating from the former aerospace and military software specialists, many of whom are now "between jobs" and are rapidly becoming "partners" with the urban specialists in defining how the computers will be used for the control and delivery of urban services.

The City of Los Angeles recently hired the Technical Services Corporation, described by its president as a "hybrid of the Institute for Defense Analysis and the Aerospace Corporation."[3] In 1968, the TSC analyzed the city's need for an effective command-control system to permit unified direction and control during major civil disasters such as floods, earthquakes or enemy attacks. With all cities, including Los Angeles, under great pressure to double their police manpower, the Corporation prepared estimates showing that it would be much cheaper to invest $100 million for the development and installation of a computer driven police control system. Urban renewal came to be known as "negro removal" and we wonder what this will be called if it ever becomes visible.

"To any sentient person who has lived and observed the past 10 years, smoothly operating data, flowing within and among city departments of housing, police, revenue, traffic and taxation, cannot occupy a high priority in the amalgam that continues to make a shambles of our urban fabric."

"Computerizing" Six Pilot Cities

It therefore looks as though this kind of bias is going to be built into the way we use and apply the computer to the control and delivery of "urban systems." A number of federal agencies have recently combined to initiate and fund a series of demonstration projects in six cities with populations under half a million. The purpose of the projects is to computerize all or the major segments of their operating records, thereby allowing for much more interchangeability and flexibility of use among these records. In two of the six pilot cities, the data of all municipal functions will be mechanized. In the other four, electronic processing of data will be undertaken in one of the following areas:
public safety, municipal financial records, physical and economic development, and human resources. As one commentator from General Electric's Re-Entry System, Missile and Space Division said: "We are going to computerize the hell out of all this data." Certainly a laudable objective if something more than efficiency or even dollar savings in the management of city processes results. To any sentient person who has lived and observed the past 10 years, smoothly operating data flows within and among city departments of housing, police, revenue, traffic and taxation cannot occupy a high priority in the amalgam that continues to make a shambles of our urban fabric.

[3]Selected papers from the ASPO National Planning Conference, Cincinnati April 19-24, 1969

With the possible exception of the area of human resources, this national demonstration program will strongly encourage the manipulation of the existing urban inventories. But if municipal officers would dare look forward to using the computer for processes or systems that can deliver community or diagnostic health services to the ill or public assistance to the poor or legal counselling and referral service for those unable to pay, new avenues might be opened to improving modes of urban livability. Yet, at the level of process control, the computer can be directed to work in man's favor if the arid combination of urban specialists and corporate systems analysts are not allowed to dominate the disposition of computer capabilities.

Potential Applications

Let us look at some specific applications in the delivery of health services that would illustrate the direction in which we could move. For example, why not establish and expand a continuous monitoring of critical hospital patients to spot potentially serious conditions? Or the use of computers by physicians to relate symptoms to diagnoses? Beyond that, a host of community health services might be fashioned and strengthened if computer applications were approached imaginatively. We certainly possess the technological capability to establish community health information and referral centers, especially in the high density areas of our major cities. Moreover, is it too utopian to consider a centralized file of patient illnesses reported from all sources and the structuring of this file on a city and regional basis via computer networks?

Moreover, law enforcement and criminal justice need not be supported solely by a mechanized super-sleuth system, especially if we are concerned with prevention and rehabilitation as well as the efficient detection of crime and criminals. Could we use the computer in another form of communication network – i.e., tying together the information flows among police records, courts, prisons and parole systems? Probably so, and very possibly for the benefit of those enmeshed in its webs. It seems quite likely that when the underlying, violence-prone situations are examined outside the context of quick and efficient arrest possibilities, many extensions of the computer are possible. In that kind of approach, the research that is now slowly being directed towards understanding the tension building features in cities, neighborhoods and even blocks will suggest legitimate and non-punitive roles for the use of the computer. We would, indeed, be bankrupt of wit, intelligence and compassion if the command-control networks emerge as the sole or principal expression of the relationship between the police and the community.

We therefore conclude with a number of observations surrounded by qualifying phrases. At the level of data organization and management, the computer would perform admirably in the areas of health, public assistance and other social services if knowledge about our status, conditions and characteristics, nationally and locally, were available for use and application. Program evaluations and other studies that would clarify policy options for administrators need both the basic operations data and the yet unraveled ability to compare and quantify the results or impacts of these programs. But to put the computer actively to work for the control and delivery of services for the disadvantaged requires an outlook that stretches beyond the needs for efficient municipal operations. □

EDUCATIONAL TECHNOLOGY

EDUCATIONAL Technology, which includes such components as teaching machines, programmed instruction, classroom film and television, language laboratories and computer terminals, is the basis for a new and growing industry. In 1969, sales of educational "hardware" such as audio-visual equipment and teaching machines were estimated at $250 million (up 242 percent since 1965). Sales of "software" such as films, records and programs were estimated at $300 million (up 525 percent since 1965). Industrial training schools, adult education centers, proprietary schools and the like spent another $250 million for educational technology.

Several factors fostered the beginnings of the industry — training of GI's in World War II with teaching devices, experiments with teaching machines by some behavioral scientists, and the Sputnik crisis that sparked experimentation in new approaches and techniques for American education. Educational technology took hold as a self-sustaining industry in the early 1960's, stimulated by support from Federal programs. Diverse industries combined talents to develop and sell various teaching devices, systems, and services. Some of these large ventures entering the market did not meet expectations, however, and the companies have since reduced the scope of their involvement.

Language laboratories, television systems, projectors, and record players are the most enduring equipment categories. Teaching machines applying principles of programmed learning sparked early interest that later waned. Such equipment supplements but does not replace teachers; adequate programming for teaching machines was not available; and furthermore, public educational institutions were slow to accommodate or even try the newer materials.

Growing confidence in educational technology and dissatisfaction with the results of traditional instructional methods has led to a rash of proposals for the purchase of education on a contractor accountability basis. One such "performance contract" produced good results but also some controversy over testing procedures. Meanwhile, interest has grown rapidly, with the Office of Economic Opportunity supporting similar contracts with six commercial organizations to teach more than 10,000 public school students in 18 school systems across the country beginning this September. An evaluation by OEC of this major step in education will deserve close attention from companies with an interest in the education market. If results are satisfactory, performance contracting will undoubtedly grow and along with it the market for the materials and equipment used by the contractors. Even the present level of activity may reduce the time lag between research and implementation, and increase public awareness of new instructional techniques. Among the possible consequences are a greatly increased use of instructional devices in schools and homes, and a major change in the structure of the education market.

Individual learning

Several firms are franchising learning centers where students may come to study new subjects or upgrade others by interacting with programmed instructional machines. At least one firm charges the student a flat fee for achievement (upon successful completion of a program) rather than for the time spent using the firm's facilities. Franchised learning centers usually offer diagnostic and consulting services as well as courses from the preschool to the college level.

Many educational technologists believe the big market for their wares is the home. Self-paced learning systems will be offered for mid-career retraining, leisure time fulfillment, child development, and job- and classroom-related studies. Simplified devices such as audio cassettes, low-cost film projectors, cartridge playback units for the TV set, and creative games and toys seem to be most promising.

Communications companies are also looking to the home market. One telephone company is experimenting with dial-up knowledge centers that offer selections from famous speeches, science, poetry, foreign languages, and law. Cable television companies envision special-interest community educational programming. Time-shared computer utilities even talk of home computer terminals that carry on dialogues with the student.

One firm has developed a child's story-telling machine that combines records with a filmstrip viewer. Sales through department stores have exceeded $1 million annually, and another version of the machine has been developed for the school market. Still another firm is preparing a complete college education home-study course which will make heavy use of educational devices. A company that operates preschool centers sells learning devices, toys, and programs to parents, recommending suitable purchases on the basis of observation of the child's learning progress. Limiting the use of all new devices, however, is a continuing dearth of films, records, programs, and other "software" for the equipment to present to students.

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OPTICAL CHARACTER RECOGNITION (OCR)

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"While it is technically feasible, it is not economically justifiable for any one reading system to handle all ranges of input images and document variations."

There is available today a wide range of Optical Character Recognition (OCR) machines. They are being used for a wide variety of applications. Let us first look at some of the classes and characteristics of these systems.

Classification by Image Read

Optical scanning systems can be categorized into classes according to the characteristics of the images which they read. Ranging from the least sophisticated to the most sophisticated they are:

1. Mark Readers
2. Single font readers – Those which can read a single style of type only. This class can be subdivided into:
   (a) Readers with limited character sets, e.g. numerics only, or upper case only.
   (b) Readers which read upper case, lower case and symbols.
3. Multi-Font Readers – This class can read two or more different type styles, and can be:
   (a) Readers which read fixed horizontal pitch fonts, including upper and lower case alphabetics and symbols.
   (b) Readers which read variable horizontal pitch (typeset), upper and lower case alphabetics and symbols.
4. Hand Print Readers

The above classes of readers are based on the character images which they will scan and convert to computer language. The more advanced systems in use combine two or more of the above image recognition capabilities.

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Mr. Frank has lectured before many business and government groups on the subject of OCR and its current and future role in information handling. He holds an M.S.E.E. and a B.S.E.E. from the Drexel Institute of Technology.

Classification by Size of Document Read

Reading systems can also be divided according to the physical dimensions of the documents they will process. For instance:

1. Journal Tape Readers
2. Small Document Readers – Generally, this class of reader scans documents of tab card size or smaller. This class of system may include turn-around documents, which are prepared on a computer's high speed printer for later re-entry to the computer system; e.g. utility bills.
3. Page Reading Systems – The minimum dimensions of documents for this class of system are usually 6″ wide by 8″ long to a maximum dimension of 12″ wide by 14″ long.

Combining Images and Document Classes

While it is technically feasible, it is not economically justifiable for any one reading system to handle all ranges of input images and document variations. Although any combination of the images could be utilized with any of the document classifications, in practice certain combinations of images and document size classes are logically utilized in sets. The following examples are practical combinations of images and document classes.

Mark Readers

Mark readers process tab card size or page size documents. The page reader size is most commonly used in test scoring, inventory control, and census applications where the range of input is limited.

Mark reading capability is also sometimes used in conjunction with more sophisticated character reading systems.

Journal Tape Readers

A journal tape reader generally has its input printed via a cash register or an adding machine. The character set includes fixed pitch numerics, very limited upper case alphabetics, and symbols.

Small Document Readers

One class of single (usually stylized) font readers for small documents has application for reading turn-around documents, such as utility bills aand credit card vouchers. A second class of reader for small documents is one with a multi-font capability.

In a third class of small document readers, the output document is physically sorted. This is a requirement for billing such as that done by a country club. This class of small document reader generally has multi-font capability.

Single-Font Page Readers

Single-font page readers combine single (usually stylized) font input images with page size input material. This type of system may be used to read information into data processing systems and typesetting systems. Page readers limited to single font recognition are marketed by several companies. The economical utilization of this class of reader can be enhanced by the addition of mark reading and handprint.

Multi-Font Page Readers

Multi-font page readers provide automation of source data for a wide range of data processing applications and typesetting (graphic arts) applications. Multifont page reading systems are marketed commercially.

This class of system requires a more sophisticated recognition capability. This capability, when used to process wide ranges of print quality for field generated documents, provides the technical base for source data automation. In graphic arts applications the ability to read upper and lower case alphabetics and punctuation is a general requirement.

Special Purpose Systems

In addition to the above classes of systems, other OCR products are available for special purpose applications. One manufacturer produces the Zip Code Readers for the U.S. Post Office Department. Another manufacturer builds a multi-font reading system which is limited to reading 16mm or 35mm microfilm. This type system transfers the paper handling problem from the OCR reader to the microfilming device. Another manufacturer offers through their Service Centers a remote scanning terminal. In this system the remote terminal is a facsimile scanner that transmits the converted image on telephone lines to a central recognition system that is shared with other users.

At the present time several new companies are emerging in the OCR field offering systems varying from mark readers to multi-font page reading systems.

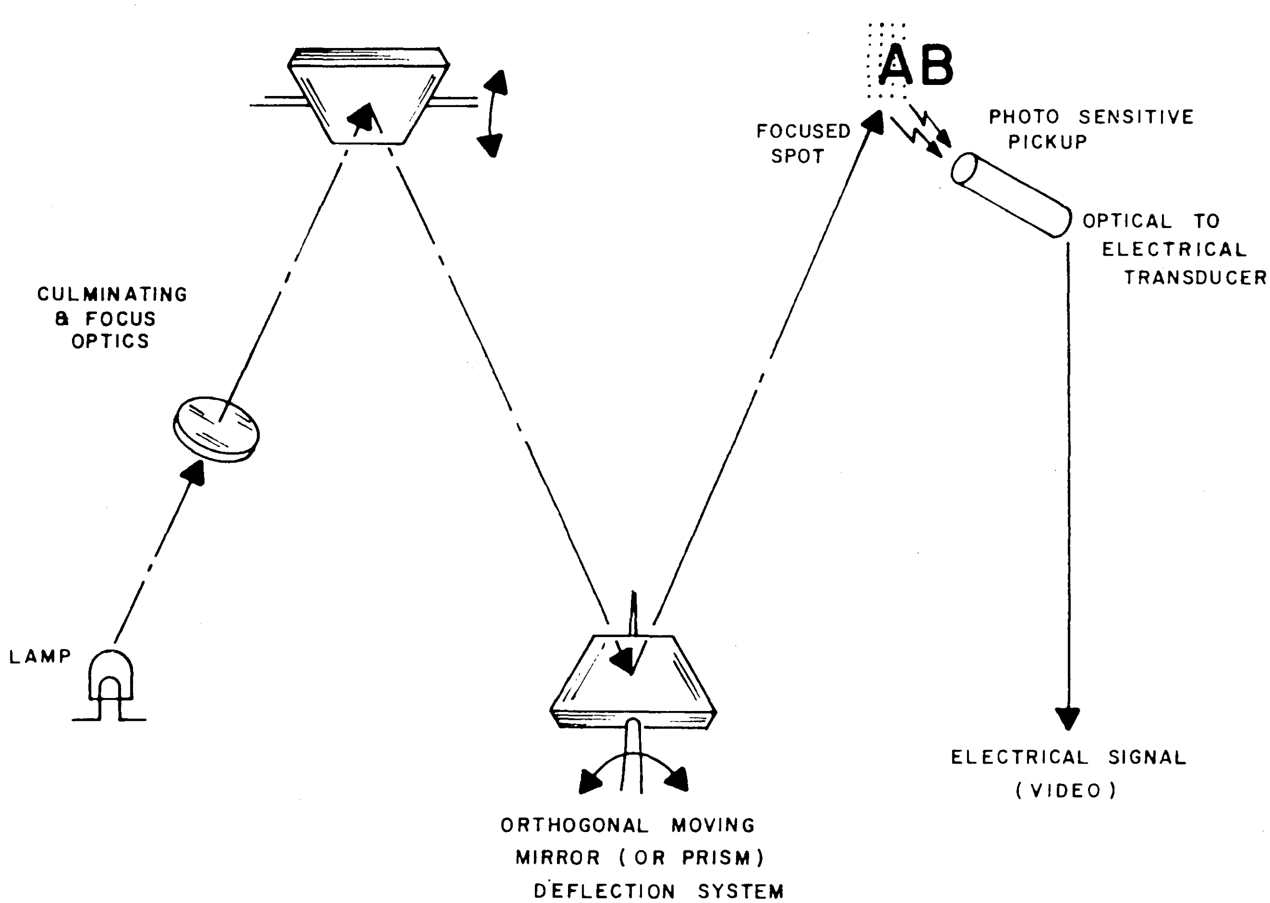

Figure 1
Mechanical Scanning – Image Stationary

Remote Systems

The use and application of a remote OCR system in which a facsimile image is transmitted requires trade-offs in specifications and transmission line costs, because of the tremendous amount of information included in a facsimile image. The future development of this class of OCR reader will develop as a greater portion of the character recognition function is implemented at the remote terminal. This reduces the amount of information which must be transmitted via a communication link.

Scanning Techniques

The technique used to scan and change an image from an optical form to an electrical form may be (1) mechanical; (2) electronic; or (3) a hybrid system of both mechanical and electronic.

Mechanical Scanning

The oldest form of scanning is mechanical. There are two types of mechanical scanning. In the first, the image is stationary and the scanning spots are caused to move over the image. In the second, the movement of the image itself produces at least one axis of scanning. An example of these is illustrated below.

Figure 1 shows two orthogonal mirror systems which give the two axes of scanning. In moving from character to character in this type of system, the distance from the image to the light source changes across a line of characters. Often in scanning systems which use this basic technique, the document is held in a concave platen to equalize this distance. The simple fρrm of this type of scanning device utilizes a focused light source to image a spot of light on the character. An array of photo tubes are used to pick up the reference light and make white, black, or gray decisions. In order to move from line to line, the paper is indexed after reading a line of information.

This type of mechanical scanner is a simpler system than an electronic scanner system, but it is also less flexible. For example, in this class of scanner it is difficult to change normalization, although it could be done with a zoom lens. The rescanning of information can only be accomplished at the expense of the scan rate, because of the mechanical motion required.

Rescan Capability

Rescan capability requires sophistication and care in the mechanical mechanism associated with it, and in its optical system. The optical system is capable of high resolution. To attain this it may be more desirable to use a small industrial laser instead of a more conventional light source. The scanning is basically mechanical and requires a high precision mechanism, carefully designed. The precision required in the mechanical system increases the cost of production and operational maintenance. An advantage of this class of scanner is that, with an appropriate selection of light source and optical filters, almost any non-read color can be utilized.

"Rescan capability requires sophistication and care in the mechanical mechanism associated with it, and in its optical system."

Light Source

Mechanical scanners can be built using a defocused but uniform light source which derives its point resolution from a Nipkow disc in front of the photo-electric transducer. This type of scanner is best utilized for low resolution applications which tend to be centered around a single-font reader which is highly stylized and controlled.

Another commonly used type of mechanical scanner employs a slit light source illuminating a character and moving across the character with a slit image on a vertical array of photocells. A horizontal movement of this light source can be implemented by a moving mirror or rotating drum. In this form all of the limitations of the previously described scanning system apply. They are:

1. Limitation on selective rescan of characters;
2. Normalization of characters;
3. The ability to change threshold levels; and
4. Resolution.

The technique utilized to simplify the two previously described scanning systems involves the rotation of the document past the light source, thereby providing one direction of scan travel (Figure 2). This is generally accomplished by placing the document on a rotating drum. With the rotation of the drum providing one direction of scan, the movement from line to line is provided by having the drum translate axially along the rotation axis.

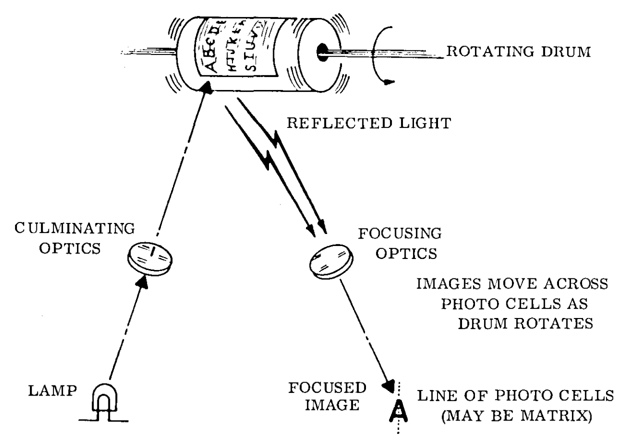

Figure 2
Mechanical Scanning – Image Moving

Imaging Characters on a Matrix of Photocells

Another method which minimizes mechanical scanning requirements, images an entire character on a matrix of photocells. The movement from character to character may be derived through the use of a mirror, or by placing the document on a rotating drum and deriving the character-to-character movement through the rotation of the drum and the line-to-line movement through the axial translation of the drum on a helix.

One currently available page reader system utilizes the latter concept. It compensates for the axial movement of the drum during scanning by an oscillating mirror synchronized to the drum movement. This class of scanner has the following limitations in practical applications:

1. Limited resolution.
2. Highly culminated light sources are required.

"In the earliest recognition systems, virtually perfect quality material had to be presented to the recognition unit in order to provide reasonable reading accuracy."

3. Renormalization is difficult and expensive electronically, and slow mechanically, through the use of zoom lens.
4. It is difficult to adjust and to compensate for threshold variations. Comparison of each element of the matrix of photocells is required.
5. Character rescan is not practical.
6. The rescanning of lines is slow because of the mechanical limitations of the system.

In applications of single line readers, very often the drum portion of the deflection system can be provided by a uniform linear translation of the document during scanning.

Normalization

By presenting a recognition system with normalized images, the number of variables that must be compensated for within the recognition unit is greatly reduced. This permits the recognition unit to handle a wider range of print quality, and the scanning system can operate with higher accuracy rates.

"By presenting a recognition system with normalized images, the number of variables that must be compensated for within the recognition unit is greatly reduced."

The process of normalization, as generally used in OCR devices, fits the image regardless of its size in its vertical, horizontal or both dimensions to a predetermined size. As an example, normalization would fit all upper case characters equal to 25 elements, even when the input image varies in height and width. These changes in size when presented to the recognition unit may be brought about through optical or electronic magnification. Optical magnification changes are generally implemented through mechanical devices, and are therefore slower in generating the proper changes in the vertical and horizontal dimensions. Electronic normalization is usually fast and allows independent normalization of both the vertical and horizontal dimensions of an image.

Electronic Scanning Systems

The movement of a spot of light very rapidly in both a vertical and horizontal direction is inherent in an electronic, flying-spot scanner. It provides a basis for a scanning system by imaging the flying spot from the face of the tube on the document to be scanned. Vertical and horizontal elements of the scan pattern are derived from the deflection of the electron beam. Movement from character to character is accomplished by translation of the scan raster over one dimension of the cathode ray tube (CRT). Line-to-line scanning is accomplished by moving the scan pattern vertically on the face of the CRT. A group of photocells picks up the reflected light; the output is summed and then transferred through one common decision net-work to make the white, black, or gray decision (video processing).

Character normalization is accomplished at electronic speeds by changing the size of the scan raster on the face of the CRT. This normalization change may be done in either the X or Y plane or both simultaneously. Changes in threshold levels are accomplished in one video processor. The color spectrum of the light spot image on the document is a function of the phospher utilized in the CRT.

In these flying-spot scanners, the overall resolution requirement on the CRT can be minimized by using gross movements along the length of the document. A summary of the advantages of this scanning technique are:

1. High resolution.
2. Variable threshold (the simple compensation eliminates the need to utilize a gray scale in the recognition system).
3. High speed character normalization.
4. Independent horizontal and vertical normalization.
5. Simple mechanical feeding (independent of the scanning mechanism).
6. High speed character rescan.

Other Light Sources

Other light sources may be used in page reading systems. Vidicon, image orthocon, image dissection, and storage tubes can image the document onto the face of the storage device. This image is then read in a manner similar to the use of flying spot scanners.

Most of the advantages of the flying spot scanners apply to systems using other light sources as well. The resolution capability of this class of tubes at this stage of technological development is not equal to the high precision available in a flying spot scanner. There are some applications however, where these storage tubes are economically feasible and also have the precision required.

Recognition

Once optical images have been converted into a suitable electrical form, the recognition portion of the system analyzes and identifies the image, for example, an upper case "A", lower case "a", numeric "0", or numeric "1".

One of the earliest practical recognition systems depended upon the unique design of a font consisting of upper case alphabetics, numerics and some symbols. The character shapes were so designed that on ideal material, a simple classification of a few strokes through a character (with each stroke designated as to its black and white transitions) could define that character. In the implementation of this system the scan pattern was treated as a unique code for each character image, and the actual recognition was converted into a conventional logic code. Initially, no attempts were made in this system to use weighted correlators or cross correlators.

In practice, virtually perfect quality material had to be presented to the recognition unit in order to provide

"A degree of success was achieved in electrical correlation systems at the expense of considerable electrical hardware, and consequent system cost."

reasonable reading accuracy. This type of recognition system, while theoretically feasible for various character shapes (different fonts), very quickly becomes economically unusable.

Cross Correlation

The next major step in recognition techniques employed cross correlation. Stored images were correlated with the image of a character being presented, and then it was determined which character most closely matched one of the stored images. In this class of recognition system one never anticipates perfect matches, but is concerned with the best match and the separation of the best match from the next closest match.

Photo Correlation

This class of system was implemented for demonstration purposes using optical cross correlators, i.e., the patterns of the image were superimposed upon stored photographs of all the images in a character set, and a correlated measurement was then taken. The decision as to definition of a character was based upon the best or closest correlation or fixed threshold levels on the output of the correlators. Even under ideal conditions this system failed to produce satisfactory results because of the variation in size of character images.

Character images change in size because of:

1. Creation of source material on different machines.
2. Use of different ribbons.
3. Change in paper size with time, temperature and humidity.
4. Aspect ratio changes because of the grain structure of the paper.
5. Dirty, broken type.
6. Dirt and smudging in handling.
7. Paper reflection changes.
8. Variations in registration of characters.

Electrical Correlation

In principle, this type of photo correlation system can be classified as a recognition system using one mass cross correlation technique. The same correlation functions could be implemented in an electrical recognition system, and in fact were implemented as part of a character recognition system built for the U.S. Post Office with another degree of sophistication added. In the photo correlation system it was very impractical to handle gray shades in a stored cross correlation. In the electrical versions, the effects of gray shades were implemented through the use of a weighted resistor summing network with a threshold detector. These resistor and diode networks attempted to compensate for gray shades and to determine the importance of different character features by assigning different weights (resistor or diodes) to each element in a character correlation.

A degree of success was achieved in electrical correlation systems at the expense of considerable electrical hardware, and consequent system cost. In order for this system to operate successfully it was necessary that the character images presented to the correlator be normalized in both horizontal and vertical dimensions, thereby reducing the number of character image variations for which the correlator had to compensate. With large or massive correlators small differences in character images become very difficult to detect.

For example, in a system in which the character space is divided into 300 elements, under degraded image conditions, there may be only 4 to 6 differences between certain character images. Very sophisticated and expensive equipment is needed to detect these small differences in a large field.

"Features"

In order to overcome this problem, the image field may be divided into a large number of overlapping areas called "features." A feature may be an element of a character such as a cross bar in an A or an H, an open space or part of an open space in the center of an O, etc. Once the image space is broken into with both positive and negative features, it becomes more practical in any one localized area of the image space to detect and identify small differences in features. Small correlators are used for each feature. The character can then be identified by a logical combination of both positive and negative features.

There are still a large number of noise sources (degradation of idealized characters) that the recognition system must overcome, these include:

1. Quantization noise.
2. Variations in image size.
3. Variation in image aspect ratio.
4. Variation in image density.
5. Variation in paper reflection.
6. Registration of the character.

Second Level of Cross Correlation

The recognition systems were next refined to include a second level of cross correlation. These systems use the feature outputs as input to correlators to produce unique character identification. This multiple-level cross correlation provides an increase in system recognition capability with almost no increase in hardware.

In the Scan-Data multi-font recognition system, for example, the features are stored in a separate storage register. All of the features are identified and recognized in a small area of the character space by programming the shifting of the character through this area. These features can be transferred to the computer for analysis, and design improvements in recognition on any character can be implemented. These features may be used to adapt the recognition unit for proper character registration at the point of recognition, and may also be used to adapt the recognition system to new character images.

The Scan-Data page reading system analyzes an image space by dissecting it into 1200 elements. The output of the stored feature system is used not only to control character recognition, but to control character normalization and threshold level changes which are implemented

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"Whether the optical/electrical transducers consist of mechanical scanners, line arrays of photocells, matrices of photocells, or electronic scan, the principles of operation of recognition units are similar."

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through an almost instantaneous electronic rescan of a character. The stored features are also used to identify the end of a character space in material which is both horizontally fixed and proportionally spaced. The detected features in this system can be stored during character rescans or can be reset on a character scan basis.

System Similarities

The principle of operation of the recognition systems is independent of the method derived to convert the image source into an electrical form to be presented to the recognition system. In short, whether the optical/electrical transducers consist of mechanical scanners, line arrays of photocells, matrices of photocells, or electron scan, the principles of operation of recognition units are similar. The choice of the scanning device is left to the machine designer. It is his responsibility to provide a given level of performance at minimum system cost and to recognize the limitations and advantages of each type of recognition unit.

Mark Image on Documents

The simplest form of input, requiring the least sophisticated technique, is a mark image. Its inherent limitation is information density; for example, while each mark defines one of two possible states, a numeric defines one of ten states and the alphabetic defines one of fifty-two states. This limitation severely restricts the economic application for a mark reader. In applications such as test scoring, for example, a mark image reader with its low machine cost may be practical. Forms can be designed to minimize the information limitations, but they never overcome them. In many applications very high error rates occur because of human error rather than machine reading errors.

Document Feeders

The document feeder requirements for each class of document size are different, and do not economically allow the intermix of these classes. For example, journal tape may vary from 1" to 6" in width; its feed mechanism is generally a simple friction drive roller. The length of this tape may vary from two feet to several hundred feet.

Small size documents characteristically include a small amount of information on the document and require in most applications the handling, processing and sorting of a large number of documents. A typical system handles between three and twenty documents per second, and may be coupled with a sorting device controlled by the information on the document itself. The feed mechanism requires a sophisticated document picker. It selects the top document from the stack and then moves the document at a high speed to maintain adequate system throughput.

Most page size document applications have a higher information density than the small or turn-around document readers. They are designed to run in the range of two to twenty documents per minute. This kind of feeding mechanism requires a stripper to select the top document and present it to the scanner. The documents in most applications are then sorted to two or three levels.

Page Feeding Devices

A selection of the appropriate feeding device for a reading system is not independent, and is often an integral part of the decision of the type of scanner to be used. For the purpose of this discussion, no attempt is made to evaluate feeding mechanisms utilized in journal tape readers. We will confine our comments to page feeding devices.

Most of the page feeding devices have a stripping or select mechanism to pull off the top sheet of a stack of documents and present this sheet to the appropriate document transport mechanism. This document transport mechanism can utilize friction drive rollers, captive belts and vacuum holding belts. All of these feeders must present a clear area over the scanning head.

The earlier OCR page readers used a captive belt system to transport the document from the stripper rollers into a picker station and then, in a stepping mode, through a scanning window. These mechanisms used a vacuum platen to hold the document in a concave form in order to satisfy the requirements of a mechanical scanner.

Rotating Drum

Manufacturers of OCR devices have built page scanners in which the document was indexed and held on a rotating drum after being selected out of the picker station. Generally on these feeders a clamp is used to hold one side of the document (orthogonal to the character lines of information) and a vacuum system to hold the balance of the document secure to the drum to prevent flapping.

These drums usually traverse on a helix to present line to line information. This requires the coupling of the vacuum system into a rotating drum and requires that the drum be stopped in order to place the document on it. After the document has been scanned, the drums must be reversed in order to strip the document off. In page feeders of this type, because of depth of field limitations, a large diameter drum is utilized even though the documents may be only 8½" wide. This reduces the character scanning rate to less than 1/3 of the actual scan rate. This type of feeding mechanism requires precision, high performance components and is therefore expensive to manufacture and maintain.

Perforated Belt

A simple and reliable transport mechanism is a perforated belt moving over a vacuum platen in which all components in the system operating at low inertia permit rapid starting and stopping of the document without the use of high precision or high performance and expensive components. This class of feeder is a device which is easy and simple to manufacture and maintain. The perforated belt can also accomodate fan-fold or continuous forms which cannot be handled by a drum type feeder.

Summary

Optical character recognition systems today represent one of the most significant methods for lowering data input costs. As we noted earlier, there is available a wide range of OCR machines for different applications. The primary objective of all of these systems is to lower the cost of capturing source data. This is accomplished by providing high accuracy rates and significantly reducing the labor costs associated with data input. The OCR technology has matured to the point where it is today producing viable products that should be considered as an integral part of most data processing systems. □

COMPUTER GRAPHICS FOR SOCIETY – Part 2

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"The interrelations of the many factors we need to take into account in considering many of society's problems can best be understood visually."

The graphic method, with its various developments, has been of immense service to almost every branch of science, and consequently many improvements have of late been effected. Laborious statistics have been replaced by diagrams in which the variations of a curve express in a most striking manner the several phases of a patiently observed phenomenon, and, further, a recording apparatus which works automatically can trace the curve of a physical or physiological event, which by reason of its slowness, its feebleness, or its rapidity, is otherwise inaccessible to observation.

Language is as slow and obscure a method of expressing the duration and sequence of events as the graphic method is lucid and easy to understand. As a matter of fact, it is the only natural mode of expressing such events; and, further, the information which this kind of record conveys is that which appeals to the eyes, usually the most reliable form in which it can be expressed.

– E.J. Marey, "Movement," D. Appleton and Company, New York, 1895.

In the first part of this article published in the October issue, we discussed: the various ways to process visual information; the uses of interactive and passive graphics; the kinds of input and output devices used; and many subfields of computer graphics (plotter graphics, alphanumeric displays, interactive design, computer animation, etc.).

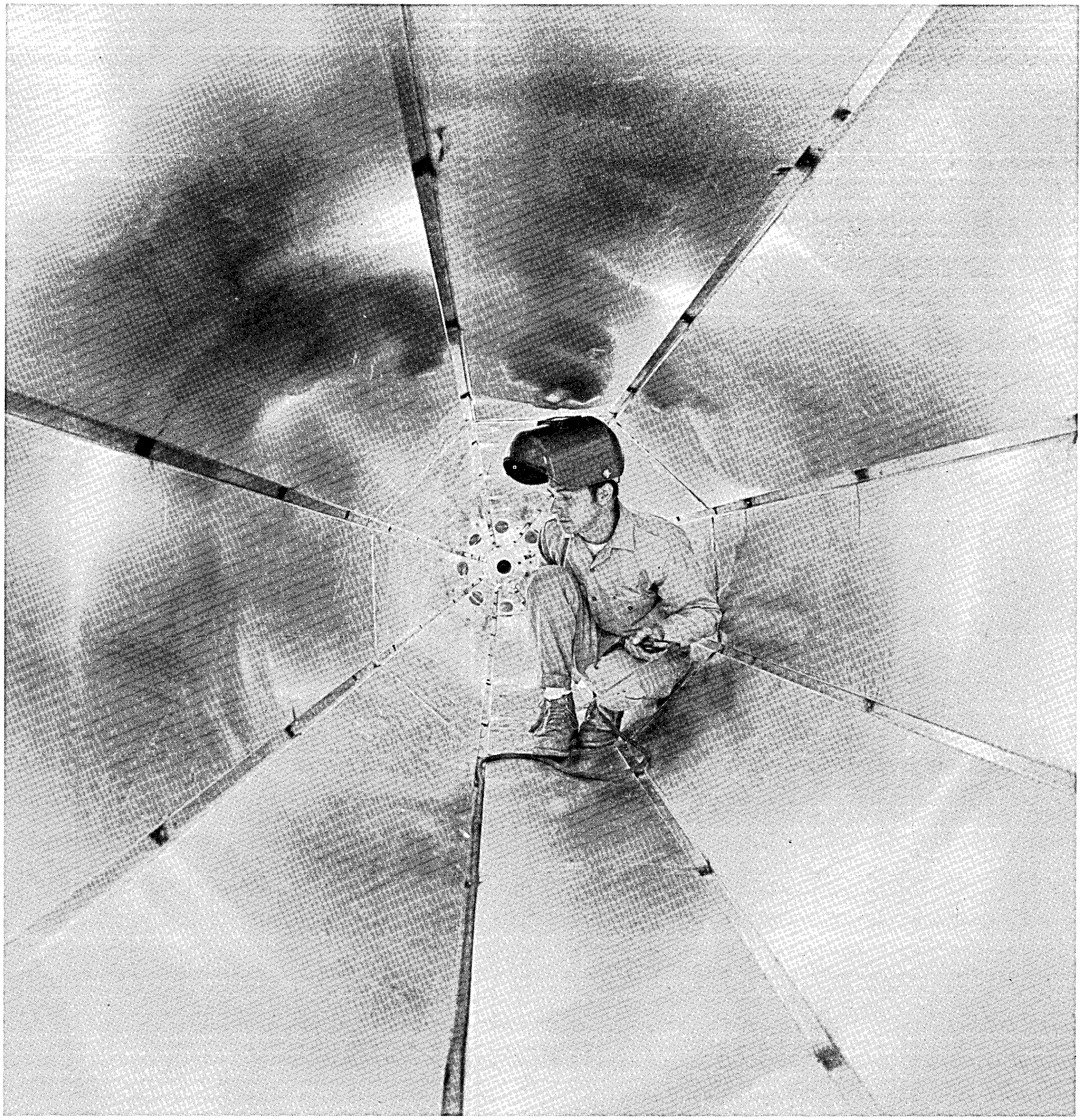
In this second part of the article, we will discuss: software requirements for graphics; the potential scope of applications of graphics techniques; and social aspects of the use of computer graphics.

Software

No fullfledged generalized programming languages for graphics have yet emerged. Most software systems are oriented toward a particular piece of hardware and a particular application area. Thus the user has to concentrate on various types of graphics problems instead of his application. Many of the potential users have no programming background at all and problem-oriented, higher-level programming languages with graphics capabilities are required.

It would appear that the best approach for now would consist of an "extensible language" in which one of the well known algorithmic languages (FORTRAN, APL, ALGOL, etc.) would have added to it the capability to deal with pictorial data and the basic graphic manipulations (translation, rotation, scaling, etc.). All program modules dealing with specific input-output devices would be separate, so that they could be easily changed for a particular installation. In addition, by means of a capability to define operators, the graphics programmer could develop particular sets of problem-oriented operators for each application area.

Thus out of the one basic system, languages using the terms familiar to particular applications could be rapidly developed for use by people with little programming skill. Such a graphics language would also be useful for communication between people in describing a particular problem or algorithm. A large number of operators could be stored in a subroutine library, so that the various users could share the development effort. An international workshop has been proposed to be held in Canada, which would be the first meeting on graphic programming languages.



At the Overly Manufacturing Company in Greensburg, Pa., a computer is used to design fabricated structures built by the company. First, the computer theoretically bombards the structure to test its ability to withstand forces ranging from hurricane winds to nuclear blasts at varying distances and angles of approach. Then a computer-controlled plotter produces a finished drawing of the structure for inspection by engineers, and a punched tape to control machine tools to make the structures. In the photograph, Sam Schrecengost is shown welding computer-designed sections of a church steeple shell before it is shipped to its destination for erection.

Interactive Procedure

In the case of interactive graphics, at the moment a great deal of attention must be paid to "picture regeneration," "attention handling," "menu building," etc. Again, no software systems exist which make it simple to prepare an interactive procedure without attention to the many "bookkeeping" problems. The human factors involved in display organization, etc. also require further study.

"The potential scope for the application of graphic techniques is virtually unlimited."

Since many pictures of interest involve a large number of points or lines and characters, much attention must be paid to efficiency. Otherwise even with our fastest present computers some applications become completely uneconomical. The efficient coding of the pictures (into coordinates) is one of these problems. The structuring of the data (into arrays, lists, rings, etc.) has also received much attention.

Three-Dimensional Objects

The representation of three-dimensional objects is particularly difficult, unless all sides have plane faces. Surfaces, for example, require appropriate mathematical expressions to be found, or a large number of contour lines stored. Research is proceeding toward efficient algorithms for a number of common problems for which straightforward brute force methods are easy to deduce, but they require unduly large amounts of computer time. Some of these are the "hidden line problem," perspective projections, shading, finding whether two pictures intersect, "windowing," "clipping," "shielding," etc. Computers with large numbers of parallel processors would be a great help, even optical computers have been considered, but both of these are still far from realization.

The handling of picture libraries share the problems of information retrieval of other material but in addition are complicated by the two (or more) dimensional nature of visual material. A data bank of coded maps, for example, has to be accessible not only by index terms, but also by the geographic boundaries of the area to be retrieved.

Too Much Emphasis on Technical Problems

Recently it has become apparent to many people working in the computer graphics field that most of the attention has been placed on these technical problems, and not nearly enough effort has been expended on the development of useful application packages for the many potential areas where graphics could make a significant contribution. Many practical applications with widespread potential are actually relatively simple. Within the next two to three years the "bandwagon" effect may well occur with respect to computer graphics, if the potential benefits are suddenly realized by a large number of users. The provision of the required software and services may well become a major industry within the field. If graphics software and services become readily available, many new areas of computer use, where calculations and data processing are not the major requirement, should be open. Accelerated progress can also be expected in the development of improved input and output equipment, and relatively small organizations with good ideas will be able to make their mark in this field.

Application Areas

The potential scope for the application of graphic techniques is virtually unlimited. We will briefly mention some of the possibilities.

Map Production and Dissemination

Our cities do not have reliable base maps of the street layouts, the lots and buildings, nor of the various utility conduits. In Part 1 of this article we described some of the statistical type of data which can be tied to a map, and displayed visually. Topographic maps, contour maps, etc. are other items in widespread use, and are expensive to produce by hand.

Display of Statistical Information

Information retrieval systems from large data banks will in many cases require graphic output. Even from non-numeric data banks, the distribution of occurrence of various items will often be required, which can be best presented graphically.

Computer Assisted Instruction

Regardless of the material being taught, one rarely sees a chalkboard with only English text and numbers in a classroom. We turn to pictorial representation time and again to explain ideas and relationships. Educational technology must take this into account, and educators must realize that this is not merely an "arty frill," but a necessity.

"If rapid means can be found to visualize the news of the day and the statistics of the many situations reported on, and if this can be done economically, our public affairs broadcasting could be greatly enriched."

Most of television programming is only radio with a camera attached, we see almost no graphics, except in the commercials. If rapid means can be found to visualize the news of the day and the statistics of the many situations reported on, and if this can be done economically, our public affairs broadcasting could be greatly enriched.

Engineering and Architectural Design

Circuit analysis; ship, car, and plane design; training simulators; structural design; architectural layouts; and display of chemical structures are some of the areas in which interactive techniques have already been applied. Graphic output of simulation programs, traffic studies, etc.

"The sad fact is that up to the present, designers and film makers are hardly aware of the existence of computer graphics, much less its personal relevance."

provide other possibilities. These techniques will make possible the examination of a larger number of alternatives than currently possible, improving the design process. They will also allow the intervention of human judgment into the mathematical design methods as they are emerging.

Medical Computing

Remote transmission of electrocardiograms have been demonstrated. Consultations without timely personal travel require that the medical communication systems offer visual possibilities. The number of microphotographs, X-rays and other material which modern medicine needs exceeds the availability of personnel for analysis. Medical doctors have available to them practically no statistical information. They could be easily provided with the computerized systems which have been proposed.

Air Traffic Control

Future air traffic control systems can be envisaged which provide the air traffic controller with a real-time, three-dimensional display of the airspace he is controlling, with the position of each aircraft indicated. He will be able to control the scale and point of view of the display. A similar display can also be installed in the cockpit of the airplane, together with a representation of the airfield to assist the pilot in instrument landings. The control of automobile traffic, and "automatic pilots" on automobiles will also require computer graphic techniques.

Visual Arts and Design

In the area of visual arts and design, I think some points discussed recently by Maurice Constant of the University of Waterloo are worth noting here.

"Computer graphics, a technique by which the computer generates images – still or moving, on paper, film or tape – has now passed through the research stage and entered the period of development. In consequence, the subject of computer-generated images has now become a matter of direct and immediate concern to the designer and film maker.

"In effect, one of the most powerful tools ever offered to the creative imagination is asking for direction from the user. What would you like me to do for you? What form would you like me to take?

"The sad fact is that up to the present, designers and film makers are hardly aware of the existence of this tool, much less its personal relevance. And where some interest has existed, too often the esoteric language and habits of mind of the computer scientists have discouraged further investigation.

Evaluating Structures and Sequences

"Nevertheless, some design-oriented minds, industrial designers and architects, have begun to explore the use of computer animation to evaluate structures and sequences. The architect or exhibition designer has been intrigued by the possibility of seeing on film an accurate model of the structure he has dreamed up. He can walk around it or through it, examine vistas, spatial relationships, and evaluate the effect of sequential experiences.

"In general, it is not a matter of inventing a technology, but rather of taking existing technology and putting it together in a computer graphics system directed specifically at the needs of the designer and film maker.

Requirements of the Film Maker

"Hitherto, much of the relevant computer technology has concerned itself with the problems of the engineer, and the need to plot information in the form of a graph. Typical of this concern is the development of high contrast film techniques. However, let us consider the more sophisticated requirements of the film maker – these will include most of the concerns of the designer. Now we must broaden our interest in computer graphics beyond points and lines to somewhat more sophisticated requirements: shape, color, shading, tone, image quality, movement within the frame and from frame to frame ('shot to shot').

"All this implies, too, an interest in the means of manipulating these elements in a meaningful way, that is, according to the conventions of the film medium. It also implies that the hardware involved be convenient, economical and, in general, more effective than existing film-making procedures.

Goals for Film Makers

"What do we wish to achieve? In general, to extend the film maker's powers to manipulate shapes and colors in space; to help him do the kinds of things he has been doing but better, less laboriously, more economically and with greater accuracy. In many cases the peculiar power of the computer makes possible the construction of images which are beyond the scope of the film maker. For example, in the field of education, the subject matter of the sciences is full of expository material which suggests or sometimes demands visual capabilities beyond the present capacities of the film maker or the film medium. An obvious instance is the accurate rendering of complex movements or shapes governed by mathematical prescription or requiring great numbers of laborious calculations and drawings.

Possibilities for a New "Medium"

"We must be prepared, too for the emergence of new techniques and modes of expression based on the peculiar capabilities of the computer – capabilities of which the film maker is not aware and which he cannot even imagine. This is a most exciting prospect. It is quite possible that the continued extension of the film maker's powers in combination with new display and projection devices and ideas (such as multiple screen and total image envelopment) will produce not just a difference of degree but of kind – in effect, a new medium."

"In many cases the peculiar power of the computer makes possible the construction of images which are beyond the scope of the film maker."

Many of the possibilities outlined here for the filmmaker could become equally useful to the visual artist, the art teacher, the graphic designer, the commercial artist, typographer, illustrator, industrial designer, landscape and interior designer, in exhibition and stage design, choreography, and so on.

Some Pioneers

Computers and Automation magazine has pioneered in this field by conducting an annual Computer Art contest (in the August issues) since 1963. *Computers and the Humanities,* since its inception in 1967, has included the visual arts in its annual bibliography (March issues). A major public show, Cybernetic Serendipity, was assembled at the Institute of Contemporary Art in London by Jaschia Reichardt.

Responsibilities

Our public agencies and educational institutions deeply involved in the visual media must become leaders in the uses of the new technology. Since the new developments break down the boundaries between media, interdisciplinary work is vital, and the different agencies must learn to work together, and also open up their doors and facilities to outsiders.

Social Aspects of the Use of Computer Graphics

We produce vast amounts of data by computers, and communicate great amounts of information. In some instances fork-lift trucks are needed to transport the computer printouts. These can only be understood, comprehended and used if they are organized into meaningful patterns. The most effective way of doing this is visually. The interrelations of the many factors we need to take into account in considering many of society's problems can best be understood visually. The complexity of our society and of our institutions makes the use of computers and of computer graphics real necessities. For proof we need only observe almost any face to face communication, where invariably sketching, drawing, plotting, outlining, etc., occur spontaneously.

> *"The complexity of our society and of our institutions makes the use of computers and of computer graphics real necessities."*

Growth

As the possibilities are realized and the needs felt, graphics promises to be a growth area within the computer field. Graphics will also serve to open the door to many new computer users for whom current communication means with the computer are unsatisfactory. Some research studies, for example, are moving toward the graphic specification of procedures for the computer.

Graphics in Underdeveloped Countries

If computers are to be successfully introduced in underdeveloped countries, graphic techniques will have to play a major role. Social scientists who understand the culture of a particular area and the habits of perception of its people must be consulted.

Costs

Before really widespread use of graphics will be possible, the cost of equipment will have to decrease and the software will have to be provided to make it easy to use. Due to the cost and complexity of maintenance; central service facilities will be needed. The research and development effort should identify the areas most likely to be of help to society as a whole, and out of these begin with the ones easiest to achieve technically.

The systems developed should have general applicability, rather than being for a specific application on a specific piece of equipment. Much can be learned from the development of the rest of the computer field, without going through the same painful steps with graphics. While we need to alert potential users to the possibilities, we must not oversell it and promise things we cannot deliver. There is already much disenchantment with computers because of previous unfulfilled promises.

Educating the Visual Sense

Our school systems tend to neglect the education of our visual sense. Many existing facilities in the graphic arts are underused because of a lack of appreciation of their value. In one university physics department a few years ago, a list of physics films was circulated, which were to be made available without charge. Only one professor expressed interest. However, now the same department has a committee on educational technology, and is becoming interested in computer animation. They want to make their own films!

The film making going on in the high schools is another positive sign. One very important factor in all of this is the realization that most graphics serve their purpose in a short time, and need not be of a quality to be preserved for the ages. Gyorgy Kepes' Vision & Value series of books constitutes one of the best resources for arguing the values of visual communication.

The Near Future

The best uses of visual data transmission will bring the non-numerate, but inherently visual citizen into the picture. People who specialize in a field and are intimately familiar with it can usually deal with it in an abstract manner. They are able to visualize the relationships and processes involved without external aid. They are not even aware of the needs of those less gifted in their field – which is one of the reasons why many teachers are less than illuminating to their students. For example, future mathematicians can absorb most of their mathematics exclusively by means of symbols, the rest of the mathematics students need graphic visualization.

Emotional Impact of Graphics

Information presented graphically tends to have a far greater emotional impact. It leads more often to a "Eureka" gut-feeling, an "Oh, now I see." And what we need if our data is to have any real value, our information explosion any real benefit, is *understanding* and *insight* which will hopefully lead to *wisdom* in making our vital decisions. In a democracy we are committed to the principle that this cannot be delegated, that the whole citizenry should be informed, so that everyone can fully participate in the social process. This includes not only the interpretation of what has happened already, but also the prediction and evaluation of alternate future courses of action. We must all become futurists in a rapidly changing world, or we will lose control.

"Information presented graphically tends to have a far greater emotional impact. It leads more often to a 'Eureka!' gut feeling, an 'Oh, now I see!' "

Everything that has been said so far refers to the near future. All these things are possible now, and will likely become economically feasible within the next 5-10 years.

The More Distant Future

In the more distant future other exciting vistas exist, but will only be mentioned here. We should remember that utopians and science fiction writers speculated about many developments 50 and even 100 years in advance. It took 300 years from Pascal's machine to develop the computer. Many of the implications were foreseen by Lady Lovelace (considered to be the first programmer for Charles Babbage and his Analytical Engine) one hundred years ago. Technological advances which make these things feasible are hard to predict.

However, we can look in our crystal ball and see the home entertainment and information center, with access not only to the supermarket and the world's libraries, the stock exchange and the race track, but also to the world's art collections, movies, and video tapes. And this would be available not only to the megalopolis housewife, but also to the Arctic eskimo, and the sailor on his ship. Not only will he be able to select what he wishes to see, but also interact with this and alter it. Each of us can be a "citizen artist" with the help of the new medium. We will be able to enter the communication stream ourselves, sending messages, poems, sonatas, pictures for others to see.

Computers can help us develop a participatory democracy – if we want it. □

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SICGRAPH Newsletter – ACM Special Interest Group on Computer Graphics UAIDE Computer Animation Committee – Year End Reports

Page 1

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THE LIFE AND TIMES OF CLARK SQUIRE: COMPUTER PROGRAMMER, BLACK PANTHER PRISONER

Joseph Hanlon
Cambridge, Mass.

> *"Today, society accepts scientific change. Einstein was rewarded, not prosecuted, when he revolutionized physics with his theory of relativity. But in the field of social science, we are still as backward as in the Middle Ages. Society today still seeks to ostracize, prosecute, and even kill those persons advocating social changes."*
>
> *Clark Squire*

Clark Squire is one of those Horatio Alger heroes of whom the computer industry is so proud. From a poor family in a small Texas town, Squire studied mathematics at a nearby college (Prairie View) and graduated at 19. After six months and many job applications, he finally got a job with an engineering department of NASA. When an EDP section was set up, Squire was part of its staff. He moved on to other aerospace and defense industries, then joined a New York City consulting company. In March, 1969, Clark Squire was earning $17,000 per year; he was married, had a young child, and had no criminal record. From 1964 to 1969, he had worked in New York City for the computer consulting firms of Computer Deductions Inc., Real Time Systems, Inc., and Computer Applications Incorporated (CAI). Associates called him a brilliant and hard working programmer.

Only one thing breaks this idyllic picture: Squire is black and politically active. As a result, he has been in jail for 19 months for lack of $50,000 bail, learning the hard way that his black skin means more than his white collar, and that a separate set of rules applies to him.

Squire is one of the victims of what the article "Patterns of Political Assassination", by Edmund C. Berkeley, in the September issue, called "a conspiracy by elements of federal and city governments in the U.S. against the Black Panthers."

The Squire case is important because it challenges many of our fundamental beliefs about the nature of justice and about the ability of a man of talent to rise in our society if only he will work hard.

Squire Joins the Panthers

Clark Squire joined the newly formed Harlem branch of the Black Panther Party in November 1968. He soon became the branch's Lieutenant for Finance.

Squire says that after he joined the party, the FBI offered him money to become an informer. When he refused, they made harrassing calls to him on the job. But that was just the beginning.

"I had been in the party for less than three months when the reign of terror began," Squire recalled. On Jan. 18, 1969, seven police "kicked in my door at 5:30 in the morning, guns drawn and cocked, stuck them to my head, pinned me against the wall and commenced to beat me almost into unconsciousness." The night before, a car rented by Squire's company and used by him to commute to his job in New Jersey was involved in a shootout with the police. Squire was not in the car, but he was arrested as part of an alleged conspiracy, involving those in the car, to use high-powered rifles to kill policemen. Squire was held in jail for two weeks before the charge was dismissed for lack of evidence.

But Squire did not get out of jail. After the charge was dismissed, but before he could leave the courtroom, Squire was arrested on a charge of armed robbery of a subway change booth. As Squire noted, "This was really absurd, because at that time my annual salary exceeded $17,000 per year." Furthermore, Squire's employer (Computer Deductions) said that Squire was at work at the time the robbery occurred. Nevertheless, Squire was held in jail for

"The Squire case is important because it challenges many of our fundamental beliefs about the nature of justice. . . . "

an additional two weeks before being released on $5,000 bail. The robbery charge is still pending.

"After I was bailed out, I went back to the Panther Party and my job with the computer consulting firm," Squire continued. "I picked up where I had left off, keeping the party's financial records and working in the community organizing black people, attending meetings on community control of schools, community control of hospitals, breakfast-for-children programs, and out in the community taking a survey, finding out what ails black people and what they wanted."

The "Conspiracy"

In the pre-dawn hours of April 2, 1969, Squire and most of the Panther leadership in New York City were arrested by police in raids on their homes. Despite the fact that they were supposed to be armed and dangerous, the Panthers did not resist arrest.

District Attorney Frank Hogan then went on television to declare that the Panthers had planned to bomb five department stores on *that day*. Entering 12 Panther's homes without search warrants, the police had found the makings of several bombs. But they did not find the kind of equipment necessary for such a huge, coordinated, immediate assault. In all, the police reported that they found: six pistols, four rifles, a shotgun, a switchblade knife, and a dagger; components and explosive powder for one time bomb; thirty feet of detonating fuse; and pipe and powder that could be assembled into three other bombs.

On April 3, a grand jury returned an indictment charging 21 Panthers, including those arrested, with:

- Conspiracy to bomb five department stores, the New Haven Railroad, the Bronx Botanical Garden, and several police stations;
- Conspiracy to kill policemen (the same charge that was previously dismissed for lack of evidence);
- Illegal possession of guns;
- The Nov. 8, 1968, bombing of a police station and a Board of Education building. [Damage was minor and there were no injuries.]

The indictment further charges Squire with two "overt acts" committed "in furtherance of this conspiracy":

- "On or about Jan. 6, 1969 . . . Squire possessed a 38 caliber Smith and Weston [sic] revolver and a 308 automatic rifle."
- "On or about Jan. 16, 1969, Clark Squire possessed a bomb."

Bail Set at $100,000 Times 21 Panthers, or $2.1 million

Bail on each of the arrested Panthers was set at $100,000.

Usually, lower bail is set for those withour prior criminal records and for those who are established in the community and who are unlikely to run away. But no lower bails were set in this case. Eventually, Squire and one other Panther, held in a jail in Queens, came up before a more liberal judge who cut their bail in half. Other Panthers in the case were not in his jurisdiction and have not had their bail cut.

Even $50,000 bail "is outrageous, way out of line, especially for people like Squire who have jobs and roots," declared Paul Chevigny, an attorney for the New York Civil Liberties Union.

WHO IS CLARK SQUIRE?

Joe Hanlon
Cambridge, Mass.

Clark Squire, sitting in his cell in January 1969, was concerned that absence from his job would impede progress on the computer program he had been working on. So without being asked, in his cell, he documented all of his work on the system. His documentation was good enough to let other people pick up where he had left off.

"I've dealt with a lot of programmers, and as far as I can tell, Squire is the best," said Allen Cooper of Pat Fashion Industries. Squire's assignment from his consulting firm was to design an allocation program for PFI which would decide when dresses would be sent to various customers. "Since Squire designed our system, IBM has put out a similar package, but we feel it is not as good as Squire's," Cooper said.

Allen Barron, marketing vice president of Computer Deductions, the consulting and software company where Squire worked before and after his first arrest, has high praise for Squire: "He has the utmost integrity. He is extremely honest and extremely professional – a very competent programmer and system designer."

But the Squire the computer industry knows is only half of Clark Squire. "I was becoming increasingly schizoid about maintaining two sets of friends, two vocabularies, and two methods of dressing – one at work and the other away from work," Squire said.

"I began to realize that by staying in the system and looking successful, I was misleading, unwillingly, a lot of other black people. I was not free, but I possessed many of the symbols and appearances of freedom. I felt I was leading brothers to mistake for freedom Brooks Brothers suits, attaché cases, American Express credit cards, first class flights, sports cars, and lunching at exclusive midtown restaurants, – and that was a lie!"

"All I had done was survive. But I couldn't be proud of my survival under the system in America, because too many of my brothers hadn't survived. I had seen too many of my brothers cut down along the way – smashed, broken, and castrated by racism, oppression, exploitation, poverty, ignorance, and disease. I could not be proud of my own survival.

"Even though we are now in jail, black and all oppressed people are beginning to understand that as a people we have been in jail all our lives anyway. Now we must be set free to determine our own destinies."

"Usually, lower bail is set for those without prior criminal records and for those who are established in the community and who are unlikely to run away. But no lower bails were set in this case."

The bail is also out of line in comparison with the bail set in similar cases involving whites. Gerald Lefcourt, one of Squire's attorneys, said that in 1966 a New York judge granted $20,000 bail to a group of white Minute Men charged with conspiracy to murder 260 civil rights workers. Also, Jane Alpert and David Hughey, white radicals accused of several serious bombings, were released on $25,000 bail each.

Supporters of the Panthers charge that the very high bail has been set in an effort to destroy the party just at the time it was beginning to have some political success through such projects as the free breakfast program for children. Chevigny agrees. "The District Attorney does believe that the Panthers are dangerous, but both the judge and the DA tend to equate political success with being dangerous," he noted. "They were put in jail at least partly to destroy them as a political force. There is no question that the high bail was set in part to break the party."

What It's Like In Prison

Being in jail for 19 months can create severe problems for a man. It is more difficult for a man to arrange his legal defense and to collect witnesses, etc. For the Panthers, it was even harder, because they were separated into four different jails so that they could not talk to each other and could not meet as a group with their lawyers.

And they were subjected to inhumane prison conditions. Squire and several others were kept in 24-hour lock-up with lights on day and night. They had no access to books, television, or recreational facilities, and were not permitted to talk to other prisoners.

"Squire and several others . . . had no access to books, television, or recreational facilities, and were not permitted to talk to other prisoners."

State Supreme Court Justice John M. Murtagh, who is hearing the case, refused to consider Lefcourt's protests about the jail conditions and the separation of the prisoners. After nine months of such treatment, U.S. District Court Judge Tyler overruled Murtagh and issued a preliminary injunction against the conditions under which the Panthers were being held.

As a result of Tyler's ruling, all of the men were moved to one prison: the Long Island City branch of the Queens House of Detention. Conditions are markedly improved, but they are still not good. The jail was designed for 160 prisoners and until Oct. 1 held more than twice that many. After a recent riot protesting the poor conditions in that jail, Anthony Principe, Director of Operations for the Department of Correction volunteered that the facility was "foul" and "should have been closed long ago." After the riots Oct. 2 to Oct. 5, all the prisoners were removed to Rikers Island.

SOME OF WHAT I THINK

Clark Squire
Queens House of Detention
One Court Square
Long Island City, N.Y. 11401

Political Prisoners — From Galileo to the Panthers

When science was young, many persons were ostracized, prosecuted, and even killed for expounding new scientific theories. In the middle ages, Galileo was forced to publicly recant his theory that the earth moved around the sun, and even then was sentenced to spending the rest of his life in strict seclusion.

Today, society accepts scientific change. Einstein was rewarded, not prosecuted, when he revolutionized physics with his theory of relativity. But in the field of social science, we are still as backward as in the Middle Ages. Society today still seeks to ostracize, prosecute, and even kill those persons advocating social changes.

Political prisoners are those people who are arrested for seeking to change a society that needs changing; those people who call into contention the way society is laid out and who challenge racism, exploitation, the way tools such as computers are used in society, and the way wealth is distributed. Those people are subjected to all types of oppression under the smokescreens of "conspiracies," frame-ups, mass predawn raids complete with "shoot-ins," and annihilation campaigns.

Violence and the Panthers

I am categorically opposed to indiscriminate terrorism.

As for the use of violence, this country perpetrates more violence, both nationally and internationally, than any other country in the world.

It perpetrates the direct violence of police brutality and murder, and the indirect violence of starvation and slow death from improper medical care. And there is the violent death resulting from living in ghetto firetraps and from flooding the black community with heroin, the major cause of death among young people aged 14 to 25.

All of these are violent deaths. But all of these forms of violent attacks are precisely what we as a people are defending ourselves against. For this we are called violent. So I am not opposed to the use of violence against an enemy which attacks violently, whether directly or indirectly.

The Case of Lee Berry

The treatment of Lee Berry, one of the arrested Panthers, deserves special mention. Berry, a Vietnam veteran, was in the Manhattan Veterans Hospital under treatment for epilepsy. He was not among those originally arrested, but on hearing that he too was wanted, he telephoned the police and offered to answer questions in the hospital.

Instead, the police came to the hospital, took him from bed and arrested him. He too was placed under $100,000 bail and was sent to an ordinary prison, not a prison hospital. He had repeated epileptic seizures. For five days he was placed in solitary confinement on a bread and tea diet and without his regular medication. His lawyer made repeated attempts to have him moved to a hospital, but the hearings were repeatedly put off because Assistant District Attorney Joseph Phillips did not appear.

In November, after seven months of jail, Berry was finally transferred to Bellevue Hospital. He was operated on for appendicitis, but the pathologist found that the hospital had removed a normal appendix. Other illnesses and operations followed. By February, Berry was too sick to appear in court for pre-trial hearings, and Murtagh separated Berry's case from the others.

On March 11, 1970, Berry was moved from Bellevue to Rikers Island infirmary. His lawyers were not told of the transfer, and his medical records were not sent with him. After four days, his wife obtained a court order allowing a private physician to visit him. That doctor found that all "medical management had been discontinued" and that his condition was deteriorating. A week later, Berry was returned to Bellevue.

The Prosecution Picks the Judge

The normal rules of jurisprudence have been broken in other ways in this case, too. For example, District Attorney Hogan selected the judge who would try the case. This information became public when Squire's lawyer was protesting still another departure from the normal rules. In general, the trial judge is supposed to come to a case unfamiliar with the defendants, so as not to be prejudiced about the case. Pre-trial hearings often require a judge to read grand jury minutes and other prejudicial material; so these hearings are often conducted by a different judge from the one who will try the case. To aid this procedure, the courts of New York City have set up a Special Part 30, where judges rule on some pre-trial motions in cases they will not try.

After several months of pre-trial hearings, Lefcourt found that Murtagh was hearing all of the pre-trial motions and usually ruling against him. So Lefcourt asked to take his motions to Special Part 30. This was impossible, Lefcourt was told, because Murtagh had been assigned to the case *permanently*, both for pre-trial motions and for the trial itself.

"How did that happen?" asked Lefcourt. The explanation was described by Murray Kempton, a writer and reporter, in the *New York Review*, of May 7, 1970:

> Justice Murtagh had been assigned full command of the case by Justice Mitchell Schweitzer as administrative judge of the criminal courts. Justice Schweitzer said that last summer he and the District Attorney had been struggling as usual with the clutter of the calendar. Mr. Hogan had observed that the Panther trial would be immensely complicated: Couldn't matters be eased if one judge were assigned to preside over the case all the way through? He suggested Justice Murtagh and Justice Schweitzer agreed. The explanation, then, was what it generally is when a question is raised about some incident in society's treatment of the New York Panthers: the convenience of an institution transcends whatever shadow of the rights of the defendants might lie across its path.
>
> The result, whatever the excuse, was for the judge who would try the Panthers to be selected by the District Attorney who would prosecute them.

"The judge who would try the Panthers was selected by the District Attorney who would prosecute them."

Covering Up The Fallibilities of Policemen

Why should Hogan want Murtagh for this case? Because Murtagh is, according to Kempton, "incapable of imagining that policemen could lie." Kempton continued:

> There are very few people who do not know by now that policemen lie; and district attorneys are dependent enough on those lies to cherish any judge innocent enough to believe them.
>
> Policemen have to lie if only because they are incurable slovens at record-keeping and must invent explanations to take care of the pedantries of constitutional prejudice. These hearings, for example, have been a series of revelations of warrants missing, official reports unfiled, memo books lost. Beyond these minor lapses in procedure, there were no search warrants in this case, a lack which cast a shadow over the rights of the arresting officers to seize any objects not in plain sight. As a result, they were forced to conjure up for Judge Murtagh vistas of rifle stocks protruding from beneath mattresses and gun butts falling out of closets. No one except Judge Murtagh could have believed any of it.

"Policemen have to lie, if only because they are incurable slovens at record-keeping . . ."

Is Squire Guilty Without a Trial?

Whether Clark Squire is guilty or innocent, for a year and a half, without trial, the City of New York (i.e., the courts, the police, the Correction Department, and the prosecuting forces) have found him guilty and have treated him as a convicted criminal, based solely on their judgment of his political activities. The trial is now in progress in New York – Judge Murtagh presiding.

It is not a fair trial. It is not a trial in accordance with the Constitutional rights of the accused.

Of course, if convicted, Squire can appeal to higher courts – but how many more years will he be tormented, held in jail on excessive bail, awaiting a fair trial on the facts? ☐

RAISING BAIL

A group of computer professionals is attempting to raise the bail money for Clark Squire.

Contributions may be sent to:

The Squire Committee
Box 1597
Brooklyn, N.Y. 11202

REPORT FROM GREAT BRITAIN

For once I have a British happening to record which could have a direct influence on life within the time-sharing fraternity of the United States.

A New Concept in Time Sharing

It is yet another bureau service, but one with many differences compared with what we have so far encountered. Approaching the problem of the little man from the consumer end, the system makes no attempt to be clever or teach an unwilling neophyte about COBOL, microcircuitry and suchlike. A user will not have to change accounting procedures or "restructure management" or whatever. All his routine accounting forms can be captured and carried within a visual display unit for display on demand on the face of the tube.

This is done by a rear port projection technique first developed for military applications some time ago by the Ferranti company. It allows comparatively unskilled operators to make any kind of entry on order forms, invoices, stock documents and so on, even though the "forms" are electronic ghosts. The entries are made through typewriter-like keyboards with a few additional keys, the only big difference being that the keyboards can be moved anywhere to suit the operator. There is also a significant difference so far as accuracy is concerned – erasure and correction of the displayed characters is immediate.

So far, nothing world-shattering. However, at the other end of the operation there are three small computers linked together adding up to about $400,000, plus disc storage for 8m bytes in 12.5 milliseconds and a vast amount of exchangeable disc capacity as second level.

The crunch comes when the company's plans are considered – to sell terminals over the next two years to the tune of 500 a year, all on this central equipment. That is clever time-sharing if it comes off. What equipment would be specified for a job this size in the U.S.?

The company behind the move is called Autonomics. It is part of a new mushroom group known as Miles Roman which last year secured some $5m of merchant bank backing and a further $1.5m from the National Research Development Corporation.

Each user has his section of computer "space" and a very simple language called ACE – Audit, Control and Evaluation – which is a mixture of English and accounting jargon, and which permits him to give precise instructions to the central equipment as to what he requires to be done.

Equipment Options

A user can start with a single terminal and line printer and work up to quite complex arrays with as many as four terminals and/or printers.

Purchase of a terminal works out at about $20,000 and, after paying line charges, the company believes operation of all accounting work and a number of other business routines by the service on one terminal should cost only $10,000 a year, which seems to make good business sense for small to medium shops and businesses.

Certainly Autonomics means what it says. It has ordered 1,000 compact printers and 1,000 displays and keyboards from International Computers and Ferranti respectively.

There is no reason to think, either, that the central complex will not cope. The machines selected are the Modular I units from Computer Technology based on really fast ECL circuits from Motorola, which thinks very highly of the design capabilities of this small company.

Chances for Success

A great deal of the software work has been done by a handful of exceptionally gifted men in the Miles Roman Group and, so far as one can know, the whole operation is set fair for success. This may seem brash to readers in America, after the sharp setbacks to so many of the advanced activities in computing since the beginning of 1969. But there is no sign of any recession in data processing in Britain. The bureau market, in particular, is still growing at the fantastic rate of close on 35 per cent a year. Hardware purchases and deliveries are also keeping up well with 20 per cent recorded generally and some companies, Honeywell included, notching up well over that growth figure.

So Miles Roman has a very good chance and will not stop at Britain. Plans have already been prepared for a European launch in the not too distant future.

Cynics would of course ask why Miles Roman should not run into network trouble where major British banks have. This remains to be seen, though the relatively small amount of computing to be done in the Autonomics system is one feature in its favour, while its computers are extremely fast message switchers.

Midland Bank's "Project 70"

The most recent report of woe comes from Midland Bank which was planning to use two Burroughs 6500 machines on-line to 1,700 branches throughout the country, hopefully by time decimalisation is brought in on February 15 next year.

Project 70 is what the ambitious branch and central accounting plan was called. But it has fallen well behind through late delivery of both hardware and software, and the bank has felt compelled to call in Stanford Research Institute to pronounce on the whole project. So far as can be ascertained, the bank is not prepared to accept formal delivery and this may not take place till early next year.

At the time of writing connections to each of the two centres are around the 100 mark. With decimalisation only 4½ months away, the bank is in a precarious position insofar that its costs, if a lot of manual work has to be done, are going to rise appreciably.

(Please turn to page *47*)

MACHINE LEARNING OF GAMES – Part 1

Prof. Ranan B. Banerji
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"With the best of all learning programs, all one ought to need to program are the rules of the game, and not any specific 'trick' associated with the strategies of the game. The program ought to develop 'tricks' for itself."

Ranan B. Banerji is a Professor of Computer and Information Sciences at Case Western Reserve University. He is the author of over thirty-five papers and reports on various subjects including information theory, linguistics, and artificial intelligence. His book, *Theory of Problem Solving: An Approach to Artificial Intelligence*, was published last year.

Mr. Banerji was born in Calcutta, India, and received his Ph.D. in Physics from the University of Calcutta in 1956. He has previously taught at the University of Calcutta, Pennsylvania State University, and the University of New Brunswick.

The great speed and reliability of digital computers, as well as their ability to recall large amounts of stored data, has already made them very useful tools for science and commerce. However, most of the work entrusted to computers today is of a routine nature. This somewhat belies the name "thinking machines" that was given to these machines by an enthusiastic public in the early days of their development. However, a belief has persisted among some professional computer scientists (as well as among laymen) that computers are capable of rendering much more help to man than just to relieve him of routine drudgeries. They believe that someday computers may complement and supplement some of the creative abilities of man in making for him wise decisions in scientific, business and strategic affairs. Efforts at programming machines to perform such complex tasks as playing games or scheduling productions or developing theories belong to a field of research which is called "Complex Information Processing" or, in a more ambitious style, "Artificial Intelligence".

Describing Complex Tasks

One of the characteristics of complex tasks is that while people can do them, they often cannot describe how they do them with the precision and clarity demanded in a computer program. It had become clear even during the early years of research in the field that the only way a machine could perform complex tasks would be by learning to do them as a person learns to do them – by experience and introspection. It would be very hard to program a machine directly to show sophisticated behavior. And even if it could be done, a machine with such a program, while extremely efficient at one task, could fall by the wayside if the task was even slightly changed.

"Efforts at making programs which could learn a variety of different activities have always resulted in the need to change the basic components of the data for each different activity to be learned."

Programs for playing games have been developed for some time – both of the pre-programmed and the learning variety. They enable computers to play specific games with great ability. However, even the learning programs learn only specific games. Efforts at making programs which could learn a variety of different activities have always resulted in the need to change the basic components of the data for each different activity to be learned.

With the best of all learning programs, all one ought to need to program are the rules of the game and not any specific "trick" associated with the strategies of the game – the program ought to develop "tricks" for itself. Of course, even such a program would have to have some very specific pre-programmed "tricks"; but these would have to be universal tricks, independent of specific games.

A Model for Two-Person Games

To write a universal, game-independent learning program one needs two things: a model for games, and a model for winning strategies in games. Various such models, of varying degrees of precision and applicability, have been available since Von Neuman and Morgenstern's publication of, "Theory of Games and Economic Behavior". The model which we found useful, although developed by my colleagues, Dr. Thomas Windeknecht and Mr. Leonard Marino, and myself is closely related to these other models.

"The rules of the game can be specified to men and to computers because the specification is done by 'describing' rather than 'exhibiting' . . . moves."

Instead of discussing the relationships and differences here, we shall merely discuss our model and how we used it in writing programs.

We start with the abstract idea that in any board game we have as our universe of discourse the set of all configurations of pieces on the board that may arise in plays of the game. The number of such possible configurations is generally quite large – even in a trivial game like Tic-Tac-Toe, the number of configurations runs into the thousands. We need not enumerate these configurations, but we do need to consider their special properties.

Special Properties of Positions in a Game

The rules of the game gives us a wherewithal to recognize a configuration as a legal position in a game. The rules of the game also specify what constitutes a win for the first player, what constitutes a win for the second player and what constitutes a draw. That is, some board positions are set apart by the rules of the game which stipulate that when one of these positions is reached, it is a win for the first player. Similarly for the second player's wins and for the draws.

In addition to the description of these four sets of configurations the rules of the game also specify a set of valid moves for each player. In general a finite number of moves is available to each player. Given any move, the rules would specify when the move can be made, i.e. it would set apart all of the board positions which are applicable to the move. Also the rules of the game specify for each position the board position which results when the move is made.

These sets of configurations and moves naturally cannot be exhibited by lists of positions or lists of pairs of positions (indicating the positions before and after each move). There are too many of them. No player could keep them memorized – nor could any computer. (Computers have essentially smaller memories than people.) However, the rules of the game can be specified to men and to computers because the specification is done by "describing" rather than "exhibiting" the sets involved and the sets of situation-pairs one calls "moves". When we say describing a set we mean, "using statements whose truth and falsity can be verified for each configuration, and which are true for each configuration in the set described".

The statements are generally made by using other statements as its components. When we describe a "win" in Tic-Tac-Toe we may say, "A position is a win if there are three X's in a row on the board". If a computer has to test a position to find if the position is a win for X, it must be able to test if certain squares in the board form a row or not. The test for "row", then, is a fundamental test that any computer must be able to perform before it can have the rules of Tic-Tac-Toe specified to it. Tests for occupancy of a square is another fundamental test. There are a few others.

For ease of discussion we shall say that the set of fundamental tests and the mode of combining these tests constitute a "language". To enable a machine to play a legal game the machine must be endowed with a language adequate for describing the rules of the game.

Strategies and Their Descriptions

A machine capable of understanding the rules of a game can certainly play it legally. However, this in general does not enable it to play well, let alone win against opponents of any ability.

One mathematically trivial way for a machine to play a game well would be for it to enumerate all possible sequence of moves and choose from it the "best" one. This "best", of course, has to be clearly defined; in literature the best move is often described as one which maximizes the minimum possible gain. We shall describe it in a slightly different manner.

Let us suppose that the first player finds himself called upon to choose a move. The problem he faces is: "Is there a move such that if it is applied to the present position, the resulting situation will be a winning situation?" If such move exists, then we shall say that the present position is a "forcing situation of type 1".

Let us now suppose that the position is not of type 1.

The player's next question would be, "Do I have a move and a resulting position such that no matter what countermove the opponent chooses the result of applying his countermove is of type 1?" If such exists for the player the first player can assure himself of a win. In this case we shall say that the present position is a "forcing situation of type 2".

Similarly type 3 situations will be the set of situations for which there exists a move and a resulting position such that for any countermove chosen by the opponent, the result is either of type 1 or type 2, and so on to greater depths.

"A good player is one who recognizes that he is in an almost winning situation when he is in it."

It is clear that if there is a sure method of winning for the first player, then the present position must be a forcing situation of type 1, 2, 3, 4, etc. (See Wang, "Games, Logic, and Computers", *Scientific American,* November 1965). A good player is one who recognizes that he is in an almost winning situation when he is in it. The higher the value of the type which he can recognize, the better player he is.

Positions of the first or second types can be recognized by exhaustive trial and error tests for each move and the possible replies of the opponent. For higher values of the type, what is needed is a "description" of the set involved, in terms of some basic tests, in the same way as the winning, losing, and draw situations need description.

The important thing to consider here is the repertoire of basic tests that a machine must have so that it can understand the descriptions of the forcing states of different types. Generally, this repertoire is unknown even to the programmer.

A "Learnable" Class of Games

In all the past efforts at programming machines to play games it was necessary to build into the machine the ability to recognize certain sets of positions which were not essential to the playing of legal games. The programs which improved their games did so, not by introducing new terms (new basic tests) into their language, but by changing the modes of combination of the different tests given to it.

Samuel's Checkers

One of the most successful cases of game learning by computer has been A. Samuel's program for checkers (see IBM Journal of Research and Development, Vol. 3, page 210). In this program certain known characteristics of "good" positions (like center control, material balance, etc.) were chosen from existing books about the game. Methods were devised to give numerical measures to these characteristics. Then it was assumed that the real value of a position was some weighted sum of these characteristics. If these weights could be found, then one could play the game by making moves in such a way that no matter how the opponent responded, he could not reduce the value of the resulting position. A sequence of moves so chosen would ultimately result in a win if the value was calculated correctly, i.e., if the weights were correctly chosen – and if indeed the actual value of the position (measured, for instance, by its position in forcing states of various types) were obtainable by weighted averages.

It is quite difficult to find out whether values of positions are obtainable as weighted sums of the specific measurements made. Nor is there any easy method available for finding the weights which yield stable values whenever they exist, without recourse to an inordinate amount of memory search. In the case of Checkers, a method was chosen which was applicable only to static cases of pattern recognition, but had no assurance of stabilizing to any fixed set of weights. However, the method was found to converge well enough to yield a very strong Checker player.

Greenblatt's Chess

The success of this method in Checkers has led to similar efforts in other games. However, no other equally strong program for game learning has emerged from this to the best of our knowledge. This is not surprising in view of the number of *ad hoc* assumptions and decisions on which the method is based. Subsequent strong programs which play non-trivial games have not been learning programs. For example, the tournament-rated Chess playing program of Richard Greenblatt (see Greenblatt, *et al., Proceedings of the Fall Joint Computer Conference,* 1967) was actually modified by the programmer himself on the basis of experience.

Manipulating Language

The most desirable situation in the field would be when the language (the basic tests and the ways of combining them) essential only to the playing of a legal game could be enriched by a machine to a language adequate for describing at least the forcing states for some high values of type. Essentially, what one is asking for is a program which, on being given the rules of Chess moves, and on being told that in all win positions the opponent's king is immobile under check, could develop for itself the importance of center control.

At present, the wherewithals for building such an ability into the machine are limited. There is also considerable doubt in the minds of some people as to whether the ability to play a game well has to be preceded by the capability to manipulate language. There is no doubt, however, that if this capability could be developed, it would facilitate game learning a good deal.

"There is no doubt that if the capability of a machine to manipulate language can be developed, game learning is greatly facilitated."

However, if one restricts one's ambitions, one can at times predict the language one would need for efficient description and learning of the forcing situations. Recently we happened to stumble across a class of games whose rules, though apparently not quite similar, can be described in terms of a rather uniform language. What is more, it appeared that the forcing situations could be described quite easily in the language if one included two more tests than were necessary for describing the rules of the game.

The games we discovered are two games of the Tic-Tac-Toe variety, a set of games known commonly as the Shannon Network games, and the game of HEX (see *Scientific American* Mathematical Games & Puzzles Section, July, 1957). We shall discuss them next month. □

CONFIDENTIAL AND SECRET DOCUMENTS OF THE WARREN COMMISSION DEPOSITED IN THE U. S. ARCHIVES

NEIL MACDONALD
ASSISTANT EDITOR

After the assassination of President John F. Kennedy in Dealey Plaza, Dallas, Texas, Nov. 1968, the Warren Commission, consisting of nine persons appointed by President Lyndon B. Johnson, and headed by Chief Justice Earl Warren of the U.S. Supreme Court, examined evidence, and concluded that Lee Harvey Oswald was the sole assassin.

The correctness of this conclusion has been challenged by many investigators and researchers. One of the latest challenges was the article, "The Assassination of President Kennedy: The Application of Computers to the Photographic Evidence", by Richard E. Sprague, published in the May 1970 issue of Computers and Automation.

Nobody who has studied the evidence, the contradictions in the Warren Commission report and documents, the acts of suppression of information, the photographs available, the physics of the shots, etc., can any longer logically maintain that a single assassin accounts for all the shots and other events in Dealey Plaza on that occasion. This implies a conspiracy.

It appears that at least some and probably a majority of the members of the Warren Commission realized very soon that there had been a conspiracy, with more than one gunman in Dealey Plaza shooting at President Kennedy; and so, on grounds of "national security", they engaged in a "second conspiracy" to cover up the first one.

Following the reporting of the Warren Commission in September 1964, ten months after the assassination, over 200 of their documents (and by some counts as many as 350), were classified as confidential, secret, or top secret, and were placed in the U.S. Archives, many of them to stay secret for 75 years. Probably by some administrative error, the list of the subjects of these documents was not so classified.

Table 1 shows a copy of a list of over 200 documents of the Warren Commission which are in the Archives of the United States in Washington, D.C., and which have been classified as confidential, secret, or top secret, so that the American people and researchers into the assassination of President John F. Kennedy cannot see them or study them.

This list shows the identifying "commission document" (CD) number, the originating agency, such as the Federal Bureau of Investigation (FBI), the subject, and in some cases the place of origin of the document.

Judging from the subjects, it is truly extraordinary that some of these documents have been classified, such as:

322g	USIA	Public and propaganda reactions to the assassination, in Poland
489	FBI	Mark Lane, Buffalo appearances

Mark Lane is the lawyer and former member of the legislature of New York State who wrote the best-selling book Rush to Judgement about President Kennedy's assassination. At least eight of these classified documents mention Mark Lane in their title, as if he had had something to do with the assassination instead of with questioning the investigation by the Warren Commission and other government agencies.

There is considerable evidence that Lee Harvey Oswald worked from time to time over a number of years, for the CIA or one of its subcontractors. Several of the subjects in Table 1 suggest confirmation of this possibility:

931	CIA	Oswald's access to information about the U2 [the high-flying spy plane]
528	CIA	re allegation that Lee Harvey Oswald was interviewed by the CIA in the USSR
692	CIA	reproduction of CIA official dossier on Lee Harvey Oswald
698	CIA	reports of travel and activities: Lee Harvey Oswald as Marine
1216	CIA	Memorandum from Helms entitled "Lee Harvey Oswald"
1273	CIA	Memorandum from Helms re apparent inconsistencies

Helms was the head of the CIA at the time of the Warren Commission's existence.

Abbreviations used in Table 1

CIA	Central Intelligence Agency
FBI	Federal Bureau of Investigation
HEW	Department of Health, Education and Welfare
IRS	Internal Revenue Service
JD	Department of Justice
La.	State of Louisiana
SIS	U.S. Senate Subcommittee on Internal Security
SS	U.S. Secret Service
State	U.S. State Department
Trs.	Department of the Treasury
USIA	U.S. Information Agency

Table 1: LIST OF SECRET DOCUMENTS

Comm. Doc.	Agency	Subject / Place
66	FBI	Lee Harvey Oswald / San Diego
76	FBI	Hoaxes, False Reports, Irresponsible Reporting
78	FBI	Lee Harvey Oswald's Mexican trip
89	FBI	Income tax returns of Jack Ruby and associates
90	FBI	Income tax returns of Lee Harvey Oswald and relatives
100	CIA	Analysis of world reaction to assassination of John F. Kennedy
101a	Trs.	Income tax information on Ruby, Lee Harvey Oswald, and others
101f	Trs.	Narcotics Bureau report re Jack Ruby
114	FBI	Lee Harvey Oswald / Louisville
117	FBI	Lee Harvey Oswald / St. Louis
119	FBI	Lee Harvey Oswald / Albany
136	FBI	Lee Harvey Oswald / Tampa
153	FBI	Lee Harvey Oswald / Norfolk
181	FBI	Lee Harvey Oswald / Cincinnati
190	FBI	Lee Harvey Oswald / Cincinnati
212	FBI	Ruth Hyde Paine / Philadelphia
218	FBI	Michael Ralph Paine / Los Angeles
222	SS	re Lloyd John Wilson and his implication in the assassination
227	FBI	Lee Harvey Oswald / Miami
258	FBI	Michael Ralph Paine / Los Angeles
271	FBI	Assassination of President John F. Kennedy / El Paso
273	FBI	Assassination of President John F. Kennedy / Charlotte
278 thru 287	State	Reports on various assassination attempts throughout the world
299	FBI	Tax returns for Jack Ruby and Earl Ruby
300	CIA	re Recent Soviet statements of Lee Harvey Oswald
321	CIA	Chronology of Lee Harvey Oswald in the USSR / Washington, DC
322f	USIA	Foreign radio and press reactions to the assassination of President Kennedy
322g	USIA	Public and propaganda reactions to the assassination in Poland
347	CIA	Activity of Lee Harvey Oswald in Mexico City
351	SIS	Lee Harvey Oswald memo
355	JD	Witnesses interviewed re Jack Ruby
361	CIA	Biographical information on Mrs. L.H. Oswald and relatives
365	La.	Compiled information on Lee Harvey Oswald / Baton Rouge (pps. 31 to 41 withheld)
367	FBI	Jack and Earl Ruby tax returns
382	FBI	Medical Records of Fanny Rubenstein
384	CIA	Activity of Lee Harvey Oswald in Mexico City
390	FBI	Lee Harvey Oswald / Chicago
425	IRS	Summary of tax returns / Washington, DC
426	CIA	Interrogations of Silvia Duran and Husband in Mexico City
432		Materials sent by James H. Martin pertaining to Marina Oswald
433	FBI	Lee Harvey Oswald / New York
434	FBI	Lee Harvey Oswald / Washington, DC
442	State	Telegrams between State Dept. and the U.S. Embassy, Mexico City
445	FBI	National Guardian; Mark Lane / New York
448	CIA	Mohammed Reggab allegations re Marina Oswald
449	FBI	re residence of Marina Oswald, James Martin
451	FBI	Yuri Ivanovich Nosenko; interview
469	FBI	Lee Harvey Oswald / Oklahoma
470	FBI	Lee Harvey Oswald / Dallas
471	FBI	Lee Harvey Oswald / Cleveland
478	FBI	Memorandum: "Lee Harvey Oswald, also known as" / Dallas
480	FBI	Marguerite Oswald in Boston / Boston
489	FBI	Mark Lane, Buffalo appearance / Buffalo
499	FBI	Deirdre Griswold; Robert Gwathmey / Washington, DC
504 thru 506 and 508	FBI	Sylvia Ludlow Hyde Hoke / Cincinnatti, Seattle, New York
527	IRS	Hyman Rubenstein; tax returns
528	CIA	re allegation Lee Harvey Oswald interviewed by the CIA in the USSR
530	FBI	George DeMohrenschildt / Washington, DC
540	FBI	George DeMohrenschildt / Washington, DC
548	FBI	George DeMohrenschildt
557	FBI	re Lee Harvey Oswald's attempted suicide / Dallas
564	FBI	Lee Harvey Oswald / Washington, DC
565	FBI	Lee Harvey Oswald / Washington, DC
566	FBI	Lee Harvey Oswald / Washington, DC
597	FBI	Bundesnachrichtendienst file
599	FBI	Vada Oswald statements / Denton
600 thru 629	FBI	George Lyman Paine, Jr. and Frances Drake Paine
631	CIA	re CIA dissemination of information on Lee Harvey Oswald / Washington
653	FBI	Lee Harvey Oswald / Chicago
663	FBI	Lee Harvey Oswald / Washington, DC
664	FBI	Lee Harvey Oswald / Washington, DC
665	FBI	Lee Harvey Oswald / Washington, DC
669	FBI	Lee Harvey Oswald / Dallas
674	CIA	Information given to the Secret Service but not yet the Warren Commission / Washington, DC
677	SS	Memorandum from Chief Rowley to Mr. Belin, report on assassination
680	CIA	Oswald chronology in Russia
681	IRS	Tax returns: Carroll, Ruby, Meyers, Volpert
687	SS	Ruth Paine; Naushon Island Cottages / Boston
688	IRS	Numerous tax returns
691	CIA	Oswald chronology in Russia
692	CIA	Reproduction of CIA official dossier on Lee Harvey Oswald
694	FBI	Various Mark Lane appearances
698	CIA	Reports of travel and activities: Lee Harvey Oswald and Marina
700	HEW	Various social security records; Jack Ruby associates
702	FBI	FBI criteria for giving information to the Secret Service
703	IRS	IRS information on those mentioned in CD 681
708	CIA	Reply to questions posed by State Dept.
710	CIA	re: Richard Thomas Gibson
713	FBI	Tax returns; Michael & Ruth Paine
720	FBI	(r) thru (ee): Photos Jack Ruby strippers
721	FBI	Oswald's trip to Mexico
726	CIA	Actions of Silvia Duran after first interrogation / Washington, DC
729	FBI	Allegation that Oswald was in Montreal, summer, 1963 / Washington, DC

Comm. Doc.	Agency	Subject / Place
751	FBI	Lee Harvey Oswald: re Mexican trip / Washington, DC
763	FBI	Mark Lane appearances / Los Angeles
785	FBI	Oswald in Mexico; 7 photos attached / Washington, DC
788	FBI	Memorandum on Eugene B. Dinkin / Chicago
794	FBI	"Lee Harvey Oswald" re Elizabeth Catlett Mora
795	SS	Interview with Harry McCormick, Dallas Morning News / Dallas
796	HEW	Social Security information on Karen Bennett et al. / Washington, DC
801	FBI	Jeanne De Mohrenschildt / Chicago
808	FBI	Lee Harvey Oswald / Cincinnati
812	FBI	Lee Harvey Oswald / Miami
817	CIA	Allegations concerning Anton Erdinger / Washington, DC
818	CIA	Revisions of CD 321 / Washington, DC
844	CIA	re Lydia Dimytruk, Russian acquaintance of Marina Oswald / Washington, DC
848	FBI	Michael and Ruth Paine tax returns, '56-'58 / Washington, DC
853	SS	re: Manuel Rodriguez, 5310 Columbia, Dallas. Reaction of Cuban exile community to Pres. Kennedy's death / Washington, DC / Miami / Dallas
854	SS	Control no. 1426; Odio, McChann, Leopoldo, J. Martin / Miami
871	CIA	Photos of Oswald in Russia / Washington, DC
872	FBI	Oswald's travel in Mexico / Washington, DC
873	FBI	Oswald's travel in Mexico / Washington, DC
874	FBI	Oswald's travel in Mexico / Washington, DC
880	FBI	re Oswald safe deposit box, in Laredo, Houston / Washington, DC
894	FBI	re Detroit branch of the Fair Play Committee for Cuba / Detroit
895	FBI	re Reva and Joseph Bernstein / Washington, DC
896	FBI	Lee Harvey Oswald / Washington, DC
902	CIA	Criteria for giving information to the Secret Service
908	FBI	Oswald trust fund / Dallas
910	FBI	Inquiry into Oswald's Mexican trip / Washington, DC
911	CIA	Marina Oswald's notebook / Washington, DC
928	CIA	Lev Setyayev and Lee Harvey Oswald contact with USSR citizens / Washington, DC
931	CIA	Oswald's access to information about the U-2 / Washington, DC
933	FBI	Investigation of Paul V. Carroll / El Paso
935	CIA	Role of Cuba Intelligence Service in processing visa application / Washington, DC
941	FBI	Telephone nos. on 47th page of Lee Harvey Oswald's address book / Washington, DC
943	CIA	Allegations of PFC Eugene Dinkin re assassination plot / Washington,DC
944	CIA	Mexican control of US citizens travel to Cuba / Mexico
945	SS	Interview of Rev. Walter McChann on April 30 / Washington, DC
955	FBI	Lee Harvey Oswald / Los Angeles
959	FBI	Arnold Louis Kessler / Washington, DC
971	CIA	Telephone call to U.S. embassy, Canberra, re planned assassination / Washington, DC
977	FBI	Interview with Abraham Bolden / Chicago
983	FBI	re claims of Manuel Santamarina Mendez and Luis Fernandez Gonzalez / Washington, DC
988	FBI	Information concerning General Edwin Walker / Boston
990	CIA	Khrushchev and Drew Pearson discussion re Lee Harvey Oswald / Washington, DC
991	FBI	Letter to Atty. Gen'l from Norman P. Michaud / Bureau Prisons
992	FBI	re: Norman P. Michaud; threat against Lyndon B. Johnson / Phoenix
1000	CIA	Mexican interrogation of Gilberto Alvarado / Washington, DC
1005	FBI	Interview of Mrs. Lucille Labonte, Sudbury, Ontario / Washington, DC
1006	FBI	re Charles Small, also called Smolikoff (Mexican trip) / Washington, DC
1007	FBI	Oswald's Mexican trip; entry & departure / Washington, DC
1008	FBI	Oswald's Mexican trip; hotel registration / Washington, DC
1012	CIA	George and Jeanne DeMohrenschildt / Washington, DC
1014	SS	Memorandum, Soddels to Chief Rowley re Zapruder film / Dallas
1029	FBI	Oswald's Mexican trip / Washington, DC
1030	FBI	Statements of Reva Frank Bernstein / Washington, DC
1037	FBI	Mexican aspects of Oswald investigation / Washington, DC
1038	FBI	Mexican aspects of Oswald investigation / Washington, DC
1039	FBI	re Charles William Denton / New York
1041	CIA	Allegations re Intelligence Training School in Minsk, U.S.S.R. / Washington, D.C.
1054	CIA	Information on Jack Ruby and associates / Washington, DC
1080	FBI	Information on Harold R. Isaacs and Marilyn D. Murret / Boston
1084	FBI	Lee Harvey Oswald; Luis Fernandez Gonzalez / Washington, DC
1085	FBI	Cuban exile Groups and individuals / Washington, DC
1089	CIA	Letter re assassination sent to Costa Rican embassy / Washington, DC
1096	CIA	Fascists and Nazis today; Paris, Albin Michel; Dennis Eisenberg
1098	FBI	Interviews of Capt. Voltz and Capt. Stutts / San Francisco
1126	FBI	Jack Ruby: long distance phone calls / Washington, DC
1131	CIA	Soviet brainwashing techniques / Washington, DC
1133	FBI	Toll charges incurred by Seth Kantor / Dallas
1138	FBI	Various Ruby phone calls (Evan Grant; Vegas club) / Dallas
1149	FBI	Investigations re Ruby, Paul, Senator, Breck, Wall / Dallas
1171	FBI	Lee Harvey Oswald; Internal Security; Cuba / Miami
1173	FBI	Letter to Tulsa Tribune by Nick Krochmal, Cleveland / Cleveland

Comm. Doc.	Agency	Subject / Place
1180	FBI	Mexican aspects of the investigation / Washington, DC
1188	CIA	Allegation Oswald was in Tangier, Morocco / Washington, DC
1206	FBI	Lee Harvey Oswald; Internal Security; Cuba / San Francisco
1212	FBI	Lee Harvey Oswald re checks / New York
1216	CIA	Memorandum from Helms entitled "Lee Harvey Oswald" / Washington, DC
1220	FBI	Lee Harvey Oswald; re Guests at Hotel Del Cammercio / Washington, DC
1222	CIA	Statements by DeMohrenschildt re assassination and Lee Harvey Oswald / Washington, DC
1262	FBI	Jack Ruby: investigation relating to Paul R. Jones / Charlotte
1268	FBI	Re interview of Jess Willard Lynch / Phoenix
1269	FBI	Location of photos of a bone specimen, CIA / Dallas
1273	CIA	Memo from Helms re apparent inconsistencies / Washington, DC
1287	CIA	re Lee Harvey Oswald and affidavit concerning cropped picture / Washington, DC
1345		Dulles memo re help given Oswald by Mme Yekaterina A. Furtseva
1353	FBI	Oswald; Internal Security; Cuba / Baltimore
1356	CIA	Soviet Hunting Societies / Washington, DC
1358	CIA	Time required for Soviet visa in Helsinki. 1964 / Washington, DC
1359	FBI	re statements on assassination by Fidel Castro / Washington, DC
1373	SS	re Waldemar Boris Kara Patnitsky / New York
1378	State	Various Moscow embassy conversations / Moscow
1380	FBI	Mark Lane / New York
1394	FBI	Information furnished by Katherine M. Halle re A.I.Kinchuk / Washington, DC
1404	FBI	Records of Dallas police; phone calls to Ft. Worth / Dallas
1409	FBI	Results of investigation to locate Carlos Camorgo / Washington, DC
1413	FBI	Interview with Richard D. Walker / Dallas
1414	FBI	Copy of slip of paper Jack Ruby left at Graphic Studio / Dallas
1424		Earl Ruby letter to the Commission
1425	FBI	re American GI Forum / Washington, DC
1427	FBI	re maintaining contact with Albert Alexander Osborne / Washington, DC
1437	FBI	re Sidney Joseph Whiteside / Houston
1443	CIA	re Konstantin Petrovich Sergievsky / Washington, DC
1452	SS	re Nancy M. Dowell, also called Tami True / Dallas
1457	FBI	Mark Lane and his trip to Europe / Washington, DC
1470	FBI	Long distance calls of Harry Olsen / Dallas
1479	CIA	re publication of documents furnished the Warren Commission / Washington, DC
1482	IRS	Tax returns Robert B.Baker, Bruce Carlin, et al. / Washington, DC
1486	FBI	Oswald; Internal Security; Cuba / Miami
1487	FBI	Memo entitled Mark Lane, James Delaney Garst / Washington, DC
1490	State	re permission for Warren Commission to publish certain State Documents / Washington, DC
1504	FBI	Bruce Ray Carlin toll charges / Dallas
1510	FBI	Translations of FBI items D-244 to D-248 and 250 / Washington, DC
1522	FBI	Mark Lane
1523	FBI	Statement from Omaha re Warren Egbert Hefflon
1528	FBI	re William Wayne Howe's interest in providing home
1532	CIA	Documents seized at end of World War II re Joachim Joesten
1539	FBI	O.Pena and B.Flechenstein / New Orleans
1543	FBI	German newspaper article / Washington, DC
1544	FBI	Report from a confidential source pertaining to a document from West Germany
1545	CIA	Activity of Lee Harvey Oswald in Mexico City / Washington, DC
1551	CIA	Conversations between Cuban President and ambassador
1552	CIA	Soviet use of kidnapping and assassination; Soviet press reaction

REPORT FROM GREAT BRITAIN

(Continued from page 40)

Barclays' Network

Barclays Bank, which also based its network on this machine, has been experiencing somewhat similar problems. They will be partly solved by delivery by Burroughs (at no charge to the bank) of about $4m worth of Sensomatic accounting machines to the various branches needing them. These machines are to fill the computing gap till the major systems can be made fully operational.

Users of IBM equipment, the other major banks, are quietly rubbing their hands, particularly as their rivals who opted for Burroughs were saying for many months that they would be coping with similar workloads on hardware costing far less than the huge arrays of IBM equipment at National Westminster Bank and at Lloyds.

Ted Schoeters

Ted Schoeters
Stanmore, Middlesex
England

CALENDAR OF COMING EVENTS

Nov. 10-12, 1970: National Symposium on Criminal Justice Information and Statistics Systems, Sheraton-Dallas Hotel, Dallas, Texas / contact: Project SEARCH, 1108 14th St. Fifth Floor, Sacramento, Calif. 95814

Nov. 12-13, 1970: Canadian IEEE Symposium on Communications, Queen Elizabeth Hotel, Montreal, Quebec, Canada / contact: IEEE Headquarters, Technical Conference Services, 345 E. 47th St., New York, N.Y. 10017

Nov. 12-13, 1970: CAST '70 Conference (AIIE), The Americana Hotel, Miami Beach, Fla. / contact: Joseph P. Lacusky, American Institute of Industrial Engineers, Inc., CAST '70, P. O. Box 1081, Miami, Fla. 33148

Nov. 12-13, 1970: 11th IEEE Symposium on Man-Machine Systems, Langford Hotel, Winter Park, Fla. / contact: The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, N.Y. 10017

Nov. 16, 1970: ACM Computer Graphics Workshop, Houston, Tex. / contact: Jackie Potts, ACM, SIGGRAPH, Box 933, Blair Station, Silver Spring, MD 20910

Nov. 16, 1970: ACM (SIGCSE) Symposium on Academic Education in Computer Science, Astroworld Hotel, Houston Tex. / contact: Dr. J. Robert Jump, Dept. of Electrical Engineering, Rice Univ., P.O. Box 1892, Houston, Tex. 77001

Nov. 17-19, 1970: Fall Joint Computer Conference, Astro Hall, Houston, Tex. / contact: L. E. Axsom, IBM Scientific Ctr., 6900 Fannin, Houston, Tex. 77025

Nov. 19-20, 1970: 1970 Data Processing Conference (sponsored by the Data Processing Management Association, Empire Division), Statler Hilton Hotel, New York City, N.Y. / contact: Conference Registrar, CONFERENCE '70, P.O. Box 1926, Grand Central Station, New York, N.Y. 10017

Nov. 19-21, 1970: DECUS (Digital Equipment Computer Users Society) 1970 Fall Symposium, Shamrock Hilton, Houston, Texas / contact: DECUS, Digital Equipment Corp., Maynard, Mass. 01754

Dec. 2-3, 1970: Conference on Display Devices, United Engineering Ctr., New York, N.Y. / contact: Sam Stone, Gen'l Tel. & Elec., 208-20 Willets Pt. Blvd., Bayside, N.Y. 11360

Dec. 7-9, 1970: 9th IEEE Symposium on Adaptive Processes: Decision and Control, Univ. of Texas, Austin, Tex. / contact: Prof. D. G. Lainiotis, Engineering Science Bldg., 502, Univ. of Texas at Austin, Austin, Tex. 78712

Dec. 7-9, 1970: 26th Annual National Electronics Conference and Exhibition (NEC/70), Conrad Hilton Hotel, Chicago, Ill. / contact: NEC, Oakbrook Executive Plaza #2, 1211 W. 22nd St., Oak Brook, Ill. 60521

Dec. 9-11, 1970: Fourth Conference on Applications of Simulation, Waldorf-Astoria, New York, N.Y. / contact: Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 11036

Jan. 31-Feb. 5, 1971: IEEE Winter Power Meeting, Statler Hilton Hotel, New York, N.Y. / contact: IEEE Headquarters, Technical Conference Service, 345 E. 47th St., New York, N.Y. 10017

Feb. 22-24, 1971: San Diego Biomedical Symposium — 1971, Ramada Inn, Harbor Island, San Diego, Calif. / contact: Richard D. Yoder, M.D., Univ. of California, San Diego, University Hospital of San Diego County, 225 West Dickinson St., San Diego, Calif. 92103

Mar. 1-3, 1971: Data Processing Supplies Association, Spring Membership Meeting, The Doral Hotel & Country Club, Miami, Fla. / contact: Data Processing Supplies Association, 1116 Summer St., Stamford, Conn. 06905

Mar. 1-3, 1971: First International Symposium on Fault-Tolerant Computing, Huntington-Sharaton Hotel, Pasadena, Calif. / contact: Dr. Francis P. Mathur, Sec'y, IEEE Technical Comm. on Fault-Tolerant Computing, Jet Propulsion Laboratory, Calif. Institute of Tech., 4800 Oak Grove Dr., Pasadena, Calif. 91103

Mar. 9-13, 1971: INEL 71, the 5th International Exhibition of Industrial Electronics, Basel, Switzerland / contact: Sekretariat INEL 71, CH-4000, Basel 21, Switzerland

March 22-24, 1971: Numerical Control Society's Eighth Annual Meeting and Technical Conference, Disneyland Hotel, Anaheim, Calif. / contact: William H. White, Numerical Control Society, 44 Nassau St., Princeton, N.J. 08540

Mar. 22-25, 1971: IEEE International Convention & Exhibition, Coliseum & N.Y. Hilton, New York, N.Y. / contact: IEEE Headquarters, 345 E. 47th St., New York, N.Y. 10017

Mar. 29-Apr. 2, 1971: Datafair '71 Conference, Nottingham Univ., Nottingham, England / contact: Datafair '71 Conference Office, The British Computer Society, 21 Lamb's Conduit St., London, W.C.1, England

Apr. 5-8, 1971: The First National Educational Technology Conference, American Hotel, New York, N.Y. / contact: Conference Manager, Educational Technology, Englewood Cliffs, N.J. 07632

Apr. 13-16, 1971: Ninth Annual Convention of the Association for Educational Data Systems, Royal York Hotel, Toronto, Ontario, Canada / contact: AEDS Convention, P.O. Box 426, Don Mills, Ontario, Canada

May 3-5, 1971: Data Processing Supplies Association, Affiliate Membership Meeting, Copenhagen, Denmark / contact: Data Processing Supplies Association, 1116 Summer St., Stamford, Conn. 06905

May 11-13, 1971: IEEE (Institute of Electrical and Electronic Engineers) 1971 Region Six Conference, Wood Lake Inn, Sacramento, Calif. / contact: Dr. D. H. Gillot, Co-Chmn, IEEE Region 6 Conference, Sacramento State College, Dept. Of Electrical Engineering, 6000 Jay St., Sacramento, Calif. 95819; or, Dr. R. F. Soohoo, Program Chmn., IEEE Region 6 Conference, Univ. of California at Davis, Dept. of Electrical Engineering, Davis, Calif. 95616

May 12-14, 1971: 22nd Annual Conference of the American Institute of Industrial Engineers (AIIE), Boston, Mass. / contact: Anthony J. Jannetti, Exhibit Manager, c/o Charles B. Slack, Inc., Pitman, N.J. 08071

May 18-20, 1971: Spring Joint Computer Conference, Convention Ctr., Atlantic City, N.J. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

May 24-26, 1971: Power Industry Computer Applications Technical Conference, Statler Hilton Hotel, Boston, Mass. / contact: P. L. Dandeno, Hydro Electric Power Commission of Ontario, 620 University Ave., Toronto, Ontario, Canada

May 24-28, 1971: 2nd International IFAC Conference and Exhibition "P.R.P.-Automation", Centenary Halls, Brussels, Belgium / contact: IFAC/P.R.P.-Automation, Jan van Rijswijcklaan 58, B-2000 Antwerp, Belgium

June 2-5, 1971: 3rd IFAC/IFIP Conference on Digital Computer Applications to Process Control, Technical University, Otaniemi, Finland / contact: 3rd IFAC/IFIP Conference, Box 10192, Helsinki 10, Finland

June 7-9, 1971: International Computer Forum and Exposition (Com-For), McCormick Place-on-the-Lake, Chicago, Ill. / contact: National Electronics Conference, Inc., Oakbrook Executive Place II, 1211 W. 22nd St., Oak Brook, Ill. 60521

July 26-29, 1971: First International Computer Exposition for Latin America, sponsored by the Computer Society of Mexico, Camino Real Hotel, Mexico City, Mexico / contact: Bernard Lane, Computer Exposition, Inc., 254 West 31st St., New York, N.Y. 10001

Aug. 3-6, 1971: IFAC Symposium on The Operator, Engineer and Management Interface with the Process Control Computer, Purdue University, Lafayette, Ind. / contact: Dr. Theodore J. Williams, Purdue Laboratory for Applied Industrial Control, Purdue University, Lafayette, Ind. 47907

Aug. 11-13, 1971: Joint Automatic Control Conference, Washington Univ., St. Louis, Mo. / contact: R. W. Brockett, Pierce Hall, Harvard Univ., Cambridge, Mass. 02138

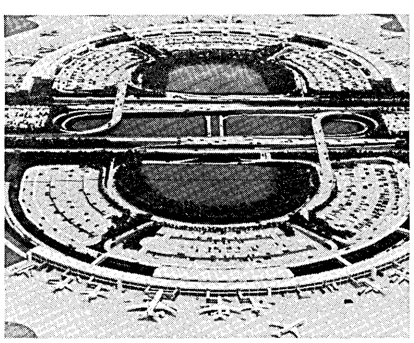
ACROSS THE EDITOR'S DESK

APPLICATIONS

COMPUTER SIMULATION STUDY AIDS DESIGNERS OF WORLD'S LARGEST AIRPORT

Under the watchful eyes of planners determined to build an efficient Dallas-Fort Worth Regional Airport, thousands of airplane passengers shuttle between parking lots and terminals in fast, efficient airport rail cars; baggage is routed from jumbo jets and supersonic transports to smaller planes without a hitch or a lost bag — all represented mathematically inside an IBM computer. IBM Corporation has developed the computer simulation study for the airport planners under a Systems Engineering Services agreement.

The Dallas-Fort Worth airport is being built to accommodate projected needs through year 2000. The sprawling facility (nine miles from end to end) will span 16,500 acres between Dallas and Fort Worth — matching the size of New York's Kennedy International Airport and Chicago's O'Hare Airport combined. The model shown below illustrates one of five



terminals to be built (to open in 1973); additional terminals will be added as needed. It will be the world's largest airport.

"One of the most severe complaints at existing metropolitan airports is the difficulty in getting from one's car to the plane and from one plane to another," said Dr. Joe L. Steele, operations research adviser for the regional airport staff. We can eliminate this problem with our automated transit system...." In the simulation studies Dr. Steele and his associates map the maze of tracks, vary the passenger load conditions, and experiment with the size, passenger capacity and speed of transit cars — all inside the computer. Simulated cars speed through the computer, making stops and switching tracks to meet passenger demands. Planners experiment with the most severe conditions, e.g., several jumbo jets landing at the same time that airport employees (a projected 22,000) change shifts.

As now envisioned, transit cars will be summoned by the press of a button at one of 29 stations — much like signalling for an elevator. The computer-controlled car will pick him up and take him to his destination along the most efficient route. Initially, there will be 80,000 feet of track. By the end of the century, there will be nearly 40 miles of track.

MINICOMPUTER DIAGNOSES LUNG ABNORMALITIES IN 90 SECONDS

In conjunction with the Nebraska State Tuberculosis and Respiratory Disease Association, Drs. Leo O'Brien and Irving Kass of the University of Nebraska Medical Center, set up a special exhibit for this year's State Fair visitors. Anyone who wished was able to have a "minicomputer" check his lungs in only a minute and a half, and tell him whether he had lung abnormalities.

The apparatus included a 35-pound 620/i minicomputer (made by Varian Associates, Palo Alto, Calif.) with 12,000 words stored in its memory. A special device, called a Wedge Spirometer, measured lung capacity, and measured breath in terms of flow and volume. The 620/i is programmed to analyze information which the Fair visitor volunteers on a special questionnaire and compare that information, and the Wedge Spirometer's analysis, with known lung health standards. The computer, via teletype printers, allows a doctor to determine within 90 seconds whether the visitor has mechanical lung problems and should see his physician.

ACCOUNTANT USES COMPUTER TO HELP SMALL BUSINESSMEN

Donald H. Thompson, Jacksonville, N.C., an accountant here since 1960, is using an IBM System/3 to automate general accounting, auditing and financial planning services for clients in this coastal town of 15,000. A service station, restaurant and a wholesaler, along with about 20 other businesses in Jacksonville, are beginning to feel the new computer is their own. Eacn month they receive a computer printout giving them detailed reports about last month's transactions, an updated general ledger, and an operating statement with percentages for the month and for the year-to-date. the printouts are giving them more information about their businesses than they ever had before.

"Now, for the first time, we can offer business management information along with our normal accounting service," says Thompson. His firm employs only six people; three staff accountants (one doubles as a computer programmer) and three office clerks.

MAHOGANY FARMS "BEEFS-UP" CATTLE WITH AID OF COMPUTER

Mahogany Farms, near Williamston, Mich., recently installed a Honeywell Model 110 computer system in an unused portion of a 50-by-160-foot hayloft. The computer is being used for cattle-breeding research aimed at developing better-tasting beefsteak for our dinner tables. Consumers, it is estimated, now buy and eat about 110 pounds of beef per person per year.

Data on the off-spring of superior purebred beef sires is analyzed and evaluated on the Honeywell system to develop cattle that eat less, grow faster and supply tastier steaks and roasts, according to Ray Record, management director of herd surveillance. When a sire with superior characteristics is identified through this research, his blood line is passed on to several thousand cows through artificial insemination. In normal breeding, only 25-30 cows can be bred and studied, prolonging development of purebred cattle.

The computer also is used to develop proper feed mixes; keep more accurate and timely breeding, cattle and inventory records; and for a variety of accounting functions.

COMPUTER WILL HELP MONITOR PLANNED COMMUNITY GROWTH

A group of small English communities (having seen the current plight of cities resulting from insufficient urban planning — or the total lack of it) has adopted a strategy of planned community growth, and has decided to use a computer to help monitor the progress of that plan. The project, sponsored by the British Government, will involve the consolidation of those communities to form the New City of Milton Keynes in a 22,000-acre area midway between London and Birmingham. The computer, a Burroughs B3500, is expected to guide the growth of the area from a present population of fewer than 50,000 to a projected 250,000 by the early 1990s.

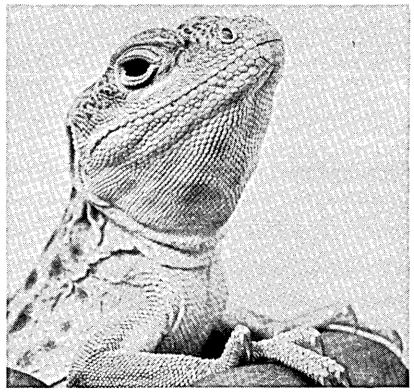
The computer will be used not only in the technical design of Milton Keynes' roads and other public works facilities, but also to monitor the socio-economic trends and requirements of its citizens. Community service planning will include such factors as education, health, employment, transportation, and religious, recreational and shopping facilities. Kenneth Wren, chief administrative and finance officer of the Milton Keynes Development Corporation, says of the project: "We have a strategic plan, but this is only intended to lay the foundations of the community. A community is more than groups of buildings; it is people. As our strategy becomes reality, as foundations become homes and jobs, so we shall be monitoring the needs and views of those living here, and where necessary, we shall change course within the flexibility of our plans. The computer is a vital tool to aid all concerned in making the best decisions, and will ensure that we fulfill our principal objective — to build a fine city."

While cities throughout the world struggle day by day with the problems that their growth has created, the New City of Milton Keynes, with the help of modern computer technology, stands an excellent chance of entering the 1990s as the planned community it intends to be.

UCLA COMPUTER-AIDED STUDY INDICATES LIZARDS BECAME STERILE AFTER PROLONGED LOW-LEVEL RADIATION

In the sandy desert scrub of Jackass Flats (Nevada), 70 miles northwest of Las Vegas, scientists and technicians from the UCLA (University of California, Los Angeles) Laboratory of Nuclear Medicine and Radiation Biology have concluded six years of study of native populations of plants and animals. Regular computerized censuses were taken in a 20-acre fenced area exposed to low levels of gamma radiation from a radioactive cesium source perched atop a 50-foot tower. Data was processed on an IBM System/360 Model 91 at the school's Los Angeles campus. (The 20-acre fenced desert area is part of the Atomic Energy Commission's Nevada Test Site; the research was funded by the division of biology and medicine of the AEC.)

Dr. Frederick B. Turner, who supervised reptile studies, reports that, in 1967, it was observed that leopard lizards in the irradiated plot were failing to reproduce. Autopsy of three females from the area two years later showed that they lacked ovaries and had highly increased amounts of body fat. Radiation was considered the reason.



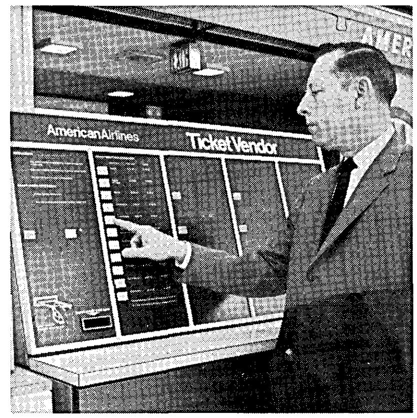
The scientists said, in view of the relatively low amounts of radiation received, these results were remarkable. These lizards were exposed to about 1,500 units of radiation (rads) from 1964 through 1967. Another species of lizard, the side-blotched uta, apparently survived exposure without ill effects. This was attributed to the fact that the uta's life-span is rarely longer than two years, whereas the leopard lizards (shown above) have a life-span of eight or nine years.

Tiny pocket mice exposed to the constant radiation exhibited a significantly reduced life span, according to studies by Dr. Norman R. French. These mice received a total dose of about 360 rads a year. Another aspect of the study revealed that these ¼-ounce mammals have an ability to "turn off" during lean years — surviving food shortages by sleeping in their burrows. The studies turned up 25 pocket mice that had survived two markedly lean years, when plant growth and seeds were even more scarce than usual in the desert.

The investigation relied heavily upon various computer procedures, particularly sorting and merging of new information into existing material. The IBM system processed some 65,000 project records. The research differed from similar work on unrestrained populations because it was possible to register essentially all plants and animals in the enclosed area — and with the computer, follow their fates with precision.

AMERICAN AIRLINES' TESTS OF DO-IT-YOURSELF TICKETING CALLED "HIGHLY SUCCESSFUL"

American Airlines has described as "highly successful" tests it conducted earlier this year with an experimental automatic ticket vendor (ATV). The computer-based ATV, a self-service ticketing device, was tested earlier this year at O'Hare International Airport in Chicago (Illinois) by American Airlines, IBM Corporation, and American Express. The ATV, built especially for the test by IBM's Advanced Systems Development Division, is said to be the first computer-based do-it-yourself ticketing machine ever used at an airport. An American Airlines passenger without a reservation is shown below about to select his destination by pushing a button



on the experimental machine. The ATV issued tickets to passengers with a reservation in an average of 49 seconds — those who lacked reservations received their tickets in an average of 56 seconds. The ATV was activated by magnetically-encoded American Express cards and Universal Air Travel Plan cards issued by American Airlines. The airline said 95% of passengers responded favorably when polled after using the ATV, and 99% said they would use the machine again. Results from the Chicago experiment will now be used as a basis for determining to what extent self-service ticketing will be implemented into airport processing.

RESEARCH FRONTIER

LATEX-LIKE FILM MAY SOON PROTECT SOME COMPUTER PARTS FROM CORROSIVE ENVIRONMENTS

A team of chemists at IBM's Poughkeepsie Lab (N.Y.) has modified a century-old electrochemical process to protect computer parts from corrosive environments. The process — Known as electrophoretic deposition — once was used by biologists to separate and collect proteins. Now, the IBM team has experimentally refined the procedure to coat parts with a latex-like film of constant thickness. The part to be coated could be a hair-thin copper line on a printed circuit board or even a complete assembly. The results are uniform — a smooth, high-quality, pinhole-free coating. Yet the procedure is so simple it can be demonstrated with a laboratory beaker and a small battery from a hardware store.

The electrophoretic deposition process consists of immersing two metallic conductors (an anode and cathode; the anode is the part to be coated) in liquid suspension of undissolved plastic particles. When a voltage is applied across the anode and the cathode, an electrochemical phenomenon causes the plastic particles to collect on and adhere to — thereby coating — the anode.

According to Eugene P. Damm, Jr., Materials Technology manager at IBM, assembled parts such as memory arrays can easily be electrophoretically coated, where traditional dip coating methods would be impractical or inefficient. Electrophoretic deposition is inexpensive, can be applied to almost inaccessible recesses, and enables the selection of coating thicknesses. Depending on the application, parts can be uniformly coated with film thicknesses of from 0.1 to 50 mils. "Electrophoretic deposition," says Mr. Damm, "is ideal for use in the cost-conscious electronics industry where part sizes have become microscopic and accuracy is essential."

RESEARCH SCIENTISTS DEVELOP COMPUTER-AIDED TECHNIQUE TO HELP DETECT MAJOR KIDNEY DISORDERS

A research team, comprised of a physician (Dr. Peter E. Jackson of Park Alameda Hospital) and several engineers (Dr. Paul O. Scheibe, Mr. William R. Be.., and Dr. Edward R. Meyer of Electromagnetic Systems Laboratories, Sunnyvale, Calif.), has developed a computer-aided technique for extending the usefulness of a test for kidney ailments. This development estimates numbers associated with fluid flow to and from the kidney from a renogram (a standard form of kidney examination).

Dr. Meyer explained that a mathematical description of pertinent kidney function was formulated from physical, chemical and physiological principles. In order to describe kidney function for a specific person, the German mathematician Karl Friedrich Gauss' method is used to estimate the required numbers from the renogram data. The numbers aid Dr. Jackson in diagnosing such kidney disorders as renovascular hypertension, a form of high blood pressure. The significance of tests for kidney function is made apparent by the fact that 10 to 30 million persons in the United States have high blood pressure — with one-fifth of these having the renovascular variety.

The new method, using an IBM System/360 computer, shows promise of providing information that normally requires a more extensive examination than the renogram — involving several days of hospitalization, uncomfortable and sometimes painful tests, with expenses that could approach a thousand dollars. Since obtaining a renogram does not introduce the danger of infection that accompanies other testing procedures, the computer-aided technique may also be used on kidney transplant patients. Additionally, estimated cost for the renogram and computer processing is expected to be near $100.

A goal of the research effort is to generate a technique that is usable in a small hospital that does not have a resident computer. The research team also is investigating similar approaches for aiding tests of the lung, brain, heart and liver. They ultimately perceive of one large computer program that can handle data from many different organs.

NEW PRODUCTS AND SERVICES

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
Digital		
Burroughs 700 Systems	Systems include: use of multiple processors; independent virtual memory; multiprogramming and multiprocessing; data communications; system expansion without reprogramming; programming in compiler languages / now available, the B 6700 can have up to 3 central processors, operating independently of each other; memory to 6 million bytes; 500 nsec main memory; 250 nsec "read" access time / ready in December, medium scale B 5700 / very large scale B 7700, to be ready early '72	Business Machines Group Burroughs Corp. Second Avenue at Burroughs Detroit, Mich. 48232
HP-2116C and HP-2114C	Offers twice the memory capacity — in same mainframe — as predecessors / HP-2116C has 1.6 msec cycle time; 8K core memory, 16-bits; maximum memory of 32K fits in mainframe / smaller 2114C, also 16 bit; cycle time 2 msec; 4K core memory expandable to 16K, in same mainframe / compatible with all HP software, peripherals, processor options and accessories	Inquiries Manager Hewlett-Packard Co. 1601 California Ave. Palo Alto, Calif. 94304
L5000 magnetic record computer	For wide variety of accounting records and management reports / reads, stores, retrieves data on magnetic memory records which may be randomly accessed / monolithic integrated circuitry; magnetic disk memory; micrologic / 48 applicational programs (COBOL)	Business Machines Group Burroughs Corp. Second Avenue at Burroughs Detroit, Mich. 48232
NCR Century 300	Extended operating systems; increased hardware capabilities for multi-programming and on-line requirements of large-scale user / basic core memory of 128K expandable to 2048K; cycle time for each 4-byte access, 650 nsec / compatible with Century 100 and 200	The National Cash Register Company Main & K Sts. Dayton, Ohio 45409
Nova 1200; Nova 800; Supernova SC	Line of three 16-bit word minicomputers; use large scale integrated (LSI) circuitry and semiconductor memory / standard configurations have 4096 word core memory, DMA channel, and Teletype interface / all are	Data General Corp. Southboro, Mass. 01772

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Digital, continued)	compatible with each other and with current Nova line / Nova 1200 has 1200 nsec cycle time; 1350 nsec add time / Nova 800, designed for high I/O requirements, is fully parallel and has 800 nsec add time / Supernova NC has all semiconductor memory with 300 nsec cycle time	
P850 minicomputer	General purpose for scientific institutes, laboratories, data communications, and industry (numerical control) / store range from 1K to 4K octads; cycle time, 1.6 msec; basic word 16 bits / up to 32 peripherals can be connected via programmed channel	NV Philips-Electrologica Industry Group Small Computers P. O. Box 245 Apeldoorn, The Netherlands
P880 system	For scientific and industrial market (message switching and process control) / several models with core stores ranging from 8K to 64K words / 0.640 msec store cycle time / uses ALGOL or FORTRAN compilers as well as a Report and Update program Generator (RUG)	(same as above)
RCA 2, 3, 6, 7	New series designed for remote computing, integrated system, large data base needs; all are compatible with existing RCA and IBM equipment / RCA 2, a small, medium scale real-memory computer; from 65,536 to 262,144 bytes / RCA 3, small, medium scale virtual memory computer with main memory sizes from 131,072 to 262,144 bytes; virtual memory up to 2 million bytes / RCA 6, a medium scale real-memory with from 262,144 to 2,097,152 bytes / RCA 7, a medium-to-large scale virtual memory computer with 262,144 to 2,097,152 bytes; virtual memory of up to 8 million bytes / new policy "Guaranteed Conversion" allows many IBM users to convert without risk	RCA/Information Systems Camden, N.J. 08101 c/o News & Information Dept.
SYSTEMS 82	For high speed applications where large memory is not a requirement; typically competing with DEC's PDP 11 and PDP 8 series / a 16-bit, 900 nsec machine; core memory expandable from 4,096 to 16,384 words; all memory locations directly addressable / wide range of mini-peripherals, communications interfaces, real-time software, etc.	Systems Engineering Laboratories, Inc. 6901 West Sunrise Blvd. Fort Lauderdale, Fla. 33313

Special Purpose Systems

Automated Cage Transaction System (ACTS)	For stock brokerage firms / records all cash/stock transaction information while original forms are typed / remaining process entirely automatic / system includes quantity of Recording Typewriters and one Processor that automatically changes data to computer-ready form	Data Instruments Co. 16641 Roscoe Place Sepulveda, Calif. 91343
System IV/70	For data entry and retrieval to-from data bases and computer systems / includes to 32 video display terminals connected and controlled by integrally designed computer / all semiconductor main frame memory; up to 96K bytes / full line of peripherals offered / (FJCC)	Four-Phase Systems, Inc. 10420 No. Tantau Ave. Cupertino, Calif. 95014 Attn: L. G. McClenning
WORD CENTRAL	Computer-based (DEC's PDP-8/L) direct numerical control system / controls up to six lathes simultaneously / small magnetic tape memory system extends computer's capability to store parts programs; offers machine-side editing of part programs, entry of new blocks, immediate access to any scheduled part program, management reporting	Lodge & Shipley Corp. 3055 Colerain Ave. Cincinnati, Ohio 45225

Memories

CDC 23141 Multiple Disk System	Replacement system for IBMs' 2314 Disk Access Storage Facility / includes CDC 23141 Storage Control Unit and from one to nine CDC 23121 Disk Storage Units / total on-line storage capacity ranges from 29 million to almost 234 million 8-bit bytes / average access time is 35 msec	Control Data Corp. 8100 34th Ave. So. Minneapolis, Minn. 55420 Attn: Kent R. Nichols
ICM-100	"Midget" 1,000-word integrated circuit magnetic core memory system / 9" x 4" x 1", organized in 8-, 9-, and 10-bit formats / operates at one msec full cycle time with access time of 310 nsec / data also may be destructively read out at 500 nsec rates / for minicomputer-based random access systems / (FJCC)	Honeywell Computer Control Old Connecticut Path Framingham, Mass. 01701 c/o Public Information Dept.
NM-1000 Series	Medium capacity, high-speed, random-access, read/write memory family / speeds are: read access 200 nsec; read time 300 nsec; write time 500 nsec / maximum capacity of family is 163,840 bits / can be configured into systems of 4K to 16K words by 8 to 40 bits per word	Nemonic Data Systems, Inc. 1301 West Third Ave. Denver, Colo. 80223

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Memories, continued)		
System/6000 Large Core Store	Can replace or augment an IBM 2361 LCS; totally com- with System/360, Models 50, 65, 67 and 75 / cycle time is 2 or 4 msec / LCS available in configurations of 1,048,576 bytes and 2,097,152 bytes / allows a 360 to be used in many on-line, real-time applications	Data Products 6219 DeSoto Ave. Woodland Hills, Calif. 91364 Attn: Gloria A. Greenlee

Software

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
"ALLTAX" COBOL Software Package	Calculates all payroll withholding taxes using one standard formula and a table of variable factors for federal, state and city taxes / permits preparation of wage bracket withholding tables based on user's own approved computer formula / free User Guide on request	Management Information Service P.O. Box 336 Ramsey, N.J. 07446
DiSPLAYALL	Designed to reduce costs, expedite implementation of on-line computer applications / permits batch off-line debugging of on-line applications / initially, system supports local, remote terminals under OS on IBM S/360	Informatics Inc. 21050 Vanowen St. Canoga Park, Calif. 91303 Attn: Robert B. Steel
LOGIC	A franchised applications program distributed through time sharing firms / program used by logic designers to simulate digital logic circuits and produce timing diagrams / permits pre-testing many alternate designs prior to starting experimental "bread-boarding" / time sharing firms' names furnished on request	Computeria, Inc. 14 Wood Road Braintree, Mass. 02184 Attn: Dick Reut
PDP-10 COBOL	Designed to give PDP-10 users commercial data processing capabilities / comprised of compiler, operating system, source library maintenance system, sort/merge facility, and test system / permits engineering services and business services on same computer in on-line or batch processing modes / minimum requirements: 21K user core area; 100,000 words disk storage; input device	Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754 Attn: Edgar E. Geithner
PLANDEC	A general-purpose computer program for corporate planning and executive decision making / designed for ease of use regardless of user's knowledge of computer techniques or simulation / written in FORTRAN IV, can be implemented on any computer, or time-sharing service / one time fee includes assistance in initial implementation	Simulation Models, Inc. P.O. Box 339 Ridgewood, N.J. 07451 Attn: H. Russell Fogler, Ph.D
SERIES	User-oriented, data processing systems development tool / emphasizes total systems design rather than program design / programmers can concentrate on total application rather than individual programs / comprised of the Program Generator; advanced File Structures and Access Methods; and On-Line Services	Western Operations, Inc. 120 Montgomery St. San Francisco, Calif. 94104 Attn: G. A. Marken
TRACE	A Sigma 5/7 debugging program / generates printouts of program paths followed by user program during execution / provides feedback on program operation / for use primarily as programmer's debugging tool; also may be used as training device	Pennsylvania Research Associates Inc. 101 North 33 St. Philadelphia, Pa. 19104
VISOR	A specialized English language inquiry search and retrieval system for use by Government and large industrial purchasing operations / two versions: a batch mode model for 65K IBM 360 systems; an interactive version for use under OS 360 / functions on equivalent Spectra 70 configurations	Dataventure, Inc. 1610 Washington Plaza Reston, Va. 22070

Peripheral Equipment

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
Compatibility-Processor-1 (CP-1)	Suitcase-sized device allows 1400 series programs to be executed as off-line peripheral functions when connected to a channel of an IBM System/360,-/370 / CP-1 is fully supported with IBM software compatibility	Polydata Corp. Cross Westchester Executive Park, Elmsford, N.Y. 10523
Card Punch, model d29	IBM compatible keypunch / also can interface with minicomputers as card punch-reader / full 64 character print and non-print models / optional and custom features / available for retail and O.E.M. sale	Datronic Rental Corp. 1052 East Meadow Circle Palo Alto, Calif. 94303 Attn: Bernard Ploshay
Data General 360 Interface	IBM 360 interface for Nova, Supernova computers / with appropriate software computers emulate standard IBM peripheral controllers / data transfer in burst mode; burst length under program control, range 1 to 641 bytes	Data General Corp. Southboro, Mass. 01772
DIGIPLOT	Automatic computing display, including an alarm, interfaces with marine radar for collision avoidance / analyzes radar echoes received; automatically acquires, tracks, plots 40 most threatening targets within 12 miles / easily interpreted information	Iotron Corp. 6 Alfred Circle Bedford, Mass. 01730

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Peripheral Equipment, continued)		
1500 Data Editor	For off-line editing and validation of input data in broad range of business applications / comprised of a small processor, an operator's console, and up to four magnetic tape units / processor has 8,192 16-bit words of core memory in basic configuration	Data Action Corp. 4445 West 77th St. Minneapolis, Minn. 55435
Line printers, Models 801 and 1321	Model 801 — impact line printer, 80-column, 150 lpm for use with minicomputers, time-sharing systems, various business systems / Model 1321 — 132-column, 110 lpm printer; full range of 96 characters, upper and lower case / both desk-top size / (FJCC, booth 2711)	Odec Computer Systems, Inc. 871 Waterman Ave. East Providence, R.I. 02914
NCR 280 retail system	Through use of hand-held "wand", system instantly reads price tags, credit cards, salesperson identification badges; also verifies credit, calculates entire sale, computes applicable taxes or discounts / transaction data is stored on magnetic tape for subsequent computer processing / point-of-sale information system includes any number of NCR 280 data terminals with attached NCR 785 "wand" readers; NCR 723 magnetic-tape data collector units; and an NCR 747 merchandise tag printer which prepares encoded tags / compatible with all computers / full stand-alone capability	The National Cash Register Company Main & K Sts. Dayton, Ohio 45409
REMKARD	Storage and display unit housing up to 75,000 pages of microfilm data / push-button display of random stored microfilm images within four seconds / internal language is binary / interfaces with any third generation computer or computer peripheral equipment / also will act as an input, output, or input-output terminal	Remington Rand Office Systems Division Sperry Rand Corp. P.O. Box 171 Marietta, Ohio 45750 Attn: K. L. Lyttle
Statos© 21	Printer/plotter operates on-line at 5,000 lines per minute / uses electrostatic writing principle / silent operation / computer directed paper rate up to 10.5 inches per second / interfaces with Varian 620 Series; IBM 1130, 1800, System 360/30, 40, 50, 65, 75, 90; Digital Equipment's PDP-8 and 10; and Sigma series of computers, modems and magnetic tape units / (FJCC)	Graphics & Data Systems Varian Associates 611 Hansen Way Palo Alto, Calif. 94303 Attn: Robert Pecotich
Term-mite Terminal	For source data preparation at virtually every desk / 20-pound, key-to-cassette, off-line terminal consists of keyboard, 5-inch CRT display, cassette tape recorder, control electronics / CRT displays up to 100 characters / cassette holds equivalent of 250 80-character card records / buffering option allows pooler to handle multiple Term-mites simultaneously	Data Input Devices, Inc. Tinkham Industrial Center Route 28 Derry, N.H. 03038 Attn: Joe Nangle

Data Processing Accessories

Cassette Tape Checker, Model TC 1000	A stand-alone instrument which automatically checks performance quality of digital tape cassettes / five configurations at two speeds / only operator function is load/start	Dytro Corp. 63 Tec Street Hicksville, N.Y. 11801 Attn: Frank Bradley
Data Center, Model No. 760	For simultaneous feeding and collection of tapes for all Teletype Model 32 and 33 terminals / no operator attention necessary / mounts easily on terminal with no modifications or tools necessary	IN/OPAC Division Numeridex Tape Systems, Inc. 4711 W. North Ave. Chicago, Ill. 60639
Plastic Identity Cards, Computer Printable	For use on high speed printers; no modification to equipment / cards affixed to pinfeed carriers / may be printed in colors / uses include check guarantee cards, employee ID cards, automobile warranty ID cards	Kimball Systems East 64 Midland Ave. Paramus, N.J. 07652 Attn: Budd Zimmerman

CLASSIFIED ADVERTISEMENTS

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Computer Technology Inc., Dallas, Texas	LTV Aerospace Corp.	Ten-year computer services agreement; contains two, five-year renewal options. CT will provide all of LTA's requirements for computer equipment, services and software under new pricing method providing that services be rendered on fixed price and fixed price incentive arrangement	$250 million (approximate)
Consolidated Computer, Waltham, Mass.	International Computers Ltd., London, England	A three year sales agreement for the purchase of the Key-Edit systems for use by ICL's existing and potential customers in the United Kingdom, Europe, Asia, Australia and South Africa	$50+ million
Control Data Corp., Minneapolis, Minn.	U.S. Army	Two CDC 6600 systems: one for USA's Redstone Arsenal, Huntsville, Ala. to process scientific data for both local and remotely located users; other for Mobility Equipment Research and Development Command (MERDC), Ft. Belvoir, Va., to provide scientific data processing services	$6.9 million
EMR Computer, Minneapolis, Minn.	Spectra Medical Systems, Palo Alto, Calif.	An initial order of computer hardware and software for several hospital communications systems	$4 million (approximate)
Conrac Corp., New York, N.Y.	U.S. Air Force, Air Force Systems Command, Aeronautical Systems Division	Design, development and production of Flight Loads Data Acquisition Systems to be used by the Air Force Logistics Command	$3 million (approximate)
Univac Division, Sperry Rand Corp., Blue Bell, Pa.	General Services Administration	A UNIVAC 1108 computer system; U.S. Army Material Command's Edgewood Arsenal will use system in support of varied and complex research and development problems	$2.8 million
General Research Corp., Santa Barbara (Calif.) Operations and its New Jersey Dept.	Army Safeguard System Command, Huntsville, Ala.	Data processing systems analysis; systems evaluation support	$2.8+ million
Electronic Memories, Hawthorne, Calif.	U.S. Department of Defense	Large scale core memory systems for use in an undisclosed application operating in conjunction with an IBM System/360	$1.2+ million
Univac Division, Sperry Rand Corp., St. Paul, Minn.	Chicago Board of Education, Chicago, Ill.	A UNIVAC 418-III Real Time Computer, 105 UNISCOPE 100 Graphic Displays, and operating programs or software; equipment will implement a CAI project for disadvantaged	$1+ million
Recognition Equipment Italia, S.p.A.	Ministry of the Treasury, General Purchasing Office (PGS), Rome, Italy	Large-scale optical character recognition (OCR) system for OCR service center for other Italian government agencies	$1+ million
Sylvania Electric Products Inc. (a GT&E subsidiary), Mountain View, Calif.	Army Security Agency, Arlington, Va.	A military signal processing system which will provide computer-controlled signal processing and data storage and retrieval	$1 million
System Development Corp.(SDC), Falls Church, Va.	U.S. Navy	Labor-hour type contract to develop new computer systems to help monitor submarine and surface ship movements	$717,000
PRC Technical Applications, Huntsville, Ala.	U.S. Army Missile Command, Huntsville, Ala.	Continued development and Pilot operation of an Automatic Specification Preparation (ASP) System	$350,000
CTC Computer Corp., Palo Alto, Calif.	California credit unions	Multiple contracts — to provide on-line data processing services to several California credit unions	$350,000 (approximate)
Computer Communications Inc., Inglewood, Calif.	Jet Propulsion Laboratory (JPL), California Institute of Technology, Pasadena, Calif.	Interactive Alphanumeric Display Terminals for use in direct support of the Mariner '71 Program as well as future missions	$300,000 (approximate)
Ampex Corp., Culver City, Calif.	Cornell University, Office of Computer Services, Langmuir Laboratory, Ithaca, N.Y.	Model ECM-65 extended core memory systems for use in on-line, plug-to-plug operation with Center's IBM 360/65 system	$280,000+
Optimum Systems Inc., Palo Alto, Calif.	Bank Bumi Daya, Djakarta, Indonesia	Design and develop full-scale automated banking system	$250,000
Computer Audit Corp., Silver Spring, Md.	Dominick & Dominick, Inc., New York, N.Y.	Development of a turn-key communications system to replace its present IBM CCAP message switching system	$90,000
Computer Sciences Corp., Systems Div., Los Angeles, Calif.	Panama Canal Company (U.S. Government owned organization)	Studying means of expanding traffic capacity of Panama Canal by automating the manual system which controls movements of over 15,000 vessels that annually transit canal	—
Compuentry Ltd. (division of Int'l Compumedics of New Jersey), Kingston, Jamaica	State of Florida	Share of Florida state contract (with Computer Centers, Inc., Palm Beach, Fla., which will be responsible for computer processing); Jamaican firm will keypunch 3 million vehicle registrations for state	—
Programming Sciences Corp. (PSC) New York, N.Y.	General Services Administration	Blanket contract for PSC's Eduputer, cover-48 contiguous states, the District of Columbia, Alaska, Hawaii and the Commonwealth of Puerto Rico; it permits federal government agencies to buy Eduputer without process of complicated non GSA purchases	—

NEW INSTALLATIONS

OF	AT	FOR
Control Data 3300 system	Ateliers et Chantiers de Bretagne (SFI-ACB), Nantes, France	Administrative and financial management, production applications and scientific computation
Control Data 6500 system	Picatinny Arsenal, Dover, N.J.	Scientific research and development activities and solutions to engineering problems (system valued at $5 million)
	VFW-Fokker, Bremen, West Germany	Support of its activities in aerospace field, e.g., real-time simulations in hybrid mode, structural analysis and vibration calculations, numerical control programming, aerodynamic calculations (system valued at $2.2 million)
Control Data 6600 system	University of Indiana, Bloomington, Ind.	Use as part of communications network that will support research and education on several campuses (system valued at $3.4 million)
Control Data 6700 system	Tel-Aviv University, Israel	University research projects, faculty and administration programs, aid in student training (system valued at $5.2 million)
Digital Equipment PDP-8/L	Michelin Tyre Company Ltd., Stoke-on-Trent, England (2 systems)	Control of rubber industry's plant, the process sequence, and delivery of materials; second PDP-8/L will be used as a standby
Honeywell Model 3200 system	Computer Research Inc., Pittsburgh, Pa.	Further expansion of firm's full-range, back-office accounting system now serving 40 stockbrokers in nine eastern and midwestern cities
IBM System/3	Camfour, Inc., Westfield, Mass.	Inventory control and sales analysis of firm's boats, camping trailers and snowmobiles
	China Doll Inc., Mobile, Ala.	Inventory control (bulk and packaged), sales analysis, preparing bills, examining expenses, updating price lists daily
	Manton Cork Corp., Merrick, N.Y.	Daily sales analyses, billing, accounts receivable, and inventory control
IBM System/360 Model 20	D&L Transport, Cicero, Ill.	Measuring profitability of 80,000 annual shipments
	Green Bay & Western Railroad, Green Bay, Wis.	Tracking over 4000 freight cars (each month) that travel via boat; helps compile billing and other reports; and payroll
	Vermont Marble Co., Proctor, Vt.	Helping determine best piece of marble to fill order (size, quality, location, etc.); also handles administrative applications
IBM System/360 Model 30	Philadelphia Suburban Water Co., Bryn Mawr, Pa.	Answering customer inquiries, maintain current records of its 200,000 customers' accounts, bill preparation, payroll, general ledger, inventory
IBM 1130 system	Gooch Milling & Elevator Co., Lincoln, Neb.	Helps blend over 100 different feeds at lowest cost while maintaining complete nutritional value; also used to produce sales analysis, financial reports and inventory records
NCR Century 100 system	Baker Manufacturing, Evansville, Wis.	Payroll, sales analysis, accounts receivable, inventory control
	Caradco, Inc., Dubuque, Iowa	Lumber analysis, accounts payable/receivable, payroll and general ledger accounting
	Davidson Electric Membership Corp., Lexington, N.C.	Customer billing, cash control, materials inventory, and line-lead analysis
	ET and WNC Transportation Co., Johnson City, Tenn.	Revenue accounting, preparing inter-line accounts receivable/payable, and payroll
	Feng Chia College of Engineering and Business, Taipei, Taiwan	Educational and administrative purposes
	Information Transfer Corp., Santa Monica, Calif.	Various contract accounting services
	Union National Bank, Pittsburgh, Pa.	General ledger accounting
NCR Century 200 system	Datamotive, Malibu, Calif.	Warranty processing for automotive dealers
	T & G Mutual Life Society, Melbourne, Australia	Supplementing existing NCR 315 system as well as processing new applications
UNIVAC 1106 system	El Paso Products Co., Odessa, Texas	Industrial and consumer applications (system valued at $1.2 million)
	Norsk Hydro A/S, Heroya, Porsgrunn, Norway	Heart of integrated system for both administrative and technical data processing (system valued at $1.4 million)
UNIVAC 9200 system	Arrow Armatures Co., Hudson, Mass.	Inventory reports, sales analysis, payroll processing and general accounting
	Hobbs Manufacturing Co., Inc., Worcester, Mass.	Production control, payroll, sales analysis and general accounting
	Massachusetts Teachers Assoc., Boston, Mass.	Maintenance of membership mailing list, billing, credit union and statistical reporting
	Staylastic/Scovill Inc., New Bedford, Mass.	Production control, billing, costings, sales analysis, inventory control, payroll, general accounting
	Worcester Telegram & Gazette, Worcester, Mass.	Subscription processing, circulation, election coverage, and payroll for 1,000 employees
UNIVAC 9400 system	General Logics Inc., Dallas, Texas (three systems, one 9200 and two 9400 systems)	Servicing nationwide data communications network for industrial applications; a principal use will be communication with photo-finishing plants throughout the United States to provide computerized pricing for the industry (systems valued at about $2.4 million)

MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND AUTOMATION

The following is a summary made by COMPUTERS AND AUTOMATION of reports and estimates of the number of general purpose electronic digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide. Please note the variation in dates and reliability of the information. Several important manufacturers refuse to give out, confirm, or comment on any figures.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit information for this census. We invite all our readers to submit information that would help make these figures as accurate and complete as possible.

Part I of the Monthly Computer Census contains reports for United States manufacturers. Part II contains reports for manufacturers outside of the United States. The two parts are published in alternate months.

The following abbreviations apply:

(A) -- authoritative figures, derived essentially from information sent by the manufacturer directly to COMPUTERS AND AUTOMATION
C -- figure is combined in a total
(D) -- acknowledgment is given to DP Focus, Marlboro, Mass., for their help in estimating many of these figures
E -- figure estimated by COMPUTERS AND AUTOMATION
(N) -- manufacturer refuses to give any figures on number of installations or of orders, and refuses to comment in any way on those numbers stated here
(R) -- figures derived all or in part from information released indirectly by the manufacturer, or from reports by other sources likely to be informed
(S) -- sale only, and sale (not rental) price is stated
X -- no longer in production
\- -- information not obtained at press time

SUMMARY AS OF OCTOBER 15, 1970

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Part I. United States Manufacturers							
Autonetics	RECOMP II	11/58	2.5	30	0	30	X
Anaheim, Calif. (R) (1/69)	RECOMP III	6/61	1.5	6	0	6	X
Bailey Meter Co.	Bailey 750	6/60	40-250 (S)	32	3	35	0
Wickliffe, Ohio (A) (10/70)	Bailey 755	11/61	200-600 (S)	6	0	6	0
	Bailey 756	2/65	60-400 (S)	13	5	18	6
	Bailey 855	4/68	100-1000 (S)	8	0	8	17
Bunker-Ramo Corp.	BR-130	10/61	2.0	160	-	-	X
Canoga Park, Calif.	BR-133	5/64	2.4	79	-	-	X
(A)	BR-230	8/63	2.7	15	-	-	X
(10/69)	BR-300	3/59	3.0	18	-	-	X
	BR-330	12/60	4.0	19	-	-	X
	BR-340	12/63	7.0	19	-	-	X
Burroughs	205	1/54	4.6	25-38	2	27-40	X
Detroit, Mich.	220	10/58	14.0	28-31	2	30-33	X
(N)	B100/B500	7/65	2.8-9.0	-	-	-	-
(1/69-5/69)	B2500	2/67	5.0	52-57	12	64-69	117
	B3500	5/67	14.0	44	18	62	190
	B5500	3/63	23.5	65-74	7	72-81	8
	B6500	2/68	33.0	4	0	4	60
	B7500	4/69	44.0	0	0	0	13
	B8500	8/67	200.0	1	0	1	5
Control Data Corp.	G15	7/55	1.6	-	-	295	X
Minneapolis, Minn.	G20	4/61	15.5	-	-	20	X
(R)	LGP-21	12/62	0.7	-	-	165	X
(9/70)	LGP-30	9/56	1.3	-	-	322	X
	RPC4000	1/61	1.9	-	-	75	X
	636/136/046 Series	-	-	-	-	29	-
	160/8090 Series	5/60	2.1-14.0	-	-	610	X
	924/924-A	8/61	11.0	-	-	29	X
	1604/A/B	1/60	45.0	-	-	59	X
	1700	5/66	3.8	-	-	106-180	C
	3100/3150	5/64	10-16	-	-	83-110	C
	3200	5/64	13.0	-	-	55-60	C
	3300	9/65	20-28	-	-	200	C
	3400	11/64	18.0	-	-	20	C
	3500	8/68	25.0	-	-	15	C
	3600	6/23	52.0	-	-	39	C
	3800	2/66	53.0	-	-	20	C
	6400/6500	8/64	58.0	-	-	85	C
	6600	8/64	115.0	-	-	85	C
	6800	6/67	130.0	-	-	1	C
	7600	12/68	235.0	-	-	1	C
							Total: 160 E
Data General Corp.	NOVA	2/69	8.0 (S)	-	-	650	-
Southboro, Mass. (A) (6/70)	SUPERNOVA	5/70	9.6 (S)	-	-	22	-
Datacraft Corp.	6024/1	5/69	54-200 (S)	9	0	9	4
Ft. Lauderdale, Fla. (A) (10/70) DC	6024/3	2/70	33-200 (S)	21	0	21	45
Digiac Corp.	Digiac 3080	12/64	19.5 (S)	14	-	-	2
Plainview, N.Y. (A) (2/70)	Digiac 3080C	10/67	25.0 (S)	5	-	-	1
Digital Equipment Corp.	PDP-1	11/60	3.4	50	2	52	X
Maynard, Mass.	PDP-4	8/62	1.7	40	5	45	X
(A)	PDP-5	9/63	0.9	90	10	100	X
(6/70)	PDP-6	10/64	10.0	C	C	23	X
	PDP-7	11/64	1.3	C	C	160	X
	PDP-8	4/65	0.5	C	C	1450	C
	PDP-8/I	3/68	0.4	C	C	2157	C
	PDP-8/S	9/66	0.3	C	C	1020	C
	PDP-8/L	11/68	-	C	C	2350	C
	PDP-9	12/66	1.1	C	C	425	C
	PDP-9L	11/68	-	C	C	41	C
	PDP-10	12/67	8.0	C	C	144	C
	PDP-11	3/70	10.5 (S)	C	C	27	C
	PDP-12	9/69	-	C	C	275	C
	PDP-15	2/16	17.0	6	C	15	C
	LINC-8	9/66	-	C	C	142	C
							Total: 1350 E

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Electronic Associates Inc.	640	4/67	1.2	90	40	130	10
Long Branch, N.J. (A) (10/70)	8400	7/67	12.0	19	6	25	2
EMR Computer	EMR 6020	4/65	5.4	C	-	-	C
Minneapolis, Minn.	EMR 6040	7/65	6.6	C	-	-	C
(N)	EMR 6050	2/66	9.0	C	-	-	C
(10/70)	EMR 6070	10/66	15.0	C	-	-	C
	EMR 6130	8/67	5.0	C	-	-	C
	EMR 6135	-	2.6	-	-	-	-
	EMR 6155	-	-	-	-	-	-
				Total: 93 E			Total: 15 E
General Electric	58	5/70	1.0	-	-	-	-
Phoenix, Ariz.	105A	6/69	1.3	-	-	-	-
(N)	105B	6/69	1.4	-	-	-	-
(9/70)	105RTS	7/69	1.2	-	-	-	-
	115	4/66	2.2	200-400	420-680	620-1080	-
	120	3/69	2.9	-	-	-	-
	130	12/68	4.5	-	-	-	-
	205	6/64	2.9	11	0	11	-
	210	7/60	16.0	35	0	35	-
	215	9/63	6.0	15	1	16	-
	225	4/61	8.0	145	15	160	-
	235	4/64	12.0	40-60	17	57-77	-
	245	11/68	13.0	3	-	3	-
	255 T/S	10/67	17.0	15-20	-	15-20	-
	265 T/S	10/65	20.0	45-60	15-30	60-90	-
	275 T/S	11/68	23.0	-	-	10	-
	405	2/68	6.8	10-40	5	15-45	-
	410 T/S	11/69	11.0	-	-	-	-
	415	5/64	7.3	170-300	70-100	240-400	-
	420 T/S	6/67	23.0	-	-	-	-
	425	6/64	9.6	50-100	20-30	70-130	-
	430 T/S	6/69	17.0	-	-	-	-
	435	9/65	14.0	20	6	26	-
	440 T/S	7/69	25.0	-	-	-	-
	615	3/68	32.0	-	-	-	-
	625	4/65	43.0	23	3	26	-
	635	5/65	47.0	20-40	3	23-43	-
	655	12/70	80.0	-	-	-	-
Process Control Computers:	3010	-	2.0	-	-	-	-
(A)	4010	-	6.0	-	-	-	-
(10/70)	4020	2/67	6.0	155	45	200	60
	4040	8/64	3.0	45	20	65	X
	4050	12/66	7.0	23	1	24	X
	4060	6/65	2.0	18	2	20	X
Hewlett Packard	2114A	10/68	0.25	-	-	915	-
Cupertino, Calif.	2115A	11/67	0.41	-	-	663	-
(A) (9/70)	2116A,2116B	11/66	0.6	-	-	1156	-
Honeywell	DDP-24	5/63	2.65	-	-	90	X
Computer Control Div.	DDP-116	4/65	0.9	-	-	250	-
Framingham, Mass.	DDP-124	3/66	2.2	-	-	175	-
(R)	DDP-224	3/65	3.5	-	-	60	-
(9/70)	DDP-316	6/69	0.6	-	-	325	-
	DDP-416	-	-	-	-	250	-
	DDP-516	9/66	1.2	-	-	800	-
	H112	10/69	-	-	-	70	-
	H632	12/68	3.2	-	-	12	-
	H1648	11/68	12.0	-	-	20	-
Honeywell	H-110	8/68	2.7	180	75	255	0
EDP Div.	H-115	6/70	3.5	30	-	30	-
Wellesley Hills, Mass.	H-120	1/66	4.8	800	160	960	-
(R)	H-125	12/67	7.0	150	220	370	-
(6/70)	H-200	3/64	7.5	800	275	1075	-
	H-400	12/61	10.5	46	40	86	X
	H-800	12/60	30.0	58	15	73	X
	H-1200	2/66	9.8	230	90	325	-
	H-1250	7/68	12.0	130	55	185	-
	H-1400	1/64	14.0	4	6	10	X
	H-1800	1/64	50.0	15	5	20	X
	H-2200	1/66	18.0	125	60	185	-
	H-3200	2/70	24.0	20	2	22	-
	H-4200	8/68	32.5	18	2	20	-
	H-8200	12/68	50.0	10	3	14	-
IBM	System 3	1/70	1.1	0	0	-	-
White Plains, N.Y.	305	12/57	3.6	40	15	55	-
(N) (D)	650	10/67	4.8	50	18	68	-
(1/69-5/69)	1130	2/66	1.5	2580	1227	3807	-
	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
	1401-H	6/67	1.3	180	140	320	-
	1410	11/61	17.0	156	116	272	
	1440	4/63	4.1	1690	1174	2864	-
	1460	10/63	10.0	194	63	257	-
	1620 I, II	9/60	4.1	285	186	471	-
	1800	1/66	5.1	415	148	563	-
	7010	10/63	26.0	67	14	81	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	2	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7070,2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-
	7094-1	9/62	75.0	10	4	14	-
				2455			

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
IBM (Cont'd.)	7094-II	4/64	83.0	6	4	10	-
	360/20	12/65	2.7	4690	3276	7966	-
	360/25	1/68	5.1	0	4	4	-
	360/30	5/65	10.3	5075	3144	8219	-
	360/40	4/65	19.3	1260	498	1758	-
	360/44	7/66	11.8	65	13	78	-
	360/50	8/65	29.1	480	109	589	-
	360/65	11/65	57.2	175	31	206	-
	360/67	10/66	133.8	9	4	13	-
	360/75	2/66	66.9	14	3	17	-
	360/85	12/69	150.3	0	0	0	-
	360/90	11/67	(S)	5	0	5	-
	360/195	-	232.0	-	-	-	-
Interdata	Model 2	7/68	0.25	-	-	18	0
Oceanport, N.J.	Model 3	3/67	0.4	-	-	240	64
(A) (9/70)	Model 4	8/68	0.6	-	-	184	92
NCR	304	1/60	14.0	15	2	17	X
Dayton, Ohio	310	5/61	2.5	8	0	8	X
(R)	315	5/62	8.7	400	300	700	-
(9/70)	315 RMC	9/65	12.0	125	45	170	-
	390	5/61	1.9	350	500	850	-
	500	10/65	1.5	1100	1550	2650	-
	Century 100	9/68	2.7	700	250	950	-
	Century 200	6/69	7.5	200	75	275	-
Philco	1000	6/63	7.0	16	-	-	X
Willow Grove, Pa.	2000-210,211	10/58	40.0	16	-	-	X
(N) (1/69)	2000-212	1/63	52.0	12	-	-	X
RCA	301	2/61	7.0	140-290	100-130	240-420	-
Cherry Hill, N.J.	501	6/59	14.0-18.0	22-50	1	23-51	-
(N)	601	11/62	14.0-35.0	2	0	2	-
(5/69)	3301	7/64	17.0-35.0	24-60	1-5	25-65	-
	Spectra 70/15	9/65	4.3	90-110	35-60	125-170	-
	Spectra 70/25	9/65	6.6	68-70	18-25	86-95	-
	Spectra 70/35	1/67	9.2	65-100	20-50	85-150	-
	Spectra 70/45	11/65	22.5	84-180	21-55	105-235	-
	Spectra 70/46	-	33.5	1	0	1	-
	Spectra 70/55	11/66	34.0	11	1	12	-
Raytheon	250	12/60	1.2	155	20	175	X
Santa Ana, Calif.	440	3/64	3.6	20	-	20	X
(A)	520	10/65	3.2	26	1	27	X
(9/70)	703	10/67	12.8(S)	168	21	188	1
	704	3/70	9.8(S)	28	7	35	6
	706	5/69	19.0(S)	44	4	48	9
Scientific Control Corp.	650	5/66	0.5	23	0	23	X
Dallas, Tex.	655	10/66	2.1	137	0	137	0
(A)	660	10/65	21.	41	0	41	0
(6/70)	670	5/66	2.7	1	0	1	X
	4700	4/69	1.8	19	0	19	4
	DCT-132	5/69	0.9	45	0	45	23
Standard Computer Corp.	IC 4000	12/68	9.0	6	0	6	8 E
Los Angeles, Calif.	IC 6000	5/67	16.0	9	0	9	-
(N) (6/70)	IC 7000	6/69	17.0	3	0	3	10 E
Systems Engineering Laboratories	810	9/65	1.1	24	0	24	X
Ft. Lauderdale, Fla.	810A	8/66	0.9	211	5	216	32
(A)	810B	9/68	1.2	75	1	76	28
(6/70)	840	11/65	1.5	3	0	3	X
	840A	8/66	1.5	36	2	38	X
	840MP	1/68	2.0	31	0	31	2
	Systems 86	-	10.0	0	0	0	2
UNIVAC (Div. of Sperry Rand)	I & II	3/51 & 11/57	25.0	23	-	-	X
New York, N.Y.	III	8/62	21.0	25	6	31	X
(R)	File Computers	8/56	15.0	13	-	-	X
(1/69-5/69)	Solid-State 80 I, II, 90,I,II,& Step	8/58	8.0	210	-	-	X
	418	6/63	11.0	76	36	112	20 E
	490 Series	12/61	30.0	75	11	86	35 E
	1004	2/63	1.9	1502	628	2130	20 E
	1005	4/66	2.4	637	299	936	90 E
	1050	9/63	8.5	138	62	200	10 E
	1100 Series (except 1107,1108)	12/50	35.0	9	0	9	X
	1107	10/62	57.0	8	3	11	X
	1108	9/65	68.0	38	18	56	75 E
	9200	6/67	1.5	127	48	175	850 E
	9300	9/67	3.4	106	38	144	550 E
	9400	5/69	7.0	3	0	3	60 E
	LARC	5/60	135.0	2	0	2	-
Varian Data Machines	620	11/65	0.9	-	-	75	X
Newport Beach, Calif.	620i	6/67	0.5	-	-	1300	400
(A) (10/70)	R-620i	4/69	-	-	-	50	30
	520i	10/68	0.4	-	-	150	330
	520/DC	12/69	1.6	-	-	25	25
	620/f	11/70	.5	-	-	-	125
Xerox Data Systems	XDS-92	4/65	1.5	10-60	2	12-62	-
El Segundo, Calif.	XDS-910	8/62	2.0	150-170	7-10	157-180	-
(R)	XDS-920	9/62	2.9	93-120	5-12	98-132	-
(10/70)	XDS-925	12/64	3.0	20	1	21	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	28-35	0	28-35	-
	XDS-9300	11/64	8.5	21-25	1	22-26	-
	Sigma 2	12/66	1.8	60-110	10-15	70-125	-
	Sigma 3	12/69	2.0	10	0	10	-
	Sigma 5	8/67	6.0	15-40	6-18	21-58	-
	Sigma 6	6/70	12.0	-	-	-	-
	Sigma 7	12/66	12.0	24-35	5-9	29-44	-

c.a NUMBLES

NUMBER PUZZLES FOR NIMBLE MINDS —AND COMPUTERS

Neil Macdonald
Assistant Editor
Computers and Automation

A "numble" is an arithmetical problem in which: digits have been replaced by capital letters; and there are two messages, one which can be read right away and a second one in the digit cipher. The problem is to solve for the digits.

Each capital letter in the arithmetical problem stands for just one digit 0 to 9. A digit may be represented by more than one letter. The second message, which is expressed in numerical digits, is to be translated (using the same key) into letters so that it may be read; but the spelling uses puns or is otherwise irregular, to discourage cryptanalytic methods of deciphering.

We invite our readers to send us solutions, together with human programs or computer programs which will produce the solutions. This month's Numble was contributed by:

Stuart Freudberg
Newton High School
Newton, Mass.

NUMBLE 7011

```
        O F F E N D E D
      ×         S E L F
      -----------------
      N G E I I D O T R
    F O L F G O L V D
  S D V L O N T O M
I N S I S L N S R
-----------------------
= S M N O E L N N F O N R
+             E S T E E M
-----------------------
  S W N O D V M L L S V R
```

RVT = DWG = RMG

02996 40457 851204

Solution to Numble 7010

In Numble 7010 in the October issue, the digits 0 through 9 are represented by letters as follows:

G = 0	I = 5
U = 1	H = 6
C,R,T = 2	N = 7
W = 3	O = 8
E = 4	S = 9

The message is: He is rich enough who owes nothing.

Our thanks to the following individuals for submitting their solutions — to **Numble 709**: A. Sanford Brown, Dallas, Tex.; T. Paul Finn, Indianapolis, Ind.; Lambert J. Simon, Irving, Tex.; Harold L. Smith, Thomson, Ga.; and Robert R. Weden, Edina, Minn. — **to Numble 708**: Lambert J. Simon, Irving, Tex.; and Harold L. Smith, Thomson, Ga. — to **Numble 707**: Krishna Moorthy, Kanpur, India.

c.a PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 7011: A PLAY AT RIGHT END

"These conversions from binary, octal, decimal, hexadecimal, or what have you, into each other is getting me down", said Joe, shaking his head. "Maybe the next generation of machines will have us working in base 32. What do you suppose they'll call that?"

"I don't know," Pete replied. "But I don't think this conversion business is so bad. Octal to decimal, for example, is a cinch."

"How do you figure that?"

"Why, all you have to do is move the first digit, the one on the left, around to the right end, and presto, you have the decimal equivalent."

"Now you know that won't work", Joe exclaimed.

"No? Well try it yourself." Pete wrote down a number on his scratch pad.

Joe performed a few operations on his calculator, then looked up in surprise. "Hey, it does work.", he said.

What was the number?

Solution to Problem 7010: Mini-Program — Sum and Substance

The series Bob was trying to sum was

$$\frac{1}{X+1} + \frac{2}{X^2+1} + \frac{4}{X^4+1} + \cdots \quad \text{which} = \frac{1}{X-1}.$$

For $X = 8$, this $= \frac{1}{7}$.

Readers are invited to submit problems (and their solutions) for publication in this column to: Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160.

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COMPUTERS, SCIENCE, AND ASSASSINATIONS

IMPORTANT INFORMATION PUBLISHED IN COMPUTERS AND AUTOMATION, MAY TO SEPTEMBER, 1970

MAY ISSUE:

The Assassination of President John F. Kennedy: The Application of Computers to the Photographic Evidence, by Richard E. Sprague
A reexamination of some of the evidence relating to the assassination of President Kennedy, (1) showing how he was shot in a crossfire in Dealey Pl., Dallas, Texas, and (2) asserting that the Warren Commission conclusions that Lee Harvey Oswald was the sole assassin are false. Publication of eleven revealing, historic photographs. An analytical tabulation of over 500 photographs taken of "the most photographed murder in history." Analysis of the possibilities of computerized analysis of the photographic evidence.

Computer-Assisted Analysis of Political Assassinations: Editorial, by Edmund C. Berkeley
Reasons for such analysis and the possibilities arising from it.

JULY ISSUE:

The Impact of the May Article on "The Assassination of President John F. Kennedy"
Report on the news coverage of the May article in over 35 newspapers and magazines.

More About Jim Hicks, by Richard E. Sprague
Jim Hicks admitted being the radio communicator among the firing teams in Dealey Plaza.

Visual Re-Creation of a Scene, Using Computer Graphics, by Leslie Mezei
The technical possibility of transposing the picture content of 360 still photos and 140 movie sequences averaging 300 frames, into motion pictures reconstructing what happened in Dealey Plaza.

Confirmation of FBI Knowledge 13 Days Before The Dallas Assassination of a Plot to Kill President Kennedy
Facsimile of Warren Commission Document 1347, U. S. Archives, showing that the Warren Commission knew of a plot by Minutemen and others, to kill President Kennedy in November, 1963.

The "Second Conspiracy" about the Assassination of President Kennedy, by Richard E. Sprague
Evidence of the "second conspiracy", involving President Lyndon B. Johnson and many other persons, to "cover up" the first conspiracy on grounds of "national security".

AUGUST ISSUE

The Assassination of Senator Robert F. Kennedy: Preface, by E. C. Berkeley
The suppression of important material evidence. Sirhan's gun could only hold eight bullets; yet ten bullets were found, and are here identified and listed.

Two Men with Guns Drawn, at Senator Kennedy's Assassination: Statement, June 4, 1970, by T. Charach
One witness reported that he saw a hotel security guard draw his gun at the same time of Sirhan's shooting, and FIRE AT SENATOR KENNEDY — but this witness was never called to testify.

Map of the Scene of the Assassination of Senator Robert Kennedy
Map of the pantry of the Ambassador Hotel, showing Kennedy's movements and the locations of Sirhan, the hotel guard, and witnesses, at the time.

The Pantry Where Senator Robert F. Kennedy was Assassinated on June 5, 1968: Photograph

Bullet Hole in the Frame of a Door in the Ambassador Hotel: Photograph

Two Bullet Holes in the Center Divider of the Pantry Door: Photograph

Complaint for the Disclosure of Information: Suit, Theodore Charach vs. Los Angeles Police Department
Text of Complaint filed June 4, 1970, against the Los Angeles Police Department, detailing evidence that has been suppressed.

SEPTEMBER ISSUE:

Patterns of Political Assassination: How Many Coincidences Make a Plot?, by E. C. Berkeley
How the science of probability and statistics can be used as an instrument of decision to determine if a rare event is: (1) within a reasonable range; (2) unusual or strange or suspicious; or (3) the result of correlation or cause or conspiracy.
Four cases:
- The Deaths of 15 Russian Generals, April-May 1969
- The Deaths of 28 Black Panthers, 1968-69
- The Deaths of 400 German leaders, 1918-32
- The Deaths of Two Kennedys and Martin Luther King, 1963-68

Computer-Assisted Analysis of Evidence Regarding the Assassination of President John F. Kennedy — Progress Report, by R. E. Sprague
The nature and progress of a computer project initiated summer, 1970, at the National Committee To Investigate Assassinations, Washington, D. C., analyzing evidence in the death of President Kennedy.

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