PRINTOUT

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PRODUCTS

Graphic Plotter

The Axiom Ex-810 at \$795 is a graphic plotter that can print 8,192 dots/sec with up to 512 dots per row. The unit can also function as an 80-column alphanumeric printer with a speed of 160 characters/sec. The Ex-810 is designed for 8-bit microcomputers.

Axiom Corporation
5932 San Fernando Road
Glendale, CA 91202

Low-Cost Printer

The AIP-40 tabletop printer prints up to 50 characters/sec in 40 columns on adding machine roll paper. Both serial and parallel interfaces are available to connect it to mini- or microcomputers. Prices start at \$425.

Datel Systems, Inc.
1020 Turnpike Street
Canton, MA 02021

LSI-11 Memory

The MSC 4601 memory card provides 16k, 24k, 28k, and 32k words of RAM for DEC LSI-11 microcomputers. Memory access time is 450 nsec and cycle time is 625 nsec. The 28k card is \$2,075.

Monolithic Systems Corporation
14 Inverniss Drive East
Englewood, CO 80110

Printer

The Model SP-302 is a 5 x 7 impact dot-matrix 40-column printer. Tab functions are standard for single software control from a host device or computer. The unit prints at 50 cps on adding machine paper. Price: \$575.

Syntest
169 Millham Street
Marlboro, MA 01752

IEEE 488 Interface

Occupying one I/O slot in a Data General cpu, the Model 417 provides IEEE 488 standard interface functions of talker, listener, and controller. Diagnostic software and drivers are supplied for all three modes.

Software also handles service requests from devices generating unsolicited interrupts. The Model 417 is sold by Ray Bushnell, Inc. of Wheaton, Maryland for \$2,100.

Bilingual CRT

Offering 64 Japanese characters and 128 Roman symbols, Hewlett-Packard's bilingual CRT computer terminal switches from one character set to another and mixes characters within the same display. To facilitate data entry, microprocessor-controlled HP2645K features a Japanese keyboard layout in addition to standard Roman layout by using both legends on the keycaps. The terminal transmits or receives bilingual information using shift-in/shift-out control characters or an 8-bit code-extension protocol. Base price is \$4,000; with cartridge tape transports, price is \$5,600.

Hewlett-Packard
Inquiries Manager
1501 Page Mill Road
Palo Alto, CA 94304

Touch-Sensitive Keyboard

Using thick-film techniques to provide a flat, sealed data entry surface, the TIP (touch-in-panel) system replaces traditional pushbutton switches with a smooth Mylar surface. Assembly consists of panel, with keyboard printed on top and contact surface on reverse side. A circuit isolation mask is sandwiched between the Mylar and a substrate circuit carrier.

Oak Industries, Inc.
Switch Division
Crystal Lake, IL 60014

Pressure-Sensitive Position Sensor

A finger, ballpoint pen, or similar stylus can be used to select or determine positions on an underlying image with the E270 transparent position sensor (a plate-glass substrate coated with semiconductor metal oxide). An electrically isolated plastic cover sheet with a transparent conductive coating is placed over the substrate. Pressure applied to a cover sheet makes contact between the two. X and Y coordinates are converted from analog to digital by ADC.

Elographics, Inc.
1976 Oak Ridge Turnpike
Oak Ridge, TN 37830

Universal Controller

The CY 480 universal printer controller interfaces between a printer and any micro- or minicomputer system through standard 8-bit ports, accepts either RS-232-C (serial) or parallel ASCII from the host system data channel, and has ready lines for full asynchronous communications with handshaking.

Cybernetic Micro Systems
2460 Embarcadero Way
Palo Alto, CA 94303

Large LED Alphanumeric Display

The Datablox alphanumeric LED matrix display provides alphanumeric digits 4 x 3 in. and uses 35 high-intensity LEDs mounted in individual reflectors. With wide-angle viewing, digits can be read at distances of 200 ft in normal room-lighting conditions.

Chicago Miniature Lamp Works
General Instrument Corporation
4433 N. Ravenswood Avenue
Chicago, IL 60640

Color Graphics Terminal

An intelligent color graphics terminal uses a permanently converged CRT, optimized for digital color displays. The terminal features standard ASCII alphanumerics, bar graphics, reverse video, blink, and up to 800 special symbol graphics, 512 of which are micro-programmable.

Industrial Data Terminals Corporation
1550 W. Henderson Road
Columbus, OH 43220

BRIEFS

National Conference on the Use of On-Line Computers in Psychology

The **National Conference on the Use of On-Line Computers in Psychology** would like volunteers for organizing colloquia and/or to present 30-45 tutorials on various aspects of computer usage in psychology. There have been a number of excellent symposia given over the years on various aspects of computer applications to which we refer the interested participant, for example, the eye-movement symposium (*Behavior Research Methods & Instrumentation*, 1975, pp. 201-220). Suggested topics might be: using the computer to generate speech-like stimuli, new developments in graphics, the state of the art in real-time software, etc.

For the individual who would prefer to give a tutorial himself rather than direct a symposia, we have a number of ideas in mind. For example, special language developments are becoming important to psychologists. Here we have in mind such new systems as the UNIX, the lan-

guage C, or even a tutorial on LISP. We can use tutorials on special hardware developments, a comparison of different machine configurations, teaching programming languages to psychologists, etc.

Contact: Professor Richard Millward, Department of Psychology, Brown University, Providence, Rhode Island 02912

Micro 488 Interface

Another IEEE 488 interface chip is coming from Motorola. Hewlett-Packard introduced the instrumentation interface on a chip.

New Microprocessor

Rockwell has a new family of 18 chips in addition to its PPS-8 and PPS-4 microprocessor families. The new R6500 family includes 10 NMOS processors, 8 I/O chips, and memory and timing chips. All operate from a single +5-V power supply.

Data Conversion System on a Chip

National Semiconductor is the first to market a data conversion system (not just an A/D converter) on a chip. The ADC 0816 system is slower than present hybrid systems but consumes less power (single +5-V supply) and is inexpensive (less than \$20). The chip includes an 8-bit successive approximation type A/D converter, 16-channel multiplexer, and outputs for interfacing to microcomputers.

Dumb Terminal

Lear Siegler cut the price of its ADM-3 CRT terminal to \$895 with the 1,920-character display capacity.

Minicomputer Accessories

A minicomputer accessories catalog is available free from Minicomputer Accessories, 1015 Corporation Way, P.O. Box 10056-M, Palo Alto, California 94303.

8080 Debugging

DEBUG: An 8080 Interpretive Debugger, a program for entering, debugging, and sorting assembly language programs is available in a book. DEBUG permits users to enter programs into 8080 microcomputer memory and single-step through, instruction by instruction. Written for reading and punching paper tape with a teletypewriter, DEBUG's I/O routines may be changed to accommodate magnetic tape cassettes on CRT terminals. User guidance information and application examples are included in the book, which sells for \$5.

E & L Instruments
61 First Street
Derby, CT 06418

Bugbooks

Introductory experiments in digital electronics and programming and interfacing an 8080A-based micro-

computer are integrated in the two-volume course, *Bugbooks V and VI*. The first book is 493 pages; the second is 490 pages. Price: \$9.50 each.

E & L Instruments, Inc.
61 First Street
Derby, CT 06418

Guide for Computerists

The January to June 1977 *Periodical Guide for Computerists* includes 1,080 articles from 23 hobby and professional computer publications. Articles are indexed by subject under 30 categories. Price: \$3.

C. Berg Publications
1360 S.W. 199th Street
Aloha, OR 97005

Touch-Sensitive Keyboards

A new 6-page brochure describes a line of standard monopanel touch-sensitive keyboards. Included are 12- and 16-key models.

Centralab Distributor Products
5757 N. Green Bay Avenue
Milwaukee, WI 53201

Rabbit Restrainer

This rabbit restrainer has adjustable no-kick bar, adjustable neck and length facility, hinged lid, and back-support plate. The unit fits existing Hoeltge rabbit racks and accommodates rabbits up to 5 kg.

C and M Company
P.O. Box 3218
Glendale, CA 91201

Purchasing a Minicomputer

Potential purchasers of minicomputers may be interested in an article covering "Support Policies of the Big-3 Mini Vendors" by M. Negin. The article appears in *Mini-Micro Systems*, October 1977, pages 38-46.

DEC Price Reductions

Digital Equipment Corporation has packaged eight of its most popular PDP-11 computer systems into standard configurations, offered at reduced prices. Price savings range from 8%-21%.

Visual Stimuli on a Relatively Slow Display Unit

(Submitted by Louis C. Boer, Free University, Amsterdam, The Netherlands)

In some experiments using visual stimuli (e.g., Nickerson, 1966; Paivio, 1975), it is essential to present the perceptual units composing the stimulus simultaneously, at least in the subject's eye. A problem arises if one has only a relatively slow CRT and the stimuli

consist of more than one perceptual unit, each consisting of a relatively large number of elements. (For example, the Tektronix 611 can be programmed such that the element is a short linear vector.) The problem is that unit by unit construction of the stimulus results in a perceived asynchrony between units, as the elements of perceptual unit i are output before unit $i + 1$ is output.

The problem can be corrected in the following way. To construct a particular stimulus, all elements from all units are randomized and then presented in that order. Thus, one unit is not presented before the next, and no perceptual sequence is observed by the subject; for example, for a 110-element stimulus (6 alphanumeric items in a row), there is a 150-msec "under construction phase," in which the elements of all units are sequentially output, but this is not perceived by the subject.

This randomization procedure may reduce stimulus accuracy, which can be corrected by an auxiliary operation, described below. Transferring the writing beam from the last point plotted to the next point becomes more inaccurate as the distance between the points increases. Randomizing the writing order increases the average distance between points, possibly generating a perceptible loss in stimulus accuracy. For the Tektronix 611 (KV interfaced to a PDP 8/I), the accuracy declines when the transfer exceeds 2 cm, and thus the new point should be addressed twice if the distance exceeds that limit. The first or auxiliary addressing effects a gross jump which places the writing beam rather close to the new point (only a few millimeters off target). Now the remaining transfer is within the 2-cm limit, so the usual procedure is applicable: Address the new point (this actually is the second addressing) and start plotting.

REFERENCES

- Nickerson, R. S. Response times with a memory-dependent decision task. *Journal of Experimental Psychology*, 1966, 72, 761-769.
- Paivio, A. Perceptual comparisons through the mind's eye. *Memory & Cognition*, 1975, 3, 635-647.

Combinatorial Methods to Count the Number of Serial Patterns

(Submitted by C. G. Wagner and S. Handel, University of Tennessee, Knoxville, Tennessee 37916)

A common thread in perceptual theory, coming from such diverse orientations as probabilistic functionalism (Brunswik, 1956) and information theory (Garner, 1962), is an emphasis on the multiplicity of percepts. According to this viewpoint, the perception of an object cannot be understood solely in terms of the physical properties of the object itself, but must also take into account alternate or equivalent objects. For this reason, the enumeration of equivalent stimuli has become a prerequisite to empirical research.

One approach is to begin with the set of all possible stimulus patterns. These patterns are then partitioned

into disjoint classes on the basis of an equivalence relation. For each equivalence there is a single partition, and there is a one-to-one correspondence between the class of all equivalence relations and the class of all possible partitions. Of all the possible equivalence relations, the so called "combinatorial" equivalences appear to be the most promising candidates with respect to relevance, for they arise from certain natural transformations (permutations) of the configurations under consideration.

The purpose of this note is to announce the availability of an expository paper reviewing some combinatorial problems connected with the partitioning of sets of linear sequences on the basis of rotational equivalence (e.g., abc is equivalent to bca and to cab). Interest in this problem aroused experimental work involving repeating serial patterns in different domains (e.g., Manning, Pasquali, & Smith, 1975; Vitz & Todd, 1969) and research illustrating the usefulness of studying the psychological equivalence of rotationally equivalent patterns (Handel, 1974).

Known, as well as new, methods for counting are presented: (1) the number of different serial patterns constructible from a fixed stock of elements with frequencies of repetition either specified or unspecified; (2) the number of "circular sequences" constructible

from a fixed stock of elements as specified above; (3) the number of circular sequences, as above, having a fixed period (equivalence class cardinality). The sequence abababab has Period 2, while pattern aabbabab has Period 8.

A detailed description of these methods, including several worked examples, is available from the second author. A comparison of Polya's cycle-index method and the Mobius inversion method for solving the enumeration problems in question is also available from: Stephen Handel, Department of Psychology, University of Tennessee, Knoxville, Tennessee 37916

REFERENCES

- Brunswik, E. *Perception and the representative design of experiments*. Berkeley, Calif: University of California Press, 1956.
- Garner, W. R. *Uncertainty and structure as psychological concepts*. New York: Wiley, 1962.
- Handel, S. Perceiving melodic and rhythmic auditory patterns. *Journal of Experimental Psychology*, 1974, **103**, 922-933.
- Manning, S. K., Pasquali, P. E., & Smith, C. A. Effects of visual and tactual stimulus presentation on learning two-choice patterned and semirandom sequences. *Journal of Experimental Psychology: Human Learning and Memory*, 1975, **1**, 736-744.
- Vitz, P. C., & Todd, T. C. A coded element model of the perceptual processing of sequential stimuli. *Psychological Review*, 1969, **76**, 433-449.