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AUTOMATIC PATTERN RECOGNITION DURING THE PERIOD 1961-1962: AN ANNOTATED BIBLIOGRAPHY

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Compiled by

Eugene E. Graziano

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Work done in support of LMSC Independent Research Program

Lockheed

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ABSTRACT

One hundred and forty references on all aspects of automatic pattern recognition for the period 1961-1962. Included are references pertaining to theory and experience with systems, components, methods, optics, speech, etc.

The period covered in the search was January 1961 - December 1962.

Search was completed in January 1963

CONTENTS

1. Alt, F. L.
Digital pattern recognition by moments.
J. ASSN. COMPUTING MCHY. 9: 240-258,
April 1962

On a means of pattern recognition, based on the consideration of a pattern as a function of two variables that relate to "black" and "white." Experimental results are given, connected with the use of SEAC and an IBM 704.

2. Andrews, M. C.
Word recognition systems. IBM TECHNICAL
DISCLOSURE BULL. 4: 15, March 1962.

On the identification of incorrectly spelled words by probability.

3. Bakis, R.
Formant tracking. IBM TECHNICAL DISCLOSURE
BULL. 5: 72, June 1962.

Description of a circuit for formant tracking in speech recognition.

4. Bakis, R.
Frequency measuring. IBM TECHNICAL
DISCLOSURE BULL. 5: 73, June 1962.

An improved circuit for learning formant frequencies in speech recognition.

5. Bakis, R.
Interpretation of speech sound sequences.
IBM TECHNICAL DISCLOSURE BULL. 4:26
Sept 1961.

Sound sequences should be stored rather than words in devices for speech recognition.

6. Ball, G. H.
AN APPLICATION OF INTEGRAL GEOMETRY OF PATTERN RECOGNITION. Stanford Research Inst., Menlo Park, Calif. Final rept., Feb. 62, 109p. (Contract Nonr-343800) ASTIA AD-275 352.

A machine for recognizing patterns may be considered to consist of a receptor and a categorizer. The receptor views the pattern and translates its features into machine language. The categorizer classifies the pattern using the information supplied to it by the receptor. In this paper information extracted from a visual pattern by receptor is required to be invariant with respect to the rotation and the translation (and at times, scale changes) of the pattern. We thereby obtain numerical parameters from the pattern that corresponds to the shape of the pattern. Integral geometry is employed to obtain these variant parameters. Probabilities of error are found as a function of the number of pattern measurements which are used to estimate a parameter. The numerical values of some parameters are obtained for the set of patterns consisting of circles, squares, rectangles, ellipses and right isosceles triangles. In addition, decision theory is used to obtain the structure of the test having minimum probability of error.

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Autocorrelation function generator. IBM TECHNICAL DISCLOSURE BULL. 4: 68, Aug. 1961.

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8. Bauldreay, J. and E. Milbradt
Solving registration problems in optical character recognition. ELECTRONICS 35: 77-81, January 1962.

Imperfections in vertical registration of characters are rectified by a transistorized vertical locator. The design of this device is described.

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CHARACTER RECOGNITION AND PHOTOMEMORY STORAGE DEVICES FEASIBILITY STUDY. Dynamic Analysis and Control Lab., Mass. Inst. of Tech.

9 (cont'd) Cambridge. Second Summary Rept. RM-7692-3, 1960, 78p. (Nonr 1841(41) PB 147787. ASTIA AD-237 108.

Feasibility study for a high-speed photoelectric scanner of printed material that will encode same into digital form.

10. Bell Telephone Labs., Inc.
CHARACTER RECOGNITION SYSTEM.
U.S.P. 2978675, 4 April 1961

A system of pattern recognition based on the scanning of predefined portions of matrix areas.

11. Betts, A. J.
RECOGNITION OF HANDWRITTEN CHARACTERS.
British Patent 860254, 1 Feb 1961.

Concerns a means of forming composite signals from handwritten elements for recognition purposes.

12. Bledsoe, W. W.
Further results on the N-tuple pattern recognition method.
IRE TRANS. ELECTRONIC COMPUTERS, EC-10:96, March 1961.

A letter that briefly reports extensions of certain pattern recognition methods.

13. Bledsoe, W. W. and C. L. Bisson
Improved memory matrices for the n-tuple pattern recognition method. IRE TRANS. ELECTRONIC COMPUTERS, EC-11:414-415, June 1962.

Improvements are reported in the memory matrices of the n-tuple pattern recognition method that consist of selecting more optimum matrices than the 0, 1 type.

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INDUCTIVE PROCESSES FOR FACTOR SELECTION IN A RECOGNITION MODEL. Vitro Labs., West Orange, 1961, 35p. (Contract AF 19(604)6626), ASTIA AD-270-013.

Given a set of measured characteristics for an unknown object, it is desired to assign this object to a class. A theoretical model and its application show that the requirements for a set of parameters to be used as inputs are not as rigid as originally assumed. It is shown that a less-qualified set of measured inputs can be used to induce an expanded set which combines both natural (measured) and artificial parameters. The expanded set allows the effective definition of a recognition function regardless of whether or not the original measurements encoded are sufficient in themselves to provide the completed recognition model.

15. Bonner, R. E.
A "logical pattern" recognition program. IBM J. RES. & DEV., 6: 353-360, July 1962.

An IBM 7090 program is described for searching out logical patterns from sets of input data.

16. Brain, A. E. and G. E. Forsen
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION. Stanford Research Inst., Menlo Park, Calif. Quarterly Prog. Rept. No. 7, 1 Dec 61 - 28 Feb 62, 34p. March 1962. (DA 36-039-sc-78343, Proj. 3A99-22-001-02) ASTIA AD-275 836.

Various means are considered for translating various signals to electrical forms for pattern recognition.

17. Brain, A.E., G. E. Forsen, and C. P. Bowne
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION. Stanford Research Inst., Menlo Park, Calif. Quarterly

17. (contd) Progress rept. no. 5, 1 Apr - 3 June 1961, 46p. July 1961. (DA 36-039-sc-78343) ASTIA AD-263 117

A binary decision unit is discussed which is capable of classifying patterns of certain types.

18. Brain, A. E., et al. GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION. Stanford Research Institute, Menlo Park, Calif. Quarterly progress rept. no. 3, 1 Oct - 31 Dec 1960, Jan 1961, 39p. (DA 36-039-sc-78343) ASTIA AD-253 334.

An investigation of photographic and equivalent electronic methods for simplification of data input.

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A discussion of the ability of learning machines to be trained.

20. Brain, A. E.; A. B. Novikoff, and C. P. Bourne GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION. Stanford Research Institute, Menlo Park, Calif. Quarterly progress rept. no. 4, 1 Jan - 31 March 1961. April 1961, 40p. (DA 36-039-sc-78343, Proj. 3A99-22-001-02) ASTIA AD-257 307.

On the design of a small pattern recognition machine.

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Learning filters for optimum pattern recognition.
IRE TRANS. INFORMATION THEORY, IT-8: 280-285.
July 1962

A system for identifying pattern samples which are the sum of a fixed signal and gaussian noise.

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MACHINE LEARNING AND AUTOMATIC PATTERN RECOGNITION. Stanford Electronics Labs., Stanford Univ., Stanford, Calif., Tech. rept. 2003-1. 83p
17 Feb 1961. (Nonr-22524, Proj. NR 373 360)
ASTIA AD-253 925.

On the optimum decision rules for identifying an object by the least number of its significant characteristics.

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Experiments on training machine to distinguish visual shapes. AUTOMATIKA I TELEMEKHANIKA, 23(3): 349-364, 1962. (In Russian, English summary).

An algorithm for training a machine to differentiate visible forms. Experimental results are given.

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Chrysler Optical Processing Scanner (COPS): a character recognition system which is independent of character, translation, size or orientation. IN EASTERN JOINT COMPUTER CONFERENCE, 1961. PROCEEDINGS, N. Y. Amer. Inst. of Elect. Eng. 1961, P. 352-370.

Description of COPS, an optical recognition system incorporating a simple computer.

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VOLTAGE COMPARATOR FOR USE IN CHARACTER RECOGNITION. U.S.P. 2987629, 6 June 1961.

A transistorized circuit for identifying maximum and minimum potentials that relate to different characters of an entity.

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SELF ORGANIZING NETWORKS. Armour Research Foundation, Chicago. Annual rept. 15 Feb 61 - 14 Feb 62. 15p. 14 Feb 1962. (Nonr-339200, Proj. NR 048-165). ASTIA AD-273 536.

Preliminary considerations on a simple optical device for achieving complex adaptive logical networks for use in pattern recognition.

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Optical character recognition. DATA PROCESSING 3: 7-10, Jan 1961.

A survey of pattern recognition philosophy and technology.

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Self-educating machines for recognition and classification of patterns. PROC. IRE. 49: 1335 Aug. 1961.

Letter on a simple machine that will learn to classify patterns.

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A new technique in automatic character recognition. COMPUTER J., 4: 121-128, July 1961.

Several lines are discussed concerning the use of autocorrelation functions for character recognition.

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ELECTRONICS 34: 26-27; July 1961.

An IBM 650 digital computer is used to simulate the action of photocells in the development of a reading machine for the blind.

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CLASSIFICATION BY STATISTICAL METHODS
(PATTERN RECOGNITION). Melpar, Inc.,
Watertown, Mass. Technical note no. 61-2,
53p. Apr 1961.

Mathematical methods which use decision theoretic methods of classification, and learning through parameter estimation, form the foundation for this discussion. Specific solutions are outlined for multivariate normal distributions. This is followed with a brief commentary on the potential contribution from the field of nonparametric statistics. The analysis concludes with a list of potential applications.

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Eyes and ears for computers. PROC. IRE.
50: 1093-1101, May 1962.

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Optical scanning equipment. DATA PROCESSING 3: 11-12, Jan 1961.

Survey of equipment available commercially for optical scanning.

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SHOEBOX - a voice responsive machine.
DATAMATION, 8: 47-50, June 1962.

SHOEBOX is an experimental device from IBM which is capable of identifying speech sounds.

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Operations useful for similarity-invariant pattern recognition. J. ASSN. COMPUTING MCHY., 9: 259-267, April 1962

Some ideas are discussed relating to position and size invariant two dimensional pattern recognition.

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Handwriting and pattern recognition.
IRE TRANS. INFORMATION THEORY. IT-8: 160-166, Feb 1962.

Handwriting is defined as a sequence of basic strokes, connected by rule. Samples have been generated experimentally by the TX-0 computer, and implications for pattern recognition are discussed.

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SYSTEMS RESEARCH STUDY ON OPTICAL CHARACTER RECOGNITION. Research rept. Feb 1961, 20p. (Nonr - 316200) ASTIA AD-259 492.

A feasibility study for using optical scanning techniques for converting printed characters into suitable form for input to data processing machines.

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The simulation of verbal learning behavior.
IN WESTERN JOINT COMPUTER CONFERENCE 1961, PROC. New York, 1961, p. 121-32.

Elementary perceiver and memorizer (EPAM) is a program that simulates the learning processes involved in the rote memorization of nonsense syllables.

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Optical scanning in the field. DATA PROCESSING 4: 15-17, July 1962.

Stroke analysis in character recognition is the practical approach as verified by various experiences.

40. Fischer, G. L., et al.
OPTICAL CHARACTER RECOGNITION.
Washington, Sparton Books, 1962, 412p.
(Proceedings of a symposium on optical character recognition held in Washington, D. C., on 15-17 1962, under the joint sponsorship of the Office of Naval Research and the National Bureau of Standards).

Explores the state-of-the-art, and the outlook.

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AN APPROACH TO GENERAL PATTERN RECOGNITION. Lockheed Aircraft Corp., Sunnyvale, Calif. Technical rept. on Mathematics, Rept. no. 6-90-62-2, 47p. Apr 62.

The pattern recognition problem is composed of two subproblems. First abstracting significant characteristics from the patterns being dealt with. The second identifying the pattern. Discussed is a special purpose digital computer, which simulates a network of threshold elements designed to correctly identify a preselected set of typical patterns. In addition to describing the design procedures, methods of feature extractation, and the hardware employed, the results of experiments involving several thousand hand-written characters are presented.

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A fast numeral reading machine. ELECTRONIC ENGRG 33: 562-573, Sept 1961.

Solar cells are used to read groups of three decimal digits from a tape at the rate of 150 characters per second. Error rate was kept below 0.01 per cent.

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Computer identification of vowel types.
ACOUSTICAL SOC. OF AMER. J. 33:7-11,
1961.

Description of a coordinate transformation system which simplifies vowel boundary determination from experimental data on vowel formant frequencies and voice pitch.

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Computer synthesis of character recognition
systems. IRE TRANS. ON ELECTRONIC
COMPUTERS. EC-10:735-748, Dec. 1961.

Description of a logic simulation program that was run in the IBM 704 to verify character recognition procedures.

45. Fritzsche, D. L.
A SYSTEMATIC METHOD FOR CHARACTER
RECOGNITION. Antenna Lab., Ohio State U.
Research Foundation, Columbus. Rept. no.
1222-4, 15 Nov 61, 56p. (Contract AF 33(616)
6137). ASTIA AD-268 360

A technique for character recognition is described such that: (1) each character is representable by a unique mathematical expression; (2) the recognition technique is independent of character size; (3) the technique is independent of character orientation; and (4) the gross features of a character are identified by using only a limited number of terms of the mathematical expression. The principal disadvantage of the technique is that it is sensitive to irregularities or distortions of standard figures. The technique is considered feasible for the recognition of typed letters or numbers, where the figures are distinct and are identical for each appearance.

46. Fujisaki, H.
ON THE EXTRACTION OF PITCH AND FORMANT
BY MEANS OF A DIGITAL COMPUTER. Profes-
sional Group of Information Theory of the Institute
of Electrical Communication Engineers of Japan,
Fujimicho, Chiyodaku, Tokyo, Japan. June 24, 1961

46. Pitch is extracted by taking the short-term auto-correlation function of the signal and then detecting the time interval corresponding to the fundamental period. Formant tracking was based on the principle of "analysis by synthesis."

47. Gen. Electric Company
MAGNETIC INK CHARACTER RECOGNITION
U.S.P. 3000000, 12 Sept 1961.

Signal amplitude is detected and amplified to secure voltage patterns representative of characters.

48. Giuliano, V. E., et al.
Automatic pattern recognition by a Gestalt method. INFORMATION & CONTROL 4: 332-345, Dec. 1961.

A method for pattern recognition by normalizing images and comparing with stored signals representing patterns.

49. Glushkov, V. M.
On one principle of constructing a universal reading automation. AUTOMATIKA, No. 1:55-65. 1962. (In Russian, English summary).

Aspects of an algorithm are presented for reading and analyzing drawings and typographical signs.

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Reading printed data electronically.
AUTOMATION, 8: 60-64, Dec. 1961.

A system is described for pattern recognition by matrix comparison.

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Lattice type character recognition. I.B.M. TECHNICAL DISCLOSURE BULL. 4: 97-98, May 1962.

Characters are projected onto photosensitive strips arranged in lattices. Parameters of each strip are functions of the character image.

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Character recognition by digital computer
using a special flying spot scanner.
COMPUTER J., 4: 129-136, July 1961.

Discussion of a device that recognizes spatial patterns by the use of a grid and a binary matrix.

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Speech recognition: a model and a program
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THEORY, IT-8: 155-159, Feb. 1962.

Input speech is transformed into a sequence of phonemes by a speech recognition model.

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Optical character recognition system.
DATA PROCESSING 4: 22-26, July 1962.

The Rabinow Universal Reader identifies typed numerals on freight waybills, and punches the data on cards by the use of an IBM 609.

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scanner. COMPUTERS & AUTOMN., 11: 17-19,
Aug 1962.

An experimental device is described which can recognize handwritten numerals.

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Inductive probability as a criterion for pattern
recognition. PROC. IRE, 49: 1951-1952,
Dec. 1961.

The merits of inductive probability for applications in pattern recognition are discussed.

57. Healy, L. D.
DIGITAL DATA PROCESSOR FOR PATTERN RECOGNITION EXPERIMENTS. Lockheed Aircraft Corp., Sunnyvale, Calif. Technical rept. on Mathematics. LMSD 895013.Jan 1961, 94p. PB 156 241 ASTIA AD 251-760.

A practical system consisting of commercially available components is described for pattern recognition.

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An analog method for character recognition. IRE TRANS ON ELECTRONIC COMPUTERS. EC-10: 502-512, Sept. 1961.

A character recognition method is discussed that should operate with machine printing or constrained hand printing. The principle relates to maximizing cross-correlation value between known and unknown characters.

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Further comments on the N-tuple pattern recognition method. IRE TRANS. ELECTRONIC COMPUTERS, EC-10: 97, March 1961.

A letter commenting on aspects of the character recognition problem.

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Linear decision functions, with application to pattern recognition. PROC. IRE. 50: 1501-1514, June 1962.

On a class of categorizers that are simple and inexpensive, based on linear decision function. Concepts and procedures are developed and applied to recognition of hand-printed numerals for illustration.

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A note on optimum pattern recognition systems.
IRE TRANS. ON ELECTRONIC COMPUTERS,
EC-10: 287-288, June 1961.

Decision criterion is given for minimizing the error rate in a recognition system.

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Autocorrelation function generator. IBM
TECHNICAL DISCLOSURE BULL., 4: 48-49,
Sept. 1961.

An arrangement is described for the optical simulation of autocorrelation functions of input patterns.

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Pattern recognition using autocorrelation.
PROC. IRE. 49: 175-185, Jan. 1961.

Registration invariant techniques of pattern recognition are discussed in detail. Computer simulation was done, and results are given.

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A COMPUTER LEARNS TO SEE. Brookhaven
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Brookhaven Lecture Series No. 14, 14p. 14 Feb.
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Pattern recognition by moment invariants.
PROC. IRE, 49: 1428, Sept. 1961.

Outline of a pattern recognition theory based on a set of two-dimensional moment invarients with which it is possible to identify characters without regard to position, size, nor orientation.

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Visual pattern recognition by moment invariants.
IRE TRANS. INFORMATION THEORY, IT-8:
179-187, Feb. 1962.

A complete system is presented for pattern recognition by relating moment invariants to algebraic invariants.

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THE RECOGNITION OF SPEECH BY MACHINE.
Research Lab. of Electronics, Mass. Inst. of
Tech., Cambridge, Tech. Rept. 395, 62p.,
1 May 1961. (DA 36-039-sc-78108) ASTIA
AD-268 489.

All aspects of the engineering of a speech recognition system are discussed. The approach is from the concept of the phoneme as the atomic unit.

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DATAMATION 7(3): 27, March 1961.

Announcement of an optical character reader marketed by IBM.

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A NEW PROCESS OF CHARACTER RECOGNITION
USING A SIEVING METHOD. Professional Group on
Automata and Automatic Control of the Institute of
Electrical Communication Engineers of Japan,
Fujimicho, Chiyodaku, Tokyo, Japan, June 23, 1961.

A discussion of the "sieving method" as an approach to pattern recognition.

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SIMULATION OF TEACHING AND LEARNING OF
AN ACTIVE SPEECH RECOGNIZER. Professional
Group on Automata and Automatic Control of the

70. (contd.) Institute of Electrical Communication Engineers of Japan, Fujimicho, Chiyodaku, Tokyo, Japan. June 23, 1961.

Simulations of the teaching and learning processes have been performed with computers, and the values obtained have been analyzed.

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Description of a system in which signature signals are produced and applied to improved processing circuitry.

72. International Business Machines Corp., CHARACTER RECOGNITION – MAGNETIC INK CHARACTERS. B. P. 861555, 22 Feb. 1961.

A multi-channel magnetic transducer assembly is presented which may be used in sensing magnetic ink characters.

73. International Business Machines Corp., MAGNETIC CHARACTER RECOGNITION. U.S.P. 3030014, 17 April 1962.

A description of magnetic heads for sensing characters printed in magnetic ink.

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Arrangements for more simple scanning in optical pattern recognition are described.

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Autocorrelation pattern recognition. PROC. IRE, 49: 1085-1086, June 1961.

A letter concerning the use of autocorrelation in pattern recognition. Experiments using the TX-0 computer are outlined.

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SOME METRIC CONSIDERATIONS IN PATTERN RECOGNITION. Air Force Cambridge Research Labs., Bedford, Mass. Rept. no. AFCRL-327, 44p. July 1961.

Speculation about machines which might learn to recognize visual patterns but which would be randomly wired are analyzed, and it is shown that at least certain mild constraints of a distance-ordering sort must be imposed upon random connections.

78. Kamentsky, L. A.
The simulation of three machines which read rows of handwritten Arabic numbers, IRE TRANS. ON ELECTRONICS COMPUTERS, EC-10: 489-501, Sept. 1961.

The required control for the writers, by each of the three machines varied. In the model study, about 1% of the numbers were misread and about 10% rejected.

79. Kaszerman, P.
AN INTRODUCTION TO THRESHOLD DEVICES AND THEIR USE IN PATTERN RECOGNITION. New York U. Coll. of Engineering, N. Y. Technical rept. no. 400-44, Aug. 61, 68p. (Contract AF 49(638)586, Proj. 9768) AFOSR-2414. ASTIA AD-281 760

Introductory concepts of switching logic by threshold devices, and examples in pattern recognition applications. A threshold device realizes a given function by: (1) forming a weighted linear sum on the binary inputs plus a threshold number; and (2) forming a binary output whose value is determined by the value of this sum. The complement

of a single variable, the AND and the OR functions of any number of variables can be realized by a single threshold device. A necessary condition for realizability by a single threshold device is that the function be completely monotonic.

80. Keller, H. B.
Finite automata, pattern recognition and perceptrons.
J. ASSOC. COMP. MACH. 8: 1-20, Jan. 1961.

Pattern recognition logic is developed together with a number of theorems in terms of set theory.

81. Kersta, L. G.
Spectrographs identify human voice patterns.
INTERNATIONAL ELECTRONICS 4: 20-21,
Aug 1962.

It is proposed that voice spectrograms could be used for identification of individuals with the aid of computer analysis.

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PROBLEMS IN THE DESIGN OF A SCANNING DEVICE. Joint Publications Research Service, Washington, D. C. JPRS 13543. April 1962. (Foreign Developments in Machine Transl. and Information Proc. No. 94). Translation from Mashinyy Perevod. Proc. Inst. Prec. Mech. Comput. Eng., Acad. Sci. U.S.S.R. No. 2, Moscow, 1961, 447p.

83. Koshikawa, T.
ON THE ELEMENTAL NATURE OF FUNDAMENTAL FREQUENCIES GOVERNING SPEECH QUALITY. Professional Group on Information Theory of the Institute of Electrical Communication Engineers of Japan, Fujimicho, Chiyodaku, Tokyo, Japan. June 24, 1961.

83. (contd) Fundamental frequencies of speech were analyzed and were found to be important to the quality of naturalness.

84. Laemmel, A. E.
MACHINE LEARNING PROCESSES APPLIED TO PATTERN RECOGNITION. Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y. Final rept., 14 Dec 61, 39p. Rept. no. PIBMRI-981-61 (Contract AF 19(604)6154)AFCRL 62-6. ASTIA AD-282 549.

The theories of the principal three methods for pattern recognition are summarized. Calibration from a sample set of patterns; derivation of numerical properties; and a decision process for determining the class of a pattern. Several mathematical processes are suggested for finding useful properties, including equations which define invariants to acceptable distortions. It is shown that if an efficient and consistant decision process is used, then the property search is easier since the addition of useless or redundant properties cannot degrade the performance.

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Recognition of handwritten characters,
B.P. 863431, 22 March 1961

A device is used to identify handwritten numerals by the actuation of different circuits for each direction of movement.

86. Larkin, W. D., et al.
SPEECH-TO-CODE CONVERTER STUDY.
General Dynamics/Electronics, Rochester, N.Y.
Final rept. 1 July 1959-31 Dec. 1960. 30 Sept 1961,
149p. (DA 36-039-sc-78908) ASTIA AD-272 109.

An experimental study was made to determine the necessary parameters for the identification of words spoken in isolation. Several approaches were demonstrated to be sound.

87. Leimer, J. J.
Design factors in the development of an optical character recognition machine. IRE. TRANS. INFORMATION THEORY. IT-8: 167-171, Feb. 1962.

On the development of the IBM 1418 Optical Character Reader, and includes a general discussion of the basic design factors to be considered in the design of optical readers.

88. Leland, H. R.
PERCEIVING AND RECOGNITION AUTOMATA. Cornell Aeronautical Lab., Inc., Buffalo, N. Y. Annual rept. on Project PARA, 1 Jan - 31 Dec. 1961. 31 Dec 1961. 19p. (Nonr-238100) ASTIA AD-272 245.

A perceptron and a computer were used in system to ascertain their abilities to recognize imperfect, mixed-font printed characters.

89. Letters, symbols, punctuation read.
DATAMATION 7:(3) 25, March 1961.

An announcement of Farrington's alphabetic page reader. This fully transistorized device is capable of reading and recording up to 300 upper case letters per second.

90. Lewis, P. M.
The characteristic selection problem in recognition systems. IRE TRANS. INFORMATION THEORY, IT-8: 171-178, Feb 1962.

An extensive discussion of statistical recognition systems, and necessary experiments to best apply such methods.

91. Lumpkin, C., and C. E. Newcomb
High-speed character recognition. IBM TECHNICAL DISCLOSURE BULL., 5: 37-38, Sept. 1962.

91 (contd) Circuitry is described that codifies video signal output from a scanner for use in recognition.

92. Martin, T. B. and J. J. Talavage
SPEECH PATTERN RECOGNITION BY
SIMULATED NEURAL NETWORKS. RCA
Defense Electronic Products, Camden, N. J.
Interim rept. no. 1, 1 Dec 61 - 1 May 62, 1 July 62,
48p. (Contract AF 33(657(7405, Proj. 4335)
ASD TDR 62-511, ASTIA AD-277 200.

A summary of the physiology of hearing including information on the middle ear, inner ear, and the intermediate levels up through the acoustic cortex; neural responses from these levels are described. The authors are using this information to guide the design of a speech recognition system using neural networks. Electrical models are described, and aspects of the performance of the models are compared with known psychoacoustic data on threshold of hearing, masking and critical bandwidth. A "neural transition AND gate" is described which abstracts time transitions of energy as they occur in the speech patterns. A final report will be issued describing the performance of the system when using speech inputs.

93. Mattson, R. L.
AN APPROACH TO PATTERN RECOGNITION
USING LINEAR THRESHOLD DEVICES.
Lockheed Missiles and Space Co., Sunnyvale,
Calif. Technical Report on Mathematics, LMSD
702680. Sept. 1960, 31p. ASTIA AD-246 244.

Pattern space, data space, and classification space are the three fundamental spaces to be considered if the problem of pattern recognition is to be represented as a mapping problem. Equipment is proposed and examples are given in the utilization of this approach.

94. Meeker, W.F. and L. S. Green
VOICE TO TELETYPE CODE CONVERTER
RESEARCH PROGRAM, PART I. EXPERIMENTAL VERIFICATION OF A METHOD TO
RECOGNIZE PHONETIC SOUNDS. Radio Corp.

94 (contd) of America, Camden, N. J. Dec. 1961. 125p. (AF 33(616)6691, Proj. 4335) ASD TR 61-666, Pt. 1. ASTIA AD-272 024.

Eventual development of a speech to teletype code converter requires basic information relating to automatic speech recognition. In general, the phoneme was taken as the basic speech unit, but a number of instrumental approaches were attempted.

95. Melpar, Inc., Watertown, Mass. APPLICATION OF RECOGNITION-THEORY TO MISSILE IDENTIFICATION AND DECOY DISCRIMINATION, v. 2, semi-annual report no. 2, 30 Jan 1962. 140p. (AF 30(602)2420, Proj. 4983). ASTIA AD-273 241.

The nine sections of this report each discusses some aspect of the pattern recognition problem; approximate decision techniques; variant form analysis; representation; and forms of testing.

96. Merry, I. W. and G. O. Norrie
Character quality and scanner organization.
COMPUTER J. 4: 137-144, July 1961.

The many variables that relate to quality in scanning systems which employ a mapping on a binary matrix are discussed.

97. Michigan University, College of Lit., Sci., and the Arts, Ann Arbor. A THEORY OF ADAPTIVE SYSTEMS. Quarterly Progress Report no. 2, 1 Feb. - 30 Apr 1961. June 1961. 2p. Report no. 04274-2-p. (DA 36-039-sc-87174) ASTIA AD-261 711.

Report of efforts to detail an adaptive system. A subclass of such systems was selected and its functions analyzed.

98. Miller, G. A.
Decision units in the perception of speech.
IRE TRANS. INFORMATION THEORY, IT-8:
81-83, Feb. 1962.

Decisions relative to speech recognition depend upon grammatical structure, and it may be necessary to include such information for automatic speech recognition.

99. Minot, O. N.
AUTOMATIC DEVICES FOR RECOGNITION OF
VISIBLE TWO-DIMENSIONAL PATTERNS: A
SURVEY OF THE FIELD. Report for Jan 58 - May 59,
13 June 1961, 60p. Research Report no. 1050,
PB181065.

Survey of existent systems for recognition of two-dimensional visible patterns; and of the general principles involved.

100. Minsky, M. L., C. N. Pryor, and P. A. Clavier
"Self-educating" pattern-recognition schemes.
PROC. IRE, 50: 1707-1708, July 1962.

Letters on the title subject.

101. Minsky, M. L.
Steps towards artificial intelligence.
PROC. IRE, 49: 8-30, Jan 1961.

A survey of the problems of using artificial intelligence to solve really difficult problems. The report consists of the following five section: Search, pattern recognition, learning, planning, and induction.

102. Newman, E. A.
Some comments on character recognition
COMPUTER J. 4: 114-120, July 1961.

102. (contd). Systems should be organized, when possible, without pattern recognition because of complexity and expense. Character recognition systems should be constructed according to minimal distinguishing features that are similar to those used by humans.

103. Nikolayeva, T. M.
CLASSIFICATION OF A TABLE OF RUSSIAN GRAPHEMES (ON THE PROBLEM OF BUILDING A READING DEVICE). Joint Publications Research Service, Washington, D.C. JPRS-13256, March 1962. (Foreign Developments in Machine Translation and Information Processing, no. 88). (Translated from: Doklady na konferentsii po obrabotke informatsii, mashinnomu perevodu i avtomaticheskomu chteniya teksta. Moscow, Institut Nauchnoy Informatsii, Akad, nauk, SSSR, no. 6, 1961, p 1-11)

On classificatory features of the Cyrillic alphabet for pattern recognition. Contains a number of references to Russian literature on the subject.

104. O'Connell, J. A.
Electroluminescent-photoconductive pattern recognizer organizes itself. ELECTRONICS, 34: 54-57, July 14, 1961.

A sandwich module for recognition of 12-bit digital words is described.

105. Optical character reading at NCR
DATAMATION 7 (3):28, Mar. 1961.

Announcement of a National Cash Register character recognition machine that is capable of reading cash register tapes at 11,000 characters per second. Other generalities are discussed.

106. Optical recognition; the breakthrough is here.
DATAMATION 7(3): 22-23, 1961.

Report on activities of the ASA subcommittee on character recognition standards. Eight criteria for judging type fonts have been established.

107. Optical scanners speed data processing.
INTERNATIONAL ELECTRONICS, 4: 22-25,
Aug 1962.

A general discussion of optical character recognition illustrated with some available equipment.

108. Optical scanning systems. AUTOMATIC
DATA PROC. 3 (3): 33-38, 1961.

A review of optical reader equipment available in Great Britain.

109. Partridge, E. M.
A linear vector recognition function. IRE TRANS.
ELECTRONIC COMPUTERS. EC-11:88, Feb. 1962.

Letter suggesting simplifications in computations for pattern recognition methods.

110. Reid, C. M. B.
A reader for hand-marked documents.
ELEC. ENGRG. 33:274-278, May 1961.

The logical operations are given in detail, and the component designs are described for a simple machine to read hand-marked documents.

111. Reistad, D. L.
BANKING AUTOMATION AND THE MAG-
NETIC INK CHARACTER RECOGNITION
PROGRAM. Detroit, Mich., Detroit Research
Institute, 1961, 173p.

The many practical aspects of the use of character recognition in banking procedures are discussed.

112. Reumerman, T. and W. H. T. Helmig
CHARACTER RECOGNITION, B. P.
895789, 9 May 1962.

Character recognition is achieved by the pattern of linear interruption detected by scanning elements.

113. Scope Inc. SPEECH RECOGNITION.
U. S. P. 3037076, 29 May 1962.

Digital signals from a converter of speech-to-digital are further converted to analog for optical comparison with stored patterns.

114. Scope Inc., SPEECH-TO-DIGITAL CONVERTER.
U. S. P. 3037077, 29 May 1962.

Spoken words are converted to digital form by a system that converts sound to light patterns.

115. Sebestyen, G. S. and Alice K. Hartley
STUDY PROGRAM OF PATTERN RECOGNITION
RESEARCH. Litton Systems, Inc., Waltham, Mass.
Final rept., 1 Jan - 31 Dec 61, 31 Dec. 61, 142p.
(Contract AF 19(604)8024, Proj. 5632) AFCRL
62-65. ASTIA AD-273 235

The basic element in pattern recognition problems is a requirement to recognize membership in classes. This analysis considers the automatic establishment of decision criteria for measuring membership in classes that are known only from a finite set of samples. Each sample is represented by a point in a suitably chosen, finite-dimensional vector space in which a class corresponds to a domain that contains its samples. Boundaries of the domain in the vector space can be expressed analytically with the aid of transformations that cluster samples of a class and separate classes from one another. From these geometrical notions a generalized discriminant analysis is developed which, as the sample size goes to infinity, leads to decision-making that is consistent with the results of statistical decision theory.

116. Sholtz, P. N. and R. Bakis
Spoken digit recognition using vowel-consonant segmentation. ACOUST. SOC. AMER. J. 34:1-5, 1962.

Computer simulation is used to recognize spoken digits by segmentation of spoken words into vowels and consonants. From segmentation, recognition is performed by dictionary search. 493 words were tested with 50 speakers, and 97% of words were recognized.

117. Shoup, J. E.
Phoneme selection for studies in automatic speech recognition. ACOUSTICAL SOC. OF AMER. J. 34: 397-403, 1962.

Study of the phoneme alone as the fundamental criterion in speech recognition, and examination of the alternative of combinations of phonemes into words.

118. Singer, J. R.
Electronic analog of the human recognition system. J. OPT. SOC. AM., 51: 61-69, Jan. 1961.

A system with many similarities to human characteristics is described. It will tolerate various sizes and degrees of tilt.

119. Singer, J. R.
A self organizing recognition system. In WESTERN JOINT COMPUTER CONFERENCE, 1961, PROC. [New York], 1961, p. 545-69.

Input patterns from a matrix array of photoreceptors are compared with patterns in the memory. The worst fit in a comparison is retained if it does not overlap with another character. In this way considerable variation is allowed in the input forms.

120. Solartron Electronic Group Ltd.,
CHARACTER RECOGNITION. B. P. 860568, 8 Feb. 1961

A means of using several readers in different locations with one pattern recognition system.

121. Standard Telephones & Cables Ltd.
CHARACTER RECOGNITION. B. P.
858374, 11 Jan 1961.

On circuit connections for recognition systems using resistance matrices.

122. Standard Telephones & Cables Ltd.
CHARACTER RECOGNITION. B. P.
871162 and 871163, 21 June 1961.

These two patents describe a means of storing signals produced by scanning, in a two-dimensional shaft register where they are evaluated.

123. Standard Telephones & Cables Ltd.
CHARACTER RECOGNITION. B. P.
878931, 4 Oct. 1961.

Bistable devices couple signals obtained by parallel scanners and interpret any particular pattern with a character.

124. Steck, G. P.
Stochastic model for the Browning-Bledsoe
pattern recognition scheme. IRE TRANS.
ELECTRONIC COMPUTERS, EC-11,
274-282, April 1962.

The Browning-Bledsoe scheme for pattern recognition is analyzed by means of a stochastic model, in which successful probability of recognition is given as a function of scheme parameters and pattern variability parameters.

125. Stevens, M. E.
Abstract shape recognition by machine. In EASTERN
JOINT COMPUTER CONFERENCE 1961, PROC.
N. Y., Amer. Inst. Elect. Eng., 1961, p. 332-351.

The ability of machines to recognize several categories of geometric shapes is investigated relative to the problem of information selection and retrieval.

126. Stevens, Mary E.
AUTOMATIC CHARACTER RECOGNITION,
A STATE-OF-THE-ART REPORT. Natl. Bur.
Standards Tech. Note 112, May 1961, 168p.
PB 161613.

A comprehensive survey of the literature on pattern recognition with generalizations and analysis. Contains a bibliography of 549 references.

127. Stone, V. W.
Optical character recognition applied to phonotypy. DATA PROC. 3(8): 38-42, 1961.

A concise description is given of the stenotype alphabet, and it is proposed that the computer type out words in full as the stenotypist codes into syllables.

128. Suzuki, H. and J. Oizumi
A PROGRAM FOR SPEECH RECOGNITION WITH
LEARNING ABILITY. Professional Group on
Information Theory of the Institute of Electrical
Communication Engineers of Japan, Fujimicho,
Chiyodaku, Tokyo, Japan. June 23, 1961.

Unknown speech signals are frequency-analyzed and transformed into 10-digit binary codes, and fed into the computer. Comparisons and decisions are made, and the output is evaluated automatically.

129. Sylvania Electric Products, Inc., Waltham, Mass.
OPTIMUM SPEECH SIGNAL MAPPING TECHNIQUES.
Final technical rept. 10 Jan 62, 94p. Rept. no. F 428-1
(Contract AF 30(602)2446) RADC TR 62-3, ASTIA AD-
273 443.

Investigations of the analysis of speech and speech-like waveforms in terms of an exponential orthogonal function series were carried out. The analysis and resynthesis of speech was accomplished with a digital computer. Connected speech consisting of two spoken sentences was successfully analyzed and resynthesized using the methods advocated and developed. The resynthesized speech is of such quality that both the phonetic information and the identity and quality of the speaker's voice

are preserved. Thus the developed analysis methods appear to have significant relevance to future application in the analysis of speech for both automatic speech recognition machines and for speech compression communications channels.

130. Thompson Ramo Wooldridge, Inc., Canoga Park, Calif. WORD SEARCHING DEVICE, PART II., 23 Sept 1961, 49p. Tech. rept. no C117-1U14, pt. 2. (AF 30(602)2300). ASTIA AD-264 440.

Work toward recognition of complete words is less attractive than letter by letter. The system for achieving the latter is presented.

131. Tuffill, H. W.
A note on recognition of hand-printed characters.
INFORMATION & CONTROL 4: 197, Sept. 1961.

Error rates in human recognition of printed characters have varied in various studies, and this note discusses the discrepencies.

132. Uhr, L.
A possibly misleading conclusion as to the inferiority of one method for pattern recognition to a second method to which it is guaranteed to be superior. IRE TRANS. ELECTRONIC COMPUTERS, EC-10: 96-97, March 1961.

A critical letter on tests of pattern recognition methods of Bledsoe and Browning by Highleyman and Kamentsky.

133. Uhr, L. and C. Vossler
A pattern recognition program that generates, evaluates and adjusts its own operators. In WESTERN JOINT COMPUTER CONFERENCE, 1961, PROC. [New York,] 1961, p. 555-69.

133. (contd) Description of a program that generates its own operators from unknown patterns in the form of binary matrices. Comparisons are made, and input correctly identified are amplified while others are deamplified.

134. Uhr, L. and C. Vossler
Suggestions for self-adapting computer models of brain functions. BEHAVIORAL SCIENCE, 6: 91-97, Jan 1961.

A general purpose computer system is described that would be self-adaptive with easily designed circuitry for operating on any kind of space.

135. Vogler, G. W.
Optical scanning of customer accounts.
DATAMATION 7(3): 26, March 1961.

Description of the operation of a system for scanning numerical data on bill stubs and transcribing same to paper tape for processing. Reading rate is 100 documents per minute.

136. Vossler, C. and L. Uhr
COMPUTER SIMULATIONS OF A PERCEPTUAL LEARNING MODEL FOR SENSORY PATTERN RECOGNITION, CONCEPT FORMATION, AND SYMBOL TRANSFORMATION, System Development Corp., Santa Monica, Calif. 8 Mar 62, 14p.
Rept. no. SP-562. ASTIA AD-276 703

137. Watanabe, S.
A note on the formation of concept and of association by information-theoretical correlation analysis.
INFORMATION & CONTROL, 4: 291-296, Sept 1961.

The method of information-theoretical correlation analysis provides a powerful tool in producing mechanisable models of certain cognitive and recognitive processes. All kinds of correlation can be added on an equal footing to form the total sum of correlation, which is a constant and characteristic of a given set of objects.

138. Weeks, R. W.
Rotating raster character recognition system.
COMMUN. & ELECTRONICS, No. 56: 353-359,
Sept. 1961.

The procedure for applying statistical decision theory to a rotating raster character recognition system is described. Results of simulations are given, and an outline is presented of a design for a completely transistorised system.

139. Welch, P. D. and R. S. Wimpress
Two multivariate statistical computer programs
and their application to the vowel recognition
problem. J. ACOUST. SOC. AM., 33:426-434,
April 1961.

Two systems based upon multivariate statistical techniques for vowel recognition are described.

140. Wentworth, V.
Farrington has optical scanning lead.
DATAMATION 7, (3):23-25, Mar. 1961.

Procedures are discussed concerning the use of Farrington Electronics, Inc. apparatus in billing.

CATCHWORD
SUBJECT INDEX