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OPERATIONS RESEARCH

An Annotated Bibliography

by

JAMES H. BATCHELOR

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OPERATIONS RESEARCH

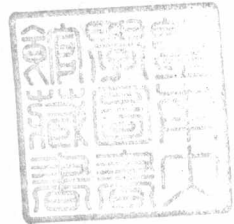
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Volume 3



SAINT LOUIS UNIVERSITY PRESS
SAINT LOUIS, MISSOURI

1963

Library of Congress Catalogue Card No. 59-6440

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Volume 3

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PREFACE

The forerunners of this volume, Operations Research: An Annotated Bibliography (Saint Louis University Press, Saint Louis, Missouri, 1959) and Operations Research: An Annotated Bibliography, Volume 2 (Saint Louis University Press, Saint Louis, Missouri, 1962) included the literature through the year 1959. This Volume 3 follows essentially the same plan and extends the list of published literature through the year 1960, including literature of previous years then cited and entries completed too late to include in the previous volume. The criterion for inclusion has been that the author or editor has indicated that the work concerns Operations Research or that it has been cited in support of such work as fully detailed in the preface to the first volume. This includes all articles from the operational research journals contained in the list of abbreviations.

The intention remains to include all articles on or related to operations research liberally construed to include the various equivalent terms (not all generally so accepted). Related specialties such as cybernetics, linear programming, already the subject of separate bibliographies, are in general omitted except where actually cited or used in operations research, as are purely mathematical derivations and proofs unless giving a solution to a specific operational research problem or type. Some exceptions have seemed desirable.

The large amount of material involved and limitations of time made it beyond the capacity of one person to cover adequately and has required the use of research assistants for literature search and abstracting. The style and content of abstracts may therefore vary considerably. I have had generous help from many authors for lists and reviews of their publications and from librarians near and far. I am particularly indebted to the following persons for foreign lists and references: J. Agard, Groupe de R. O., Air France; Francisco Brambilla, Centro per la Ricerca Operativa Presso l'Università Commerciale, L. Bocconi (Milano); Enrique Chacon Xerica, Universidad Commercial de Deusto (Bilbao); Center of Scientific Information and Documentation, Institut Ekonomiki I Organizacji Przemyslu; Tore Dalenius, Institute of Statistics, University of Stockholm; Ilja Epsztejn, Institut Ekonomiki I Organizacji Przemyslu (Warsaw); P. P. Gillis, Centre D'Etudes de Recherche Opérationnelle (Brussels); Erik Johnsen, Institute of Economic Research, Copenhagen School of Economics and Business Administration; Elji Kometani, Kyoto University;

A. A. Korbut, Leningradskoe Otdelenie Matematicheskovo Instituta, Akademiya Nauk SSSR; Kenichi Koyanagi, Nippon Kagaku Gijutsu Renmei (Tokyo); Yoshiro Kuratani, Case Institute of Technology; Sigeiti Moriguti, Tokyo University; I. H. Abdel Rahman, Under Secretary of State for Planning (Cairo); Sixto Rios, Consejo Superior de Investigaciones Cientificas, Instituto de Investigaciones Estadisticas (Madrid); Leo Törnqvist, University of Helsinki, Institute of Statistics; J. Wanty, Société de Recherche Opérationnelle et d'Economie Appliquée (Brussels); S. Husain Zaheer, Regional Research Laboratory, Hyderabad.

This volume was prepared with the support in part of Grant NSF-G13849, Amendment No. 1, from the National Science Foundation, and in part with assistance from the RAND Corporation and additional support from the Operational Research Society of America, to each of whom grateful acknowledgement is made.

James H. Batchelor

Saint Louis
Twelfth Night
1963

HELPS TO THE USER

The contents of the book are arranged in three sections. Subsequently published additions to entries in the previous volumes are in numerical order from 0001 to 6723 using the same serial numbers of the original entry to which the addition belongs. Entries beginning with number 6724 are arranged alphabetically by author, journal or institution. The index is arranged alphabetically containing entries for name of author where there are multiple authors, title of book or paper (omitting the definite or indefinite article), subject, and a few other entries which may be helpful.

There are three ways to locate a particular known article. If you know any of the following, look in the index for -

1. Title of the article
2. Name of one of multiple authors
3. Some principal word of the title

To find an unknown article or explore an area, select a probable subject or related subjects and search the index.

Trial of one hundred randomly selected items by a layman not familiar with operations research resulted in locating the article sought seventy-five percent on the first look, ninety-five percent on the first two looks and all on the first three looks.

ABBREVIATIONS

BCRO	Bolletino del Centro per la Ricerca Operativa
JORSJ	Journal of the Operations Research Society of Japan
MS	Management Science
NRLQ	Naval Research Logistics Quarterly
ORA	Operations Research Association (Bangalore) News Letter
OR JORSA	Operations Research The Journal of the Operations Research Society of America
ORMS (JUSE)	Operations Research as a Management Science (Japan Union of Scientists and Engineers)
ORQ	Operations Research Quarterly
RFRO	Revue Française de Recherche Opérationnelle
UFO	Unternehmensforschung (Operations Research)
na	Not available

Additions to Entries in Preceding Volumes

OPERATIONS RESEARCH

An Annotated Bibliography

(Saint Louis University Press, 1962)

0108 AMERICAN MANAGEMENT ASSOCIATION - How the DuPont Organization Appraises Its Performance. A Chart System for Forecasting, Measuring and Reporting the Financial Results of Operations

See: 7114, E. I. DuPont de Nemours and Company - Executive committee control charts. A description of the DuPont chart system for appraising operating performance.

1137 PAUL F. DUNN, CHARLES D. FLAGLE, PHILIP A. HICKS - The queulac: an electromechanical analog for the simulation of waiting-line problems

See: 7115, T. F. Dunn, C. D. Slagle, P. A. Hicks, Simulation of message handling problems in Army communication systems.

1188 LESLIE C. EDIE - Optimization of traffic delays at toll booths

Port of New York Authority - Police Study Report April 15, 1953

Review by Leslie C. Edie, in OR JORSA, Mar-Apr 1960, 8:2:263, 277.

1516 HARRY H. GOODE, ROBERT E. MACHOL - Systems Engineering: An Introduction to the Design of Large Scale Systems

Review by Charles D. Flagle in OR JORSA, Mar-Apr 1959, 7:2:263-264

1984 B. JANSSON - Optimal eldfördelning. Exempel pa stridsbeskrivning Artilleritidskrift 1955, 84:3:95-103

2086 L. V. KANTOROVICH - O peremeshchenii mass (Mass displacement)

Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences USSR), 1942, 37:7-8:227-230 (English edition pp 199-201)

2096 WILLIAM KARUSH - A queueing model for an inventory problem

Comments by Vazsonyi in OR JORSA May-Jun, 1960, 8:3:418-420

2530 HARRY MARKOWITZ - Portfolio selection

Journal of Finance, Mar 1952, 7:1:77-91

The process of selecting portfolio may be divided into two stages. The first stage begins with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with

the relevant beliefs about future performance and concludes with the choice of portfolio. Only the first stage is dealt with here. Two rules are considered. In the first rule the investor does maximize discounted expected returns; in the second he does consider expected return a desirable thing and variance of return an undesirable thing. Finally, relations between beliefs and choice of portfolio according to the second rule are illustrated geometrically.

3508 C. E. SHANNON, J. MCCARTHY - Automata Studies edited by C. E. Shannon and J. McCarthy \$4.00

Annals of Mathematics Studies No. 34

A collection of papers dealing with various aspects of automata theory divided into three groups, finite automata, Turing machines, and synthesis of automata. Authors and titles are: S. C. Kleene - Representation of events in nerve nets and finite automata; J. von Neumann - Probabilistic logics and the synthesis of reliable organisms from unreliable components; James T. Culbertson - Some uneconomical robots; M. L. Minsky - Some universal elements for finite automata; Edward F. Moore - Gedanken-experiments on sequential machines; Claude E. Shannon - A universal Turing machine with two internal states; M. D. Davis - A note on universal Turing machines; John McCarthy - The inversion of functions defined by Turing machines; K. de Leeuw, E. F. Moore, C. E. Shannon, N. Shapiro - Computability by probabilistic machines; W. Ross Ashby - Design for an intelligence-amplifier; D. M. MacKay - The epistemological problem for automata; Albert M. Uttley - Conditional probability machines and conditioned reflexes; Albert M. Uttley - Temporal and spatial patterns in a conditional probability machine.

4215 R. H. ADAMS, J. L. JENKINS - Simulation of air operations with the air-battle model

OR JORSA, Sep-Oct 1960, 8:5:600-615

Discusses the Air-Battle Model, with computer programs, as a device for simulating a large-scale two-sided global war on a high-speed computer. Discusses the three parts of the model: the Plan Converter (input system); the Air-Battle Model; and the Output Programs. Applications are shown and the techniques of using gross summary measures to obtain a feel for some key conclusions and of using detailed studies to determine why some conclusions resulted are demonstrated. The model is a tool to provide operational oriented personnel with a feel for the effects of their decisions in many areas of air operations.

4328 JAMES H. BATCHELOR - Operations Research, An Annotated Bibliography

Review in Advertising Research Foundation Sources of Published Advertising Research, No. 7, p 9.

4481 EDWARD H. BOWMAN, ROBERT B. FETTER, editors - Analysis of Industrial Operations

Review by Paul Peach in the Book Reviews Section of Industrial Quality Control, Aug 1960, 17:2:43

4491 FRANCESCO BRAMBILLA, ANGELO PAGANI - Economia e societa (Economy and society)

BCRO (Serie Sociologica) Jan-Apr 1959, 1:1:3-5

Discusses new series introduced by the BCRO, i.e., methodological and sociological, which will present the contributions to methodology and the results of sociological research conducted by the Center of Operational Research.

4493 FRANCESCO BRAMBILLA - The statistical determination of quality

Introduces new statistical concepts of determination of quality. Problems are studied in statistical terms, not solely in terms of certain values of physical units, and include: natural variability as a stochastic process limit, the Markov stochastic processes, the central theorem of probability calculation and the natural variability of manufacturing processes. Analyzes the regulation of production process as a stochastic process, the variability of decision and general theory of hypothesis testing. Tables, diagrams and mathematical models.

4511 DOUGLAS L. BROOKS - Choice of pay-offs for military operations of the future

OR JORSA, Mar-Apr 1960, 8:2:159-168

Discusses means for avoiding undesirable suboptimization, for including the effects of feedback and competition, and for introducing the effect of significant constraints when choosing criteria on which to base long-range planning decisions. Presents new measures of merit which emphasize the research and development leverage over potential enemy countermeasure developments. Suggests operations research studies can profitably emphasize the optimization of: (a) deployment of existing forces, (b) military decision-making processes.
3 refs

4517 LEWIS BROTMAN, BARRY SEID - Digital simulation of a massed-bomber, manned-interceptor encounter

OR JORSA, May-Jun 1960, 8:3:421-423

Reports on a method for simulating on the IBM-704 digital computer the performance of an advanced type manned-interceptor weapon system against a massed raid of enemy bombers. The program can accommodate a maximum of 250 interceptors and 500 bombers. Two points are given particular emphasis: the problem simulated conforms closely to reality; the program is flexible enough to handle many different situations. Output contains target, interceptor and interference data. The program utilizes 10,000 out of 32,000 storage locations and is optimized (hence it is readily feasible to increase the number of targets and interceptors).

4583 LUIGI CASTOLDI - Variante di un problema probabilistico di Banach (Variance of Banach's probability problem)

Equations and tables illustrate probability theory with special reference to Banach's probability problem in the solution of a problem of extraction. 2 refs

4822 N. A. DUDLEY - Operational research in engineering production

Journal of the Institution of Production Engineers, Nov 1958, 37:11:669-672.

4835 ACHESON J. DUNCAN - Quality Control and Industrial Statistics

Review by W. D. Baten in *Industrial Quality Control*, Sep 1960, 17:3:34-36

4857 STELLAN EKBERG - Determination of the traffic-carrying properties of gradings with the aid of some derivative-parameters of telephone traffic distribution functions

Presents a new mathematical method applicable to grading and routing problems, using the first call arrival distribution - a very complex function. Deduces expressions of a very general character for values of time derivative at zero time (called derivative parameters). Develops from these parameters an unequivocal mathematical description of traffic overflow or lost traffic. Investigates use of derivative parameters for several approximation methods for loss formulae which eliminates much computation required for exact mathematical solution, and with results sufficient for most practical applications. Describes an analogy traffic analyzer, and tabulates the results compared with calculated values. 19 refs

4869 J. W. ELLIS, JR., T. E. GREENE - The contextual study - a structured approach to the study of political and military aspects of limited war

OR JORSA, Sep-Oct 1960, 8:5:639-651

Suggests a structured analytical method (termed contextual study) whereby the military and political factors of the environment of a limited war are considered simultaneously throughout a campaign or a series of campaigns. Discusses advantages and limitations of the method and distinctions between it and operational war gaming. Suggests applications to other types of problems than limited war - problems involving close interaction among quantifiable and nonquantifiable factors. The realms of business management and of government are cited as examples of possible applications. 6 refs

4921 SIDNEY I. FIRSTMAN - An approximating algorithm for an optimum aim-point problem

NRLQ, Jun 1960, 7:2:151-167

Discusses use of an algorithm to obtain approximate solutions to the problem of assigning weapons to aim points within a target complex to minimize the expected target value remaining after an attack. Given a number of attack weapons, where should each weapon be aimed to maximize the expected damage? The weapons may be aimed directly at targets or at some point between targets. Either or both may have a non-zero probability of destroying more than one. Finding the marginal return per weapon is discussed. A dynamic programming method of optimum allocation over a set of target complexes is demonstrated. The algorithm for the approximate solution of the latter has been programmed for the IBM-704 digital computer. 6 refs

5307 JAMES R. JACKSON - Some problems in queueing with dynamic priorities

NRLQ, Sep 1960, 7:3:235-249

3 refs

5339 LEONARD G. JOHNSON - Optimum allocation of time and equipment for several fatigue tests

Industrial Mathematics, 1958, 9:2:27-31

Presents a method for determining what optimum number of specimens should be run simultaneously for each of many fatigue tests, assuming known Weibull life distributions, waiting cost per hour and manufacturing cost per specimen. Parts of the calculations are said to be achievable by high speed computer.

5553 A. M. LEE - Some aspects of a control and communication system

B ORSA OR, Fall 1960, 8:Supplement 2:B-126 (abstract)

5599 B. W. LINDGREN, C. W. McELRATH - Introduction to Probability and Statistics

A text in a one-quarter or a one-semester course in statistics for undergraduate students with mathematical knowledge through integral calculus. A number of illustrative examples and problems (with answers) slanted toward engineering and quality control are included.

Review by Joseph J. Moder in Book Reviews section, Industrial Quality Control, Aug 1960, 17:2:42

5759 SEYMOUR MELMAN - Decision-making and Productivity

Review in MS, Jan 1960

5765 A. MERCER, C. S. SMITH - A random walk in which the steps occur randomly in time

6038 JOHANN PFANZAGEL - A general theory of measurement: application to utility

See: 7691, W. G. Mellon - Comments on a general theory of measurement applications to utility.

6088 ROY RADNER - The application of linear programming to team decision problems (Preliminary Papers, Section B, presented at the Seminar on Techniques of Industrial Operations Research, June 12-14, 1957, Illinois Institute of Technology, Chicago, Illinois) 13 pp

6152 ROAD RESEARCH LABORATORY - RN/2976/JCT - Accidents Before and After the Provision of Roundabouts and the Staggering of Crossroads

See: 8000, Herbert E. Scarf - Some remarks on Bayes solution to the inventory problem.

6300 MELVIN F. SHAKUN - Application of operations research to complex financial agreements - a profit sharing illustration

OR JORSA, Jan-Feb 1960, 8:1:65-81

Concerned with the assistance operations research can offer in connection with complex financial agreements. In the case history presented the initial wording of an involved profit-sharing incentive plan lacked operational definition and a mathematical approach was needed to translate it into an acceptable set of calculating procedures. The mathematical formulation involved the solution of simultaneous linear or nonlinear equations depending on the amount of profit earned by the company. No refs

Comment by Gordon B. Davis in OR JORSA, May-Jun 1960, 8:3:425

6496 HAROLD TOMBACH - Design of threat models

OR JORSA, Jan-Feb 1960, 8:1:134-139

Formalizes an approach to threat model design that provides the model builder with criteria for selecting from the universal set of all possible threat models a limited subset of models that are realistic, usable and useful. The approach contributes to the elimination to a large degree the arbitrariness that often accompanies the design of the more complex threat models.

6660 DOUGLASS J. WILDE, ANDREAS ACRIVOS - Minimization of a piece-wise quadratic function arising in production scheduling problems

OR JORSA, Sep-Oct 1960, 8:5:652-674

Uses a probabilistic measure of effectiveness in a study of production scheduling to meet random fluctuations in supply and demand. This measure is a piecewise quadratic positive definite function having discontinuous derivatives at a finite number of points. Presents an algorithm with a section devoted to the properties of the solution upon which the algorithm is based. Some computational problems are discussed and suggestions made for future research. Proofs of the two theorems on which the algorithm is based are presented in the appendix. 25 refs

6666 K. B. WILLIAMS, K. B. HALEY - A practical application of linear programming in the mining industry

See: 8287, K. B. Williams, K. B. Haley - A practical application of linear programming in the mining industry.

OPERATIONS RESEARCH ABSTRACTS

6724 J. ABADIE - Programmes linéaires: une méthode de décomposition (A method of decomposition for linear programming) Séminaire de Recherche Opérationnelle, séance du 17 nov 1959

RFRO, 4th Qr, 1959, 3:13:225 (abstract)

6725 C. ABRAHAM - Criteres de choix en matiere d'investissements routiers. (Criteria of choice in matters of route investments) Séminaire de Recherche Opérationnelle, séance du 10 mars 1959

RFRO, 1st Qr 1959, 3:10:46 (abstract)

6726 C. ABRAHAM, J. THEDIE - Le prix d'une vie humaine dans les décisions économiques (Cost of a human life in economic decisions)

RFRO, 3rd Qr 1960, 4:16:157-167

Considers the problem of how much a community should spend for saving a human life. The nature of the various elements for the computation of the cost of a human life is examined. An attempt is made to estimate these elements in order to have a valid evaluation in the case of road accidents.

Comments by G. Rosen and Gabriel Deasus, in RFRO, 2nd Qr 1961, 5:19:121-155

6727 RUSSELL L. ACKOFF - Towards a Behavioral Theory of Communication

Research Memorandum 2, Research Project 450-156, Mar 28, 1957 (Operations Research Group, Engineering Administration Department, Case Institute of Technology, Cleveland 6, Ohio) 26 pp

An exploratory paper on the development of a behavioral theory of communication. The objectives of this paper are threefold: to identify the behavior of the receiver as affected by a sender; to construct measures of these effects; and to determine and construct measures of effectiveness for the effects in terms of the receiver as well as the sender's objectives.

6728 RUSSELL L. ACKOFF - Unsuccessful case studies and why OR JORSA, Mar-Apr 1960, 8:2:269-263

Reviews the experience of the OR group at Case Institute of Technology with 48 projects with sponsors. None are considered a technical failure although there are recognized objections to this criterion. Discusses difficulties in defining practical failure. Offers as a criterion for considering a case unsuccessful, partial or complete failure to implement findings. Only one case was a complete failure in this sense. Reviews the case and others in detail, citing four reasons why results of OR studies had not been put into operation: (a) reorganization of the company, which changes

the persons responsible for the operations under study; (b) lack of involvement of a high enough level of management to enforce inter-department coordination; (c) attempts by individuals to capture the research so that it can be used to serve personal rather than organizational objectives; (d) economic pressures that lead to a general reduction of expenditures for outside services. Suggests five rules tried with success: (1) do not ever sign a contract you cannot break; (2) never report to anyone lower than the authority capable of controlling all the functions involved in a study; (3) never report to the responsible authorities through intermediaries; (4) never fail to complain forcibly to management about research conditions; (5) never perform research for anyone at no cost to him.

Abstract by A. F. Meyer in Quality Control and Applied Statistics, Jan 1961, 6:1:45-46. See also 4206

6729 RUSSELL L. ACKOFF - An addendum to General Heiman's remarks

Management Technology, edited by Roger R. Crane and C. West Churchman (The Institute of Management Sciences, Dec 1960) Monograph No. 2, Vol. 1, pp. 26-28

Cites some relevant applications of Operations Research to construction and design problems, with a view to supporting General Heiman's calling the attention of civil engineers and the construction industry to Operations Research. 15 refs

6730 M. A. ACZEL - The effect of introducing priorities
OR JORSA, Sep-Oct 1960, 8:5:730-733

Compares two disciplines for customers in a queue: (1) serve them in order of arrival; (2) give precedence to customers likely to require a short service time (priority discipline). The paper relies heavily on a model that has already been studied and it is expected that similar results hold true for more general models, with less restrictive assumptions about arrivals and the number of servers. Assumes that the system has utilization less than one and that an equilibrium state is reached. 3 refs

6731 HEBRON E. ADAMS, RICHARD E. FORRESTER - Carmonette: a computer combat simulation

B ORSA, OR 1959, 7:Supplement 2:B-98-99 (abstract)

6732 W. T. ADAMS - Factors influencing mass-transit and automobile travel in urban areas

Public Roads, Dec 1959, 30:11:256-260

Develops a relationship between relative urban travel mode use and its principal influencing factors by using multiple regression analysis and data for 16 cities. The relationship is tested by applying a derived equation to data received from five additional cities. The use of this equation enables the prediction of relative transit with an acceptable degree of accuracy.

6733 R. B. ADLER, S. J. FRICKER - Notes on the flow of scheduled air traffic

Journal of the Royal Aeronautical Society, Jul 1954, 58:523:475-484

IRE Transactions, Aeronautical and Navigational

Electronics (Institute of Radio Engineers), Jun 1955,
pp 22-31

Presents qualitatively the effects on air traffic of scheduling aircraft and of controlling them enroute in the form of the studies of four problems: (1) relations between the random in deviation of aircraft from schedules and the resulting stack and total delays, (2) effectiveness of a single enroute control point when it reschedules aircraft in an attempt to reduce terminal congestion and when it attempts to bring each plane back on its original schedule, (3) congestion caused by relaxing schedules, (4) effect of a sudden terminal shutdown. Discusses the limiting cases of random arrival and continuous control and some aspects of multi-point, discreet, enroute control. The fourth problem is simplified for use of analytic methods. 5 refs

6734 A. AGANBEGIAN - Application of mathematical methods in economic analysis

Planovoe Khoziaistvo (Planned Economy) 1960, 37:2:54-66
Problems of Economics, Nov 1960, 3:7:6-15 (translated into English)

This is a discussion paper presented in the scientific conference on the application of mathematical methods in economic studies and planning held in Moscow in April, 1960. Discusses the building of several mathematical models and the fields of their application. Qualitative analysis must precede the formulation of a mathematical model. The unity of the qualitative and quantitative aspects of a given economic process is expressed in the model, but abstraction from a number of characteristics of the process is a necessary condition in building the model. Briefly discusses examples of linear economic models, linear programming of economic factors, mathematical-statistical economic models, and differential and functional economic models. A linear input-output model is presented mathematically, the others discussed verbally. 4 refs

6735 TORBEN AGERSNAP, ERIK JOHNSEN - A decision game of managerial strategy as a research tool

Management Sciences, Models and Techniques, edited by C. W. Churchman and M. Verhulst (Pergamon Press, New York, 1960), Vol 1, pp 225-240

A multistage decision game developed at the Copenhagen School of Economics and Business Administration for implementing management researches in sociology and economics. The ultimate objective of the game is to maximize the total assets of each of five firms in a ten-year period. It is designed also to describe: the team work of an optimal decision group; the decision criteria used by business people; the optimal managerial behaviour in an oligopolistic market. The background of the construction and the specific working procedures of the game are discussed. 10 refs

6736 SALIM S. AIZER, JOHN B. LATHROP - Measures of effectiveness in airline operation

B ORSA OR, Spring 1960, 8:Supplement 1:B-29 - B-30
(abstract)

6737 M. A. AIZERMAN, L. A. GUSEV, L. I. ROZONOER, I. M. SMIRNOVA, A. A. TAL - Konechnye avtomaty (Finite Automata)
Avtomatika i Telemekhanika, Feb-Mar 1960, 21:2,3:224-236, 359-368

Presents some basic concepts for the theory of finite automata and its relationship to the theory of switching and relay circuits. 25 refs

6738 H. AKAIKE - On the statistical control of the gap process

Annals of the Institute of Statistical Mathematics (Japan), 1959, 10:233-259

The gap process is defined as a strictly stationary discrete-time-parameter process with successive gaps mutually independent and following one same gap distribution. Constructs a statistical control system for the gap process. A silk-reeling process is used to illustrate the model construction. Some numerical examples are given. 11 refs

6739 SHELDON B. AKERS, JR. - The use of wye-delta transformations in network simplification

OR JORSA, May-Jun 1960, 8:3:311-323

Deals with the simplification of network problems before applying the various algorithms available for solution. Uses the wye-delta transformation technique for analyzing and simplifying electrical networks in two classical network optimization problems: the maximum-flow and the minimum-route problems. Application to the maximum flow (both with and without node capacities) is discussed, illustrating that for the minimum-route problem, dual transformations apply. The effect of the topological properties of a network on the usefulness of these transformations is examined and their application to two networks in the literature discussed. 8 refs

6740 BERNARD S. ALBERT - A methodology for naval-weapon-system cost analysis

B ORSA OR, Spring 1960, 8:Supplement 1:B-47 (abstract)

6741 WROE ALDERSON - Marketing and management decision Cost and Profit Outlook, Jan 1960, 13:1:1, 3-6

Major developments in marketing include application of operations research. Application of system analysis to business activities is the common element of contemporary developments in marketing counsel, operations research, and cost accounting. Information flow as an aspect of an operating system is extensively discussed in relation to control, problem solving and planning.

6742 LAWRENCE T. ALEXANDER - Man-machine simulation as an equipment design tool

B ORSA OR, Spring 1960, 8:Supplement 1:B-15 (abstract)

6743 MICHEL ALGAN, MICHEL SIMONNARD - Une méthode d'analyse marginale pour la détermination d'un contrat d'abonnement optimal à Electricité de France dans le cadre du Tarif Vert (A method of marginal analysis for determining an optimal subscription contract to Electricité de France under the Green Tariff)