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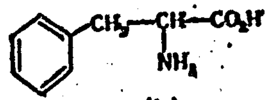
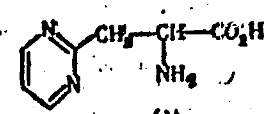

(Ia)


(I)

The starting material used was ethyl β-(2-pyrimidyl)pyruvate (II), which reacted with hydroxylamine to form ethyl α-oximino-β-(2-pyrimidyl)propionate (III). The latter is then reacted with stannous chloride in an acid medium; this single step accomplishes the reduction of the ketoxime fragment and the saponification of the ester group, and yields β-(2-pyrimidyl)alanine (I). This new pyrimidyl amino acid has very definite amphoteric properties. Authors thank Prof. M. A. Prokof'yev for his interest and attention to this work, and are also deeply grateful to A. P. Skoldinov for the tetraethoxypropane which he kindly supplied. Orig. art. has: 1 figure.

SUB CODE: 07 / SUBM DATE: 11Jan65 / ORIG REF: 001 / OTH REF: 004

jw

Card 2/2

KRASIL'NIKOV, N.A.; BOLTYANSKAYA, E.V.; SOKOLOV, A.A.; MELKONYAN, Zh.

Flagelliform outgrowths in Azotobacter. Dokl. AN SSSR 164 no.4:931-933 O '65. (MIRA 18:10)

1. Moskovskiy gosudarstvennyy universitet. 2. Chlen-korrespondent AN SSSR (for Krasil'nikov).

TERENT'YEVA, I.V.; BOLYAK, V.A.

Spectrophotometric determination of "brevikollin". Izv. AN Mold. SSR no.10:71-74 '62. (MIRA 17:12)

KOTEL'NIKOV, Boris Pavlovich; BOLYANOVSKIY, Dmitriy Mikhaylovich; AGEYEV, P.M., red.; GONCHAROVA, Ye.A., tekhn. red.

[First in the country; story of the Shebekino Combine of Synthetic Fatty Acids and Aliphatic Alcohols]Pervyi v strane; rasskaz o Shebekinskom kombinate sinteticheskikh zhirnykh kislot i zhirnykh spirtov. Belgorod, Belgorodskoe knizhnoe izd-vo, 1961. 49 p. (MIRA 15:8)

1. Direktor Shebekinskogo nauchno-issledovatel'skogo instituta sinteticheskikh zhirozameniteley i moyushchikh sredstv (for Kotel'nikov). 2. Glavnyy inzhener kombinata sinteticheskikh zhirnykh kislot i zhirnykh spirtov (for Bolyanovskiy).
(Shebekino--Oils and fats)

BOLTYANSKIY, A.

[Problems of socialist organization of labor and wages in assembly-line production] Voprosy sotsialisticheskoi organizatsii truda i zarabotnoi platy v potochnom proizvodste. [Moskva] Gos.izd-vo polit.lit-ry, 1953. 159 p. (MLRA 6:8)

(Industrial management) (Wages)

BOLTYANSKIY, A.

Comprehensive utilisation of hidden potentialities in the growth of labor productivity. Sots. trud no.10:104-112 O '56. (MIRA 9:11)
(Labor productivity)

AUTHOR: Boltyanskiy, A. SOV-2-58-8-3/12

TITLE: The Study of Mechanization and Automation of Industry (Ob izuchenii mekhanizatsii i avtomatizatsii v promyshlennosti)

PERIODICAL: Vestnik statistiki, 1958, Nr 8, pp 20 - 29 (USSR)

ABSTRACT: Many questions on the characteristics of mechanization and automation of industrial production have not been completely worked out theoretically and are interpreted in practice in different ways. Such initial concepts as partial and complete mechanization or complex mechanization are without a definite content and clearly outlined limits. The present article examines some of these questions, taking the work in foundries of machine construction plants as an example. A proper evaluation of the engineering-economic degree of mechanization and automation can only be given provided the following four basic indices are thoroughly examined: 1) the extent of mechanization and automation of individual operations; 2) the extent of the complexity of mechanization and automation in a section, a workshop or

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206210003-7"

in the enterprise as a whole; 3) the engineering degree of the adopted means of mechanization and automation; 4) the effectiveness of mechanization and automation. The author quotes generally accepted definitions for stages of development of partial and complete mechanization and automation with which he does not entirely concur. He examines the difference of opinion by examples, quoting in this connection a table which shows the expenditure of time in molding one machine part. He tries to prove that an increase in the degree of mechanization and automation is accompanied by a relative augmentation of the share of manual labor if all or most of the labor-consuming operations are not simultaneously mechanized. A higher form of mechanization should be regarded as that in which basic operations are completely mechanized, and only auxiliary work is performed by hand. The lower stage of mechanization is the one where only a part of the basic operations are mechanized. Turning to the complexity of automation, the author maintains that none of the existing definitions are sufficiently clear. He illustrates this by particulars on the operation of a continuous conveyer section of a foundry. To characterize the degree of mechanization (automation) of an area, workshop or enterprise, the author suggests considering several symptoms and comments on them. Dealing with indices of effectiveness of mechanization, he states that effectiveness is not characterized by any single index but by the total of indices. There are 6 tables and 5 Soviet references.

INVENTOR: Boltyanskiy, A. A.; Pshenichnikov, Yu. V.

ORG: None

TITLE: Measurement attachment to fit on an automatic machine for multiple-range sorting according to deviation of some parameter from standard. Class 42, No. 182898 [announced by the Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut)]

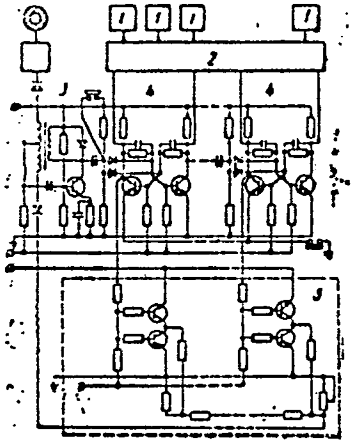
SOURCE: Izobretniya, promyshlennyye obraztsy, tovarnyye znaki, no. 12, 1966, 89

TOPIC TAGS: analog digital converter, digital analog converter, sorter, parameter

ABSTRACT: This Author's Certificate introduces a measurement attachment to fit on an automatic machine for multiple-range sorting according to deviation of some parameter from standard. The device contains an industrial-frequency induction transducer for converting this deviation to AC voltage. Measurement accuracy is improved and sorting speed is increased by equipping the instrument with magnets, a decoder and a converter with feedback which includes a device for comparing AC input voltage of industrial frequency with the output voltage of the converter. The converter also incorporates a generator null indicator connected to the output of the comparator and generating pulses if the amplitude of the AC input voltage in the comparator is greater than the output voltage of the converter. Counters convert the pulses from

Card 1/2 UDC: 531.7:621.3.078.3

output of the generator null indicator to binary code. A controlled voltage divider converts this binary code to DC voltage which is fed to the comparator for checking against the AC input voltage. The sorting command is given by the magnets which are connected by the decoder to the converter counters.



1--magnets; 2--decoder; 3--generator null indicator; 4--counters; 5--voltage divider

SUB CODE: 09, 13/ SUBM DATE: 31May65

Card 2/2

ACCESSION NR: AR4042171 S/0272/64/000/005/0024/0024

SOURCE: Ref. zh. Metrologiya i izmerit. tekhn. Otd. vy*p., Abs. 5.32.138

AUTHOR: Boltyanskiy, A. A.

TITLE: Inductive multirange meter of small displacements

CITED SOURCE: Nauchn. tr. vuzov Povolzh'ya, vy*p. 1, 1963, 180-186

TOPIC TAGS: inductive multirange meter, displacement

TRANSLATION: A differential multirange inductive pickup with linear scale (non-linearity within 2%) is described. Limits of measurements ± 30; ± 30; ±300; and ±30; ±60 and ± 300 μ. Measuring force 100-150 gs. Eight illustrations. Bibliography: 4 references.

SUB CODE: EM, IE ENCL: 00

Card 1/1

BOLTYANSKIY, A.-

BOLTYANSKIY, A.I., kand. ekon. nauk.

Production resources of assembly line operations in foundries. Mashinostroitel' no.1:11-14 Ja '58. (MIRA 11:1)
(Foundries) (Assembly line methods)

BOLTYANSKIY A.I.

117-58-7-10/25

AUTHOR: Boltyanskiy, A.I., Candidate of Economic Sciences

TITLE: Production Reserves on a Foundry Conveyer Line (Rezervy proizvodstva na konveyernoy linii v liteynom tsekhe)

PERIODICAL: Mashinostroitel', 1958, Nr 7, pp 30 - 32 (USSR)

ABSTRACT: The work of the conveyer line in the grey cast iron section of the "KATEK" Plant, a foundry in Kuybyshev, is here statistically analyzed. "Bottlenecks" forming on the line are explained by incomplete mechanization. Only the preparation of molding mix is nearly fully mechanized. Of 27 different operations only 10 are mechanized, and 103 workers of the 133 working on the line are occupied by manual work which includes the pouring. The mechanization of the line is illustrated in table 3 showing the situation in 1955 and after re-mechanization in 1957. The author stresses the importance of continuous rhythmic work. The Chetvërtyy Gosudarstvennyy Ordena Lenina Kuybyshevskiy podshipnikovyy zavod (4th State Order of Lenin Kuybyshev Bearing Plant) and the plant "Avtopribor" in Leningrad are mentioned as plants where single, "advanced", sections and shops do such rhythmic work. There are 3 tables.

Card 1/2

Production Reserves on a Foundry Conveyer Line 117-58-7-10/25

1. Conveyer systems--Analysis

Card 2/2

SOV-3-58-10-15/23

AUTHOR: Boltyanskiy, A.I., Candidate of Economic Sciences, Docent

TITLE: To Cultivate an Economic Way of Thinking (Vospityvat' ekonomicheskoye myshleniye)

PERIODICAL: Vestnik vysshey shkoly, 1958, Nr 10, pp 74 - 77 (USSR)

ABSTRACT: An increase in the economic training of prorpective engineers can only be attained with the active cooperation of all the chairs of a vtuz. The problems which the various chairs have to face in this connection must be differentiated. For this purpose the Kuybyshev Aeronautical Institute has divided engineering subjects into 3 categories: general theoretical, applied, and specialized. The author states which subjects pertain to the different categories and that the possibilities of furthering the students' economic thinking mount as they transfer from the first to the third group. He describes how the connection between the subject (mathematics, drawing, engineering) and economics can be established by the instruc-

Card 1/2

tor during the lesson. Other methodical means to cultivate economic thinking are also given: the preparation of special questions on the economics and organization of production during laboratory and other exercises. The article contains 1 table.

ASSOCIATION: Kuybyshevskiy aviatsionnyy institut (Kuybyshev Aeronautical Institute)

SOV/122-59-4-23/28

AUTHOR: Boltyanskiy, A.I., Candidate of Economic Sciences, Docent

TITLE: On the Planned and Actual Effectiveness of Technical Organisation Measures (O raschetnoy i deystvitel'noy effektivnosti organizatsionno-tekhnicheskikh meropriyatiy)

PERIODICAL: Vestnik Mashinostroyeniya, 1959, Nr 4, pp 78-80 (USSR)

ABSTRACT: Organisational and technical measures are judged by the predicted annual savings and the period during which they pay for themselves. The difference between measures such as design improvements or new production methods which have an integrated effect composed of savings throughout the chain of manufacture and those which have a localised effect, is emphasised. The computation of the actual economies arising from improvements is discussed and illustrated with examples. Again, the effect of improvements in one stage on the total cost must be considered. Some localised improvements yield no overall savings, mostly because of poor coordination with the complete production process. Improvements at different stages should be complementary. In a factory of electrical automotive equipment, a sand blasting

Card 1/2

SOV/122-59-4-23/28

On the Planned and Actual Effectiveness of Technical Organisation Measures

installation was replaced with a shot peening plant. The predicted productivity was higher but, owing to the absence of spare parts and an excessive hourly output without accompanying organisational measures to utilise the released time of the operatives, no actual economies were achieved. An automatic machine for assembling roller chains did not yield an overall saving in the absence of measures to speed up preceding operations. Other examples are given showing individual improvements yielding only a fraction of the predicted saving through poor coordination. Reduced machining times led to underloading of machines. The conception of an "implementation factor" for organisational and technical production improvements is introduced.
There is 1 table.

Card 2/2

BOLTYANSKIY, A.I. (Assist.Prof.Cand.Econ.Sc.)

"On certain Processes of Determining Effectiveness of Industrial Improvement."

report presented at the 13th Scientific Technical Conference of the Kuybyshev Aviation Institute, March 1959.

MOCHALOVA, A.; BOLTYANSKIY, A.; TRISHIN, G.

State Bank control over the delivery of goods in the trade system. Den.i kred. 18 no.2:60-63 F '60. (MIRA 13:1)
(Russia--Commerce) (Credit)

Boltyanskii, V. G. On dimension theory. Uspehi Matem. Nauk (N.S.) 4, no. 4(32), 162 (1949). (Russian)

Let the space X be given. There exists a space Y such that (*) $\dim (X \times Y) < \dim X + \dim Y$, dimension being taken in the sense of Urysohn, if and only if there exists a Y and a prime p such that (*) holds for dimension with respect to p.

L. Zippin (Flushing, N. Y.).

Source: Mathematical Reviews, Vol 11 No. 3

BOLTYANSKII, V.

Boltyanskii, V. An example of a two-dimensional compactum whose topological square is three-dimensional. Doklady Akad. Nauk SSSR (N.S.) 67, 597–599 (1949). (Russian)

Let p be an arbitrary, but fixed, prime and let k be an arbitrary, but fixed, positive integer. The author constructs a space P (lying in four-dimensional Euclidean space), $P=P(p,k)$, such that $\dim P=2$ but $\dim(P\times P)=3$, as follows. Begin with an annulus K, with edges α and β. Identify as a single point each set of p points of α which divide it into p equal arcs and similarly identify each set of p^k points of β dividing β into p^k equal arcs. The resulting polyhedron is called a leaf of order k, and is denoted by Π_k. Its edges a and b are the "circles" which result from α and β respectively after the identifications. Now if a circular hole is cut out of some two-cell, and the edge a of Π_k is matched with the edge of this hole, then the hole of the two-cell is said to be overlaid with the leaf Π_k. Next one defines a tower $\Pi_{k,l}$ depending on the integers k and l, as follows. Start with a leaf Π_k. Cut a hole in it, not touching the edges of the leaf, and overlay this hole with a leaf Π_{k+1}; in that leaf cut out a hole not meeting its edges and overlay this hole with a leaf Π_{k+2}. Continue this leaf-upon-leaf to the lth stage. The resulting polyhedron is the desired tower.

Let S^2 be a triangulated two-dimensional sphere. In each simplex, cut out a hole and overlay with the leaf Π_k. Let $P_{k,k}$ denote the resulting space, and suppose now that somehow there is constructed a triangulated surface $P_{k,l}$ $(l\geqq k)$ consisting of a "riddled" sphere and overlaid leaves of respective orders $k, k+1, \cdots, l$. Now, cut a hole in each simplex of $P_{k,l}$. The holes belonging to S^2 are to be overlaid with $(k,l+1)$-towers, but the holes belonging to a leaf Π_i are overlaid with an $(i+1,l+1)$-tower. This gives the polyhedron of the next stage, denoted by $P_{k,l+1}$. The constructions can be thought of as carried out in a four-space, the simplexes of successive triangulated surfaces approaching zero in diameter. The resulting surfaces $P_{k,n}$ converge with increasing n to a limiting surface denoted by P_k. This is the desired space P. The proof is sketched in some detail.

L. Zippin (Flushing, N. Y.)

Source: Mathematical Reviews, Vol 11 No. 1

BOLTYANSKIY, V.G.

Boltyanskii, V. On the dimensional full-valuedness of compacta. Doklady Akad. Nauk SSSR (N.S.) 67, 773–776 (1949). (Russian)

The compact space X is called dimensionally full-valued (topologically) if, for every compact Y, the associated dimensions satisfy the relation: (1) $\dim (X \times Y) = \dim X + \dim Y$. The author characterizes this class of compacta, solving an old problem due to P. Alexandroff [Math. Ann. 106, 161–238 (1932), problem XII]; it is known that all polyhedra and all one-dimensional compacta belong to the class. If we let P_p, for each prime p, denote the compactum constructed by the author in a previous note [same vol., 597–599 (1949); these Rev. 11, 45] and not belonging to the class in question, then the first theorem is as follows: in order that X^n be topologically dimensionally full-valued it is necessary and sufficient that relation (1) hold whenever $Y = P_p$, for all primes p. The compactum X is algebraically dimensionally full-valued if $\dim X = n$, for some n, and if for every prime p there exists a relative cycle $Z^n \bmod p^v$ in X which is not homologically divisible by p. The author shows that the algebraic and topologic definitions are equivalent. Let Q_p, denote the additive group of rationals of the form m/p^k, p a fixed prime, reduced mod 1. Let $D_p(X)$ denote the homology V-dimension of X with Q_p as coefficient group. Then in order that X^n be dimensionally full-valued, it is necessary and sufficient that $\dim X^n = D_p(X^n)$, for every prime p. The proofs appear to be quite detailed.

L. Zippin (Flushing, N. Y.).

Source: Mathematical Reviews, Vol 11 No. 3

BOLTYANSKIY, V. G.

2

Boltyanskii, V. On a property of two-dimensional compacta. Doklady Akad. Nauk SSSR (N.S.) 75, 605–608 (1950). (Russian)

For any finite closed covering $\Sigma=(F_1, \cdots, F_s)$ of a compactum Φ denote by n_i the number of indices $j\neq i$ for which $F_i\cap F_j\neq 0$. The density of the covering Σ is max $\{n_1, \cdots, n_s\}$. The density of the space Φ is the minimum of those integers n such that for every ϵ there exist finite closed ϵ-coverings of Φ with density n. The author proves that the density of any 2-dimensional compactum is $\leqq 6$ (and hence that the density of a square is $=6$) and asserts that it is known that the density of a 1-dimensional compactum is 2 or 3.

R. H. Fox (Utrecht).

Source: Mathematical Reviews, Vol 13 No. 2

BOLTYANSKIY, V.

188T56

USSR/Mathematics - Dimension Theory, Topology — May/Jun 51

"Concerning a Theorem on the Addition of Dimensions," V. Boltyanskiy

"Uspekh Matemat Nauk" Vol VI, No 3 (43), pp 99-128

Considers the construction of compacta F_m, P_m and their 'inglutination'; dimensions of phi-compactum; Pontryagin's compactum; topological product (production) of structured compacta; relative cycles of complexes K_1; relative cycles of complexes $K_1 x L_1$; 2-dimensionality of compacta F_m; dimensionality of the product $F_m x F_n$; relative cycles

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188T56

USSR/Mathematics - Dimension Theory, Topology (Contd) — May/Jun 51

of complexes $K_{k,1}$; relative cycles of complexes $K_{k',1} x K_{k'',1}$; 2-dimensionality of compacta P_m; dimensionality of the product $P_m x P_m$; additivity of dimensions with respect to prime modulus.

188T56

BOLTYANSKIY, V. G.

"Construction of a Two-Dimensional Compactum Possessing a Three-Dimensional Topological Square," Usp. Mat. Nauk Vol. 6 No. 4 (44), pp 193-220, 1951.

U-1635, 16 Jan 52

BOLTYANSKIY, V.G.

"Vector Fields in a Manifold." Sub 27 Jun 51, Sci Res Inst of Mechanics and Mathematics, Moscow Order Lenin State U imeni M. V. Lomonosov

Cand. Physics - Mathematical Sci.

Dissertations presented for science and engineering degrees in Moscow during 1951.

SO: Sum. No. 480, 9 May 55

USSR/Mathematics - Dimensions Nov/Dec 51

"New Geometric Characteristics of Uryson's Dimensions," V. G. Boltyanskiy, Moscow

"Matemat Sbor" Vol XXIX (71), No 3, pp 603-614

Gives a new definition of the Uryson dimensions, which to a certain extent is similar to the homological definition of dimensions, differing however from the latter in that there are neither groups, coeffs, nor orientations in the cited definition. Calls dimensions thus obtained by the name geometric. The theorem that geometric dimensions coincide with Uryson dimensions is easily deduced from the fundamental results of the homological theory of

198T42

USSR/Mathematics - Dimensions (Contd) Nov/Dec 51

dimensions. However, the demonstration of these results was conducted by algebraic means whereas the author's demonstration here is completely geometrical. Submitted 16 May 51.

198T42

BOLTYANSKIY, V. G.

USSR/Mathematics - Modern Algebra, Secant Surfaces 1 Jul 52

"Secant Surfaces of Diagonal Products," V. Boltyanskiy

"Dok Ak Nauk SSSR" Vol LXXXV, No 1, pp 17-20

Gives the condition for the possibility of constructing secant surfaces on B^{r+2}. Designates P as the diagonal product whose basis is the complex B and whose layer is the manifold C admitting transitive compact group (Lie) G of transformations, which basis enters into the detn of the diagonal product (as a group of homeomorphisms of the layer). This means that to each point a in B corresponds a certain subset (layer) C_a in P homeomorphic C; here if a and b are different

224T81

points of B, then C_a and C_b do not intersect; moreover, if T is a simplex of complex B and a is a point of simplex T, then the definitely homeomorphic reflection $x_{T,a}$ of manifold C on C_a depends continuously on a in T. Submitted by Acad A. N. Kolmogorov 23 Apr 52.

224T81

BOLTYANSKIY, V.

USSR/Mathematics - Topology

Card 1/1 Pub. 22 - 1/56

Authors : Boltyanskiy, Vladimir Grigor'yevich

Title : The problem of taking off a secant surface from a subproduct

Periodical : Dok. AN SSSR 99/5, 669-672, Dec 11, 1954

Abstract : A solution of a problem is given which deals with finding the conditions under which a secant surface $\mathcal{G}_*$: $B \to P$ of the slant product P can be taken off from a subproduct Q, otherwise, under which conditions the secant surface $\mathcal{G}_*$ can be transformed into such a secant surface $\mathcal{G}_*$ of the product P, that $\mathcal{G}^{-1}(B) \subset P/Q$. The symbols B, ρ, Q and P & Q are defined. Two references 1-USSR (1947 and 1950).

Institution : Mathematical Institute im. A. V. Steklov of the Acad. of Scs. of the USSR

Presented by: Academician P. S. Alexandroff, September 28, 1954

BOLTYANSKIY, V. G.

1-FW

2

★ Болтянский, В. Г. [Boltyanskiĭ, V. G.] Что такое дифференцирование? [What is differentiation?] Gosudarstv. Izdat. Tehn.-Teor. Lit., Moscow, 1955. 63 pp. 90 kopeks.

Attempt to explain in a form accessible to students of higher grades of secondary schools certain concepts of higher mathematics such as derivative, differential equation, number e, natural logarithm; it is brought out that such concepts are reflections of real processes that take place in nature.

Intuitive aspects are stressed sometimes at the expense of rigor.

BOLTYANSKIY, V.G.

★ Boltyanskiĭ, V. G. Gomotopičeskaya teoriya nepreryvnyh otobraženiĭ i vektornyh poleĭ. [Homotopy theory of continuous mappings and of vector fields.] Trudy Mat. Inst. Steklov. no. 47. Izdat. Akad. Nauk SSSR, Moscow, 1955. 199 pp. (Russian)

Despite the suggestion of strong specialization conveyed by its title, this memoir contains a rather systematic introduction to combinational topology. In fact, the first part of the work, which covers nearly half the book, is subtitled 'homology theory' and deals with the homology and cohomology of simplicial complexes and cell-complexes with a special section on manifolds. The cell-complexes treated here are essentially those of J. H. C. Whitehead but the bibliography refers the readers to an early paper [On C^1-complexes] and omits all mention of the series of post-war papers on combinational homotopy. Steenrod squares are defined in the final section of the first part with a view to their subsequent application.

The second part of the book is entitled 'homotopy theory and its applications'; here the emphasis is far more strongly on the application to obstruction theory. The opening sections consist of a brief treatment of homotopy groups and the basic notions of obstruction theory. The

1/3

Boltyanskii, V. G.

Hopf classification theorem (for maps $K^n \to S^n$) is given together with Whitney's generalization, and there follows a section on relations between homotopy and homology. Then vector fields on manifolds are defined with special reference to Stiefel manifolds. In the next section the groups $\pi_{n+1}(S^n)$ are computed by the Pontrjagin method; the reviewer was unable to find any reference to Freudenthal's fundamental work. The last two sections discuss the problem of the second obstruction, first to the extension of a map and second to the construction of a vector field.

This book does not represent itself as a foundation course in homology and homotopy; and, obviously, certain topics have been excluded (singular homology, suspension, general theory of fibre-spaces) because they were not relevant to the particular problems of algebraic topology which the author wished to discuss. None the less, the book is probably the most comprehensive of its kind to be published and it is to be hoped that, in translation, it may reach a wider public.

J/3

Bo Hyanskii, V. G.

[Reviewer's note: P. M. Cohn has pointed out that the statement of Sperner's Lemma on p. 18 is wrong. The usual hypothesis (in the author's notations, that, for all s, $1 \leq s \leq r$, the face $[b_{i_1}, b_{i_2}, \cdots, b_{i_{s-1}}]$ of the simplex T^r is contained in $F_{i_1} \cup \cdots \cup F_{i_{s-1}}$) is replaced by the weaker hypothesis that this holds for $s=r$ only, and the author's proof contains the erroneous assertion that the weaker hypothesis implies the stronger.] *P. J. Hilton.*

3/3

BOLTYANSKIY VLADIMIR GRIGOR'YEVICH

BOLTYANSKIY, Vladimir Grigor'yevich

BOLTYANSKIY, Vladimir Grigor'yevich, Academic Degree of Doctor of Physico-Mathematical Sciences, based on his defense, 26 May 1955, in the Council of the Mathematics Inst imeni Steklov of the Acad Sci ussr, of his dissertation entitled: "Research on the homotopic theory of intersecting surfaced of oblique works". For the Academic Title of Doctor of Sciences.

SO: Byulleten' Ministerstva, Vysshego Obrazovaniya SSSR, List No 19, 24 Sept. 1955, Decision of Higher Certification Commission Concerning Academic Degrees and Titles.

BOLTYANSKIY, V. [G.]

Infinite-dimensional homologies and cohomologies. Dokl.AN SSSR 105 no.6:1141-1143 D '55. (MLRA 9:4)

1. Predstavleno akademikom A.N.Kolmogorovym.
(Topology)

BOLTYANSKIY, V.G.

CARD 1/1 PG - 592

SUBJECT USSR/MATHEMATICS/Geometry
AUTHOR BOLTJANSKIJ V.G.
TITLE Equally large and decomposition-equal figures.
PERIODICAL Moscow: State publication for technical-theoretical literature 64p. (1956) (Popular lectures on mathematics No. 22).
reviewed 2/1957

The present book gives an introduction to the theory of the contents, where especially the modern results of Hadwiger's school are considered. At first it is shown that for plane polygons the equality of decomposition is equivalent to their equality of contents. Then the theorem of Hadwiger and Glur is shown that the equal polygons can be decomposed such that the corresponding parts are congruent only by means of shiftings and point reflections. Furthermoer it is proved that the group of shiftings and point reflections is also the smallest with respect to which all equal polygons can be decomposed into equivalent parts. In the second part the well-known theorem of Dehn is proved that in the R_3 there exist volume-equal but not decomposition-equal or completion-equal polyhedra, e.g. cubes and tetrahedra. The proof for this is given in modern form by aid of a lemma of Hadwiger on additive functions of the angles of edges. After a short discussion of the possibilities to define contents by limit values, the theorem of Siedler on the equivalence of decomposition- and completion-equality of polyhedra is proved.

ABRAMOV, A.A., redaktor; BOLTYANSKIY, V.G., redaktor; VASIL'YEV, A.M., redaktor; MEDVEDEV, B.V., redaktor; MYSHKIS, A.D., redaktor; NIKOL'SKIY, S.M., otvetstvennyy redaktor; POSTNIKOV, A.G., redaktor; PROKHOROV, Yu.V., redaktor; RYBNIKOV, K.A., redaktor; UL'YANOV, P.L., redaktor; USPENSKIY, V.A., redaktor; CHETAYEV, N.G., redaktor; SHILOV, G.Ye., redaktor; SHIRSHOV, A.I., redaktor; SIMKINA, Ye.N., tekhnicheskikh redaktor

[Proceedings of the third All-Union mathematical congress] Trudy tret'ego vsesoiuznogo matematicheskogo s"ezda. Moskva, Izd-vo Akademii nauk SSSR. Vol.1. [Reports of the sections] Sektsionnye doklady. 1956. 236 p. (MLRA 9:7)

1. Vsesoyuznyy matematicheskiy s"yezd.3rd Moscow, 1956. (Mathematics)

ABRAMOV, A.A., redaktor; BOLTYANSKIY, V.G., redaktor; VASIL'YEV, A.M., redaktor; MEDVEDEV, B.V., redaktor; MYSHKIS, A.D., redaktor; NIKOL'SKIY, S.M., otvetstvennyy redaktor; POSTNIKOV, A.G., redaktor; PROKHOROV, Yu.V., redaktor; RYBNIKOV, K.A., redaktor; UL'YANOV, P.L., redaktor; USPENSKIY, V.A., redaktor; CHETAYEV, N.G., redaktor; SHILOV, G.Ye., redaktor; SHIRSHOV, A.I., redaktor; SIMKINA, Ye.N., tekhnicheskiy redaktor

[Proceedings of the all-Union Mathematical Congress] Trudy tret'ego vsesoiuznogo Matematicheskogo s"ezda; Moskva iiun'-iiul' 1956. Moskva, Izd-vo Akademii nauk SSSR. Vol.2. [Brief summaries of reports] Kratkoe soderzhanie obzornykh i sektsionnykh dokladov. 1956. 166 p. (MLRA 9:9)

1. Vsesoyuznyy matematicheskiy s"yezd. 3, Moscow, 1956. (Mathematics)

BOLTYANSKIY, V. G.

1-FW

Boltyanskii, V. G. Fibering of function spaces. Trudy Moskov. Mat. Obšč. 5 (1956), 299-309. (Russian)

Let S be a path-connected, locally contractible space and let the topological group G operate effectively and transitively on S. Let $q \in S$ and let Γ be the stability group of q. Suppose that the projection $p: G \to S$, given by $p(g) = gq$ gives G the structure of the total space of a fibre bundle (with local cross-section) with base S and fibre Γ. The author describes such a space S as an s-space (with respect to G).

Let X be a compact Hausdorff space and A a closed subspace. Let

$$P = (S, q)^{(X \times I, X \times 0 \cup A \times I)}, \quad C = (S, q)^{(X \times I, X \times 1 \cup A \times I)},$$

and let $B \subseteq (S, q)^{(X, A)}$ be the subspace of maps which are nullhomotopic rel A. As usual, P, C, B have the compact-open topology. Let $p: P \to B$ be given by [illegible], and let $\mathfrak{G}$ be the space $(G, \Gamma \ e)^{(X \times I, X \ldots)}$ [illegible] the unity in G, and let $\mathfrak{G}$ be given [illegible] topological group induced by that in G [illegible] on C by $(\gamma \cdot \xi)(x, t) = \gamma(x, t) \cdot \xi(x, t)$ [illegible] author's main theorem [illegible] the pr[illegible] the structure of [illegible] base B, fibre C and group $\mathfrak{G}$. The author [illegible] bib is an appr[illegible] coordinate [illegible]

BOLTYANSKII, V.G.

2

1-FW

The remaining results are contained in five lemmas. The first two assert elementary facts about the compact-open topology for which the author gives quite unnecessarily involved proofs. Lemma 3: If C is path-connected, it is an s-space relative to $\mathcal{G}$. Lemma 4: If C is an s-space relative to $\mathcal{G}$, then its universal cover $\tilde{C}$ is an s-space, relative to $\tilde{\mathcal{G}}$, where $\tilde{\mathcal{G}}$ is the space of paths on $\mathcal{G}$ issuing from its unit element, $\tilde{\mathcal{G}}$ being given the obvious structure of topological group. Lemma 5: Every connected manifold admits the structure of an s-space. The author acknowledges that this result is due to Fuller [Ann. of Math. (2) 59 (1954), 219–226; MR 15, 642]. *P. J. Hilton.*

BOLTYANSKIY, V.G.

"Non-elementary problems in elementary formulation." A.M.IAglom, I.M.IAglom. Reviewed by V.G.Boltianskii. Usp.mat.nauk 11 no.1: 266-268 Ja-F '56. (MIRA 9:6)
(Mathematics--Problems, exercises, etc.)(IAglom, A.M.)(IAglom,I.M.)

BOLTYANSKIY, V.G.

SUBJECT USSR/MATHEMATICS/Topology CARD 1/2 PG - 35
AUTHOR BOLTJANSKIJ V.G.
TITLE The second impediments for intersection surfaces.
PERIODICAL Izvestija Akad. Nauk, Ser. mat. 20, 99-136 (1956)
reviewed 5/1956

Let P be a fibre bundle with a complex B as basis, with a fibre C being aspherical in the dimensions $< r$ $(r \geq 2)$ and with a connecting structure group G operating effectively and transitively on C which possesses a local intersection surface (e.g. a Lie group). Further let the isotropy group $\Gamma \subseteq G$ be continuous-connecting and the characteristic class of cohomologies $Y^{r+1} \in \nabla^{r+1}(B, \pi^r(C))$ of the bundle B be equal zero. Then there exists an intersection surface $\mathcal{T}$ of P over B^{r+1}. The author determines the second impediment $Z^{r+2}(\mathcal{T}) \in \nabla^{r+2}(B, \pi^{r+1}(C))$ against the continuation of $\mathcal{T}$ on B^{r+2}. We have $Z^{r+2}(\mathcal{T}) = Z^{r+2}(\mathcal{T}_0) + R^{r+2}(D^r) + D^r \cup \tilde{Y}^2_{\mathcal{T}_0}$. There $\mathcal{T}_0$ is an arbitrary intersection surface over B^{r+1}, $D^r \in \nabla^r(B, \pi^r(C))$ is the r-difference of $\mathcal{T}_0$ and $\mathcal{T}$, $R^{r+2}(D^r)$ is the impediment against the continuation on B^{r+2} for a mapping $f: B^{r+1} \longrightarrow C$ which, compared with the constant mapping of B^r, has a difference cocycle $\in D^r$ in C. For the term $R^{r+2}(D^r)$ explicit expressions are

SUBJECT USSR/MATHEMATICS/Differential equations
AUTHOR BOLTJANSKIJ V.G., GAMKRELIDZE R.V., PONTRJAGIN L.S.
TITLE On the theory of optimal processes.
PERIODICAL Doklady Akad.Nauk 110, 7-10 (1956)
reviewed 4/1957

The problem of the quality of control being actual in the theory of automatic control is represented in general form and is considered.

Let be given the system $\dot{x}^i = f^i(x^1,\dots,x^n; u^1,\dots,u^r) = f^i(x,u)$, $(i=1,\dots,n)$, where $x = (x^1,\dots,x^n)$ is the image point in the n-dimensional phase space and $u = (u^1,\dots,u^r)$ is the "controlling vector". If u(t) is piecewise smooth and continuous and if it belongs to a fixed closed region $\bar{\Omega}$ of the variables $u^1,\dots,u^r$, where Ω has a piecewise smooth (n-1)-dimensional boundary, then u(t) is called permissible.

Formulation of the problem: In the phase space $x^1,\dots,x^n$ two points ξ_0 and ξ_1 are given. A permissible control vector u(t) is to be chosen in such a way that the point of the phase space comes from the position ξ_0 to the position ξ_1 in minimal time. Assuming the existence of a solution and if u(t) is the optimal vector and x(t) the corresponding optimal path, then to the somewhat deviating vector $u(t)+\delta u(t)$ there corresponds the path $x+\delta x$. In linear approximation we have

and ψ let $H(x,\psi,u) = \psi_\alpha f^\alpha(x,u)$ have a maximum $M(x,\psi)$ in u if u changes in Ω.

Doklady Akad.Nauk 110, 7-10 (1956) CARD 3/3 PG - 707

If the 2n-dimensional vector (x, ψ) is a solution of the system

$$(2)\qquad \left.\begin{aligned} \dot{x}^i &= f^i(x,u) = \frac{\partial H}{\partial \psi_i} \\ \dot{\psi}_i &= -\frac{\partial f^\alpha}{\partial x^i}\psi_\alpha = -\frac{\partial H}{\partial x^i} \end{aligned}\right\} \quad i=1,\dots,n,$$

where the piecewise continuous vector $u(t)$ always satisfies the condition $H(x(t), \psi(t), u(t)) = M(x(t), \psi(t)) > 0$, then $u(t)$ is the optimal control and $x(t)$ is the corresponding locally optimal path.
Starting from a fixed initial condition $x(t_0) = \xi_0$ and changing the condition $\psi(t_0) = \eta_0$, then (2) with these conditions and the condition $H(x(t), \psi(t), u(t)) = M(x(t), \psi(t)) > 0$ determines the set of all locally optimal paths through the point $\xi_0 = x(t_0)$ and the corresponding optimal control mechanisms $u(t)$.

INSTITUTION: Math.Inst.Acad.Sci.

BOLTYANSKIY, V.G. (Moscow); YEFREMOVICH, V.A. (Ivanovo)

Outlining the basic ideas of topology. Mat. pros.no.2:3-34 '57.
(MIRA 11:7)

(Topology)

BOLTYANSKIY, V.G., red.; DYNKINA, Ye.B., red.; POSTNIKOV, M.M., red.; SOLOMENTSEV, Ye.D., red.; IOVLEVA, N.A., tekhn.red.

[Fiber spaces and their applications; collection of translations] Rassloennye prostranstva i ikh prilozheniia; sbornik perevodov. Moskva, Izd-vo inostr.lit-ry, 1958. 460 p. (MIRA 12:1)
(Topology)

NIKOL'SKIY, S.M., otv.red.; ABRAMOV, A.A., red.; BOLTYANSKIY, V.G., red.; VASIL'YEV, A.M., red.; MEDVEDEV, B.V., red.; MYSHKIS, A.D., red.; POSTNIKOV, A.G., red.; PROKHOROV, Yu.V., red.; RYBNIKOV, K.A., red.; UL'YANOV, P.L., red.; USPENSKIY, V.A., red.; CHETAYEV, N.G., red.; SHILOV, G.Ye., red.; SHIRSHOV, A.I., red.; GUSEVA, I.N., tekhn.red.

[Proceedings of the Third All-Union Mathematical Congress] Trudy tret'ego Vsesoiuznogo matematicheskogo s"ezda. Vol.3 [Synoptic papers] Obzornye doklady. Moskva, Izd-vo Akad.nauk SSSR. 1958. 596 p. (MIRA 12:2)

1. Vsesoyuznyy matematicheskiy s"yezd. 3d, Moscow, 1956. (Mathematics--Congresses)

BOLTYANSKIY, V.G. (Moskva); YEFREMOVICH, V.A. (Ivanova)

Outlining the basic ideas of topology (continued). Mat. pros. no.3:5-40 '58. (MIRA 11:9)

(Topology)

AUTHOR: Boltyanskiy, V.G. (Moscow) SOV/39-46-1-5/6

TITLE: Homotopic Classification of the Secant Surfaces (Gomotopicheskaya klassifikatsiya sekushchikh poverkhnostey)

PERIODICAL: Matematicheskiy sbornik, 1958, Vol 46, Nr 1, pp 91-124 (USSR)

ABSTRACT: The paper consists of six paragraphs. The first five contain, partially with and partially without proof, well-known results of Steenrod, Pontryagin and Postnikov and form the basis for the last paragraph, in which the general classification theorem for secant surfaces of an oblique product is proved (necessary and sufficient conditions for the homotopy). From this general criterion the classification theorems of Steenrod, Pontryagin and Postnikov can be concluded. The proofs for some results of Postnikov [Ref 5,6] which have not been published till now, seem to be of interest.
There are 15 references, 10 of which are Soviet, 4 American, and 1 Swiss.

SUBMITTED: March 26, 1957

Card 1/1

BOLTYANSKIY V.

20-118-1-2/58

AUTHOR: BOLTYANSKIY, V.G.

TITLE: Homotopic Classification of Vector Fields (Gomotopicheskaya klassifikatsiya vektornykh poley)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol 118, Nr 1 pp 13-16 (USSR)

ABSTRACT: The author gives a homotopic classification of the vector fields on n-dimensional manifolds. In the case $n \leqslant 3$ this is a trivial consequence of well-known facts. For $n \geqslant 4$ the classification follows from the author's results [Ref.4] on the homotopic classification of the secant surfaces and consists in the fact that to each element of an integer cohomology group $H^{n-1}(M^n)$ for $n \geqslant 4$ there correspond exactly two classes of vector fields.
Theorem: Let K^n be a simplicial decomposition of the n-dimensional manifold M^n. Let two vector fields on M^n be denoted (n-1)-homotopic, if, considered only on the (n-1)-dimensional K^{n-1}, they are homotopic. Then the elements of the group $H^{n-1}(M^n)$ biunivoquely correspond to the (n-1)-homotopy classes of the vector fields on M^n. For $n \geqslant 4$ each (n-1)-homotopic class is decomposed into exactly two homotopy classes, which gives for $n \geqslant 4$ a complete classification

Card 1/2

Homotopic classification of Vector Fields

of the vector fields on M^n. 3 Soviet and 5 foreign references are quoted.

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova, Akademii nauk SSSR (Mathematical Institute imeni V.A. Steklov, Academy of Sciences, USSR)

PRESENTED: June 25, 1957, by P.S. Aleksandrov, Academician

SUBMITTED: June 24, 1957

AVAILABLE: Library of Congress

AUTHOR: Boltyanskiy, V.G.

TITLE: The Maximum Principle in the Theory of Optimum Processes (Printsip maksimuma v teorii optimal'nykh protsessov)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 119, Nr 6, pp 1070-1073 (USSR)

ABSTRACT: Let the motion of the point $x = (x^1, \dots, x^n)$ in the n-dimensional phase space X be described by

$$\dot{x} = f^i(x^1, \dots, x^n, u) = f^i(x, u) \qquad i=1, \dots, n .$$

The "steering parameter" $u=u(t)$ is to be chosen in an arbitrary topological space U so that the point comes from the position $x_0 \in X$ into the position $x_1 \in X$ in a minimum of time. Then the process $x=x(t)$ is called optimum.
In a common paper of the author, Pontryagin and Gamkrelidze [Ref 1] the author conjectured a certain general maximum principle. In the present paper the author proves the correctness of this conjecture, namely it holds the theorem: In order that the process $x=x(t)$, $t_0 \leqslant t \leqslant t_1$, runs optimally for the steering $u(t)$, it is necessary that there exists a vector $\psi(t)$ so that

$$H(x(t), \psi(t), u(t)) = \max_{u \in U} H(x(t), \psi(t), u) \geqslant 0$$

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where H is a certain well-defined function. Furthermore it is proved that H is constant along $x(t)$, $\psi(t)$ and $u(t)$ $(t_0 \leqslant t \leqslant t_1)$.

$u(t)$ is assumed to be piecewise continuous.
There is 1 Soviet reference.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova Akademii nauk SSSR (Mathematical Institute imeni V.A.Steklov of the Academy of Sciences of the USSR)

PRESENTED: December 19, 1957, by P.S.Aleksandrov, Academician

SUBMITTED: December 18, 1957

Card 2/2

PHASE I BOOK EXPLOITATION SOV/3882

Matematika v SSSR za sorok let, 1917-1957, tom 2: Biobibliografiya (Mathematics in the USSR for Forty Years, Vol 2: Biobibliography) Moscow, Fizmatgiz, 1959. 819 p. Errata slip inserted. 6,000 copies printed.

Eds.: A. G. Kurosh (Chief Ed.), V. I. Bityutskov, V. G. Boltyanskiy, Ye. B. Dynkin, G. Ye. Shilova, and A. P. Yushkevich; Tech. Ed.: S. N. Akhlamov.

PURPOSE: This book is intended for mathematicians and science historians.

COVERAGE: This is the second of a two-volume work. It contains contributions of Soviet mathematicians for the period 1917-1957 and was compiled by Yu. A. Gor'kov. Ke. Ye. Chernin wrote the part pertaining to the approximation method and "machine" mathematics. This includes bibliographic material from "Mathematics in the USSR for 15 Years" and "Mathematics in the USSR for 30 Years". A significant part of the bibliographic material has been checked against lists of works sent to the editor by various scientists. The authors are presented in alphabetical order, while the works of each author are arranged chronologically. At the end of the book is a list of the basic mathematical journals of the world. Some 22,000 titles of works of more than 3,600 authors are given (in "Mathematics in the USSR for 30 Years", there are about 7,000 works and 1,300 authors).

Card 1/2

The book emphasizes those works which are important either for the mathematical methods presented in them or for their statement of mathematical problems. As a rule, no publications on mathematical methodology and pedagogic literature are included; the latter is represented only by existing university textbooks. In addition to the bibliographic material, the book contains a large amount of biographic data on Soviet mathematicians. This biographic material was assembled by R. S. Bityutskova, mainly on the basis of information sent to the editor. The book also gives information on reviews of the works of Soviet scientists in journals and articles from "Mathematics in the USSR for 30 Years", "Mathematics in the USSR for 15 Years", and from the first volume of the present work, "Mathematics in the USSR for 40 Years", referred to in the book by the following symbols respectively: M-XV, M-XXX, and M-XL.

TABLE OF CONTENTS: None given.

AVAILABLE: Library of Congress

GC/Rem/fal
7-18-60

Card 2/2

Boltyanskiy, V.G.

16(1) PHASE I BOOK EXPLOITATION SOV/2508

Matematicheskoye prosveshcheniye; matematika, yeye prepodavaniye, prilozheniya i istoriya, vyp. 4 (Mathematical Education; Mathematics, Its Teaching, Application and History, Nr. 4) Moscow, Gostekhizdat, 1959. 15,000 copies printed.

Ed.: I.N. Bronshteyn; Editorial Board of Series: I.N. Bronshteyn, A.I. Markushevich, I.M. Yaglom; Tech. Ed.: S.N. Akhlamov.

PURPOSE: This book is intended for persons without an extensive mathematical education who are interested in trends in contemporary mathematics. The book may be useful to high school mathematics teachers.

COVERAGE: The book consists of articles, reviews, and scientific and methodological reports, some of which are translations from other languages. The state of modern mathematics is covered, including applications, history, teaching of mathematics in schools, and mathematical developments in the USSR and abroad. One section deals with scientific and pedagogical life in the USSR and another contains reviews of certain mathematical publications. Some mathematical background is necessary to understand the book; certain articles require a knowledge of higher mathematics.

TABLE OF CONTENTS:

I. REVIEWS, ARTICLES, TRANSLATIONS

Card 2/8

Card 3/8

16(0) PHASE I BOOK EXPLOITATION SOV/3177

Matematika v SSSR za sorok let, 1917-1957. tom 1: Obzornyye stat'i (Mathematics in the USSR for Forty Years, 1917-1957). Vol 1: Review Articles) Moscow, Fizmatgiz, 1959. 1002 p. 5,500 copies printed.

Eds: A. G. Kurosh, (Chief Ed.), V. I. Bityutskov, V. G. Boltyanskiy, Ye. B. Dynkin, G. Ye. Shilova, and A. P. Yushkevich; Ed. (Inside book): A. F. Lapko; Tech. Ed.: S. N. Akhlamov.

PURPOSE: This book is intended for mathematicians and historians of mathematics interested in Soviet contributions to the field.

COVERAGE: This book is Volume I of a major 2-volume work on the history of Soviet mathematics. Volume I surveys the chief contributions made by Soviet mathematicians during the period 1917-1957; Volume II will contain a bibliography of major works since 1917 and biographic sketches of some of the leading mathematicians. This work follows the tradition set by two earlier works: Matematika v SSSR za pyatnadtsat' let (Mathematics in the USSR for 15 Years) and Matematika v SSSR za tridtsat' let (Mathematics in the USSR for 30 Years). The book is divided into the major divisions of the field, i.e., algebra, topology, theory of probabilities, functional analysis, etc., and contributions and outstanding problems in each discussed. A listing of some 1400 Soviet mathematicians is included with references to their contributions in the field.

BOLTYA[illegible]IY, V.G. ([illegible]): [illegible], V.. ([illegible])

Basic ideas of [illegible]. [illegible]: Combinatorial topology. Mat.pros. no.[illegible]:[illegible]-52 '5[illegible]. (MIRA 1[illegible]:[illegible])

(Topology)

BOLTYANSKIY, V.G. (Moskva); VIL[illegible], N.Ya. (Moskva); YAGLOM, I.M. (Moskva)

Mathematics curriculum for secondary schools. Mat. pros. no.[illegible]:131-[illegible] '58. (MIRA [illegible])

(Mathematics--Study and teaching)

BOLTYANSKIY, V.G.

Optimal processes with parameters. Dokl. AN Uz. SSR no.10:9-12 '59. (MIRA 13:3)

1. Institut matematiki AN UzSSR. Predstavleno akademikom AN UzSSR T. A. Sarymsakovym.
(Differential equations)

~~16(1)~~ 16.5400 16.5500 SOV/38-23-6-5/11

AUTHOR: Boltyanskiy, V.G.

TITLE: Mappings From Compacts Into Euclidean Spaces

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959, Vol 23, Nr 6, pp 871 - 892 (USSR)

ABSTRACT: The mapping f of the compact X into an Euclidean space is called k-regular ($k \geqslant 1$) according to K. Borsuk [Ref 4], if for arbitrary different k + 1 points $x_0, x_1, \ldots, x_k$ of X the points $f(x_0), f(x_1), \ldots, f(x_k)$ do not lie in a (k - 1)-dimensional plane. The author considers the following embedding problem : Determine the smallest natural N' so that for dim $E \geqslant N'$ the set of all k-regular mappings of an arbitrary n-dimensional compact X into the Euclidean space E is everywhere dense in the set of all continuous mappings $X \rightarrow E$. The main result of the paper is the statement : $N' = n k + n + k$. For the proof the author gives at first a generalization of the well-known embedding theorem of Pontryagin-Nöbeling (theorem 3). From this it follows theorem 1 : Let E be an Euclidean space of the dimension $\geqslant n k + n + k$ and f an arbitrary mapping of the n-dimensional compact X into E. Then for every $\varepsilon > 0$ there exists a k-re-

Card 1/2

gular mapping $\varphi : X \rightarrow E$ which differs from f by less than ε. Theorem 2 is known (Hurewicz [Ref 6]). Theorem 4 is the infinite-dimensional analogue of theorem 1. From theorem 1 it follows: $N' \leq n k + n + k$. The proof of the main result is concluded by the proof of the inequality $N' \geq n k + n + k$. There are 7 references, 3 of which are Soviet, and 4 German.

PRESENTED: by P.S. Aleksandrov, Academician

SUBMITTED: January 3, 1959

ANTONOVSKIY, M.Ya.; BOLTYANSKIY, V.G.; SARYMSAKOV, T.A.;
SIRAZHDINOV, S.Kh., prof., otv. red.

[Topological semifields]Topologicheskie polupolia. Tashkent, Izd-vo SamGU. 1960. 48 p. (MIRA 16:4)
(Topology)

report to be presented at the 1st Intl Congress of the Intl Federation of Automatic Control, 25 Jun-5 Jul 1960, Moscow, USSR.

AGEYKIN, D. I. - "Compensating thermo-magnetic gas analysers"
ANDREYEV, N. I. - "Method of determining the optimum dynamic system according to the criterion of the functional extra, which is a given function of several other functions"
AYZERMAN, M. A., and GANTMAKHER, F. P. - "Some problems of the theory of nonlinear systems of automatic regulation with discontinuous characteristics"
BARBASHIN, E. A. - "Concerning the organization of the LYAPUNOV function for nonlinear systems"
BASHARIN, A. V. - "Graphic methods of synthesis of nonlinear systems of automatic regulation"
BASHTA, T. M. - "Problems of the application of high liquid pressures for automatic systems"
BEDEL'BAYEV, A. K. - "The theory of stability of regulation systems"
[illegible]OV, Yu. N. - "Multicoordinate nonlinear interpolator for program control of machines"
[illegible]DS, T. K., and TAL', A. A. - "Pneumatic alloy systems"
[illegible]ADSKIY, V. L., KALASHNIKOV, V. I., KRYAZHEVSKIY, V. V., MAZIN, L. V., POPOV, G. A. - "Automated electric drive of the propeller installation of the atomic icebreaker 'Lenin'"
[illegible]SKIY, V.A., and FEDOROV, S. M. - "Application of the equivalent transmission function in the calculation of follower systems by the logarithmic frequency curve method"
BILIK, R. V., BOCHIKASHVILI, V. A., and PRANGISHVILI, I. V. - "Contactless telemechanical systems with temporary separation of channels"
BOLTYANSKIY, V.G., GAMKRELIDZE, R. V., MISHCHENKO, YE. F., and ~~PONTRYAGIN, L. S.~~ - "The maximum principle in the theory of optimum control processes"
[illegible]OZOOL', M. M. - "Automated electric drives of a metallurgical plant"
BUROVOY, I. A. - "Automatic regulation of froth-layer processes in nonferrous metallurgy"

BOLTJANSKIJ, V. G. (Boltyanskiy, V. G.); JEFREMOVIC, V. A. (Yefremovich, V. A.)

On topology. Pokroky mat fyz astr 5 no. 1:7-27. '60

BOLTYANSKIY, V.G.; RYSHKOV, S.S.; SHASHKIN, Yu.A.

K-regular imbeddings and their application to the theory of approximation of functions. Usp. mat. nauk 15 no. 6:125-132 N-D '60. (MIRA 14:2)

(Topology)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206210003-7"

16(1)

S/038/60/024/01/001/006

AUTHORS: Boltyanskiy, V.G., Gamkrelidze, R.V., and Pontryagin, L.S.

TITLE: Theory of Optimal Processes. I Maximum Principle

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya matematicheskaya, 1960, Vol 24, Nr 1, pp 3-42 (USSR)

ABSTRACT: The paper contains a detailed representation of the results published by the authors in [Ref 1-6, 10]. At the Mathematical Congress in Edinburgh L.S.Pontryagin has reported about the most essential results.
There are 10 references, 7 of which are Soviet, 1 German, and 2 American.

SUBMITTED: May 14, 1959

Card 1/1

86463
S/020/60/133/004/032/040 XX
C111/C333

16.2200

AUTHORS: Boltyanskiy, V.G., Postnikov, M.M.

TITLE: On Principal Notions of Algebraic Topology. Axiomatic Definition of Cohomology Groups

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 4, pp. 745 - 747

TEXT: The objects of a category $\mathfrak{A}_0$ are assumed to be topological spaces with marked points, the mappings of $\mathfrak{A}_0$ are assumed to be continuous and to transfer marked points into marked points. Let 0_x be a marked point of the space X. Let IX be the topological product $[0,1] \times X$ in which $[0,1] \times 0_X$ is drawn together into the point $0 = 0_{IX}$. Let the mapping $X \to IX$ defined by $x \to (t,x)$ be denoted by q_t. For every $f: X \to Y$ let If denote the mapping $IX \to IY$ defined by $q_t(x) \to q_t(f(x))$.

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The sequence .... $X_{i-1} \xrightarrow{f_{i-1}} X_i \xrightarrow{f_i} X_{i+1} \longrightarrow$ .... is called exact, if for every i the image $\operatorname{Im} f_{i-1} = f_{i-1}(X_{i-1})$ coincides with the kernel $\operatorname{Ker} f_i = f_i^{-1}(0)$ of f_i. The exact sequence $X \xrightarrow{f} Y \xrightarrow{g} Z \to 0$ is called cofibring (with respect to a subcategory L of $\mathfrak{A}_0$) if for every space Q from L and arbitrary Λ: $IX \to Q$, μ: $Y \to Q$ from $\mathfrak{A}_0$, for which $\Lambda \circ q_0 = \mu \circ f$, there exists a mapping M: $IY \to Q$ such that $\mu = M \circ q_0$ and $\Lambda = M \circ If$. X is called cobasis, Y the space of the cofibring, Z the cofibre.
Let L = $\mathfrak{A}_0$. The subcategory $\mathfrak{A}$ of $\mathfrak{A}_0$ is called admissible, if 1. $\mathfrak{A}$ contains the zero-dimensional sphere S^0, 2. $\mathfrak{A}$ with X also contains IX and q_0, q_1 : $X \to IX$; furthermore if $\mathfrak{A}$ with every mapping f contains If too.
3. If in (*) $X \xrightarrow{f} Y \xrightarrow{g} Z$ X,Y belong to $\mathfrak{A}$, also Z is to belong to $\mathfrak{A}$; if in (*) X,Z belong to $\mathfrak{A}$, then also Y is to belong to $\mathfrak{A}$; if X,Y,Z belong

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to $\mathfrak{A}$, then also the mappings f,g are to belong to $\mathfrak{A}$. Let $\mathfrak{A}$ be admissible and fixed. Spaces and mappings of $\mathfrak{A}$ then are called admissible too. The cofibrings (*) with admissible X,Y,Z are called admissible too. Admissible mappings f_0, f_1 : $X \to Y$ are called homotopic (in $\mathfrak{A}$), if there exists an $F: IX \to Y$ such that $F \circ q_i = f_i$, $i = 0,1$.

Let to every integer n a contravariant functor H^n be given which is defined in $\mathfrak{A}$ and attains values in the category of the abelian groups and their homomorphisms. Then three functors H^n_I, H^n_{II}, H^n_{III} are defined on the category of all admissible cofibrings (and of their admissible mappings). H^n_I makes correspond the group $H^n(X)$ to the cofibring (*), $H^{(n)}_{III}$ the group $H^n(Z)$.

The functors H^n form the group theory of the cohomologies, if for every n a natural transformation δ^n from H^n_I into H^{n+1}_{III} is given and if the following axioms are satisfied:

1^H. The groups $H^n(S^0)$ are trivial for $n \neq 0$.

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2^H. For arbitrary admissible mappings $f,g : X \to Y$ which are mutually homotopic the homomorphisms $H^n(f)$, $H^{(n)}(g) : H^n(Y) \to H^n(X)$ are identical.

3^H. For every admissible cofibring $X \xrightarrow{f} Y \xrightarrow{g} Z$ it holds the rigorous sequence

$$\ldots \to H^n(Z) \xrightarrow{H^n(g)} H^n(Y) \xrightarrow{H^n(f)} H^n(X) \xrightarrow{\delta^n} H^{n+1}(Z) \to \ldots \quad .$$

$H^o(S^o)$ is called group of coefficients of the theory considered.
The same axioms (correspondingly changed) describe the homology groups.
There are 2 American references.

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V.A. Steklov of the Academy of Sciences USSR)

PRESENTED: May 10, 1960, by I.M. Vinogradov, Academician
SUBMITTED: May 9, 1960

Card 4/4

ANTONOVSKIY, M.Ya.; BOLTYANSKIY, V.G.; SARYMSAKOV, T.A.; SIRAZHDINOV, S.Kh. prof. otv.red.

[Metric spaces above half-fields] Metricheskie prostranstva nad polupoliami. Tashkent, 1961. 70 p. (Tashkent. Universitet. Trudy, no.191). (MIRA 15:5)

(Topology)

BOLTYANSKIY, Vladimir Grigor'yevich; CHERNYSHEVA, L.Yu., red.; LIKHACHEVA, L.V., tekhn. red.

[Envelopes] Ogibaiushchaia. Moskva, Gos. izd-vo fiziko-matem. lit-ry, 1961. 75 p. (Populiarnye lektsii po matematike, no.36)
(MIRA 14:10)

(Envelopes (Geometry))

PONTRYAGIN, Lev Semenovich; BOLTYANSKIY, V.G., red.; BAYEVA, A.P., red.; YERMAKOVA, Ye.A., tekhn. red.

[Ordinary differential equations] Obyknovennye differentsial'nye uravneniia. Moskva, Gos. izd-vo fiziko-matem. lit-ry, 1961. 311 p. (MIRA 14:7)

(Differential equations)

BOLTYANSKIY, V.G.

PHASE I BOOK EXPLOITATION SOV/5883

Pontryagin, Lev Semenovich, Vladimir Grigor'yevich Boltyanskiy, Revaz Valerianovich Gamkrelidze, and Yevgeniy Frolovich Mishchenko

Matematicheskaya teoriya optimal'nykh protsessov (Mathematical Theory of Optimum Processes) Moscow, Fizmatgiz, 1961. 391 p. 10,000 copies printed.

Ed.: N. Kh. Rozov; Tech. Ed.: K. F. Brudno.

PURPOSE: This book is intended for specialists concerned with the mathematical theory of optimum control processes.

COVERAGE: The book contains a systematic presentation of results on the theory of optimum control processes obtained by the authors during the years 1956-1961. Some data obtained from other scientists are also included. The authors' so-called "Principle of Maximum" makes possible the solution of a considerable number of variational problems of nonclassical type associated with the optimization of controlled processes. The principle is presented in detail and is compared with Bellman's principle of dynamic programming. A series of problems on optimum processes is studied on the basis of general methods of the Principle

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S/569/61/002/000/002/008
D298/D302

16.8000 (1031, 1132, 1329)

AUTHORS: Boltyanskiy, V.G., Gamkrelidze, R.V., Mishchenko, Ye. F., and Pontryagin, L.S. (USSR)

TITLE: Principle of maximum in the theory of optimal processes

SOURCE: IFAC, 1st Congress, Moscow 1960. Teoriya diskretnykh, optimal'nykh i samonastraivayushikhsya sistem. Trudy, v. 2, 1961, 457 - 470

TEXT: The general optimum problem is formulated, as well as the basic results obtained by the authors. The n-dimensional phase-space X^n is considered, and the controlled object (plant) is described by the vector equation

$$\dot{x} = f(x, u), \; f = (f^1, \ldots, f^n); \qquad (2)$$

is the class of allowed controllers is defined as the class of piecewise linear functions $u(t)$, $t_1 \leq t \leq t_2$. The optimum problem is formulated as follows: The two points ξ_1, ξ_2 are given in X^n; it

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is required to choose, among the allowed controllers, a controller $u(t)$, so that the corresponding trajectory $x(t)$ of Eq. (2), defined on the entire interval $t_1 \leq t \leq t_2$, connects the points ξ_1, ξ_2, ($x(t_1) = \xi_1$, $x(t_2) = \xi_2$), and the integral

$$\int_{t_1}^{t_2} f_0(x(t), u(t))dt \qquad (3)$$

is minimized. Any allowed controller which satisfies the above conditions, is called the optimal controller, and the corresponding trajectory -- optimal trajectory. Depending on the choice of the function $f^0(x, u)$ integral (3) may represent the time elapsed, the fuel, energy, etc. spent during the process. The necessary conditions which any optimal controller and its corresponding trajectory satisfies, are expressed by the following basic theorem 1, called the principle of maximum. Preliminarily, the vector $\bar{x}$ of (n + + 1)-dimensional space X^{n+1} is introduced, as well as the covariant vector $\bar{\psi}$ and the scalar function

$$H(\overline{\psi}, x, u) = \sum_{\alpha=0}^{n} \psi_\alpha f^\alpha(x, u) .$$

Thereupon the Hamiltonian system of equations

$$\dot{x}^i = \frac{\partial H(\overline{\psi}, x, u)}{\partial \psi_i}, \quad i = 0, \ldots, n \qquad (6)$$

$$\dot{\psi}_i = \frac{\partial H(\overline{\psi}, x, u)}{\partial x^i}, \quad i = 0, \ldots, n \qquad (7)$$

is set up. The notation

$$M(\overline{\psi}, x) = \sup_{u \in \Omega} H(\overline{\psi}, x, u)$$

is used. Theorem 1 (principle of maximum): Let u(t) be the optimum controller and x(t) -- the corresponding optimum trajectory of (2). Then the nonzero, covarient, continuous function $\Psi(t)$ can be found so that the coordinates x^1 and x^0 satisfy on the interval $t_1 \leq t \leq t_2$ the Hamiltonian system

$$\left.\begin{aligned} \dot{x}_i &= \frac{\partial H(\overline{\psi}, x, u)}{\partial \varphi_i} \\ \dot{\psi}_i &= -\frac{\partial H(\overline{\psi}, x, u)}{\partial x^i} \end{aligned}\right\} \quad i = 0, 1, \ldots, n$$

and the condition of maximum

$$H(\overline{\psi}(t), x(t), u(t)) = M(\overline{\psi}(t), x(t)); \qquad (8)$$

thereby M, x ≡ 0, and ψ_0 = const ≤ 0. It is noted that the principle of maximum holds also under more general assumptions than above Under certain conditions, the problem is equivalent to Lagrange's problem of variational calculus, whereby the principle of maximum coincides with Weierstrass's criterion. The basic difference between both formulations consists in the arbitrariness of the set Ω (of the values of u) in the case of the principle of maximum. The optimum problem for the case of limited phase coordinates means that only such allowed controllers can be chosen, for which the corresponding phase trajectory of (2) belongs entirely to a fixed, closed region G of n-dimensional phase space X^n. In this case the functional (3) is minimized. Further, a theorem is formulated for optimal trajectories which lie at the boundaries of the region G. In order to uniquely determine the optimum trajectory, a further condition has to be satisfied by the trajectory when it passes from the interior of G to its boundary; this condition is called discontinuity (jump) condition (as the covariant function $\bar{\psi}$ may undergo a discontinuity). Points of the boundary $g(x) = 0$, which satisfy certain conditions, are called point of contiguity (junction). A theorem is formulated which relates the discontinuity conditions to the points of contiguity. Further, a statistical problem is stated. The significance, for optimization theory, of the obtained result, has yet to be ascertained. It is noted, that it led already to the solution of a new problem "small parameter" for parabolic equations. The phase-coordinates are denoted by z. In addition, the point Q with probability distribution in the space R, is considered. It is required to select the controller u(t) of z so that the functional

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$$\int_0^\infty h(\tau) \frac{\partial}{\partial \tau} [\Psi_u(x, \sigma, \tau)] d\tau \qquad (15)$$

is minimized. The author obtained an effective formula for calculating the probability function Ψ_u. A discussion followed, A.I. Lur'ye (USSR), Sun-Tsyan' (People's Republic of China) were taking part. There are 18 references: 14 Soviet-bloc and 4 non-Soviet-bloc The references to the English-language publications read as follows: R.E. Bellman, G.I. Glicksber, O.A. Gross, Some aspects of the mathematical theory of control provesses. U.S.Air Force Project RAND, RAND Corporation, California, 1958; J.P. La Salle, Time optimal control systems. Proc. Nat. Ac. Sci., v. 45, no. 4, 1958, 573 - 577 D.W. Bushaw, Experimental towing tank. Stevens Institute of Technology, Report N 469, Hoboken, N.Y., 1953.

Card 6/6

BOLTYANSKIY, V.G. (Moskva); YEFREMOVICH, V.A. (Moskva)

Outline of the basic ideas of topology (conclusion). Mat.pros. no.6: 107-138 '61. (MIRA 15:3)

(Topology)

BOLTYANSKIY, V.G. (Moskva); ROZENDORN, E.R. (Moskva)

The 21st Mathematics Olympiad for the schools of Moscow. Mat.pros. no.6:301-309 '61. (MIRA 15:3)
(Moscow--Mathematics--Competitions)

29896
S/517/61/060/000/002/009
B112/B125

16.4100

AUTHOR: Boltyanskiy, V. G.

TITLE: Application of the theory of optimal processes to approximation problems of functions

SOURCE: Akademiya nauk SSSR. Matematicheskiy institut. Trudy. v. 60, 1961, 82 - 95

TEXT: The author considers the following "fundamental problem": For the integral $\int_a^b F(x(t), y(t))dt$ ($F(x,y)$ and $y(t)$ are given continuous functions), an extremal function $x(t)$ is sought, which satisfies n Lipschitz conditions with a given constant $\alpha \geqslant 0$. The existence of a solution and its uniqueness for the special case $F(x,y) = (x - y)^2$ are demonstrated. Then, the author reduces the fundamental problem to the following problem of the theory of optimal processes: A function $u(t)$ ($|u(t)| \leqslant \alpha$) is sougth, which has such a form that the system of differential equations $\dot{x}^1 = x^2, \dot{x}^2 = x^3, \ldots, \dot{x}^n = x^{n+1}, \dot{x}^{n+1} = u(t)$ ($x^1 = x(t), \ldots, x^{n+1} = x^{(n)}(t)$)

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Application of the theory of ....

has a solution x^1 which is an extremal function of the integral $\int_a^b F(x^1, y(t))dt$ for given boundary values $x^i(a)$ and $x^i(b)$ ($i = 1,2,...,n+1$). In order to solve this problem, the author applies some theorems of his (et al.) earlier paper "Teoriya optimal'nykh protsessov (Theory of optimal processes). I." (Izv. AN SSSR, ser. matem., 1960, 24, 3 - 42). The principal result is the following: If x(t) is a solution of the fundamental problem, one of the relations

$$\int_a^t (\xi - t) \frac{\partial F(x(\xi), y(\xi))}{\partial x} d\xi = 0,$$

$$x^{n+1}(\tau) = \alpha \text{ sign } \left(\int_a^t (\xi - t)^n \frac{\partial F(x(\xi), y(\xi))}{\partial x} d\xi\right)$$

will be fulfilled in the interval [a,b]. Several examples illustrate the theoretical part of this paper. The author refers to the following papers: V. G. Boltyanskiy, R. V. Gamkrelidze, L. S. Pontryagin. DAN SSSR, 1956, 110, No. 1, 7 - 10., V. G. Boltyanskiy. DAN SSSR, 1958, 119, No. 6, 1070 - 1073., R. V. Gamkrelidze. DAN SSSR, 1958, 123, No. 2, 223 - 226.,

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B112/B125

Application of the theory of ...

L. S. Pontryagin. UMN, 1959, 14, No. 1, 3 - 20. N. V. Yefimov. S. B. Stechkin. DAN SSSR, 1958, 118, No. 1, 17 - 19. N. V. Yefimov. S. B. Stechkin. DAN SSSR, 1958, 121, No. 4. 582 - 585. N. V. Yefimov, S. B. Stechkin. DAN SSSR, 1959, 127, No. 2, 254 - 257. There are 6 figures and 9 Soviet references.

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16.4000 (1031, 1121, 1344)

25772
S/020/61/139/002/002/017
C111/C333

AUTHOR: Boltyanskiy, V. G.

TITLE: Modelling of optimal linear highspeed operations by means of relay circuits

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 2, 1961, 275-278

TEXT: The author considers an object with the equations of motion

$$\dot{x}^i = \sum_{\alpha=1}^{n} a^i_\alpha x^\alpha + \sum_{\varrho=1}^{r} b^i_\varrho u^\varrho , \quad i = 1, \ldots, n , \qquad (1)$$

where the control variable $u = (u^1, \ldots, u^r)$ is a point of the convex closed bounded polyhedron U in the space E^r with the coordinates $u^1, \ldots, u^r$. Find an $u(t) \in U$ so that the system comes from the position x_0 into the position x_1 within shortest times.

In vector form (1) has the form

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APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206210003-7"

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$$\dot{x} = Ax + Bu, \qquad (2)$$

where $A : X \to X$ (X-- phase space$(x^1, \ldots, x^n)$) and $B : E^r \to X$ are linear operators defined in the coordinates $x^1, \ldots, x^n$ and $u^1, \ldots, u^r$ by the matrices (a^i_j) and (b^i_k).

Let the following condition be satisfied: If the vector w is parallel with one of the edges of U, then the vectors Bw, $ABw, \ldots, A^{u-1}Bw$ are linearly independent in X.

The author introduces the auxiliary system

$$\dot{\Psi} = - A^{*}\Psi, \qquad (3)$$

where the operator A^{*} is described by the matrix transposed to (a^i_j).

For an arbitrary vector $\Psi = (\Psi_1, \ldots, \Psi_n)$ assume that $e(\Psi)$ denotes the set of all $u \in U$ for which

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Modelling of optimal linear . . .

$$(\psi, Bu) = \sum_{\alpha=1}^{n} \sum_{\varsigma=1}^{r} \psi_\alpha b_\varsigma^\alpha u^\varsigma \qquad (4)$$

as function of $u \in U$ attains its maximum.

Theorem 1: For an arbitrary nontrivial solution $\Psi(t)$ of (3) the set $e(\Psi(t))$ is a corner of the polyhedron U for all values t except a finite number. I. e. the relation

$$u(t) = e(\Psi(t)) \qquad (5)$$

(which is meaningless in a finite number of points) defines a piecewise constant function u(t) with values in the corners of U. Such functions are denoted as extremal controls.

Theorem 2: Every optimal control is extremal. Conversely, assume that the origin of E^r is an interior point of U and that all eigen values

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Modelling of optimal linear . . . S/020/61/139/002/002/017
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of (a^i_j) possess negative real parts. Then, for every point $x_0 \in X$, there exists one and only one(up to time translation) extremal control u(t) transferring the phase point from the position x_0 into the origin O of the space X. This extremal control is simultaneously optimal.

The extremal trajectory is uniquely determined by the choice of the initial value ψ_0. The author proposes a modelling plant which allows to determine the corresponding extremal trajectory x(t) for given ψ_0. Figure 1 shows the scheme of the plant.

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Modelling of optimal linear . . .

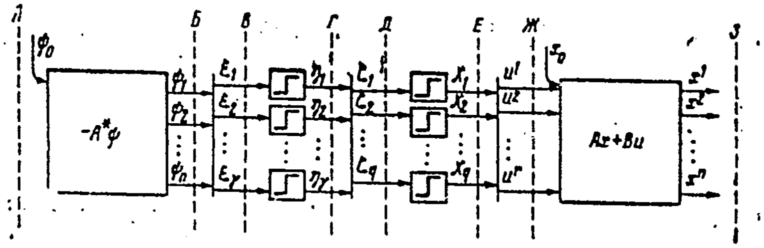

Fig. 1

Here it holds

$$\xi_j = (\psi, Bw_j) = \sum_{\alpha=1}^{n} \sum_{\varrho=1}^{r} \psi_\alpha b_\varrho^\alpha w_j^\varrho, \quad j = 1,2,\ldots,\gamma. \quad (7)$$

where

$$w_1, w_2, \ldots, w_\gamma \quad (6)$$

are vectors parallel with the edges of U, $w_j^1, \ldots, w_j^r$ are the components of w_j. Furthermore $\eta_j = \operatorname{sgn} \xi_j$. Then

$$\zeta_i = l_i - 1 + \sum_j \varepsilon_{ij} \eta_j \qquad (8)$$

where $\varepsilon_{ij} = 1$ or $= -1$, if the vector w_j or $-w_j$ beginning in the corner e_i of U lies in one of the edges of U; otherwise, ε_{ij} is not defined and is not considered. Then $\varepsilon_{ij} w_j$ are in the direction of the edges beginning in the corner e_i; the number of these edges is l_i. Finally we have

$$u^\varrho = \frac{1}{2} \sum_{\alpha=1}^{q} (1 - \chi_\alpha) e_\alpha^\varrho, \quad \varrho = 1, \ldots, r \qquad (9)$$

where $e_i^1, \ldots, e_i^r$ are the coordinates of the corner e_i of U and q is

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the number of corners.

Theorem 3: The scheme shown on figure 1 (see also (7), (8), (9) realizes a motion of the object (2) along the extremal trajectory (for arbitrary initial values of the variables Ψ_i and x^i).

A simpler scheme is obtained in the case where U is a rectangular parallelepiped so that the u^i in (1) are independent from each other.

L. S. Pontryagin and R. V. Gamkrelidze are mentioned. There are 2 figures and 5 Soviet-bloc references.

ASSOCIATION: Matematicheskiy institut imeni V. A. Steklova Akademii nauk SSSR (Institute of Mathematics imeni V. A. Steklov of the Academy of Sciences USSR)

PRESENTED: March 11, 1961, by L. S. Pontryagin, Academician

SUBMITTED: March 9, 1961

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16.8000(1013)

29108
S/020/61/140/005/003/022
C111/C222

AUTHOR: Boltyanskiy, V. G.

TITLE: Sufficient conditions for optimality

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 5, 1961, 994-997

TEXT: The author gives sufficient conditions for the optimality of a process on the base of the dynamic programming by Bellman as well as on the base of the maximum principle by Pontryagin whereby a connection between these two methods is found.

In the phase space X of the variable $x = (x^1, x^2, \ldots, x^n)$ the author considers

$$\dot{x}^i = f^i(x^1, \ldots, x^n, u), \quad i = 1, \ldots, n. \qquad (1)$$

The piecewise continuous control $u(t)$, $t_0 \leq t \leq t_1$, with values in a topological space U is called admissible with respect to $x_0 \in V \subset X$ if for a substitution of u into (1) the solution of (1) with the initial value $x(t_0) = x_0$ for $t_0 \leq t \leq t_1$ lies in V. Let the f^i and $\partial f^i/\partial x^j$ be continuous on $V \times U$.

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Problem: Among the admissible $u = u(t)$ that one shall be determined which transfers the phase point from the position x_o in a given other position x_1 in the shortest time (optimal control).

Let K be a bounded closed s-dimensional ($s \leq n$) convex polyhedron in the space E^s of the variables $\xi = (\xi^1, \xi^2, \ldots, \xi^s)$. On an open set N of E^s containing K let be given a differentiable mapping $\varphi: N \to X$ so that the functional matrix $(\partial x^i/\partial \xi^j)$ in every $\xi \in K$ has the rank s and that to different points of K there correspond different points of X. The image $L = \varphi(K)$ of K is called a curvilinear s-dimensional polyhedron in X. Every set $M \subset V$ being representable as a union of an at most countable number of curvilinear polyhedra of the dimensions $\leq n$ is called a piecewise smooth set in V if these polyhedra lie so that in every closed bounded set in V there intersect at most a countable set of these polyhedra

Theorem I: Let $a \in V$ be a fixed point. In V let be given a real continuous function $\omega(x)$ so that a) $\omega(a) = 0$, $\omega(x) < 0$ for $x \neq a$; b) in V there exists a piecewise smooth set M so that $\omega(x)$ on $V \setminus M$ is

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continuously differentiable with respect to $x^1, x^2, \ldots, x^n$, and satisfies the condition

$$\sup_{u \in U} \sum_{\alpha=1}^{n} \frac{\partial \omega(x)}{\partial x^{\alpha}} f^{\alpha}(x,u) = 1 \quad \text{for } x \in V \setminus M \quad . \quad (2)$$

Then for every $x_0 \in V$ and every control admissible with respect to x_0 which transfers the phase space from the position x_0 into the position a, the time of transferring from x_0 to a is not smaller than $-\omega(x_0)$.

Theorem 2: Theorem 1 is valid also then if instead of the piecewise smoothness of M it is demanded: M is closed in V and contains no inner points; besides, $\omega(x)$ satisfies locally the Lipschitz condition (in the neighborhood of each $x \in V$).

Conclusion: If the assumptions of theorem 1 (or theorem 2) are satisfied and for every $x_0 \in V$ there exists a control admissible with respect to x_0 which transforms x_0 to a in the time $-\omega(x_0)$ then all these

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controls are optimal.

Theorem 3 is devoted to the maximum principle. Let

$$P^0 \subset P^1 \subset P^2 \subset \ldots \subset P^{n-1} \subset P^n = V \qquad (3)$$

where all P^i are piecewise smooth; let v(x) be a function with values in U given in V. Under numerous assumptions on the structure of the sets P^i and on the course of the trajectories of

$$\dot{x}^i = f^i(x^1, \ldots, x^n, v(x)), \quad i=1, \ldots, n \qquad (4)$$

with the aid of the sets (3) and the function v(x) the author introduces the notion of the regular synthesis for (1) in V. Then it is proved that certain trajectories appearing in the definition of the regular synthesis which satisfy the maximum principle are really optimal (theorem 3).

There are 2 Soviet-bloc and 1 non-Soviet-bloc reference. The reference

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Sufficient conditions for optimality

to the English-language publication reads as follows: R. Bellman. Dinamicheskoye programmirovamiye (Dynamic programming), JL, 1960

ASSOCIATION: Matematicheskiy institut imeni V. A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V. A. Steklov of the Academy of Sciences USSR)

PRESENTED: May 19, 1961, by L. S. Pontryagin, Academician

SUBMITTED: May 17, 1961

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