AIZENBERG, D.Ye. [Ayzenberg, D.IE.]

Sedimentary complexes in the lower Carboniferous of the Greater Donets Basin. Geol. zhur. 17 no.4:51-59 '57. (MIRA 11:4)
(Donets Basin--Rocks, Sedimentary)

Note on the Correlation of the Lower Carboniferous 20-3-47/59
of the Donets Basin and Other Regions of the Russian Platform.

the Osero-Khovansk and Bisfer layers - lower parts of the Malev massif). For this the designation Novotroitzkiy is proposed. In the Chernyshin lower zone it is proposed, to distinguish the Cherepets horizon in the range of the zone $C_1^v c$ and of the lower part of $C_1^v d$ of the Donets basin or of the Chernyshin massif of the Moscow region and the Chikman-horizon according to N.P. Malakhova. Within the Stalinogorsk horizon three massifs can be separated (from the top) Lun'yev, Ol'gin and the carboniferous. The authors propose, to separate from the upper part of the lower carbon in the sub zone $C_1^n a_2$ and in the zones $C_1^n b$, $C_1^n c$ and $C_1^n d$ an "upper BESHEV sub zone of the VISE zone. (There are 14 Slavic references and 1 table).

PRESENTED. By N. M. Strakhov, Academician., March 4, 1957.

SUBMITTED July 16, 1956.

AVAILABLE Library of Congress.

Card 2/2

3(5) PHASE I BOOK EXPLOITATION SOV/1938

Ayzenverg, David Yefemovich

Stratigrafiya i paleogeografiya nizhnego karbona zapadnogo sektora Bol'shogo Donbassa (Stratigraphy and Paleogeography of the Lower Carboniferous of the Western Sector of the Great Donets Basin) Kiev, Izd-vo AN USSR, 1958. 270 p. (Series: AN USSR. Institut geologicheskikh nauk. Trudy, seriya stratigrafii i paleontologii, vyp. 16) Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR, Kiev. Institut geologicheskikh nauk.

Resp. Ed.: N.Ye. Brazhnikova, Candidate of Geological and Mineralogical Sciences; Ed. of Publishing House: V.N. Zaviryukhina; Tech. Ed.: V.Ye. Sklyarova.

PURPOSE: This book is intended for geologists interested in the exploration and study of the Carboniferous sediments of the Greater Donets Basin.

Card 1/5

O.A. Kul'skaya, and analysts Ye.S. Nazarevich and O.F. Vdovenko. Photographic work was performed by V.P. Burilov and V.N. Vil'ken of the Photographic Laboratory of the Institut geologicheskikh nauk AN UkrSSR. There are 31 photographic plates included with the work. There are 174 references of which 170 are Soviet, and 4 French.

TABLE OF CONTENTS:

Stratigraphy and Paleogeography (Cont.) SOV/1938

AVAILABLE: Library of Congress

Card 5/5

MM/jab
6/23/59

AYZENVERG, D.Ye., geolog; BALUKHOVSKIY, N.F., geolog; BARTOSHEVSKIY, V.I., geolog; BASS, Yu.B., geolog; VADIMOV, N.T., geolog; GLADKIY, V.Ya., geolog; DIDKOVSKIY, V.Ya., geolog; YERSHOV, V.A., geolog; ZHUKOV, G.V., geolog; ZAMORIY, P.K., geolog; IVANTISHIN, M.N., geolog; KAPTARENKO-CHERNOUSOVA, O.K., geolog; KLIMENKO, V.Ya., geolog; KLUSHIN, V.I., geolog; KLYUSHNIKOV, M.N., geolog; KRASHENINNIKOVA, O.V., geolog; KUTSYBA, A.M., geolog; LAPCHIK, F.Ye., geolog; LICHAK, I.L., geolog; MAKUKHINA, A.A., geolog; MATVIYENKO, Ye.M., geolog; MEDYNA, V.S., geolog; MOLYAVKO, G.I., geolog; NAYDIN, D.P., geolog; NOVIK, Ye.O., geolog; POLOVKO, I.K., geolog; RODIONOV, S.P., geolog; SEMENENKO, N.P., akademik, geolog; SERGEYEV, A.D., geolog; SIROSHTAN, R.I., geolog; SLAVIN, V.I., geolog; SUKHAREVICH, P.P., geolog; TKACHUK, L.G., geolog; USENKO, I.S., geolog; USTINOVSKIY, Yu.B., geolog; TSAROVSKIY, I.D., geolog; SHUL'GA, P.L., geolog; YURK, Yu.Yu., geolog; YAMNICHENKO, I.M., geolog; ANTROPOV, P.Ya., glavnyy redaktor; FILIPPOVA, B.S., red. izd-va; GUROVA, O.A., tekhn.red.

[Geology of the U.S.S.R.] Geologiia SSSR. Glav. red. P.IA.Antropov. Vol.5.[Ukrainian S.S.R., Moldavian S.S.R.] . . Ukrainskaia SSR, Moldavskaia SSR. Red. V.A. Ershov, N.P. Semenenko. Pt.1.[Geological description of the platform area] Geologicheskoe opisanie platformennoi chasti. Moskva, Gos. nauchno-tekhn.izd-vo lit-ry po geol. i okhrane nedr. 1958. 1000 p. [___ Supplement] ___Prilozheniia.

(Continued on next card)

AYZENVERG, D.Ye.---(continued) Card 2.
3 fold.maps (in portfolio)

(MIRA 12:1)

1. Russia (1923- U.S.S.R.) Glavnoye upravleniye geologii i okhrany nedr. 2. Ukrainskoye geologicheskoye upravleniye Ministerstva geologii i okhrany nedr SSSR i Institut geologicheskikh nauk Akademii nauk USSR (for all except Antropov, Filippova, Gurova). 3.Glavnyy geolog Ukrainskogo geologicheskogo upravleniya (for Yershov). 4. AN Ukrainskoy SSR (for Semenenko).
(Ukraine--Geology) (Moldavia--Geology)

AUTHOR: Ayzenverg, D.Ye. 21-58-5-24/28

TITLE: On Graptolite Remains in the Lower Carboniferous Deposits of the Great Donbas (Ob ostatkakh graptolitov v nizhnem karbone Bol'shogo Donbassa)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 5, pp 562-564 (USSR)

ABSTRACT: During the study of the fauna and stratigraphy of the Lower Carboniferous deposits in the western extension of the Donbas, the author discovered remains of dendritic graptolites related, according to modern concept, to the class of Dendroidea. Judging by literature data, no remains of this fauna have thus far been known in the Carboniferous deposits of the USSR. The specimen described was found in the sediments of Visean stage (analogues of the subzone C_{1}^{a} in the Donbas). Its precise identification is not possible because of incomplete preservation. Its relation to the genus Ptiograptus Ruedemann is most probable. Representatives of this genus are known in the Devonian deposits of the USA and Lower Visean of Belgium. There is 1 Photo and

Card 1/2

AYZENVERG, D.Ye.; BRAZHNIKOVA, N.Ye.

Stratigraphy of the lower part of the lower Carboniferous in the western sector of the Greater Donets Basin. Trudy VNIGNI no.14: 156-168 '59.
(MIRA 12:10)

1. Institut geologicheskikh nauk AN USSR.
(Donets Basin--Geology, Stratigraphic)

AYZENVERG, D.Ye. [Aizenverg, D.IE.]; BARANOVA, N.M.; VEKLICH, M.F.; GOLYAK, L.M. [Holiak, L.M.]; GORAK, S.V. [Horak, S.V.]; DIDKOVSKIY, V.Ya. [Didkovs'kyi, V.IA.]; ZELINSKAYA, V.O. [Zelins'ka, V.O.]; ZERNETSKIY, B.F. [Zernets'kyi, B.F.]; KAPTARENKO-CHERNOUSOVA, O.K.; KRAYEVA, Ye.Ya. [Kraieva, IE.IA.]; KRASHENINNIKOVA, O.V.; KUTSIBA, A.M.; LAPCHIK, T.Yu.; MAKARENKO, D.Ye.; MOLYAVKO, G.I. [Moliavko, H.I.]; MULIKA, A.M.; PASTERNAK, S.I.; PERMYAKOV, V.V.; ROMODANOVA, A.P.; ROTMAN, R.N.; SLAVIN, V.I.; SOKOLOVSKIY, I.L.; SOROCHAN, O.A.; SYABRYAY, V.T.; TKACHENKO, T.O.; SHUL'GA, P.L. [Shul'ha, P.L.], doktor geol.-mineral.nauk; YAMNICHENKO, I.M. [IAmnychenko, I.M.]; BONDARCHUK, V.G. [Bondarchuk, V.H.], akademik, otv.red.

[Atlas of paleogeographical maps of the Ukrainian and Moldavian S.S.R. with lithofacies elements. Scale 1:2,500,000] Atlas paleogeografichnykh kart Ukrains'koi i Moldavs'koi RSR z elementamy litofatsii. Masshtab 1:2,500,000. Sklaly D.IE. Aizenverg i dr. Za zahal'nym kerivnytstvom V.N.Bondarchuka. Kyiv, 1960. xvi p., 78 col.maps. (MIRA 13:12)

1. Akademiya nauk USSR, Kiyev. Institut geologicheskikh nauk. 2. Institut geologicheskikh nauk AN USSR (for all, except Bondarchuk, Pasternak, Slavin). 3. Instytut geologii korysnykh kopalyn AN URSR (for Pasternak). 4. Moskovskiy gosudarstvennyy universitet im. Lomonosova (for Slavin).
(Ukraine--Paleogeography--Maps) (Moldavia--Paleogeography--Maps)

DUNAYEVA, Nataliya Nikolayevna [Dunaieva, N.M.]; AYZENBERG, D.Ye., doktor geol.-mineral.nauk, otv.red.; CHEKHOVICH, N.Ya., red.; LIBERMAN, T.R., tekhn.red.

[Upper Carboniferous moss animals of the western Donets Basin] Verkhn'okam'ianovuhil'ni mokhovatky zakhidnoi chastyny Donbasu. Kyiv, Vyd-vo Akad.nauk Ukrains'koi RSR, 1961. 120 p. (Akademiia nauk URSR, Kiev. Instytut geologichnykh nauk. Trudy, no.38). (MIRA 14:12)

(Donets Basin—Polyzoa, Fossil)

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000102710019-0"

AYZENVERG, D.Ye.

Fauna of the Lower Visean brachiopods in the Donets Basin. Trudy Inst.geol.nauk AN URSR. Ser.strat.i paleont. no.44:95-112 '62. (MIRA 15:9)

(Donets Basin—Brachiopoda, Fossil)

1

AYZENVERG, D.Ye. [Aizenverg, D.IE.]; KONOPLINA, O.R.; LAGUTIN, P.K.

Stratigraphic correlation of Devonian sediments in the southern margin of the Donets Basin. Geol.zhur. 22 no.4:53-56 '62. (MIRA 15:9)

1. Institut geologicheskikh nauk AN UkrSSR.

(Donets Basin--Geology, Stratigraphic)

AYZENVERG, D.Ye. [Aizenverh, D.IE.]; BRAZHNIKOVA, N.Ye. [Brazhnikova, N.IE.]; ISHCHENKO, T.A.; LAGUTIN, P.K. [Lahutin, P.K.]

Carboniferous basalt layers in the Donets Basin. Geol.zhur. 23 no.1:73-78 '63.
(MIRA 16:4)

1. Institut geologicheskikh nauk AN UkrSSR.
(Donets Basin--Basalt)

AYZENVERG, D.Ye.; BRAZHNIKOVA, N.Ye.; POTIYEVSKAYA, P.D.

Stratigraphy of the Middle Carboniferous of the southern slope of the Voronezh massif. Dokl. AN SSSR 151 no.5:1153-1155 Ag '63. (MIRA 16:9)

1. Institut geologicheskikh nauk AN UkrSSR. Predstavleno akademikom A.L.Yanshinym.
(Voronezh Province--Geology, Stratigraphic)

AYZENVERG, David Yefremovich; BRAZHNIKOVA, Nina Yevgen'yevna; NOVIK, Yekaterina Osipovna; ROTAY, Avraam Prokhorovich, prof.; SHUL'GA, Polina Lukinichna; BONDARCHUK, V.G., akademik, otv.red.; ZAVIRYUKHINA, V.N., red.izd-va; KADASHEVICH, O.A., tekhn.red.

[Stratigraphy of Carboniferous sediments in the Donets Basin] Stratigrafiia kamennougol'nykh otlozhenii Donetskogo basseina. Kiev, 1963. 182 p. (Akademiia nauk URSR. Institut geologichnykh nauk. Seriia stratigrafii i paleontologii. Trudy, no.37).

(MIRA 16:12)

1. AN UkrSSR (for Bondarchuk).

AYZENBERG, D.Ye.; BELEVTSEV, Ya.N.; BORDUNOV, I.N.; BORISENKO, S.T.; BULKIN, G.A.; GORLITSKIY, B.A.; DOVGAN', M.N.; ZAGORUYKO, L.G.; KAZAKOV, L.R.; KALYAYEV, G.I.; KARASIK, M.A.; KACHAN, V.G.; KISELEV, A.S.; LAGUTIN, P.K.; LAZARENKO, Ye.K.; LAZARENKO, E.A.; LAPITSKIY, E.M.; LAPCHIK, F.Ye.; LAS'KOV, V.A.; LEVENSHTEYN, M.L.; MALAKHOVSKIY, V.F.; MITKEYEV, M.V.; PRUSS, A.K.; SKARZHINSKIY, V.I.; SKURIDIN, S.A.; SOLOV'YEV, F.I.; STRYGIN, A.I.; SUSHCHUK, Ye.G.; TEPLITSKAYA, N.V.; FEDYUSHIN, S.Ye.; FOMENKO, V.Yu.; SHKOLA, T.N.; SHTERNOV, A.G.; YAROSHCHUK, M.A.; ZAVIRYUKHINA, V.N., red.

[Problems of metallogeny in the Ukraine] Problemy metallogenii Ukrainy. Kiev, Naukova dumka, 1964. 254 p. (MIRA 18:1)

1. Akademiya nauk URSR, Kiev. Instytut geologichnykh nauk.

AYZERMAN, M. A.

"Dynamics of Automatic Pressure Regulation in Gas Automobiles," Collection of Scientific-Research Works on Tractors (Sbornik nauchno-issled rabot po avtotraktornomu delu), Moscow/Leningrad, Mashgiz, 1938, pp. 51-92, 12 ill.

AYZERMAN, M. A.

"Dampening of Oscillations Given by Third-Order Linear Differential Equations with Constant Coefficients," Avtomatika i Telemekhanika, 1940, No. 1, pp. 55-65, 3 ill.

"Dynamics of Automatic Multistage Pressure Regulation," Trudy (Works) NATI (Scientific Auto Tractor Institute), 1940, Vol. 38, pp. 191-202, 1 ill.

AYZERMAN, M. A.

"The Effect of Dry (Coulomb) Friction Forces on the Movement of Indirect-Acting Automatic Regulators," Bibliography, Automatics & Telemechanics, Vol. 6, No. 3, 1941 (pp. 15-35, 17 ill., 8 ref.)

"Review of B. I. Rubin and Yu. G. Kheynman's Book, 'Principles of Aviation Automatics,'" Ibid.

AYZERMAN, M. A.

"Influence of Nonlinearity on the Convergence of Automatic Regulation and on the Conditions Governing the Generation of Oscillations," Izvestiya AN, SSSR, OTN, 1944, No. 12, pp. 826-835, 7 ill., 2 ref.

AYZERMAN, M. A.

"Criteria of Convergence of Processes of Automatic Regulation, Which Take In Account the Non-Linearity of characteristics of Elements of the Installation."

A dissertation toward a degree of doctor of techinal sciences. Institute of Automatics and Telemechanics of the Academy of Sciences of the USSR, 1946

AYZERMAN, M. A.

"Convergence of Regulation After Large Initial Deflections," Avtomatika i Telemekhanika, 1946, No. 2-3, pp. 148-167, 21 ill., 7 ref.

"Convergence Criteria in Automatic Regulation, Taking Into Consideration the Nonlinearity of Parts of the Apparatus," Institute of Automatics and Telemechanics of Academy of Sciences USSR, 1946.

AYZERMAN, M. A. PA 22T48

USSR/Engineering Jan 1947
Controls
Stabilizers

"Calculation of Nonlinear Functions from Certain Variables in Studying the Stability of an Automatic Regulation System," M. A. Ayzerman, 10 pp

"Avtomat i Telemekh" Vol VIII, No 1

The article discusses the conditions of convergence in automatic regulation after a given (but not small) initial deflection. Well illustrated mathematical discussion. Submitted at the Automatic Regulators Section of the Institute of Automatic Machinery and Telemechanics of the Academy of Sciences of the USSR.

22T48

COMPLETE TRANSLATION AVAILABLE - W-17764, 17 Apr 51

AYZERMAN, M. A.

PA 64T54

USSR/Electronics Mar/Apr 1948
Regulators, Electronic
Synchronous Machines

"Some Structural Conditions of Stability in a System of Automatic Regulation," M. A. Ayzerman, Inst of Automatics and Telemech, Acad Sci USSR, 12¼ pp

"Avtomat i Telemekh" Vol IX, No 2

Determination of structural conditions necessary to permit system of automatic regulation containing series of bells hooked up in series, to be made stable based on selected parameters. Theorem for the determination of such necessary conditions. Examples show practical application of the theories. Submitted 29 Oct 1947.

64T54

PA 13/49T20

AYZERMAN, M. A.

Jul/Aug 48

USSR/Electronics
Regulators, Electronic
Mathematics, Applied

"One Erroneous Theorem in the Theory of Structural Stability of Regulating Systems," M. A. Ayzerman, 6 pp

"Avtomatika i Telemekh" Vol IX, No 4

During the past few years, six articles by I. I. Gal'perin on the analysis and synthesis of automatic regulating systems have appeared in "Iz V-S Teplotekh". Many of these theorems are erroneous according to Ayzerman. Discusses

13/49T20

AYZERMAN, M. A.

PA 13/49T30

USSR/Electronics
Servo Systems
Fire Control Systems

Jul/Aug 48

"Review of V. A. Besekerskiy's Book "Remote Control of Artillery,'" M. A. Ayzerman, Ya. Z. Tsypkin, 2¼ pp

"Avtomatika i Telemekh" Vol IX, No 4

Unfavorable review. Part I: "The Foundations of the Theory of Automatic Regulating and the Theory of the Synchronous-Servo Drive." Published by the Leningrad Order of Red Banner Mil Mech Inst, Leningrad, 1947.

13/49T30

AYZERMAN, M. A.

"Problem of the Stability of the Process of Direct Regulation of Engine rpm Accounting for the Nonlinearity of Its Characteristics." Symposium on stability of engine performance, Ministry of the Automobile Industry USSR, NAMI, No. 51, Mashgiz, 1948.

AYZERMAN, M.A.

390

Aizerman, M. A. On a problem concerning the stability "in the large" of dynamical systems. Uspehi Matem. Nauk (N.S.) 4, no. 4(32), 187–188 (1949). (Russian)

Consider the linear system: $dx_1/dt = \sum_{j=1}^{n} a_{1j}x_j + ax_1$, $dx_i/dt = \sum_{j=1}^{n} a_{ij}x_j$, $i = 2, 3, \cdots, n$, where it is assumed that the characteristic roots of the coefficient matrix have uniformly negative real parts for $\alpha < a < \beta$. Then if $f(x)$ is a continuous function satisfying the condition $\alpha x \leq f(x) \leq \beta x$, $f(0) = 0$, the solution $x_1 = x_2 = \cdots = x_n = 0$ of the system $dx_1/dt = \sum_{j=1}^{n} a_{1j}x_j + f(x_1)$, $dx_i/dt = \sum_{j=1}^{n} a_{ij}x_j$, $i = 2, 3, \cdots, n$ is stable. This result can be generalized.

R. Bellman.

Source: Mathematical Reviews, Vol 11 No.

AYZERMAN, M.A.; KALISH, G.G., prof., doktor tekhn.nauk, laureat Stalinskoy premii, retsenzent; FEL'DBAUM, A.A., kand.tekhn.nauk, retsenzent; BLOKH, Z.Sh., prof., doktor tekhn.nauk, red.; SOKOLOV, T.F., tekhn.red.

[Introduction in the dynamics of the automatic control of engines] Vvedenie v dinamiku avtomaticheskogo regulirovaniia dvigatelei. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1950. 150 p. (MIRA 14:4)

(Automatic control) (Engines)

AYZERMAN, M. A.

Vvedenie v dinamiku avtomaticheskogo regulirovaniia dvigatelei. Moskva, Mashgiz, 1950. 152 p.

Introduction to dynamics of the automatic control of engines.

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

AYZERMAN, M. A.

Automatics, Telemechanics, and Wire Communications, from a selected list of works by personnel of the Technical Sciences, Dept., Academy of Sciences USSR, published in 1948-1949, Izvestiya Akademiy Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No. 3, 1950, pp. 451-476.

AYZERMAN, M. A.

166T107

USSR/Physics - Servos
Nonlinear
Stability, Regulation

Jul/Aug 50

"Determining the Stable and Unstable Portions on the Boundary of Stability," M. A. Ayzerman, Moscow

"Priklad Matemat i Mekh" Vol XIV, No 4, pp 444-448

Describes geometric method of studying safe and unsafe regions and boundaries of trajectories in phase plane. Submitted 7 May 50.

166T107

AYZERMAN, M. A.

PA 187T75

USSR/Physics - Servomechanics Mar/Apr 51

"Increasing the Critical Value of the Amplification Coefficient of a Single-Circuit Automatic-Regulation System by Introducing an Action Corresponding to the Derivative," M. A. Ayzerman, Inst of Automatics and Telemech, Acad Sci USSR

"Avtomat i Telemekh" Vol XII, No 2, pp 123-134

Determines greatest value of crit coeff of amplification which can be attained because of introduction of action corr to a deriv. Finds this action for realizing greatest crit coeff of amplification. Submitted 25 Oct 50; resubmitted 15 Jan 51, after revision.

187T75

AYZERMAN, M. A. 185T75

USSR/Mathematics - Mathieu Equations May/Jun 51

"Sufficient Condition for First-Class Stability of Dynamical Systems With Variable Parameters," M. A. Ayzerman, Moscow

"Prik Matemat i Mekh" Vol XV, No 3, pp 382-384

Considers Mathieu eq $\ddot{x} + a\dot{x} + (1 + q\cdot\cos 2t/m)x = 0$. Determines conditions that are sufficient for unbounded stability of this syst. Dynamic syst is called stable without bounds if independently of magnitudes of finite quantities m, x_0, $\dot{x}_0$, the function x(t) tends toward x = 0 as the time t tends to infinity, and if the function satisfies above Mathieu eq. Submitted 10 Jul 50.

185T75

AYZERMAN, Mark Aronovich

TEORIYA AVTOMATICHESKOGO REGULIROVANIYA DVIGATELEY; URAVNENIYA DVIZHENIYA I USTOYCHIVOST' (THEORY OF AUTOMATIC REGULATION OF ENGINES) MOSKVA, GOSTEKHIZDAT, 1952. 523 P. DIAGRS., TABLES. "LITERATURA": P. (511)-519.

AYZERMAN, M. A.

3

Mathematical Reviews
Vol. 14 No. 7
July - August 1953
Analysis

8-10-54
LL

Aizerman, M. A. On the construction of resonance graphs for systems with nonlinear feedback. Akad. Nauk SSSR. Inženernyi Sbornik 13, 151–160 (1952). (Russian)

Consider the equation $D(p)x=K(p)[f(x)+A \sin \omega t]$, where $p=d/dt$, $D(p)$ and $K(p)$ are polynomials with constant coefficients, $f(x)$ a given function. The values of A, ω are assumed to be such that this equation has a periodic solution close to the harmonic $x=d+c \sin (\omega t-\gamma)$. If $f(d+c \sin u)$ is approximated by

$$f_0(c, d)+a(c, d) \sin u+b(c, d) \cos u,$$

equations for c, d, γ result which the author solves by a construction based on the graphs of $D(i\omega)/K(i\omega)$ $(0<\omega<\infty)$ and of $[a(c, d)+ib(c, d)]/c$ $(0<c<\infty)$. Thus c, d, γ are obtained as functions of A, ω. A similar construction can be used to find c, γ, C, Ω for an approximate solution of the form $x=c \sin (\omega t-\gamma)+C \sin \Omega t$, where Ω is the frequency of the auto-oscillations. *M. Golomb* (Lafayette, Ind.).

AYZERMAN, M.A.

Ayzerman, M.A., "Physical Principles Underlying the Application of Small-parameter Methods to the Solution of Non-linear Problems in the Theory of Automatic Control" Avtomatika i telemekhanika, 1953, Volume XIV, No 5, pages 595-603, three figures; bibliography, eight items.

AYZERMAN, M.A.

SOLODOVNIKOV, V.V.; professor, doktor tekhnicheskikh nauk, redaktor; AYZERMAN, M.A., doktor tekhnicheskikh nauk; BASHKIROV, D.A., kandidat [redacted] nauk; BROMBERG, P.V., kandidat tekhnicheskikh nauk; VORONOV, A.A., kandidat tekhnicheskikh nauk, dotsent; GOL'DFARB, L.S., doktor tekhnicheskikh nauk, professor; KAZAKEVICH, V.V., doktor tekhnicheskikh nauk; KRASOVSKIY, A.A., kandidat tekhnicheskikh nauk, dotsent; LERNER, A.Ya., kandidat tekhnicheskikh nauk; LETOV, A.M., doktor fiziko-matematicheskikh nauk; professor; MATVEYEV, P.S., inzhener; MIKHAYLOV, F.A., kandidat tekhnicheskikh nauk; PETROV, B.N.; PETROV, V.V., kandidat tekhnicheskikh nauk; POSPELOV, G.S., kandidat tekhnicheskikh nauk, dotsent; TOPCHEYEV, Yu.I., inzhener; ULANOV, G.M., kandidat tekhnicheskikh nauk; KHRAMOY, A.V., kandidat tekhnicheskikh nauk; TSYPKIN, Ya.Z. doktor tekhnicheskikh nauk, professor; LOSSIYEVSKIY, V.L., doktor tekhnicheskikh nauk, professor, retsenzent; TIKHONOV, A.Ya., tekhnicheskiy redaktor

[Fundamentals of automatic control; theory] Osnovy avtomaticheskogo regulirovaniia; teoriia. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1954. 1116 p. (MLRA 8:2)

1. Chlen-korrespondent AN SSSR (for Petrov, B.N.)
(Automatic control)

AYZERMAN, M. A.

USSR/Mathematics - Stability

Card 1/1

Authors : Ayzerman, M. A.; Gantmakher, F. R.

Title : Conditions for the existence of a region of stability for a single-circuit system of automatic regulation

Periodical : Prikl. mat. i mekh., 18, 103-122, Jan/Feb 1954

Abstract : A single-circuit system is described by systems of linear differential equations with constant real coefficients. For each different system, necessary and sufficient conditions are proved for the existence of a region of stability. The basic result of the article is a necessity theorem for a system whose characteristic equation has the form:
$D^{(1)}(p) + D^{(2)}(p) = 0.$

Institution : Moscow Physicotechnical Institute, Moscow

Submitted : September 12, 1953

AYZERMAN, M.A

AIZERMAN, M.A.; SMIRNOVA, I.M.

Note on E.P.Popov's article "Approximate calculation of natural and forced vibrations in nonlinear systems." (Izv. AN SSSR, OTN, no.5, 1954). Izv. AN SSSR Otd. tekh nauk no.10:185-189 O '54.
(Vibrations)(Popov, E.P.) (MIRA 8:3)

AYZERMAN, M.A., doktor tekhnicheskikh nauk, redaktor; VORONOV, A.A., kandidat tekhnicheskikh nauk, redaktor; KOGAN, B.Ya., kandidat tekhnicheskikh nauk, redaktor; KOTEL'NIKOV, V.A., kandidat tekhnicheskikh nauk, redaktor; LETOV, A.M., doktor fiziko-matematicheskikh nauk, redaktor; LOSSIYEVSKIY, V.L., doktor tekhnicheskikh nauk, redaktor; MEYEROV, M.V., doktor tekhnicheskikh nauk, redaktor; NAUMOV, B.N., redaktor; PETROV, B.N., redaktor; SOLODNIKOV, V.V., doktor tekhnicheskikh nauk, redaktor; TRAPEZNIKOV, V.A., redaktor; KHRAMOY, A.V., kandidat tekhnicheskikh nauk, redaktor; TSYPKIN, Ya.Z., doktor tekhnicheskikh nauk, redaktor; PEVZNER, R.S., tekhnicheskiy redaktor.

[Transactions of the Second All-Union Conference on the Theory of Automatic Control. Trudy vtorogo Vsesoiuznogo soveshchaniia po teorii avtomaticheskogo regulirovaniia. Moskva. Vol.2 [Problem of quality of dynamic precision in the theory of automatic control] Problema kachestva i dinamicheskoi tochnosti v teorii avtomaticheskogo regulirovaniia. 1955. 536 p. [Microfilm]
(MLRA 9:1)

1. Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki. 2. Chlen-korrespondent AN SSSR (for Petrov and Trapeznikov)
(Automatic control)

AYZERMAN, M.A., doktor tekhnicheskikh nauk, redaktor; VORONOV, A.A., kandidat tekhnicheskikh nauk, redaktor; KOGAN, B.Ya., kandidat tekhnicheskikh nauk, redaktor; KOTEL'NIKOV, V.A., kandidat tekhnicheskikh nauk, redaktor; LETOV, A.M., doktor fiziko-meditsinskikh nauk, redaktor; LOSSIYEVSKIY, V.L., doktor tekhnicheskikh nauk, redaktor; MEYEROV, M.V., doktor tekhnicheskikh nauk, redaktor; NAUMOV, B.N. redaktor; PETROV, B.N., redaktor; SOLODNIKOV, V.U, doktor tekhnicheskikh nauk, redaktor; TRAPEZNIKOV, V.A., redaktor; KHRAMOY, A.V., kandidat tekhnicheskikh nauk, redaktor; TSYPKIN, Ya.Z., doktor tekhnicheskikh nauk, redaktor; VORONOV, A.A., redaktor; PEVZNER, R.S., tekhnicheskiy redaktor.

[Proceedings of the Second All-Union Conference on the theory of automatic control] Trudy vtorogo Vsesoyuznogo soveshchaniia po teorii avtomaticheskogo regulirovaniia.

(Continued on next card)

AYZEEMAN, M.A. doktor tekhnicheskikh nauk, redaktor (Cont'd) Card 2.

Vol.3 [Methods and means of experimental research on systems of automatic control. Bibliography on the theory of automatic control and related problems] Metody i sredstva eksperimental'nogo issledovaniia sistem avtomaticheskogo regulirovaniia. Bibliografiia po teorii avtomaticheskogo regulirovaniia i smezhnym voprosam. 1955. 351 p. (MLRA 9:1)

1. Chlen-korrespondent AN SSSR(for Petrov, Trapeznikov) 2. Vsesoyuznoye soveshchaniye po teorii avtomaticheskogo regulirovaniya 2d, Moscow, 1953.
(Automatic control) (Bibliography--Automatic control)

AYZERMAN, M.A., dokt. tekhn. nauk, redaktor; VORONOV, A.A., kandidat tekhn. nauk, redaktor; KOGAN, B.Ya., kandidat tekhn. nauk, redaktor; KOTEL'NIKOV, V.A., kandidat tekhn. nauk, redaktor; LETOV, A.M., dokt. fiz.-mat. nauk, redaktor; LOSSIYEVSKIY, V.L., dokt. tekhn. nauk, redaktor; KHRAMOY, A.V., kand. tekhn. nauk, redaktor; TRAPEZNIKOV, V.A., redaktor; MEYEROV, M.V., dokt. tekhn. nauk, redaktor; NAUMOV, B.N., redaktor; PETROV, B.N. redaktor; SOLODOVNIKOV, V.V., dokt. tekhn. nauk, redaktor; TSYPKIN, Ya.Z. dokt. tekhn. nauk, redaktor PEVZNER, R.S., tekhn. redaktor.

[Proceedings of the Second All-Union Conference on the Theory of Automatic Control.] Trudy Vtorogo Vsesoiuznogo soveshchaniia po teorii avtomaticheskogo regulirovaniia. Moskva, Izd-vo Akad. nauk SSSR.[Vol. 1 Problem of continuous and periodic operations in the theory of automatic control] Vol.1 Problema ustoichivosti i periodicheskikh rezhimov v teorii avtomaticheskogo regulirovaniia. 1955. 603 p. (MLRA 8:8)

1. Chlen korrespondent AN SSSR (for Trapeznikov, Petrov) 2. Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki.

AYZERMAN, M.A.

LEONTOVICH, M.A., akademik, redaktor; GREKHOVA, M.T., professor, redaktor; AYZERMAN, M.A., doktor tekhnicheskikh nauk, redaktor; GINZBURG, V.A., professor, redaktor; GORELIK, G.S., professor, redaktor; LEONTOVICH-ANDRONOVA, Ye.A., dotsent, redaktor; ZHELETSOV, N.A., dotsent, redaktor; PETROV, V.V., kandidat tekhnicheskikh nauk, redaktor; NIKOLAYEV, Ya.N., dotsent, redaktor; AGITOVA, N.A., redaktor; BRYLEYEV, A.M., redaktor; ALEKSEYEV, T.V., tekhnicheskiy redaktor.

[Dedicated to the memory of Aleksardr Aleksandrovich Andronov] Pamiati Aleksandra Aleksandrovicha Andronova. Moskva, 1955. 718 p. (MIRA 8:4)

1. Akademiya nauk SSSR.
(Mathematical physics)(Automatic control)(Astrophysics)

SOV/124-57-5-5181

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 5, p 12 (USSR)

AUTHORS: Ayzerman, M. A., Smirnova, I. M.

TITLE: On the Application of the Small-parameter Methods in the Investigation of the Periodic Modes of Oscillation of Automatic-control Systems Which do not Contain a Small Parameter (O primenenii metodov malogo parametra dlya issledovaniya periodicheskikh rezhimov v sistemakh avtomaticheskogo regulirovaniya, ne soderzhashchikh malogo parametra)

PERIODICAL: V sb.: Pamyati Aleksandra Aleksandrovicha Andronova. Moscow, Izd-vo AN SSSR, 1955, pp 77-92

ABSTRACT: The paper discusses methods of the approximate determination of the periodic modes of oscillation in nonlinear automatic control systems. The discussion refers to those methods which are based on the assumption of a proximity of these modes of operation to harmonic oscillations. Two hypotheses are analyzed (the hypothesis of self-resonance and the filter hypothesis) which in many cases allow a substantiation of the approximate methods. The paper describes methods for the solution of problems of the determination and problems of the

Card 1/2

SOV/124-57-5-5181

On the Application of the Small-parameter Methods in the Investigation (cont.)

stability of periodic modes of oscillation based on the above-mentioned hypotheses. In the case of self-resonance the authors consider the approximate methods for determining the periodic modes of oscillation, as well as the methods for investigating their stability, to be sufficiently substantiated. In case of a filter the application of the assumption of a small difference between the periodic mode of oscillation from the harmonic oscillation alone is formally justified. The article shows, however, that even in that case, in a number of cases [such as with odd constant-sign nonlinearity of f(x)], good results are obtained with the "illegitimate" application of methods corresponding to the assumption of the presence of a generating frequency of the approximate system which strictly speaking applies to small-parameter systems only.

N. N. Krasovskiy

Card 2/2

AYZ RMAN, M.A.

Aizerman, M.A.

1971. Aizerman, M. A., The problem of determining periodic conditions in systems of automatic regulation (in Russian), Trudi 2-go Vses. soveshch. po teorii avtomat. regulirovaniya, Vol. 1, Moscow-Leningrad, Izd. Akad. Nauk SSSR, 1955, 105-130; Ref. Zh. Mekh. 1956, Rev. 5746.

The survey contains the following sections: (1) The importance of the problem of determining periodic conditions; (2) the history of the matter; (3) the place occupied by the problem of periodic conditions in the general complex of nonlinear problems in the theory of regulations; (4) statement of the problem of the determination of periodic conditions; (5) approximate methods for determining periodic conditions; (6) the theory of periodic conditions in relay systems; (7) periodic conditions in cases where the characteristics of an arbitrarily harmonized linear system are present; (8) systems near to periodic conditions; (9) the formulation of the fundamental problems.

*Paper available only from Consultants Bureau, New York

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AIZERMAN, M. A.

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It is shown that the tendency of systems of automatic regulation to develop self-excitation, to generation of oscillation lies in the very nature of these systems, as in the system with feedback. In the cases of self-excitation, the systems of regulation are entirely inadmissible; in the cases of others, self-oscillation systems depend basically on the correct work of the regulator (vibrating regulators). The estimate of effectiveness of both types of systems of regulation requires study of the dynamics of the systems and, in particular, the determination of the periodic conditions.

It is noted that the determination of periodic conditions in view of the present stage of development of the theory follows regular methods in the following three cases:

(1) In systems in which the periodic oscillations approach the sinusoidal (approximate to the method of Poincare, Vanderpol, N.N. Krylov, and N.N. Bogolyubov and others). The nearness of the self-oscillations to the sinusoidal is dependent on whether the "linear part" of the system manifests itself either as a resonance system or as a filter of the lower harmonics—and cuts off, more or less effectively, all the harmonics of the periodic oscillation (with the exception of the fundamental).

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Aizerman, M. A.

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(2) For relay systems consisting of a linear part and a relay characteristic, there are available accurate methods of finding periodic conditions (A.I. Lur'e, Ya.I. Neimark). The simplest have been found to be symmetrical periodic systems.

(3) For subdivided linear systems (systems with subdivided-linear characteristics), a full investigation of the dynamics and, in particular, the determination of the periodic oscillations can be carried out by the method of point transformation (A.A. Andronov and others). A large number of problems on different systems of automatic regulation has been solved by this method, which can be described as differential equations of the second and third degree.

In conclusion, the basic problems confronting the theory of automatic regulation are formulated. The solution of these would permit a marked forward step in determining oscillatory movements and in reaching methods of determination of such movements for simple engineering procedure.

N. A. Zheleznov

Courtesy Referativnyi Zhurnal, USSR

Translation, courtesy Ministry of Supply, England

3/3

Ayzerman, M. A.

USSR/Mathematics - Relay systems

FD-1655

Card 1/1 Pub. 85-7/16

Author : Ayzerman, M. A., and Gantmakher, F. R. (Moscow)

Title : A class of dynamic problems that reduce to the theory of relay systems

Periodical : Prikl. mat. i mekh., Vol. 19, 222-224, Mar-Apr 1955

Abstract : The author studies an oscillatory system described by the following equations: $d_{ij}(p)x_j - M_i z = A_i \sin(wt + a_i)$, $z = f(x_k)$ (tensor summation convention applies to repeated indices; $i=1,..,n$; $p=d/dt$), where x_j and z are generalized coordinates of the system, $d_{ij}(p)$ are polynomials with real coefficients, w, M_i, A_i, a_i are given numbers, and function $f(x_k)$ corresponds to one of the graphs shown of step function. He notes that many problems of the theory of oscillations reduce to the determination of the periodic solution of the above system, where self-excited oscillations are represented by all $A_i = 0$ and A_i not zero represent forced oscillations in the zone of damping. Ten references (e.g. Ya. Z. Tsypkin, "Forced oscillations in relay systems of automatic regulation," Avtom. i telem., Vol. 13, No 5, 1952; "Stability of periodic regimes in relay systems of automatic regulation," ibid., Vol. 14, No 5, 1954).

Institution : --

Submitted : November 25, 1954

АЙЗЕРМАН, М.А.

ABDULLAYEV, Anner Alekper ogly; HADZHAFOV, Enver Mamed ogly; AYZERMAN, M.A., professor, doktor tekhnicheskikh nauk, redaktor; GONCHAROV, I.A., redaktor izdatel'stva

[Automatic control in oil extraction using compressors] Avtomaticheskoye regulirovanie v kompressornoi neftedobyche. Baku, Azerbaidzhanskoe gos.izd-vo neft.i nauchno-tekhn.lit-ry, 1956. 242 p. (MLRA 10:9)

(Automatic control)
(Petroleum engineering)

AIZERMAN, M.A.
[MARK ARONOVICH]

CARD 1/2 PG - 588

SUBJECT USSR/MATHEMATICS/Differential equations
AUTHOR AJZERMAN M.A.
TITLE Lectures on the theory of automatic control.
PERIODICAL Moscow: State Publication for technical-theoretical literature 428p. (1956)
reviewed 2/1957

The present book is the result of a lecture practice of more than 10 years. It is composed with extraordinary educational skill and gives a representation of the theory of control which seems to be particularly suitable as an introduction to the modern methods. In the frame of the textbook completeness was neither intended nor possible; nevertheless an excellent survey is obtained by the skillful selection of the most important branches of the control theory, and partially the representation even leads to the most recent research results. Historical details - concerning the presentation of the material as well as the nomination of original papers and authors - had been appreciably avoided. However, at the end of the book a detailed bibliography is to be found.

The book is divided into the following 5 chapters and an appendix:

1. General introduction concerning automatic controllers.
2. The set up of the initial data for the calculation of control circuits.
3. The stability of control circuits.
4. Construction and estimation of control processes in linearized systems.
5. Self-excited and forced oscillations in non-linear control circuits.

AYZERMAN, M. A. (Dr. Tech. Sci.)

"Problems Arising in Connection with the Theory of Auto-Oscillations in Systems of Automatic Regulation,"

paper read at the Session of the Acad. Sci. USSR, on Scientific Problems of Automatic Production, 15-20 October 1956.
Avtomatika i Telemekhanika, No. 2, p. 182-192, 1957.

9015229

AYZERMAN, M.A.; GANTMAKHER, F.R.

Comment of the article of M.A. Airzerman and F.R. Gantmakher "Conditions for the existence of a region of stability for a single-circuit automatic control system," in PMM vol.18, no.1, '54. Prikl.mat.i mekh. 20 no.3:447 My-Je '56. (MLRA 9:8)
(Automatic control)

AYZERMAN, M.A.

TOPCHIYEV, A.V., akademik, glavnyy redaktor; PETROV, B.N., otvetstvennyy redaktor; AYZERMAN, M.A., redaktor; BERNSHTEYN, S.I., redaktor; VASIL'YE~~V, B.V., redaktor~~; IVANOV, V.I., redaktor; KARAGODIN, V.M., redaktor; KOGAN, B.Ya., redaktor; LETOV, A.M., redaktor; PORTNOV-SOKOLOV, Yu.P., redaktor; SOLODOVNIKOV, V.V., redaktor; ULANOV, G.M., redaktor; TSUPKIN, Ya.Z., redaktor; KRUTOVA, I.N., redaktor; ASTAF'YEVA, G.A., tekhnicheskiy redaktor

[A session of the Academy of Sciences of the U.S.S.R. on scientific problems in automatization of production, October 15-20, 1956; principal problems of automatic control] Sessiia Akademii nauk SSSR po nauchnym problemam avtomatizatsii proizvodstva, 15-20 oktiabria 1956 g.; osnovnye problemy avtomaticheskogo regulirovaniia i upravleniia. Moskva, 1957. 334 p. (MLRA 10:5)

1. Adakemiya nauk SSSR. 2. Chlen-korrespondent AN SSSR. (for Petrov)
(Automatic control)

~~AYZERMAN, M.A.~~ AYZERMAN, M.A.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/2 PG - 667
AUTHOR AIZERMAN M.A., GANTMACHER F.R.
TITLE On the determination of periodic motions in non-linear dynamic systems with piecewise linear characteristic.
PERIODICAL Priklad.Mat.Mech. 20, 639-654 (1956)
reviewed 3/1957

The authors consider a dynamic system which is described by the differential equations

$$(1) \qquad \frac{dx_i}{dt} = \sum_{j=1}^{s} \alpha_{ij}x_j + \varrho_i y \qquad (i=1,\dots,s)$$

where α_{ij} and ϱ_i are real numbers and $y = f(x_1)$ is the given piecewise linear characteristic. $y = f(x_1)$ is assumed to consist of m connected pieces of the m straight lines $y = k_r x_1 + b_r$ $(r=1,\dots,m)$. The authors consider the given system on each single straight line piece of the characteristic by substituting $y = k_r x_1 + b_r$ in (1):

$$(2) \qquad \frac{d\varphi}{dt} = \mathfrak{A}_r \varphi + \mathfrak{b}_r \qquad (r=1,\dots,m)$$

with $\mathfrak{A}_r = \begin{pmatrix} \alpha_{11} + \varrho_1 k_r & \alpha_{12} & \dots & \alpha_{1s} \\ \vdots & \vdots & & \vdots \\ \alpha_{s1} + \varrho_s k_r & \alpha_{s2} & \dots & \alpha_{ss} \end{pmatrix}$, $\varphi = \begin{pmatrix} x_1 \\ \vdots \\ x_s \end{pmatrix}$, $\mathfrak{b}_r = \begin{pmatrix} \varrho_1 b_r \\ \vdots \\ \varrho_s b_r \end{pmatrix}$.

From the solutions of the corresponding homogeneous system $\frac{d\mathfrak{z}}{dt} = \mathfrak{A}_r \mathfrak{z}$ normed fundamental matrices $\mathfrak{Z}_r = (z^r_{ij})$ $(i,j=1,\dots,s)$ are obtained by aid of which the solution of (2) can be written in the form

$$(3) \qquad \varphi(t) = \mathfrak{Z}_r(t-t_{r-1})(\varphi(t_{r-1})-\vartheta_r) + \vartheta_r.$$

The vector ϑ_r is obtained from $\mathfrak{A}_r \vartheta_r + \mathfrak{b}_r = 0$. These single solutions are then combined. Obvious continuity and periodicity conditions lead to a system of equations for the time intervals τ_r in which the single straight line pieces of the characteristic are run through.
In a similar way the differential equation of higher order is considered which arises from (1) by eliminating all the variables except x_1. The jumps of the derivatives of x_1 and y in the break points of the characteristic are very intuitively combined with each other by a system of equations. Although the systems for the determination of the period T and for the single parts τ_r are set up in closed form, the practical applicability of the method seems to be very doubtful since already in the simplest cases most extended calculations must be carried out and since the unknown terms occur in powers as well as in transcendental form.
INSTITUTION: Physical-Technical Institute, Moscow.

8(0) SOV/112-59-4-7473

Translation from: Referativnyy zhurnal. Elektrotekhnika, 1959, Nr 4, p 145 (USSR)

AUTHOR: Ayzerman, M. A.

TITLE: Problems Arising in Connection With the Theory of Self-Oscillations in Automatic-Control Systems

PERIODICAL: Sessiya AS USSR po nauchn. probl. avtomatiz. proiz-va, 1956, Vol 2, M., AS USSR, 1957, pp 49-59

ABSTRACT: A review of the state of the problem of determining self-oscillations in automatic-control systems and a formulation of some yet-unsolved problems is presented. Insufficient substantiation and inherent contradictions in the frequently used approximation methods for determining self-oscillations (a harmonic-balance method, and the like) are noted. A review of the problems solved by exact methods, such as adjusting of and searching for the periodic solution in the form of a complete Fourier series, is given. Need for further investigations in the field of self-oscillations is noted. Bibliography: 15 items.

P.A.B.

Card 1/1

AYZERMAN, M.A.

AYZERMAN, [illegible]

[illegible] periodic systems in automatic control systems.

I[illegible] [illegible]nal: Tekh. nauki no.1:44-71 '57. (MIRA 10:8)

(Automatic control)

AYZERMAN, M. A.

Opredelenie Periodicheskikh Rezhimov v Sistemakh s Kusochno-Lineinoi Kharakteristikoi, Sostavlennoi iz Zven'ev, Parallel'nykh Dvum Zadannym Priamym. I. M. A. Aizerman and F. R. Gantmakher. *Avtomatika i Telemekhanika*, Feb. 1957, pp. 97-110. In Russian. Determination of periodic solutions in systems with a nonlinear characteristic composed of two straight-line pieces. Periodic solutions of corresponding differential equations are found in the form of complete Fourier series without neglecting harmonics.

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1b

SAW

AUTHOR AYZERMAN, M.A., GANTMAKHER, F.R. (Moscow) PA - 2555

TITLE Determination of Periodic Solutions in Systems with a Straight-Line Characteristic Composed of Line Pieces Parallel to two Given Straight Lines. II. (Opredeleniye periodicheskikh rezhimov v sistemakh, soderzhashchikh kusochno-lineynyy kharakteristiki, sostavlennyye iz zven'yev, parallel'nykh dvum zadannym pryamym. II, Russian)

PERIODICAL: Avtomatika i Telemekhanika, 1957, Vol 18, Nr 3, pp 193 - 200
U.S.S.R.
Received: 4 / 1957 Reviewed: 6 / 1957

ABSTRACT: The problems which can be solved according to the method quoted in the first part of the paper are generalized in four directions in the second part. 1) Complicated processes can be investigated in systems with a binary broken characteristic. 2) Continuous characteristics or characteristics consisting of any number of line pieces of different straight lines can be investigated on the condition that the angular coefficients of the straight lines are equal to one of the two given factors k' and k". 3) Also more general conditions for the transition of one characteristic- unit to the other can be examined. 4) A far more general class of exterior influences (that is of the functions $F_j(t)$) can be investigated, in the course of which these functions have to be determined by their Fourier

Card 1/2

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000102710019-0"

PA - 2555

Determination of Periodic Solutions in Systems with a Straight - Line Characteristic Composed of Line Pieces Parallel to two Given Straight Lines.

series. It is assumed that the period T can be devided into N stages and that during each stage the point x_1, y_1 moves on a straight line that has one of the given directions determined by the angular coefficients k' and k". It is assumed that for each i-stage (i = 1,2,....,N) the equation of the straight line and the conditions for the conclusion of the stage are given. The processes are illustrated by three examples. In the following chapter the equation of the periods in the generalized problem will be deduced.
(6 illustrations and 2 citations from Slav publications)

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED 20.6.1956
AVAILABLE: Library of Congress.

Card 2/2

AUTHORS: Ayzerman, M. A., Gantmakher, F. R.,(Moscow) 103-11-7/10

TITLE: On Some Peculiarities of Switching Over in Non-Linear Systems of Automatic Control with a Partly Smooth Characteristic of a Non-Linear Element (O nekotorykh osobennostyakh pereklyucheniy v nelineynykh sistemakh avtomaticheskogo regulirovaniya s kusochno gladkoy kharakteristikoy nelineynogo elementa)

PERIODICAL: Avtomatika i Telemekhanika, 1957, Vol. 18, Nr 11, pp. 1017-1028 (USSR)

ABSTRACT: The processes investigated appear as follows: $x_i = \sum_{j=1}^{n} \alpha_{ij} x_j + \lambda_i y$ $(i=1,2,\ldots,n)$, $y=f(x)$, $x = \sum_{j=1}^{n} \beta_j x_j - \varkappa y$, where $\alpha_{ij}, \beta_j, \lambda_i$ and $\varkappa$ are numbers (some of them may also be noughts). It is assumed that the characteristic $y=f(x)$ consists of two smooth curves which are called the granches I and II of the characteristic. On these curves the points of convergence P_1 and P_2 are given. If the representing point moves in the plane x,y along one of the branches and reaches the point of convergence at $t = t^*$ transition to the other branch takes place at that moment. This is switching over, which can be continuous or discontinuous.

Card 1/3

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000102710019-0"

On Some Peculiarities of Switching Over in Non-Linear Systems 103-11-7/10
of Automatic Control with a Partly Smooth Characteristic of a Non-Linear
Element.

There is normal and sliding switching over. In the case of the latter, though the point passes over to the other branch, it immediately returns to the old branch in the same moment without moving along the new branch at all. Types of switching over in the case of characteristics consisting of infinite curves as well as of curve sections, and types of switching over in systems with a feedback closed round the non-linear element are investigated. It is shown that, in the case of discontinuous characteristics, also in relay systems, in the case of sliding switching over considerable changes of x during sliding and jumps along the straight line inclined towards the y-axis in the direction of the "lacking characteristic branches" are observed. In practice the type of the sliding switching over realized depends on the small parameters, and the sliding switching over with the above mentioned changes of x and the discontinuities are observed in systems with elastic feedback if their time constant is small. Sliding motions are observed also in the case of continuous but kinked characteristics. In systems with discontinuous characteristics, which are different from relay characteristics, indefinite switching over, i.e. such with dis-

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On Some Peculiarities of Switching Over in Non-Linear Systems 103-11-7/10
of Automatic Control with a Partly Smooth Characteristic of a Non-Linear
Element.

continuities, which, however, cannot be determined by means
of the equations investigated here, can occur. There are 12
figures and 5 Slavic references

SUBMITTED: April 29, 1957.

AVAILABLE: Library of Congress

Card 3/3

The Stability in Linear Approximation of Periodic Solutions of a System of Differential Equations With Discontinuous Right Sides 40-5-7/20

analogous to the corresponding stability theorems of Lyapunov. Thus the asymptotic stability and also the instability can be determined from the behavior of the solutions of the linear approximation of the non-linear initial system. There are 4 figures, no tables, and 2 Slavic references.

ASSOCIATION: Moskovskiy fiziko-tekhnicheskiy institut (Moscow Physico-technical Institute)

SUBMITTED: May 15, 1957

AVAILABLE: Library of Congress

Card 2/2

AUTHOR AYZERMAN M.A. PA - 2516

TITLE ~~Criticism and~~ Bibliography. Collection of A.A.Andronov's works. (Sbornik tudov A.A.Andronova -Russian)

PERIODICAL Vestnik Akademii Nauk SSSR,1957, Vol 27,Nr 2, pp 134-136 (U.S.S.R.)

Received 5/1957 Reviewed 6/1957

ABSTRACT The research work carried out by Andronov A.A., member of the Academy, was of eminent importance for the theory of motion and automatic control. Andronov established the nonlinear theory of motion. The expression "Avtokolenaniya" (self-motions, self-fluctuation) which was coined by him was adopted throughout the world. He published 3o works in his life-time, others were published after his death. It was practically impossible to utilize these works. Some of themwere printed in foreign countries. He occupied himself with mathematics, physics, and technical science. The published volumecontains all his basic works with the exception of his theory of self motion which he wrote together with S.Ye.Khaykin. The volume consists of three parts. Two problems treated deserve special mention. One of them, which is connected with the conception of the "great system", was introduced into science by A.A.Andronov and L.S. Pontryagin. This system makes it possible to avoid several methematical difficulties arising on the occasion of the investigation of dynamical systems of a general nature. The second problem is connected with the statistical theory of dynamical systems and was solved in 1933 in cooperation with L.S. Pontryagin and A.A.Witt. These two problems fill the first volume. The second, which is entitled "Theory of Cybernetics"

Card 1/2

AYZERMAN, M.A.

AUTHOR: AYZERMAN, M.A., GANTMAKHER, F.R. 20-4-1/51

TITLE: Stability After the Linear Approximation of the Periodic Solutions of a System of Differential Equations With Discontinuous Right Sides (Ustoychivost' po lineynomu priblizheniyu periodicheskikh resheniy sistemy differentsial'nykh uravneniy s razryvnymi pravymi chastyami)

PERIODICAL: Doklady Akad. Nauk SSSR, 1957, Vol. 116, Nr. 4, pp. 527-530 (USSR)

ABSTRACT: Given the system

$$(1) \qquad \frac{dz_i}{dt} = f_i(z_1,\dots,z_n,t)$$

with the periodic solution $z_i = \tilde{z}_i(t)$, the period be τ. Let the f_i be defined in an infinite cylinder with the axis $z_i = \tilde{z}_i(t)$. Let the sequence of hyper surfaces $F_\alpha(z_1,\dots,z_n,t) = 0$ cut C into the regions H_α, $\alpha = 1,2,3,\dots$, where the curve $z_i = \tilde{z}_i(t)$ intersects the surface F_α in the moment $t = t_\alpha$ in M_α and thereby it goes over from the "positive" to the "negative" side of F_α. Here the f_i in M_α may have jumps ξ_i^α. Otherwise let the f_i be

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Stability After the Linear Approximation of the Periodic Solution of a System of Differential Equations With Discontinuous Right Sides 20-4-1/51

2) In the points of intersection with the planes $t = t_\alpha$ the integral curves $x_i = x_i(t)$ have jumps which are determined from the linear relations:

(3) $$x_i(t_\alpha+0) - x_i(t_\alpha-0) = \xi_i^\alpha \sum_{j=1}^{n} h_j^{\alpha-} x_j(t_\alpha-0),$$

where

$$h_j^{\alpha-} = \left[\frac{\partial F_\alpha/\partial z_i}{(dF_\alpha/dt)^-}\right]_{M_\alpha}, \quad \frac{dF_\alpha}{dt} = \sum_{i=1}^{n} \frac{\partial F_\alpha}{\partial z_i} f_i + \frac{\partial F_\alpha}{\partial t}.$$

Theorem: If under these assumptions the trivial solution of (2)-(3) is asymptotically stable, then the solution $z_i = \tilde{z}_i(t)$ of (1) is asymptotically stable too.

Theorem: If only one root of the characteristic equation of the above defined linear system of approximation is greater than 1 with respect to its absolute value, then the periodic solution $z_i = \tilde{z}_i(t)$ of (1) is instable.

Card 3/3

ASSOCIATION: Moscow Physical-Technical Institute (Moskovskiy fiziko-tekhnicheskiy institut)

PRESENTED BY: I.G. Petrovskiy, Academician, April 23, 1957

SUBMITTED: April 18, 1957

AVAILABLE: Library of Congress

KHUTOV, Vitaliy Ivanovich; AYZERMAN, M.A., doktor tekhn. nauk, retsenzent; POPIK, K.G., kand. tekhn. nauk, retsenzent; MELITSEV, A.S., inzh., red.; GELLER, I.Yu., red. izd-va; MODEL', B.I., tekhn. red.

[Automatic control of internal combustion engines] Avtomaticheskoe regulirovanie dvigatelei vnutrennego sgoraniia. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1958. 344 p.
(Gas and oil engines) (Automatic control) (MIRA 11:10)

28(1) PHASE I BOOK EXPLOITATION SOV/1342

Ayzerman, Mark Aronovich

Lektsii po teorii avtomaticheskogo regulirovaniya (Lectures on the Theory of Automatic Control) 2d ed., rev. and enl. Moscow, Fizmatgiz, 1958. 520 p. 15,000 copies printed.

Ed.: Sobolev, O.K.; Tech. Ed.: Akhlamov, S.N.

PURPOSE: The book is intended for engineers engaged in designing automatic control systems.

COVERAGE: The author discusses the theory of automatic control. He describes methods of obtaining initial information for designing control systems and presents ways of linearizing equations. He also discusses stability, self-oscillations and forced oscillations in nonlinear control systems and presents methods of approximate and exact solution of periodic functions. The author describes methods of constructing response curves of linear analogs of nonlinear systems. He also gives information on Laplace and Fourier transforms. This second edition includes a description of intermittent, vibrating, and optimalizing regulators. The discussion on stability is expanded and a description of static methods of designing the control system with random input signals is also included.

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The material of the book is based on lectures delivered by the author to scientific personnel and engineers of a number of scientific-research institutes, design offices and plants in Moscow. The author thanks Ya.Z. Tsypkin, Yu.V. Dolgolenko, and A.Ya. Lerner for reviewing the manuscript. He also thanks Yu.V. Krementulo, Yu.I. Ostrovskiy, and Ye.A. Andreyeva for their help in preparing the book for publication. There are 391 references, of which 341 are Soviet (including 9 translations), 28 English, 16 German, and 6 French.

TABLE OF CONTENTS:

AUTHORS: Ayzerman, M. A., Gantmakher, F. R. (Moscow) 103-19-6-9/13

TITLE: On the Stability of Periodic Methods of Operation in Non-linear Systems With Piece-Wise Linear Characteristics (Ob ustoychivosti periodicheskikh rezhimov v nelineynykh sistemakh s kusochno -lineynoy kharakteristikoy)

PERIODICAL: Avtomatika i telemekhanika, 1958, Vol 19, Nr 6, pp 606 - 608 (USSR)

ABSTRACT: A method is described here by means of which the equations of a linear approximation for solving problems concerning the stability of a periodic solution in a system with piece-wise linear characteristics can be found. As in references 1 and 2 the automatic control system is here expressed by equation (1). At first the more general equation (2) is investigated and beside it also the linear equations (3) which, supplemented by linear relations, yields equation (4). Formulae (3) and (4) together determine the discontinuous integral curves. The totality of (3) and (4) is designated as linear approximation of (2) for the periodic solution of (2) $z_i = \widetilde{z}_i(t)$. ($f(z_i)$ is given function which is piecewise linear). By additional

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On the Stability of Periodic Methods of Operation in Nonlinear Systems With Piece-Wise Linear Characteristics 103-19-6-9/13

limitations the following theorem is obtained: (reference 1): When the zero-solution $x_i = 0$ of a system of linear approximation (3) + (4) is asymptotically stable, the periodic solution $z_i = \tilde{z}_i(t)$ of the set of equations (2) also is asymptotically stable. Going back to the set of equation (1) the equations (3') and (4') are obtained for it. Linear relations are found and written down in matrix form: $x(t_o+\tau) = Ux(t_o)$, where U denotes the constant transformation matrix. For the stability of the periodic solution of system (1) it is sufficient when the roots of the characteristic equation $\det(U-\lambda E)=0$ lie on the circle of unit radius. The problem concerning the stability of the periodic solution of system (1) can also be solved by direct alignment. There are 4 references, 4 of which are Soviet.

SUBMITTED: May 15, 1957

Card 2/2 1. Servomechanisms--Mathematical analysis

AYZERMAN, M.A.; GANTMAKHER, F.R. (Moskva)

Stability of periodic motions. Prikl.mat. i mekh. 22 no.6: 750-758 N-D '58. (MIRA 11:12)

1. Moskovskiy fiziko-tekhnicheskiy institut.
(Motion)

AYZERMAN, M. A.

Kibernetika i avtomatizatsiya proizvodstva /Cybernetics and Automation of Production/, Znaniye Publishing House, Moscow, 1960, Series IV, 32 pages.

AYZERMAN, Mark Aronovich, doktor tekhn.nauk; DUBROVSKIY, Yu.N., red.; ATROSHCHENKO, L.Ye., tekhn.red.

[Cybernetics and automation of industry] Kibernetika i avtomatizatsiia proizvodstva. Moskva, Izd-vo "Znanie," 1960. 31 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii. Ser.4, Nauka i tekhnika, no.12). (MIRA 13:6)

(Cybernetics) (Automation)

AYZERMAN, M.A., prof., doktor tekhn.nauk, otv.red.; TAL', A.A., red.izd-va;
TIKHOMIROVA, S.G., tekhn.red.

[Questions of pneumatic and hydraulic control] Voprosy pnevmo- i gidro-avtomatiki. Moskva, 1960. 211 p. (MIRA 13:9)

1. Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki.
(Pneumatic control) (Hydraulic control)

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D201/D302

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AUTHORS: Ayzerman, M.A. and Gantmakher, F.R.

TITLE: Fundamentals of the theory of non-linear automatic control systems with discontinuous characteristics

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 6, 1961, 33-34, abstract 6 V242 (V sb. Vses. Mezhvuz. konferentsiya po teorii i metodam rascheta nelineyn. elektr. tsepey, no. 1, Tashkent, 1960, 30-44)

TEXT: The analysis of systems is given which differ from the linear ones by the presence of one or several elements with straight line segmented characteristics. The peculiarities are explained in the notation of equations of motion in discontinuous systems and of the processes occuring during the transition over the discontinuity surface (slip states). An exact method is suggested for determining the periodic states and an analysis of their stability is given

B

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AYZERMAN, M.A. (Moskva); GUSEV, L.A. (Moskva); ROZONOER, L.I. (Moskva);
SMIRNOVA, I.M. (Moskva); TAL', A.A. (Moskva)

Finite automats. Part 1. Avtom.i telem. 21 no.2:224-236
F '60. (MIRA 13:5)
(Automatic control) (Switching theory)

9.3200

78165
SOV/103-21-3-11/21

AUTHORS: Ayzerman, M. A., Gusev, L. A., Rosenoer, L. I., ~~Smirnova, I. M.,~~ Tal', A. A. (Moscow)

TITLE: Finite Automatons. II.

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 21, Nr 3, pp 359-368 (USSR)

ABSTRACT: The paper is a continuation of the article published in "Avtomatika i telemekhanika," Vol 21, Nr 2. In Part II of this article the following problem is discussed: an automaton A', operating at a selected pace of time, T' is to be formed out of automatons A, operating at a different pace of time T. In referring to Part I of the paper, it is shown that this may be obtained by two methods. According to the first method, l delay elements, operating at pace T, are connected in series as shown in Fig. 1,

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the automaton with the desired pace may be obtained. The second method is applied to an automaton A, which at the moment t_0 assumes an input state ρ_0, the latter remaining constant until t_1. During time $t_0 \leqslant t \leqslant t_1$ the automaton operates as an autonomic automaton (see part I). At $t = t_1$ the input state ρ_0 changes to ρ_1 and remains constant until $t = t_2$, thus defining a new autonomic automaton. At $t = t_2$ the state ρ_1 changes to ρ_2, etc. Under the assumption that the input state ρ and the states $K(t)$ (see part I) are registered only at times t_0, t_1, t_2,..., t_i,..., an automaton A' is obtained and is based on the equilibrium states of autonomic automatons. The pace T' of A' is defined by t_0, t_2, etc., and does not depend on the pace of the automaton A. It is shown that the above two methods may be applied to neurons and to

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relay-contact systems. By neuron is meant an element with a finite number of inputs and one output only. The input and output states are designated by symbols from the "alphabet" $\{0,1\}$. The output symbol is singularly determined by the input symbols which existed τ seconds ago. A neuron may be considered as a finite automaton with only two possible states. Neurons may be combined into networks without the use of symbol converters (see Part I). Relay systems may also be considered as finite automatons of the "neuron network" type, the time delay of τ sec being determined by the duration of the relay operation. Concluding remarks are made on the possibility of considering a system designed as to belong to the class of finite automatons. The application of the theory of finite automatons is terminated as soon as equations of type (6), Part I, are written. These equations are then used as a basis for engineering design. There are 5 figures; and 1 table.

SUBMITTED: November 26, 1959

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16.9500 (1024, 1031, 1132)

AUTHORS: Ayzerman, M. A., Gusev, L. A., Rozonoer, L. I., Smirnova, I. M., Tal', A. A. (Moscow)

TITLE: Methods of Working out a Finite Automaton the Time Pace of Which Is Dependent Upon the Variation of the Input State

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol. 21, No. 12, pp. 1576-1594

TEXT: The papers of Refs. 1, 2 define such a dynamic system as a finite automaton the behavior of which is determined at the given instants (rhythms) 1, 2, ..., p by equation (1): $\kappa(p) = F[\kappa(p-1), \rho(p-1)]$, where $\kappa(p)$ and $\rho(p)$ are variables and $F(\kappa, \rho)$ an unambiguous function. The variable λ was assigned to the output of the automaton, and determined from formula (2): $\lambda(p) = \Phi[\kappa(p)]$ a new variable μ is introduced into equation (1) and formula (3) is obtained: $\kappa(p) = \mu(p-1)$, $\mu(p) = F[\kappa(p), \rho(p)]$. Instead of (2), the more general formula (5) is written down: $\lambda(p) = \Psi[\kappa(p), \rho(p)]$. The system expressed by equations (3) and (5) is called a sequential machine. In so far as (2) is a special case of (5),

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Methods of Working out a Finite Automaton the Time Pace of Which Is Dependent Upon the Variation of the Input State

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the "sequential machine" comprises the notion of the "finite automaton". On the other hand there is a theorem which shows that a sequential machine is "no more efficient" than a finite automaton with an output converter (Ref. 4). This theorem reads: Every sequential machine M can be compared to a finite automaton A with an output transformer in such a way that for any state of M, a corresponding state of A will exist, where in the case of an arbitrary input sequence the output sequence of A in all cases of $p \geqslant 1$ represents the output sequence of M by a delay by one rhythm, and vice versa.- This paper deals with sequential machines only, which realize the finite automaton, formula (6). (6) is obtained from (3) and (5) by eliminating μ and κ. It reads $\lambda(p) = F_1[\lambda(p-1), \rho(p)]$. The working cycles 1, 2, ..., p are clearly determined by the instants at which the input state is changed. It is assumed that the basic table of the (6) automaton is given. Three methods of realizing this basic table by means of the sequential machine are studied. The methods differ by the amount of information reaching the input of the automaton. The first method is that of D. D. Huffman (Ref. 5). The second method provides for the feed of an

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AUTHORS: Ayzerman, M. A., Gusev, L. A., Rozonoer, L. I., Smirnova, I. M., Tal', A. A.

TITLE: Finite Automatons. I

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 22, Nr 2, pp 224-236 (USSR)

ABSTRACT: The authors give their point of view on the theory of finite automatons. A finite automaton is defined as a dynamical system which at certain discrete moments satisfies the following conditions: (1) The state of the system is selected from a finite number k of possible states (2) The state of the input to the system is selected from a finite number r of possible input states. (3) The state of the system at any considered moment is defined singularly by the state of the system and the state of the input at the preceding moment. The following designations are introduced: (a) $_1$, $_2$,..., $_k$ are symbols of k possible systems

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of states. Their totality $\{\chi\}$ is called a state alphabet; (b) $\rho_1, \rho_2, \dots, \rho_2$ are symbols of the r possible input states. Their totality $\{\rho\}$ is called an input alphabet. According to the condition (3) the operation of a finite automaton is described by the expression

$$\varkappa(p) = F[\varkappa(p-1), \rho(p-1)], \tag{1}$$

where F is a function with a single value. The abstraction introduced by the concept of "finite automaton" singles out a class of systems in which the processes are described not by differential equations but by specific equations of type (1). A finite automaton may have $l (l \leq k)$ possible output states designated as $\lambda_1, \lambda_2, \dots, \lambda_l$ or, in their totality designated as an output alphabet $\{\lambda\}$. In case of an automaton with an output, Finite Automatons. I

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Eq. (1) must be supplemented by the "momentary" relationship given as

$$\lambda(t) = \Phi[\nu(t)], \qquad (2)$$

Equations (1) may be represented by Table 1.

Table 1

	ν_1	ν_2	…	ν_k
ρ_1	ν_3	ν_5	…	ν_5
ρ_2	ν_1	ν_k	…	ν_6
…				
ρ_r	ν			ν_2

This table is called the basic table of finite automaton and may be set up in the following manner: a pair of symbols selected from alphabets $\{\rho\}$ and $\{\nu\}$ determines one case in the table. Assuming the symbol pair as

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ρ and $\varkappa$ for each moment t. The band is called a state band. Three symbols, $\varkappa(p-1)$, $\rho(p-1)$, and $\varkappa(p)$, defined by Eq. (1) are separated by a heavy line on Table 3. They are called a triad. When the system is defined by Eq. (1) and Eq. (2), then an output band, as represented by Table 4, must also be considered.

TABLE 4

t	1	2	3	4	5	...
ρ	ρ_1	ρ_3	ρ_5	ρ_r	ρ_4	...
λ	λ_2	λ_1	λ_5	λ_l	λ_8	...

When the input state does not vary with time the automaton is called autonomic. Equation (1) for this case has the form

$$\varkappa(p) = F[\varkappa(p-1), \rho(0)]. \qquad (3)$$

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Finite Automatons. I

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where $\rho(0)$ may be considered a parameter. The operation of an autonomic automaton may be represented graphically by k points corresponding to system states and represented by arrows which show the direction of transition from one point to the other, in accordance with Eq. (3). Since a nonautonomic automaton has r input states, it can be represented by r various autonomic automatons, under the assumption that the r input states do not vary. The totality of r graphs representing the above autonomic automatons characterizes the nonautonomic automaton. Figure 1 shows an example of a totality of 3 graphs

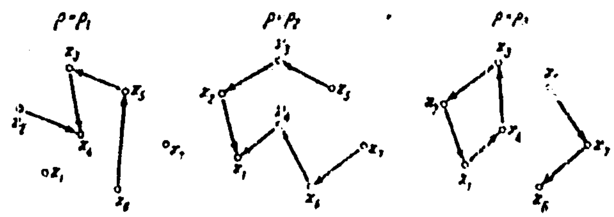

Fig. 1.

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Table 5 corresponds to the automaton characterized by Fig. 1.

TABLE 5

	x_1	x_2	x_3	x_4	x_5	x_6	x_7
p_1	x_1	x_4	x_4	x_4	x_3	x_5	x_7
p_2	x_1	x_1	x_2	x_1	x_3	x_6	x_6
p_3	x_4	x_1	x_2	x_3	x_1	x_4	x_6

The introduction of the concept of "finite automaton" poses a series of problems. The bands represented by Tables 3 and 4 are assumed to be infinite and cannot be selected. Selected are the algorithms which determine the symbol for any case of an infinite band. For the band represented by Table 3, the algorithms corresponding to the upper (ρ) and to the lower (χ) line are designated as A_ρ and A_χ, respectively.

Similarly, A_ρ and A_λ are the algorithms of the output band, represented by Table 4. For a given automaton, the analysis, i.e., the determination of A_χ or A_λ in accordance with A_ρ, does not represent any scientific problem. On the contrary, the synthesis of an automaton, i.e., finding the Eq. (1) from the given band algorithms poses several problems. When A_χ and A_ρ are known, the first problem consists in finding an algorithm proving that A_ρ and A_χ are not contradictory, i.e., there are no contradictory triads in the band. Two triads are contradictory when their symbols $\rho(p-1)$ and $\chi(p-1)$ are the same, but when symbols $\chi(p)$ are different. When A_ρ and A_χ are not contradictory, an algorithm must be found determining all various triads of the band. Synthesis corresponding to the output band is a more complex problem. Here A_ρ and A_λ are known and the number of states k and function

Φ in Eq. (2) have to be determined. It is stated that in case of finite state and output bands, the synthesis problem becomes less complex. To discuss the synthesis problem the following concepts are introduced: (1) The Symbol Converter. This is an abstract arrangement performing the transformation defined by Eq. (2), (2) The Equivalent Automatons. On Fig. 2, atuomaton

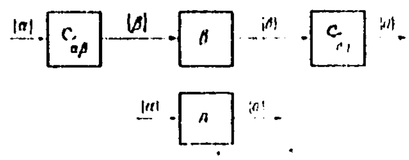

Fig. 2.

A is operating according to the input alphabet $\{\alpha\}$ and the state alphabet $\{a\}$. Automaton B has the input alphabet $\{\beta\}$ and the state alphabet $\{b\}$. It is assumed that two symbol converters $C_{\alpha\beta}$ and C_{ba} may be selected in such a manner that for any sequence of input symbols from $\{\alpha_i\}$, the sequence of symbols from the alphabet $\{a\}$, at the output of the combined system $C_{\alpha\beta}$, B, C_{ba}, will be the same as the sequence of state symbols in A. In this case it is said that B is an image of A and may be written as.

$$A \subseteq B \text{ or } B \supseteq A.$$

When at the same time,

$$A \subseteq B \text{ and } A \supseteq B,$$

then A and B are equivalent automatons. (3) The Abstract Structure of a Finite Automaton. An arrangement of s input lines $u_1, \ldots, u_s$ and of n, generalized coordinates $x_1, \ldots, x_n$ is considered. At moments 0, 1, 2, 3, ..., p, each input and each coordinate has only one of a finite number of values. The operation of such an arrangement is described by

$$x_i(p) = f_i[x_1(p-1), \ldots, x_n(p-1); u_1(p-1), \ldots, u_k(p-1)] \; (i = 1, \ldots, n) \quad (6)$$

Equation (6) is another form of Eq. (1). To one equation of type (1) correspond varios equations of the type (6). The transition from Eq. (1) to the equivalent Eqs. (6) is called a selection of structure of a finite automaton, and Eq. (6) themselves are called an abstract structure (AS) of a finite automaton. (4) The Net. This is a totality of AS, interconnected by means of symbol converters. Based on the above concepts, the authors arrive at the conclusion that a finite automaton may be designed by combining into a net other finite automatons. The design of a multitude of automatons from a small number of initial automaton-"elements" is called abstract aggregation. A set of AS and converters is called complete, when by means of this set the networks designed are images of any selected automaton. A technically very important complete set is set-up of the following elements: (a) a binary delay element, described by the equation $x(p) = z(p-1)$, where x and z are selected from an alphabet comprising only two symbols, 0 and 1, for example; (b) a set of logic elements enabling performance of any logical function. It is shown that from the above set a net may be designed to be an image of any finite automaton. (To be continued). There are 4 figures; 6 tables; and 25 references 17 Soviet, 1 French, 7 U.S. The 5 most recent U.S. references are: Burks, A. W., Wright, J. B., Theory of Logical Nets, Proc. IRE, No. 4 (1953); Huffman, D. A., The Synthesis of Sequental Switching Circuits, Journ. Francl Inst., Vol 257, Nr 3, 4 (1954); Burks, A. W., Wang, H., The Logic of Automata., Journ. Assoc. Comp. Mach., Vol 4, Nr 2, 3 (1957); Davis, M. D., Computability and Unsolvability, McGraw Hill, New York (1957); Copi, I. M., Elgct, C., Wright, J. B., Realisation of Events by Logical Nets, Journ. Assoc., Comp. Mach., 5, p 181, Nr 2 (1958).

SUBMITTED: June 10, 1959

80248

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S/040/60/024/02/12/032

AUTHORS: Ayzerman, M. A., Gantmakher, F. R. (Moscow)

TITLE: On the Stability of the Position of Equilibrium in Discontinuous Systems

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. 2 pp. 283-293

TEXT: Let a discontinuous motion be described above or below the surface

(2) $F(x) = 0$

by the systems of equations

$$(+1) \quad \frac{dx}{dt} = f^{+}(x)$$

or

$$(-1) \quad \frac{dx}{dt} = f^{-}(x)$$

Both systems are assumed to possess unique solutions for given initial conditions and to be without singular points on the surface (2). The motion of the image point on (2) is not defined by (± 1) and must be additionally determined. Thereby positions of equilibrium can arise

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On the Stability of the Position of Equilibrium in Discontinuous Systems

on (2), the stability investigation of which has to be carried out either by considering the additional conditions or by considering the systems (± 1). The last case is investigated in the present paper. Let (2) be the plane $x_n = 0$, in the semiplane $x_n = 0$, $x_1 > 0$ the trajectories of (+1) are assumed to proceed downwards and in the semiplane $x_n = 0$, $x_1 < 0$ to proceed upwards. Then (± 1) describes a point transformation G_1 of the semiplane $x_n = 0$, $x_1 > 0$ into the semiplane $x_n = 0$, $x_1 < 0$ and (-1) describes a point transformation G of $x = 0$, x 0 into $x_n = 0$, $x_1 > 0$. The limit $x_n = 0$, $x_1 = 0$ consists of fixed points of the transformations G_1, G_2, $G = G_1 G_2$. The stability of the fixed point x = 0 of G is equivalent to the stability of the position of equilibrium in the origin (see (Ref.3,9)). It is shown that, if $f^+(0)$ and $f^-(0)$ are not collinear vectors, the position of equilibrium x = 0 is unstable. In the case where $f^+(0)$ and $f^-(0)$ are collinear the authors give sufficient conditions for the stability and instability of the fixed point x = 0 (generalization of the results of Yu. J. Neymark (Ref.8),(Ref.5)).
There are 3 figures, and 10 references: 8 Soviet, 1 German and 1 Italian.

SUBMITTED: November 3, 1959

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S/053/60/071/01/10/011
B006/B011

AUTHOR: Ayzerman, M. A.

TITLE: A Classical Book on the Theory of Nonlinear Oscillations

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 71, No. 1, pp. 167-170

TEXT: The author gives a detailed review of the book "Teoriya kolebaniy" (Theory of Oscillations) by A. A. Andronov, A. A. Vitt, and S. E. Khaykin, Publishing House Fizmatgiz, Moscow, 1959. Price 31.50 rubles. There are 3 references, 1 of which is Soviet.

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