NIKITIN, Konstantin Filippovich; NEYMARK, Yefrem Zinov'yevich;
MANIKOV, M.Ye., red.

[Problems in the hydrogen sulfide therapy of nervous diseases] Voprosy serovodorodnoi terapii nervnykh zabolevanii. Moskva, Meditsina, 1964. 210 p.
(MIRA 17:5)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

NEYMARK, YU. ANDRONOV A.

"On the Movements of an Ideal Clock System With Two Degrees of Freedom."

Reports of the Acad. of Sci. of the USSR, 1946, New series, vol. 51, no. 1, pp. 17-20, illustr. 1, Bibli. - 3

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

NEYMARK, YU. I. PA 76T18

USSR/Electronics May/Jun 1948
Regulators, Electronic
Circuits, Linear

"Determination of the Value of Parameters for Which a System of Automatic Regulation is Stable," Yu. I. Neymark, Gor'kiy State U, 14 pp

"Avtomat i Telemekhan" Vol IX, No 3

Gives method of plotting stability regions of equilibrium positions of linearized systems, both divided and discrete, for any pair of parameters. Submitted 2 Dec 1947.

76T18

PA 13/49T33

USSR/Engineering
Turbines, Water
Turbo Regulators

Jul/Aug 48

"Problem of the Effect of Hydraulic Thrust on the Regulation of a Turbine," Yu. I. Neymark, Physicotech Inst, Gor'kiy U, 2½ pp

"Avtomatika i Telemekh" Vol IX, No 4

G. V. Aronovich, in a previous article (76T47) on this subject, reduced the problem to the equation: $\alpha(P_2+P_1)ch\frac{\ell x}{2}+(P_6-2P_1)ch\frac{\ell\tau}{2}=0.$

Stability of system was investigated with respect to the compound parameter $\frac{1+\alpha^2}{2(1+\alpha^2)}$ and the

13/49T33

[redacted]

USSR/Engineering (Contd)

Jul/Aug 48

lag τ. Here Neymark investigates system with respect to parameters α and τ, using a method previously described (76T18). Submitted 29 Mar 1948.

13/49T33

[redacted]

NEYMARK, YU. I.

PA 61/49T97

USSR/Physics
Regulation

Jul/Aug 49

"The 'D-Pulse' of the Space of Quasi-Polynomials (Stability of Linearized Distributed Systems)," Yu. I. Neymark, Gor'kiy State U, 31 pp

"Priklad Matemat i Mekh" Vol XIII, No 4

Many problems in regulation stability reduce to the study of the expansion in the complex plane z of the roots of a transcendental function of the form: (1) $a_{ks} \cdot z^k \cdot \exp(t_s z)$ (summation from k,s equal 0 to n,m). Since 1941, N. G. Chebotarev has been trying to find an effective

61/49T97

USSR/Physics (Contd)

Jul/Aug 49

criterion which would establish in a finite number of steps whether all roots of the quasi-polynomial (1) lie to the left of the imaginary axis. Considers problem uniting Chebotarev's mathematical problem with practical studies, i.e., that of a space of quasi-polynomials and its profiles in a space corresponding to quasi-polynomials with different numbers of roots to the right of the imaginary axis. Submitted 16 Mar 49.

61/49T97

NEYMARK, Yu. I.

NEYMARK, YU. I.

USSR/Engineering - Hydraulics, Structures Apr 52

"Theory of the Vibration Sinking of Sheet Piles," Yu. I. Neymark, Cand Physicomath Sci

"Gidrotekh Stroi" No 4, pp 24-27

On the basis of simplified process, develops the theory of pile sinking by vibration, establishing relationship among sinking rate, parameters of driving installation, its power and experimentally detd parameters of ground. Vibratory method for driving sheet piles, suggested by D. D. Barkan, Laureate of Stalin Prize, is used in construction of a number of hydroelec power stations.

219T26

NEIMARK, Yu. I. and KUBLANOV, I. M.

"Investigation of Periodic Processes and Their Stability for the Simplest Distributed System of Relay Regulation of Temperature", Avtomatika i Telemekhanika, Vol 14, No 1, 195[illegible], pp 34-43.

Discusses periodic solutions of an equation of thermal conductivity [illegible] satisfying the boundary conditions:

[illegible]

when f(T) = 0 with T>T', f(T)=1 with T∠T"

An investigation of periodic solutions is conducted for establishing and studying the relation between coefficients of the Fourier series, corresponding to solutions of equation of thermal conductivity at f(T) = 1 and f(T) = 0 respectively.

Conti.

This connection is considered as a point transformation of infinite dimension space. Th immobile point of this transformation corresponds to a periodic solution.

An investigation of the stability of periodic solutions leads to an investigation of the stability of immobile points at small changes of their coordinates. The stability of immobile points is determined by the distribution roots of a certain transcendent equation in respect to the circle of a unit radius.

A numerical example and graphs are presented. (RZhMekh, No 11, 1954)

SO: Sum. No. 443, 5 Apr. 55

NEYMARK Yu.I. (Gor'kiy)

I.I. Gal'perin works on structural stability conditions of dynamic systems. Avtom. i telem. 14 no.1:88-92 Ja-F '53. (MLRA 10:3)
(Automatic control)

NEYMARK, YU. I.

"Periodic Cycles and the Stability of Relay Systems", Avtomatika i Telemekhanika, Vol 14, No 5, 1953, pp 556-569.

Discusses a relay system of automatic regulation, consisting of a linear element with a transfer coefficient K(P) $\sum \frac{c_j}{p - r_j}$ and a relay element, the generalized coordinate of which may acquire only two values.

In a periodic operating condition the time intervals form a periodic sequence when ..., $\tau_n = t_n - t_{n-1}, t_{n+1} - t_n$... the tripping time of the relay is ..., t_{n-1}, t_n, t_{n+1} .... Repetition takes place after m trippings of the relay; the duration of the period is $T = \tau_1 + \ldots + \tau_m$.

In the simplest case (m = 1) ..., τ_n, τ_{n+1}, τ_{n+2} ... are equal.

Conti.

The output coordinate of the linear element $y(t)$ is constructed according to the transfer coefficient of the linear element and to the values ..., t_{n-2}, t_{n-1}, t_n, ..., preceding the specified instant. Tripping of the relay occurs at $|y(t)=\delta$ and at the corresponding sign of $y'(t)$. Knowing ..., t_{n-2}, t_{n-1}, t_n, the instant of tripping of the relay t_{n+1} may be found as the root of the equation $y(t) = (-1)^{n+1}\delta$.

For m unknowns $\tau_1, \tau_2, \ldots, \tau_m$ m transcendent equations were derived $y(0) = \delta$, $y(\tau_1) = -\delta \ldots$, $y(\tau_1 + \ldots + \tau_m) = (-1)^{m-1}\delta \ldots$ (1)

Analogous equations were derived for cases of forced oscillations.

The stability of the periodic operating condition at times ..., τ_{-1}, τ_0, τ_1 is determined in the following way: for the initial time sequence..., $\tau_{-1}+\Delta\tau_{-1}$, $\tau_0+\Delta\tau_0$ the sequence $\tau_1+\Delta\tau_1$, $\tau_2+\Delta\tau_2$ is built; the system, corresponding to the initial sequence ... τ_{-1}, τ_0 is stable, if for small disturbances ..., $\Delta\tau_{-1}$, $\Delta\tau_0$ corresponding to $\Delta\tau_1$, $\Delta\tau_2$ tend to zero.

Conti.

Finally, the investigation of the stability of free and forced periodic operating conditions of the discussed relay system leads to a clarification of the distribution of roots of the type $F(z) = \sum$ [illegible] with respect to a unit circle (a_j, β_j, B as constants).

The problem of D - expansion with respect to unit circle for the characteristic equation is briefly analyzed. Examples are given. (RZhMekh, No 11, 1954) SO: Sum No. 443, 5 Apr. 55

NEYMARK, Yu.I. (Gor'kiy).

Theory of vibrations used in pile driving and pulling. Inzh.sbor. 16:13-48 '53. (MLRA 7:3)
(Pile driving)

1. [illegible]

2. [illegible]

4. [illegible]

7. [illegible]

State that a remark in V.V. Dobronravov's article (Prik Mat i Mekh, Vol. 16, No 6, 1952) was in response to a criticism of certain of his works. The criticism appeared in the authors' (critics') article entitled "An Error by Volterra Admitted by Him in His Derivation of the Equations of Motion of Nonholonomic Systems" (ibid. Vol. 15, No. 5, 1951). Point out errors in Dobronravov's articles. [illegible]

9. Monthly List of Russian Accessions, Library of Congress, June 1953. Unclassified.

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

NEYMARK, Yu. I.

2

1-F/W

Neimark, Yu. I. On auto-oscillations and forced oscillations of relay systems with retardation. Avtomat. i Telemeh. 16 (1955), 225-232. (Russian)

The author utilizes discrete idealizations and considers the transfer coefficient $K(p) = K_0(p) + K_1(p)e^{-\alpha_1 p} + \cdots + K_s(p)e^{-\alpha_s p}$, where $K_i(p)$ are quotients of polynomials and α_i are time delays. Several cases are considered and some examples given. *N. Levinson* (Cambridge, Mass.).

NEYMARK, Yu. I.

USSR/Physics - Singing flame FD-2202

Card 1/1 Pub. 146-7/25

Author : Neymark, Yu. I., and Aronovich, G. V.

Title : Conditions for self excitation of a singing flame

Periodical : Zhur. eksp. i teor. fiz. 28, 568-578, May 1955

Abstract : The authors consider the problem of the stability of a singing flame, by proceeding the representations of Rayleigh and taking account of the phenomenological lag in combustion. They find their results in close qualitative agreement with the well known experimental facts. The present work was completed in 1952 (results appearing in Otchet GIFTI [Reports of the Gor'kiy Sci.-Res. Physicotechnical Institute]). In 1953 a related work appeared on the problem of the excitation of vibrations during slow propagation of a flame in tubes (B. V. Raushenbakh, Zhur. tekh. fiz. 23, 358, 1953). Six references: e.g. Yu. I. Neymark. Uch. zap. GGU, 14, 191, 1950; Ustoychivost' linearizovannykh sistem (Stability of linearized systems), LKVVIA (Leningrad Red Banner Military Aviation Engineering Academy), 1949.

Institution : Gor'kiy State University (GGU)

Submitted : May 10, 1954

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

112-57-7-14803D

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1957, Nr 7, p 146 (USSR)

AUTHOR: Neymark, Yu. I.

TITLE: Dynamics of the Relay Systems of Automatic Regulation (Mechanical Automatic Systems With Dry Friction, Regulation Systems With Hydraulic Constant-Speed Servomotor, and Other Similar Systems) (Dinamika releynykh sistem avtomaticheskogo regulirovaniya (mekhanicheskiye sistemy avtomatiki s sukhim treniyem, sistemy regulirovaniya s gidravlicheskim servomotorom postoyannoy skorosti i inyye sistemy podobnogo roda))

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Doctor of Technical Sciences, presented to In-t avtomatiki i telemekhan. AN SSSR (Institute of Automation and Telemechanics, AS USSR), Moscow-Gor'kiy, 1956.

ASSOCIATION: In-t avtomatiki i telemekhan. AN SSSR (Institute of Automation and Telemechanics, AS USSR)

Card 1/1

SOV 124-57-4-3912

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 4, p 11 (USSR)

AUTHOR: Neymark, Yu. I.

TITLE: On the Connection Between the Stability Characteristics of Open and Closed Dynamic Systems (O svyazi ustoychivostey razomknutoy i zamknutoy dinamicheskikh sistem)

PERIODICAL: Tr. 3-go Vses. matem. s"yezda. Vol I. Moscow, AN SSSR, 1956, p 63

ABSTRACT: Bibliographic entry

Card 1/1

NEYMARK, Yuriy Isaakovich (Gor'kiy State Univ imeni Lobachevskiy) awarded sci degree of Doc Tech Sci for 24 Jan 57 defense of dissertation: "Dynamics of relay systems for automatic regulation (Mechanical systems of automatics with dry friction, systems of regulation with single-speed hydraulic servo units, and other similar systems)" at the Council, Inst of Automatics and Telemechanics, AS, USSR; Prot No 6, 15 Mar 58.

(BMV., 7-58,21)

NEYMARK, Yu.I. (Gor'kiy)

On sliding process in control relay systems. Avtom. i telem.18 no.1:27-33 Ja '57. (MIRA 10:3)
(Electric relays)

NEYMARK, Yu. I.

30-12-40/45

AUTHOR: None Given.

TITLE: Defense of Dissertations (Zashchita Dissertatsiy). January - July 1957 (Yanvar' - Iyul' 1957). Section of Technical Sciences (Otdeleniye tekhnicheskikh nauk).

PERIODICAL: Vestnik AN SSSR, 1957, Vol. 27, Nr 12, pp. 120-122 (USSR).

ABSTRACT: At the Institute for Automation and Telemechanics (Institut avtomatiki i telemekhaniki). - Applications for the degree of Doctor of Technical Sciences: N. N. Bautin - Nonlinear problems of the automatic control theory which arises in connection with the dynamics of the clockwork regulator of working (Nelineynyye zadachi teorii avtomaticheskogo regulirovaniya, voznikayushchiye v svyazi s dinamikoy chasovykh regulyatorov khoda). Yu. I. Neymark - Dynamics of the relay systems of automatic control (mechanical automatic systems of dry friction, control systems with a hydraulic servomotor of constant velocity, and other similar systems (Dinamika releynykh sistem avtomaticheskogo regulirovaniya (mekhanicheskiye sistemy avtomatiki s sukhim treniyem, sistemy regulirovaniya s gidravlicheskim servomotorom postoyannoy skorosti i drugiye sistemy podobnogo roda). Applications for the degree of Candidate of Technical Sciences: N. O. Biryukov - The automatic control of cable winding in an electric tractor (Avtomaticheskoye regulirovaniye namotkaniya kabelya elektrotraktora).

Card 1/4

Defense of Dissertations. 30-12-40/45
January - July 1957.
Section of Technical Sciences.

V. P. Kazakov - Elaboration of the building principles of a control system with many channels. (Razrabotka printsipov postroyeniya mnogokanal'noy sistemy regulirovaniya). N. A. Korolev - Investigation of two methods of stabilizing the relay systems of automatic control (Issledovaniye dvukh sposobov stabilizatsii releynykh sistem avtomaticheskogo regulirovaniya).
At the Institute for Mining (Institut gornogo dela). Applications for the degree of Candidate of Technical Sciences: G. P. Nikonov - Investigation of washing of strip-pit deposits by Giant coal-mining method (Issledovaniye razmyva vskryshnykh porod pri gidromonitornoy razrabotke ugol'nykh mestorozhdeniy). A. D. Pomortsev - Investigation of the expediency of working steeply declining layers of the shield system having a thickness of 2 - 4 m (Issledovaniye tselesoobraznosti razrabotki krutopadayushchikh plastov moshchnost'yu 2 - 4 m shchitovoy sistemy).
At the Mineral Fuels Institute Institut goryuchikh iskopayemykh). Application for the degree of Candidate of Technical Sciences: V. K. Krakovskiy - Investigation of the process of heating of Lisichansk mineral coal by means of current (Issledovaniye protsessa nagreva lisichanskogo kamennogo uglya elektricheskim tokom).

Card 2/4

Defense of Dissertation. 30-12-40/45
January - July 1957.
Section of Technical Sciences.

At the Institute for Complex Problems of Transport (Institut konpleks=nykh transportnykh problem). Application for the degree of Doctor of Technical Sciences: A. A. Sovuzov - Organization of inland water transportation operations as a part of USSR single transportation network (Organizatsiya raboty vnutrennego vodnogo transporta kak chasti yedinoy transportnoy seti SSSR).

At the Institute for Machine Science (Institut mashinovedeniya). Applications for the degree of Doctor of Technical Sciences: M. A. Kasparov - The production of a coupled hydroturbine with sluable vanes for high pressure, and its investigation (Sozdaniye socanoy povorotno-lopastnoy gidroturbiny na vysokiye napory i yeye issledovaniye). Yu. B. Tsvis - The study of the process of the grinding of cylindrical teeth (Issledovaniye protsessa zubotocheniya tsilindricheskikh zubchatykh koles). Applications for the degree of Candidate of Technical Sciences: M. L. Daychik - "Tensometrization" (Tenzometrirovaniye) of hydroturbines and generators (Tenzometrirovaniye gidroturbin i generatorov). V. G. Lyutsau - Investigation of the tension relaxation of metals at room temperature by measuring methods of the transversal deformation and X-ray analysis (Issledovaniye relaksatsii napryazheniy v metallakh pri komnat=

Card 3/4

Defense of Dissertation. 30-12-40/45
January - July 1957.
Section of Technical Sciences.

noy temperature metodami izmereniya poperechnoy deformatsii i rentgeno-analiza).
At the Institute for Metallurgy imeni A. A. Baykov (Institut metallurgii imeni A. A. Baykova). Applications for the degree of Doctor of Technical Sciences: P. A. Aleksandrov - Contradictions in the modern development of blooming, and ways of solving the problem (Protivorechiya v sovremennom napravlenii razvitiya blyumingov i puti razresheniya ikh). M. A. Kekelidze - Investigation of Chiatura manganese ores from the metallurgical point of view (Issledovaniye chiaturskikh margantsevykh rud s metallurgicheskoy tochki zreniya). Applications for the degree of Candidate of Technical Sciences: L. I. Ivanov - Elaboration and application of the methods of isotope exchange for the thermodynamical investigation of some double alloys (Razrabotka i primeneniye metoda izotopnogo obmena dlya termodinamicheskogo issledovaniya nekotorykh dvoynykh splavov). I. Yu. Kozhevnikov - Investigation of the thermodynamic reaction of the dephosphorization of iron (Issledovaniye termodinamiki reaktsii defosforatsii zheleza). G. A. Sokolov - Viscosity, crystallization processes, and mineralogical composition of primary and finite blast-furnace slags (Vyazkost', protsessy kristallizatsii i mineralogicheskiy sostav pervichnykh i konechnykh domennykh shlakov).

AVAILABLE: Library of Congress.
Card 4/4 1. Control systems--Automation 2. Telemetry 3. Geology
4. Inland waters--Transportation 5. Metallurgy

06515
SOV/141-58-1-5/14

AUTHOR: Neymark, Yu. I.

TITLE: Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Nr 1, pp 41-66 (USSR)

ABSTRACT: The article attempts to give a systematic representation of some general problems related to the method of point transformations, as applied to the systems with an arbitrary number of degrees of freedom. This is only the first part of the whole work; the second part is to follow later. The method of point transformations was first proposed by A. A. Andronov and his collaborators (Refs 1-10) and was applied by them to the problems of automatic control. The importance of this method in the theory of nonlinear oscillations and the theory of automatic control systems spurred the author to collect the available material from various sources and to construct a complete unified theory. The paper is primarily concerned with the problem of the stability of fixed points in a point transformation and its relationship to the problems of the stability of non-periodic motion and the states of equilibrium. The point transformation is defined as follows. Each point

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Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

$M(x_1, x_2, \dots x_n)$ of a geometrical system $\mathcal{M}$ is transformed into another point $M(\bar{x}_1, \bar{x}_2, \dots \bar{x}_n)$ of the system by means of:

$$\begin{aligned} \bar{x}_1 &= f_1(x_1, x_2, \dots x_n) , \\ \bar{x}_2 &= f_2(x_1, x_2, \dots x_n) , \\ &\dots\dots\dots\dots\dots \\ \bar{x}_n &= f_n(x_1, x_2, \dots x_n) \end{aligned} \tag{1.1}$$

The coordinates $x_1, x_2, \dots, x_n$ are the coordinates of M while $\bar{x}_1, \bar{x}_2, \dots \bar{x}_n$ are the coordinates of $\bar{M}$. The transformation is denoted by T so that the system of Eqs (1.1) can be written as $\bar{M} = TM$ which means that the transformation T is applied to the point M and transforms it into the

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Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

point $\bar{M}$. The transformation T can in turn be applied to the point $\bar{M}$ so that this is transformed into the point $\bar{\bar{M}}$. The point $\bar{\bar{M}}$ is thus obtained by a double transformation so that $\bar{\bar{M}} = T\bar{M} = T(TM)$. The transformation which transforms the point M into point $\bar{\bar{M}}$ may be denoted by Similarly, the m-th transformation is denoted by T^m . A point M^* is said to be a fixed point of the transformation T if the transformation transforms the point M^* into itself, that is,

$$TM^* = M^* \qquad (1.2)$$

The coordinates $x_1^*, x_2^* \ldots x_n^*$ of the fixed point M^* obey the relationships defined by Eqs (1.2), which can be regarded as formulae representing coordinates of the fixed points of the transformation. The ε-region of the point M^* is defined as the ensemble of the points M for which the relationship expressed by Eq (1.3) is fulfilled. The left-hand side terms of this equation can be denoted by $\rho(M, M^*)$ and it represents the distance between M and M^*. The fixed point

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Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

M^* is said to be asymptotically stable (differentially) if it is possible to find a certain ε-region (ε > 0) for the point M^* which, when subjected to a multiple T transformation converges on to the point M^*. This means that for an arbitrary point not belonging to the small ε-region of M^* it is necessary that:

$$\rho(T^m M, M^*) < \varepsilon_m , \qquad (1.4)$$

where $\varepsilon_m \to 0$ for $m \to \infty$ and $\max \varepsilon_m \to 0$ for $\varepsilon \to 0$. The fixed point M is said to be unstable when for a certain ε > 0 in the vicinity of the point M^*, there are points M which go outside the limits of the ε-region when the T-transformation is applied. The stability problem is discussed on the basis of the above definitions and it is demonstrated in a number of theorems. It is shown that the

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Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

coordinates of the point M^* can be represented in a canonical form by means of Eqs (3.2), which are derived by means of the Taylor-series expansion (see Eq (3.1)). When the non-linear terms in Eq (3.2) are neglected, a linearized transformation is obtained; this is represented by Eq (4.1). By employing this transformation it is possible to construct the so-called Lyapunov function which is given by Eq (4.6). The Lyapunov function is used to establish the stability criterion for a fixed point. The criterion is used to analyze the case of a linear transformation, i.e. when a straight line is transformed into a straight line. In this case it is possible to give a geometrical representation of the transformation. If the motion of a system is represented by a set of differential equations of the type:

$$\frac{dx_i}{dt} = X_i(x_1, x_2, \ldots x_n; t) \quad (i = 1, 2, \ldots n) \qquad (6.1)$$

where the functions $X_1 \ldots X_n$ are either independent of time or are periodic functions of time, then the system is

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Method of Point Transformations in the Theory of Nonlinear Oscillations, Part I.

autonomous in the first case and non-autonomous in the latter. It is shown that the motion of an autonomous system, represented in the phase space by a closed curve Γ, is asymptotically orbitally stable, if all the phase trajectories near to the curve Γ tend to it asymptotically for $t \to +\infty$. A periodic motion $x_i = \varphi_i(t)$ is asymptotically stable (in terms of the Lyapunov criterion), if, for an arbitrarily small positive ε it is possible to find such $\delta > 0$ that for every perturbation displacement $\bar{x}_1(t), \ldots \bar{x}_n(t)$ for $t \to \infty$ the following is always true:

$$|\bar{x}_i(t) - \varphi_i(t)| < \varepsilon \quad .$$

It is shown that the problem of determining and investigating the stability of periodic motion can be reduced to the problem of investigation of the stability of the fixed points of the transformation. The relationship between the stability of a

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Method of Point Transformations in the Theory of Nonlinear Oscillat-ions, Part I.

fixed point of a transformation and the stability of the equilibrium state of a system is investigated and the results are stated by means of theorems. The linearization of a point transformation and its relationship to the variation problems is also discussed. The solution of linear differential equations with periodic coefficients is investigated and its relationship with the roots of the characteristic equation of a corresponding point transformation is analyzed. Further, the relationship between various types of mapping (transformations) is dealt with and the Andronov-Vitt theorem is demonstrated. The paper contains 9 figures and 31 references, of which 4 are French, 2 Italian and 25 Soviet.

ASSOCIATION: Issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Physics Engineering Research Institute of [illegible] Gor'kiy University)

SUBMITTED: May 5, 1957.

Card 7/7

NEYMARK, Yu.I.

Point transformation method in the theory of nonlinear oscillations. Part. 2. Izv.vys.ucheb.zav.; radiofiz. 1 no.2:95-117 '58. (MIRA 11:11)

1. Issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.

(Oscillations)

AUTHOR: Neymark, Yu.I. 06476 SOV/141-1-5-6-20/28

TITLE: The Method of Point Reflections in the Theory of Non-linear Oscillations. III.

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Vol 1, Nr 5-6 pp 146 - 165 (USSR)

ABSTRACT: A further instalment of the author's previous two papers (Refs 40, 41) devoted to the stability and dependence on parameters of periodic motions. Dynamical systems described variously as piecewise-linear, impulsive interaction and discontinuously oscillating may be represented in terms of the phase spaces (1.1) where the transition from one space to another must satisfy (1.2) and (1.3) in accordance with the transformation (1.4). For systems with a small number of degrees of freedom the geometrical interpretation of this description is of spaces "glued together" as in Figures 1a and 1b. The transition between the closed trajectories on the surfaces in Figure 2 is represented symbolically in (1.5). The motion described by a trajectory is stable if all the roots of its reflection in a surface lie within the unit circle and unstable if

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The Method of Point Reflections in the Theory of Non-linear Oscillations. III.

even one root lies outside. In order to construct a reflection a solution must be known to Eq (2.1) describing the motion. This is best obtained as an expansion in terms of a small parameter. This is best done if Eq (2.1) first suffers a change of variable as in Eq (2.6). The reflection of surfaces S and $\bar{S}$ in the neighbourhood of points M_o and $\bar{M}_o$ can be achieved by using the intermediate t-surfaces as in Figure 3. Previous qualitative discussions of the behaviour of single-degree-of-freedom systems (Refs 61-68) have been presented in two-dimensional phase-space. A study of the way in which parameter values influence more complicated systems leads to an interest in the incidence of bifurcation. Two broad divisions may be observed; autonomous, i.e. in which time does not appear explicitly in Eqs (1.1) to (1.2) inclusive, and non-autonomous. The former may be further divided into those cases in which the construction of point reflections are possible or not. The stability of a system is conveniently determined by the manner in which it becomes

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The Method of Point Reflections in the Theory of Non-linear Oscillations. III.

unstable. The asymptotic phase trajectories may vanish (Figure 6b) or contract to within a particular region (Figure 6a). The application of the method of small parameters is much facilitated by the derivation of two theorems in Section 5. There are 8 figures and 46 references, of which 44 are Soviet and 2 international.

ASSOCIATION: Issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Physico-technical Research Institute of Gor'kiy University)

SUBMITTED: December 25, 1958

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SOV/109-3-11-2/13

AUTHORS: Neymark, Yu.I., Maklakov, Yu.K. and Yelkina, L.P.

TITLE: The Circulation of Pulses in a Highly Non-linear System Having a Delayed Feedback With Losses (Tsirkulyatsiya impul'sov v sil'nonelineynoy sisteme s zapazdyvayushchey obratnoy svyaz'yu, obladayushchey dispersiyey)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 11, pp 1348 - 1360 (USSR)

ABSTRACT: The generators with a delayed feedback have a certain practical interest in radio engineering. A generator of this type (Figure 1) consists of the following elements: 1) a non-linear circuit which can be described by a non-linear function f(u) such that the input signal can be expressed by

$$x(t) = f\left[u\ (t)\right] \qquad (1)\ ;$$

2) a linear circuit with constant parameters which can be described by a linear response $\varphi(t)$ so that the relationship between its input signal and its output is expressed by:

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$$y(t) = \int_{-\infty}^{t} \varphi(t - \xi)x(\xi)d\xi \qquad (3)$$

and 3) a delay circuit which is described by:

$$u(t) = y(t - \alpha) \qquad (4)$$

where α denotes the delay time. Eq (4) does not take the dispersion (losses) into account but, together, Eqs (1), (3) and (4) can be used to describe also a lossy system having a delayed feedback. The solution of a number of problems relating to the generator of Figure 1 can be effected by employing the method developed by one of the authors (Refs 12, 13, 14 and 15). For the purpose of analysis, it is assumed that the characteristic of the non-linear element of the generator is of the Z-type, such as shown in Figure 2. This means that for any input signal $u(t)$, the output signal $x(t)$ will be in the form of a train of rectangular pulses. Consequently, the output signal can be expressed

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by Eq (6), where t_j are the time instants at which $u(t)$ reaches a value δ and at which $x(t)$ changes abruptly from "zero" to "one" or from "one" to "zero". The signal at the output of the linear element can be expressed by Eq (7) and the output signal is given by Eq (8). The above equations can be used to analyse the operation of various generator systems. In particular, when each operating cycle of the system consists of 1 pulse (this is shown in Figure 5), the basic formulae are given by Eqs (9) and (10). In these, t_1^n and t_2^n denote the instants of the commencement and the termination of a pulse corresponding to the n-th cycle. Eq (9) shows that the leading edges of the pulses have a repetition period, as expressed by Eq (11). Eq (10) determines the duration of the n-th pulse in terms of the duration of (n-1)-th pulse. Eq (10) can be written as Eq (14), where τ^n denotes the duration of the n-th pulse. This can further be written as Eq (15). On the basis of the theory of oscillations and the problem of iterations (Refs 16, 17 and 18), it follows that the

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solution of Eq (15) is stable provided the conditions expressed by Eqs (17) and (19) are fulfilled. If the system contains multi-pulse cycles, the relationships for the inception instant and the termination of the i-th pulse are expressed by Eqs (22) and (23). These instants for the n-th cycle (consisting of m pulses) can also be expressed by Eqs (24). If $r_m = t_{2m-1} - t_{2m-2}$ and $\tau_m = t_{2m} - t_{2m-1}$, where r_m denotes distance between m-1 and m-th pulses and τ_m is the duration of the m-th pulse, Eqs (22) and (23) can be written in the form of Eqs (27) and (28). In order to determine the cycle, it is necessary to find the solution of these equations for the case:

$$\tau_m^n = \tau_m^{n-1} = \tau_{m\pi p} , \quad r_m^n = r_m^{n-1} = r_{m\pi p} ,$$

where the subscripts πp relate to the threshold values.

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The Circulation of Pulses in a Highly Non-linear System Having a Delayed Feedback With Losses

This leads to Eqs (29) and (30). The stability of the system is therefore described by Eqs (31) and (32). The above equations can be used to construct the so-called cyclic function for single-pulse and multi-pulse cycles for various values of δ . The function is represented graphically in Figure 7, where the duration of the n-th pulse is expressed by (n-1)-th pulse. From the figure, it is seen that for $\delta > 0.5$, each pulse introduced into the system gradually becomes smaller and finally disappears. On the other hand, for values of $\delta < 0.5$ it is possible to obtain a stable, single-pulse cycle. The above theoretical findings were verified experimentally. The non-linear element in the investigated system was in the form of a cut-off tube, type 6P9, whose characteristic is as shown in Figure 9; this was sufficiently close to the required Z-type characteristic. The delay line in the system was a coaxial cable having a total delay of 2.5 μs. The losses of the line did not introduce any particular complications. The experimental results obtained are illustrated by the oscillograms of Figures 10, 11, 12 and 13.

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The oscillograms of Figure 10 show the transient processes in a single pulse system, while those of Figure 12 illustrate the transients in a two-pulse system. It was also possible to obtain three-pulse cycles such as shown in Figure 13 but there were practical difficulties in obtaining the cycles containing a large number of pulses (more than 3). There are 13 figures and 20 references, 18 of which are Soviet, 1 English and 1 French.

ASSOCIATION: Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio Engineering and Electronics of the Ac.Sc.USSR)

SUBMITTED: March 19, 1957

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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

SOV/141-2-3-23/26

AUTHOR: Neymark, Yu.I.

TITLE: Investigation of the Stability of the Fixed Transformation Point for Critical Cases

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 3, pp 507 - 508 (USSR)

ABSTRACT: The work is concerned with defining the stability or instability criteria for a fixed point of a transformation of the Euclidean space into itself for the so-called critical cases. Some of the results given were obtained in an earlier work (Ref 1) during the investigation of the bifurcations of the fixed points. The principal theorem states that if V(x) is a Lyapunov function in the vicinity of a fixed point x^* and if in the vicinity (Ref 2) for the transformation T_m of a transformation T_n of a fixed point $[x^*, y^*(x^*)]$:

$$|q(x, y)| < q < 1 ; \quad (4)$$

$$|V[f(x, y)] - V[f(x, y^*(x)]| < B|y - y^*(x)|$$

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Investigation of the Stability of the Fixed Transformation Point for Critical Cases

the function:

$$\Omega(x, y) = V(x) + A|y - y^{*}(x)| \quad (5)$$

for $A > (1 - q)^{-1}B$ will be the Lyapunov function for the transformation T_n in the vicinity of the point $(x^{*}, y^{*}(x^{*}))$.

Two numerical examples of the application of the theorem are given.

There are 2 Soviet references.

ASSOCIATION: Issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Physico-engineering Research Institute of Gor'kiy University)

SUBMITTED: April 10, 1959

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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001136820(

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S/141/59/002/06/015/024
E192/E382

AUTHORS: Neymark, Yu.I., Gorodetskiy, Yu.I. and Leonov, N.N.

TITLE: Investigation of the Stability of Some Distributed Linear Systems

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 6, pp 967 - 968 (USSR)

ABSTRACT: The following dynamic system is considered. The output variable y(t) is uniquely determined by the input function $x(\tau)$ for $\tau \leq t$. The set of operations necessary for the functions x(t), in order to obtain y(t), is the operator of the system. If the operator is linear the system is also linear. The dynamic system is said to be stable if small input perturbations result in small perturbations at the output. In order to make this definition clearer it is necessary to have quantitative characteristics of the input and output perturbations. If the characteristics of the input and output are denoted as r and ρ, the stability requirement states that for $\varepsilon > 0$, ρy should be smaller than ε if $rx < \delta$, where $\delta > 0$ and is independent of ε. It is assumed that the input and output variables x(t)

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and $y(t)$ can undergo Laplace transformations and that the relationship between them can be expressed by:

$$y(p) = K(p)x(p) \qquad (1.1) .$$

It is known that from the condition expressed by Eq (1.2) it follows that the transformation $F(p)$ of the function $f(t)$ is an analytic function of p in the semi-plane $\mathrm{Re}\,p > \sigma$ and that for an arbitrary $\sigma' > \sigma$, it is possible to write:

$$rf = \int_0^{\infty} |f|^2 e^{-2\gamma t} dt , \quad \rho f = \int_0^{\infty} |f|^2 e^{-2\Gamma t} dt \qquad (1.5) .$$

If $rf = \rho f$, the following theorem is true: "In order that a linear system be stable with respect to all the perturbations $x(t)$, for which $\rho x < +\infty$, it is necessary that the function $K(p)$ should be analytical for $\mathrm{Re}\,p > \gamma$

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and it is sufficient for the function to be analytical in any semi-plane $\mathrm{Re}\,p > \gamma'$ where $\gamma' < \gamma''$. A further theorem states the following: "In order that the linear system be stable in the sense:

$$rf = \mathrm{Sup}_{t>0} e^{-\gamma t} \left| f(t) \right| , \quad \rho f = \mathrm{Sup}_{t>0} e^{-\Gamma t} \left| f(t) \right| \qquad (1.7)$$

for $\Gamma = \gamma$ it is necessary that the system should be stable in accordance with Eqs (1.5) at $\Gamma = \gamma$ and it is sufficient that the function $K(p)$ should be analytical in any semi-plane $\mathrm{Re}\,p > \gamma'$ for $\gamma' < 0$ and that the integral:

$$\int_{-\infty}^{+\infty} \left| dK \middle/ dp \right|^2_{p=i\omega} d\omega \qquad (1.8)$$

should be convergent". A system described by :

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$$\frac{\partial^2 u}{\partial t^2} - a\frac{\partial^2 u}{\partial x^2} - b\frac{\partial u}{\partial x} - c_1 u = f_o(u) \qquad (1.9)$$

$$\frac{d\xi_i}{dt} - \sum_{s=1}^{n} a'_{is}\xi_s = f_i(\xi_1, \xi_2, \ldots, \xi_n) \qquad (1.10)$$

$$(i = 1, 2, \ldots, n - 2)$$

is considered as a general example. The system can be linearized and the equations are then written as Eqs (1.11) and (1.12). If it is assumed that the initial conditions are 0 , Eqs (1.11) and (1.12) can be written as Eqs (1.13) and (1.14). The solution of this system can be written as:

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$$\underline{B} = K(p)\underline{A} \qquad (1.16)$$

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Investigation of the Stability of Some Distributed Linear Systems

where A and B are vectors and K(p) is expressed by the matrix given by Eq (1.17). It is shown that the solution of the stability problem is equivalent to the investigation of the roots of the so-called characteristic equation; this is expressed by $\Delta(p) = 0$. The above theoretical results are employed to investigate the stability of several systems. First, the so-called problem of I.N. Voznesenskiy is considered. The system is described by Eq (2.1). It is shown that its characteristic equation is in the form of Eq (2.7). Secondly, a feedback amplifier containing a lossy delay line in the feedback loop is investigated. The characteristic equation of the system is in the form of Eq (3.1), where J(p) is the transfer function of the feedback loop. The stability of an automatic compressor station operating between input and output mains of a gas supply system is investigated. The operation of this system is described by Eqs (4.1), (4.2) and (4.3) A temperature controller is also considered. The operation

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Investigation of the Stability of Some Distributed Linear Systems

of the system is described by Eqs (5.1) and (5.5). There are 11 figures and 24 references, 1 of which is English and 23 are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Scientific-research Physics-engineering Institute of Gor'kiy University)

SUBMITTED: July 2, 1959

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E031/E335

16,9500

AUTHOR: Neymark, Yu.I.

TITLE: A Numerical Method for Determining Periodic Motions in an Automatic-control System

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 6, pp 989 - 994 (USSR)

ABSTRACT: A control system consisting of a linear loop and a nonlinear element is considered. It is assumed that there is a periodic excitation at the input and that as a result a periodic regime is possible. Then the output of the nonlinear element is also periodic and Fourier series can be written in all three cases. Further relations are obtained by noting that the output from the nonlinear element is the input to the linear loop. Apart from the difficulty of writing down the equations explicitly, a further difficulty arises in that the system of equations is infinite. The solution is approached by neglecting higher harmonics and by making suitable approximations in the non-linear terms. The period of the input excitation is divided into a number of equal parts and the values of the output of the nonlinear element at these times are

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A Numerical Method for Determining Periodic Motions in an Automatic-control System

obtained by the method of least squares. After substitution of the input expressions in the output expressions we arrive at the required approximation. This will give equations for the amplitudes of the harmonics and a similar procedure will give equations for the values of the input excitation at the discrete moments of time. A particular example is considered consisting of a linear centrally stable loop and a non-linear loop with a symmetric characteristic. Two sets of equations are obtained, each of which is inconsistent (corresponding to two guessed values of the frequency). Each set is solved by omitting the last equation and after substitution in the last equation, interpolation gives a new value of the frequency. Thus, eventually, a value of the frequency is obtained for which a consistent set of equations exists. This is then the required frequency.

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A Numerical Method for Determining Periodic Motions in an Automatic-control System

There are 1 figure and 21 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Scientific-research Physics-engineering Institute of Gor'kiy University)

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SUBMITTED: July 2, 1959

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NEYMARK, Yu. I.

Numerical method for determining the periodic motions of automatic control systems. Izv. vys. ucheb. zav.; radiofiz. 2 no.6:989-994 '59. (MIRA 13:6)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.
(Automatic control)

[illegible]

AUTHORS: Neymark, Yu.I., and Shil'nik[illegible]

TITLE: On the Application of the [illegible] of Small [illegible] to Systems of Differential Equations [illegible] Right-hand Terms

PERIODICAL: Izvestiya Akademii nauk SSSR, [illegible] nauk, Mekhanika i mashinostroyeniye, 195[illegible] pp 51-5[illegible] (USSR)

ABSTRACT: The method described is based on [illegible] (Ref 1), where a solution of the system of [illegible] equations, such as Eq (1.1) for [illegible] Similar [illegible] solutions can be derived [illegible] sufficiently small [illegible] analytical continuity of [illegible] the function [illegible] x1, ..., xn [illegible] must be analytical. If Lyapunov's theory is applied, [illegible] right-hand term of Eq (1) will become [illegible] Thus, the method described can be applied in such cases as dry friction, relay or partly linear systems. [illegible] above limitations can be [illegible] solutions of the function [illegible] case of smooth surfaces with broken [illegible]

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On the Application of the Meth[illegible] of Small Paramet[illegible] Syst[illegible] of Differential Equations with Dis[illegible] Righ[illegible]

case occurs when the fun[illegible] Eq (2.1), the solution of [illegible] Eqs (2.3) - (2.11). In partic[illegible] defined by Eq (2.1) with small μ [illegible] Eqs (2.22) or (2.23) in the [illegible] system and as Eq (2.25) in an [illegible] There are 17 references, of [illegible] are S[illegible] and 2 are French.

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SUBMITTED: June 1[illegible], [illegible]

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16(1)

AUTHOR: Neymark, Yu.I.

SOV/20-127-5-6/58

TITLE: On the Permissibility of Linearization in Studying Stability

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 5, pp 961-964 (USSR)

ABSTRACT: Let the values of the functions $u(t)$ and $\omega(t)$ belong to the linear normed functional spaces U and Ω . The operator which makes correspond uniquely a $u(t)$ to every $\omega(\tau)$, $\tau \leq t$, is called a dynamic system. $\omega(t)$ is called the input and $u(t)$ the output. Let the output $u(t) = 0$ correspond to the input $\omega(t) = 0$. The motion of the dynamic system which corresponds to the input $\omega(t) = 0$ is called stable, if $\| u(t) \| < \varepsilon$, if $\| \omega(t) \| \leq \delta$. Theorem : The linear dynamic system

$$(1) \quad u(t) = \int_{-\infty}^{t} G(t,\tau)\omega(\tau)d\tau ,$$

where $G(t,\tau)$ is a linear operator, is stable, if

$$(2) \quad \sup_{t_1 \geq t_0} \int_{t_0}^{t_1} \| G(t_1,\tau) \| d\tau < +\infty .$$

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On the Permissibility of Linearization in Studying Stability SOV/20-127-5-6/58

Then the equation

$$(4) \quad u(t) = \int_{-\infty}^{t} G(t,\tau)(f(\tau,u(\tau)) + \omega(\tau))d\tau$$

is considered; let the solution for $t \leqslant t_0$ be known. Theorem 2 gives conditions which must be satisfied by G and f in order that the solution be uniquely continuable onto the interval $[t_0, t_1]$; an estimation for $\| u(t) \|$ is given. In theorem 3 it is concluded from the stability of the linear system (2) (misprint !) that (4) is stable under certain suppositions. The author considers the extension of the results to systems and possibilities of application of the three theorems. There are 7 references, 4 of which are Soviet, 1 American, 1 German, and 1 English.

ASSOCIATION: Issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom gosudarstvennom universitete imeni N.I.Lobachevskogo (Physico-Technical Research Institute at the Gor'kiy State University imeni N.I. Lobachevskiy)

PRESENTED: April 27, 1959, by L.S. Pontryagin, Academician

SUBMITTED: April 25, 1959

Card 2/2

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~~16(1)~~ 16.5400

AUTHOR: Neymark, Yu.I. SOV/20-129-4-6/68

TITLE: Some Cases of the Dependence of Periodical Motions on Parameters

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 4, pp 736-739 (USSR)

ABSTRACT: The author formulates without a proof five long theorems on the bifurcation of fixed points of a mapping and on some cases (not appearing in the plane), where the periodic motion arises from another one in the moment of the change of stability. The change of stability may appear if the characteristic equation contains one root -1 or two roots $e^{\pm i\varphi}$. Besides it is shown that the proposed method can also be used for the investigation of the case where a periodic solution arises from a position of equilibrium of the type of a composed vortex point. Theorem 1 is already published in [Ref 5]. The author mentions A.A. Andronov, Ye.A.Leontovich, and N.N.Brushlinskaya. There are 12 references, 11 of which are Soviet, and 1 French.

ASSOCIATION: Gor'kovskiy issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom gosudarstvennom universitete imeni N.I.Lobachevskogo (Gor'kiy Physical-Technical Research Institute at the Gor'kiy State University imeni N.I.Lobachevskiy)

PRESENTED: July 17, 1959, by L.S.Pontryagin, Academician.
SUBMITTED: July 16, 1959

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NEYMARK, Yu. I.

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

LERNER, A. Ya., - "The application of a self-adjusting system of automatic control"
MALOV, V. S., PEREL'MUTIKOV, A. M., and [illegible] A. - "Industrial telemeasurement systems and digital technique"
MEYEROV, M. V. - "Some peculiarities of the structure of multi-communications regulation systems"
MIKHAYLOVSKIY, V. N. - "Evaluation indexes and the possibility of increasing the quality of telemeasurement systems"
MOCTENSKIY, V. V. - "Concerning the problem of established routines in automatic regulation systems"
NETRENEKO, K. A. "Principals of construction of digital double code automatic compensators"
NEYMARK, Yu. I. - "Concerning the relation of systems of automatic regulation with the parameters of periodic movements"
NIKOLAYEV, N. S., and EPSHTEYN, V. L. - "System of automatic control of cutting of rolled metal on a continuous bar mill with the use of digital calculating machines"
ONUYENSKY, V. M. - "Some principles of organizing systems of complex automation of large scale chemical production and optimization of these systems"
OSTROVSKIY, G. M. - "Systems of automatic regulation with intermittent change of parameters"
PEROV, V. P. - "Statistical synthesis of impulse systems"
PETROV, B. N. - "The invariant principle and its application in the calculation of linear and nonlinear systems"
PIVEN, V. D. - "The problem of autonomy in the technique of automatic control"
POPOV, E. P. - "Some problems of synthesis of automatic control non-linear systems"
PUGACHEV, V. S. - "Method of determining the optimum system with non-linear relation of the observed function with the parameters of the signal"
PUTKILO, V. P., PETROV, V. V., KOZLINOV, B. V., and VOLODIN, A. E. - "Principles of construction of a single class of extra control systems for automating production processes"
ROGINSKIY, V. N. - "The development of the theory of relay devices in the USSR"
ROZENBLAT, M.A. - "Dynamic characteristics of cores with right angle hysteresis winding and their influence on magnetic boosters"
ROZONER, L.I. - "Varied methods of investigating the quality of automatic control systems"
RUBINSKIY, V. M. - "Dynamics of automatic regulation of boiler-turbine units"
SHISHLIANNSKIY, S. S., MEL'TTSER, L. V., SADKOV, A. A., KOH-CHEN-CHZHUN, and PIVOVAROV, L. A. - "Automatic control of composition of multi-ingredient mixtures"
SHAOOVSKIY, N. S., and SEGALIN, Ya. G. - "Some results of work for the utilization of radioactive radiation for automatic control of mining machinery"
SOLODOVNIKOV, V. V., BATKOV, A. M., BABURIN, V. M., VAL'DENBERG, Yu. S., MATVEYEV, P. S., and POKROVSKIY, A. K. - "Analyses and synthesis of automatic control systems with the aid of calculating machine facilities"
STAKHOVSKIY, R. I., PITSNER, L. N., and [illegible] "Automatic optimizers and their use for solution of variation problems in automatic synthesis"
STRAKHOV, S. V. - "A system of alternating current electric drives with autonomous power supply"
TAKSAR, I. M., and YANUSHKOVSKIY, V. A. - "Apparatus for technical control of production with the use of nuclear radiation"
TEODORCHIK, K. F., and BENDRIKOV, G. A. - "Methods of organizing the trajectory of roots of linear systems and qualitative determination of type of trajectory"
TSYPKIN, Ya. Z. - "Elements of the theory of digital automatic systems"
VESELOVSKIY, D. B., KASHIRIN, V. A., CHUGIN, Yu. I., and SHASTOVA, G. A. - "Static stability of telemeasurement"
VENIKOV, V. A. - "Interactions of a mathematical modeling and calculating technology experiment in calculating loads in electrical systems"

S/141/60/003/02/024/025
E192/E382

AUTHOR: Neymark, Yu.I.

TITLE: Stability of the Fixed Point of a Point Transformation for a Critical Case 16

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol 3, Nr 2, pp 342 - 343 (USSR)

ABSTRACT: Two theorems regarding the stability or instability of a fixed point M^* (0, ..., 0) of a type T point transformation, defined by:

$$\bar{x}_i = x_i + \tau(x_1, x_2, \ldots, x_n)\left\{A_i + \sum_{j=1}^{n} a_{ij}x_j + 0\left(x_1^2 + \ldots + x_n^2\right)\right\} \quad (1)$$

are given. The expression $\tau(x_1, \ldots, x_n)$ in Eq (1) is a non-negative function which becomes zero at the point M^*. The first theorem states that the fixed point of the transformation defined by Eq (1) is stable if all $A_1 = 0$ and if the equilibrium state of the system of linear differential equations with constant coefficients:

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Stability of the Fixed Point of a Point Trandformation for a Critical Case

$$\frac{dx_i}{dt} = \sum a_{ij} x_j \qquad (2)$$

is asymptotically stable. The second theorem affirms that the fixed point M^* of the transformation given by Eq (1) is unstable if at least one $A_i \neq 0$ and if at least one root of the characteristic equation of the system defined by Eq (2) has a positive real part. The theorems are proved on the basis of the Lyapunov function v which is defined by Eq (4). There are 3 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Scientific-research Physics-engineering Institute of Gor'kiy University)

SUBMITTED: March 30, 1960

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82456

16.9500 S/141/60/003/03/011/014
E192/E382

AUTHORS: Neymark, Yu.I. and Shil'nikov, L.P. 16A

TITLE: Investigation of Nearly Piece-linear Dynamic Systems

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika, 1960, Vol. 3, No. 3, pp.478 - 495

TEXT: The results obtained in an earlier work (Ref. 3) are extended to the nearly piece-linear systems by employing the method of a small parameter (Refs. 1-3). It is assumed that depending on the state and possibly the previous behaviour of the dynamic system considered, this can be described by one of N systems of the differential equations of the type (Ref. 9): X

$$dx_i^j/dt = X_i^j(t;\ x_1^j,\ \ldots,\ x_{n_j}^j) \qquad (1.1)$$

$$(i = 1.2,\ \ldots,\ n_j;\quad j = 1.2,\ \ldots,\ N).$$

The transformation from p description to q system of description takes place when the transformation point is on the surface:

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S/141/60/003/03/011/014
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Investigation of Nearly Piece-linear Dynamic Systems

$$S_{pq}(t;\ x_1^p, \ldots,\ x_{n_p}^p) = 0; \quad \Omega_{pq}^s(t;\ x_1^p, \ldots,\ x_{n_p}^p) > 0 \qquad (1.2)$$

$$(s = 1,\ \ldots,\ r_{pq});$$

Here, the values of the new variables $x_1^q, \ldots, x_{n_q}^q$ at the instant t are determined by the values of the previous variables at the same instant and are defined by:

$$x_j^q = G^{pq} \ (t;\ x_1^p,\ \ldots,\ x_{n_p}^p) \qquad (1.3)$$

$$(j = 1.2,\ \ldots,\ n_q) \quad .$$

The functions X_i^j of each system of Eqs. (1.1) and also the
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functions S, Ω , G are capable of being differentiated a suitable number of times. Further, it is assumed that if the system is non-autonomous, i.e. if the time t is explicitly present in at least one of the functions X, S, Ω , G , the functions are periodic with a period 2π . The phase space of the above system consists of phase sub-spaces $\Phi_1, \ldots, \Phi_n$. The transition from one phase sub-space Φ_p into another sub-space Φ_q is effected in accordance with the transformation defined by Eq (1.3), provided the conditions of Eq.(1.2) are met. Consequently, the points of the surface S_{pq} of the phase sub-space Φ_p , which satisfy Eq. (13), can be regarded as being identical with the corresponding points of the phase sub-space Φ_q . As an example of a system which can be describ~d by the above equations, the following system of differential equations:

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$$dx_i/dt = f_i\ (t;\ x_1,\ \ldots,\ x_n) \qquad (1.4)$$

$$(i = 1.2,\ \ldots,\ n)$$

is considered. In this system, the functions φ_i are subject to the discontinuities of the first kind on the smooth surfaces S_α, which split the space D of the variables $x_1, x_2, \ldots, x_n$ and t into regions $D_1, \ldots, D_k$. In each of these regions, D_j, the equations of motion are in the form of Eqs. (1.5), where f_i^j are smooth functions in D_j. In order to obtain a complete description of the phase-point motion it is necessary to determine what happens when the point reaches the boundary of the region D_j. For this purpose, various special cases of the phase trajectories lying in the vicinity of the discontinuity surfaces S_α

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Investigation of Nearly Piece-linear Dynamic Systems

are investigated. In the sub-space Φ_k, a trajectory L is described by a system of vectorial equations defined by Eq. (2.1). Now the transformation $T_k G^{k-1}$ of the solution of Eqs (2.1) is in the form of Eqs (2.5). Investigation of the stability of the periodic solutions of the system represented by Eqs (1.1) for $\mu = 0$ is done by considering the characteristic equation, which is in the form of Eq (3.6). The periodic solution is stable for all the roots of the characteristic equation lying inside a unit circle. It is shown that the periodic solutions corresponding to the generating solutions for μ are stable if $(n - m)$ roots of the characteristic equation, are smaller than unity and if the roots of Eq. (4.6) lie in the lefthand semiplane. The above analytical results are used to investigate some special systems. The first of these is described by Eqs (5.1). The second system is

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NEYMARK, Yu.I.; KINYAPIN, S.D.

State of equilibrium on the surface of a discontinuity. Izv.vys. ucheb.zav.; radiofiz. 3 no.4:694-705 '60. (MIRA 13:9)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.
(Differential equations)

88751

S/040/60/024/006/005/024
C 111/ C 333

16.5600

AUTHORS: Neymark, Yu. I., Fufayev, N. A. (Gor'kiy)

TITLE: Permutable Relations in Analytical Mechanics of Nonholonomeous Systems

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. 6, pp. 1013-1017

TEXT: The authors investigate the question how far it is justified to assume the correctness of the relation

(0.1) $d\delta q_{\tau} - \delta d q_{\tau} = 0$,

where d is the differentiation with respect to the time and δ the virtual variation, not only for holonomeous but also for non-holonomeous systems. It is admissible according to Hamel and Volterra, it is not admissible according to Levi-Civita, Amaldi and others. X

The authors show that the discrepancy arises, since the operations $d\delta$ and δd occurring in (0.1) are not satisfactorily defined. In the neighborhood of the considered path of motion $q_i = q_i(t)$ the authors introduce a curvilinear system $q_i = q_i(u_1, u_2, \ldots, u_n)$ so that $u_2 = u_3 = \ldots = u_n = 0$ corresponds to the path, where $u_1 \equiv t$

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C 111/ C 333

is on the path. The planes which touch the surfaces $u_{m+1} = \dots$ $\dots = u_n = 0$ in the points $u_2 = u_3 = \dots = u_n = 0$ are the planes of virtual displacements of the system. For linear and homogeneous kinematic bindings now it is defined:

$$(1.1)\quad \begin{aligned} dq_\tau &= \frac{\partial q_\tau}{\partial u_1} du_1, \quad \delta q_\tau = \frac{\partial q_\tau}{\partial u_r} \delta u_r \quad (\tau = 1, \dots, m+k;\ r = 1, \dots, m) \\ dq_\tau &= a_{\tau s} dq_s, \quad \delta q_\tau = a_{\tau s} \delta q_s \quad (\tau = m+k+1, \dots, n;\ s = 1, \dots, m), \end{aligned}$$

where m is the number of the degrees of freedom, k fixed number $(0 \leqq k \leqq n-m)$, where it is summed over double indices, and where $r, s, l = 1, \dots, , m$; $i = 1, \dots, n$; $j = m+1, \dots, n$; $\varrho = m+1, \dots, m+k$ $\alpha, \beta, \lambda, \mu, \nu = 1, \dots, m+k$; $\sigma = m+k+1, m+k+2, \dots, n$.

If for a nonholonomeous system with the bindings

$$(1.2)\qquad \dot{q}_j = a_{js}\dot{q}_s$$

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Permutable Relations in Analytical Mechanics of Nonholonomeous Systems

there are introduced the quasicoordinates $\pi_1, \ldots, \pi_{m+k}$ by

(1.3) $\dot{\pi}_r = a_{rs}\dot{q}_s, \quad \dot{\pi}_\varrho = a_{\varrho s}\dot{q}_s - q_\varrho$

then one obtains the relations

(1.4) $d\delta q_\lambda - \delta d q_\lambda = 0, \quad d\delta\pi_\lambda - \delta d\pi_\lambda = \gamma_{\nu\lambda\mu}\, d\pi_\mu\, \delta\pi_\nu, \quad d\delta q_\sigma - \delta d q_\sigma = B^\sigma_{rs}\, dq_r \delta q_s$

where

(1.5) $\gamma_{\nu\lambda\mu} = b_{\alpha\nu} b_{\beta\mu}\left(\frac{\partial a_{\lambda\alpha}}{\partial q_\beta} - \frac{\partial a_{\lambda\beta}}{\partial q_\alpha}\right), \quad b_{\alpha\lambda} a_{\lambda\beta} = \delta_{\alpha\beta}$ ($\delta_{\alpha\beta}$ Kronecker symbol) .

(1.6) $B^\sigma_{rs} = \frac{\partial a_{\sigma s}}{\partial q_r} + \frac{\partial a_{\sigma s}}{\partial q_i} a_{ir} - \frac{\partial a_{\sigma r}}{\partial q_s} - \frac{\partial a_{\sigma r}}{\partial q_i} a_{is}$

The two aspects mentioned above correspond to the cases k = n - m and k = 0.

Now the authors show that the equations of motion of a nonholonomeous system can be written with the aid of (1.4) so that the equations

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C 111/ C 333

Permutable Relations in Analytical Mechanics of Nonholonomeous Systems

in quasicoordinates of Hamel as well as the equations in real coordinates of Chaplygin are obtained as special cases. In the same way the principle of stationary effect can be formulated in a general form also valid for nonholonomeous systems.

The authors mention Suslov, Chaplygin, V. J. Kirgetov and P. Voronets.

There are 23 references: 11 Soviet, 5 German, 3 Italian, 2 French, 1 American and 1 Norwegian.

SUBMITTED: March 21, 1960

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86384
S/020/60/135/002/004/036
C111/C222

16 3500

AUTHORS: Neymark, Yu.I., and Gol'dberg, V.N.

TITLE: Existence Theorems for Nonlinear Mixed Problems

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 2, pp. 262 - 265

TEXT: Problem I : Determine in the strip $\Pi_T = \left\{ 0 \le x \le 1,\ 0 \le t \le T \right\}$ an n_0 times ($n_0 = \max(2,n)$) continuously differentiable solution $u(x,t)$ of the problem

(1) $u_{xx} - u_{tt} = - f(x, t, u, u_x, u_t, \mu)$

(2) $$\sum_{j=0} \sum_{k+l=n} \alpha_{k,l}^{(i,j)}(t,\mu) \left.\frac{\partial^{(n)} u}{\partial x^k \partial t^l}\right|_{x=j} = \varphi_i \left(t, \ldots, D^{(s)} u\Big|_{x=0}, D^{(s)} u\Big|_{x=1}, \ldots, \mu \right); \quad i = 1,2,; \quad 0 \le s \le n-1$$

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Existence Theorems for Nonlinear Mixed Problems S/020/60/135/002/004/036
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(3) $u(x,0) = \psi_0(x,\mu)$, $u_t(x,0) = \psi_1(x,\mu)$

Problem II : Determine in Π_T an n_0 times continuously differentiable solution of

(4) $$u_t - u_{xx} = f(x, t, u, u_x, \mu)$$

(5) $$\sum_{j=0,1} \sum_{k+2l=n} \alpha^{(i,j)}_{k,l} (t,\mu) \frac{\partial^{(n)} u}{\partial x^k \partial t^l}\Big|_{x=j} = \varphi_i \left(t, \ldots, \frac{\partial^{(s)}(u)}{\partial x^p \partial x^q}\Big|_{x=0} , \frac{\partial^{(s)} u}{\partial x^p \partial t^q}\Big|_{x=1} , \ldots, \mu \right), \quad i=1,2;\ 0 \le p+2q \le n-1$$

(6) $u(x,0) = \psi_0(x,\mu)$.

Under the assumption that the functions f, φ_i , ψ_i and the coefficients α as well as their derivatives satisfy certain conditions, the author prove the
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existence of the solutions in the large, the uniqueness of them and the continuous dependence on the parameter and differentiability with respect to the parameter, with the aid of the method used in (Ref. 11) for questions of stability (theorems 1-3). Then it is shown that if the derivatives $u_{\alpha\beta}$ are understood as components of a vector $\underline{u}\,(x,t)$, then the problems can be reduced to a system of integral equations which, with the aid of a certain "dynamic" operator Ω, is written in the form

(8) $\underline{u} = \Omega \underline{u}$.

The theorems 4-6 contain assertions of existence and uniqueness as well as assertions on the continuous dependence of μ and differentiability with respect to μ for the solutions of (8). Then the theorems 1-3 follow from the theorems 4-6 . - There are 12 Soviet references.

ASSOCIATION: Gor'kovskiy issledovatel'skiy fiziko-tekhnicheskiy institut Gor'kovskogo gosudarstvennogo universiteta imeni N.I. Lobachevskogo (Gor'kiy Physical Technical Research Institute of the Gor'kiy State University imeni N.I. Lobachevskiy)

PRESENTED: June 9, 1960, by S.L. Sobolev, Academician SUBMITTED: May 30, 1960

Card 3/3

NEYMARK, YU. I.

"Method of point mappings in the theory of nonlinear oscillations."

Paper presented at the Intl. Symposium on Nonlinear Vibrations, Kiev, USSR, 9-19 Sep 61

Gorky state University named after N. I. Labachevskiy, Research Institute of Technical Physics, Gorky, USSR

16.4000(1103,1329,1031)

31332
S/569/61/001/000/017/019
D274/D304

AUTHOR: Neymark, Yu. I. (USSR)

TITLE: Parameter dependence of periodic motions in automatic control systems

SOURCE: International Federation of Automatic Control. 1st Congress, Moscow, 1960. Teoriya nepreryvnykh sistem. Spetsial'nyye matematicheskiye problemy. Moscow, Izd-vo AN SSSR, 1961. Trudy, v. 1, 603-610

TEXT: The relationship is considered, by the method of point transformations, between variation of the parameters μ and periodic motion of the system, represented in phase space by the closed trajectory Γ. The system is described by the equations

$$\frac{dx_i}{dt} = X_i(x_1, x_2, \ldots, x_n; \mu_1, \mu_2, \ldots, \mu_m) \quad (i = 1, 2, \ldots, n) \quad , \quad (1)$$

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where x are phase coordinates. The periodic motion, represented by Γ, is asymptotically stable if the trajectories, neighboring to Γ, converge to Γ for $t \to +\infty$. The totality of these converging trajectories form the region of convergence $\sigma(\Gamma)$ of the periodic motion Γ. It is assumed that the right-hand sides of Eq. (1) are sufficiently smooth functions. If the parameters μ vary continuously, the periodic motion Γ also varies continuously; for certain values of the parameters, called bifurcation values, the periodic motion may vanish. These values of the parameters form special surfaces (called bifurcation surfaces) in the parameter space. The region of parameter space bounded by these surfaces corresponds to the values of the parameters for which the system allows periodic motion and inside of which this motion is a continuous function of the parameters μ. The bifurcation of Γ can occur in the following circumstances: (1) One of the characteristic roots of Γ equals +1 ; (2) Γ contracts to a point, i.e., a state of equilibrium; (3) the period of the motion becomes infinite. Only the first two cases are considered in detail (as the third is less interesting). The stability of the periodic motion depends on the roots of

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$$x(z; \mu_1, \mu_2, \ldots, \mu_n) = 0 \quad . \tag{2}$$

Stability is disturbed if one of the conditions

$$x(+1; \mu_1, \ldots, \mu_m) = 0, \quad x(-1; \mu_1, \ldots, \mu_m) = 0,$$

$$x(e^{i\varphi}; \mu_1, \ldots, \mu_m) = 0 \quad (0 < \varphi < \pi) \quad .$$

is satisfied. The satisfaction of each of these conditions corresponds to a surface in parameter space $\mu_1, \mu_2, \ldots, \mu_m$; these surfaces are denoted by N_{+1}, N_{-1} and N_φ respectively. Taking into consideration the surfaces which correspond to the vanishing of Γ, it follows that the region of existence and stability of Γ is bounded by the surfaces N_{+1}, N_{-1}, N_φ, N_ω and N_∞. If the parameters μ vary continuously and thereby the system is carried outside the region of existence and stability of Γ through one of the bounding surfaces, the following cases may arise:

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Parameter dependence of...

Either Γ and σ vanish, or the stable periodic motion passes into a new stable element (a new stable periodic motion, stable equilibrium, a stable torus), whereby the region σ is transformed into the region of convergence of the new stable element. The first case corresponds to a complete change in operating conditions; the new operating conditions may turn out to be emergency conditions. In the second case, the transition is smooth. The two cases differ also by the fact that, whereas in the first case a return to the original operating conditions is impossible, in the second case this may happen. Further, the case of smooth transition is discussed in more detail; in particular, passage through the various bounding surfaces is considered. Another type of bifurcation of periodic motion may be due to discontinuities in the right-hand sides of the differential equations. Such a bifurcation is illustrated by means of a relay system. Another typical case of bifurcation is the appearance of so-called additional switching. A discussion followed. There are 12 Soviet-bloc references.

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NEYMARK, Yu.I.

Concerning some common properties of Liapunov's functions.
Izv. vys. ucheb. zav.; radiofiz. 4 no.2:379-380 '61. (MIRA 14:7)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.
(Differential equations)

NEYMARK, Yu.I.; SHIL'NIKOV, L.P.

Study of the stability of the periodic motion of quasilinear systems. Izv. vys. ucheb. zav.; radiofiz. 4 no.4:776-779 '61. (MIRA 14:11)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.
(Oscillations) (Automatic control)

88814

16.9500 (1031,1132,1121)

S/103/61/022/001/005/012
B019/B056

AUTHOR: Neymark, Yu. I. (Gor'kiy)

TITLE: Some Numerical Methods for Finding Periodic Motions of Automatic Control Systems

PERIODICAL: Avtomatika i telemekhanika, 1961, Vol. 22, No. 1, pp. 47-56

TEXT: The numerical methods for finding periodic motions of automatic control systems discussed here are based upon a method suggested in one of the author's previous papers (Ref.20). When applying this method, the equation of motion of the system is not assumed to be known. Knowledge of the frequency characteristic of the linear terms and of the graphical representation of the characteristic of non linear terms is fully sufficient. In the first part of the present paper, the author develops the initial relations for his numerical methods. He studies an open system (Fig.1) consisting of a linear term K(p) with a frequency characteristic $K(i\omega) = K_1(\omega) + iK_2(\omega)$ and a non linear term whose characteristic is given both graphically and analytically. The periodic motion may approximately be given either in form of a finite section of a

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Fourier series or in form of a number of values with equal time intervals. If the input quantity may be described with $x = \sum_{k=0}^{n} A_k \sin k\omega t + B_k \cos k\omega t$ (1) and the output quantity with $z = \sum_{k=0}^{n} \bar{A}_k \sin k\omega t + \bar{B}_k \cos k\omega t$ (2), the relations

$$\bar{A}_k = \frac{2}{m} \sum_{j=0}^{m-1} \Omega \left[\sum_{s=0}^{n} A_s \sin \frac{2\pi}{m} sj + B_s \cos \frac{2\pi}{m} sj + f_j \right] \times \times \left[K_1(k\omega) \sin \frac{2\pi}{m} kj - K_2(k\omega) \cos \frac{2\pi}{m} kj \right]; \quad (3)$$

$$\bar{B}_k = \frac{2}{m} \sum_{j=0}^{m-1} \Omega \left[\sum_{s=0}^{n} A_s \sin \frac{2\pi}{m} sj + B_s \cos \frac{2\pi}{m} sj + f_j \right] \times \times \left[K_1(k\omega) \cos \frac{2\pi}{m} kj + K_2(k\omega) \sin \frac{2\pi}{m} kj \right],$$

hold for the Fourier coefficient. Here, f_0, f_1, ..., f_{m-1} are the values of the external effect f(t) at the instances of time t_0, $t_1 = t_0 + 2\pi/m\omega, \ldots, t_{m-1} = t_0 + 2\pi(m-1)/m\omega$, which, together with x, occurs at the input of the non-linear element. For the initial quantity $z = z(t)$ the relation

$$z_j = \frac{2}{m}\left\{\sum_{\sigma=0}^{m-1}\Omega(x_\sigma)\sum_{k=0}^{n}\left[K_1(k\omega)\cos\frac{2\pi}{m}k(\sigma-j)+K_2(k\omega)\sin\frac{2\pi}{m}k(\sigma-j)\right]\right\}+f_j. \tag{4}$$

holds at the same instances of time. In agreement with (3) and (4), the equations for A_k, B_k or x_j may approximately be described as periodic motion with the period $2\pi/\omega$.

$$x_j = \frac{2}{m}\left\{\sum_{\sigma=0}^{m-1}\Omega(x_\sigma)\sum_{k=0}^{n}\left[K_1(k\omega)\cos\frac{2\pi}{m}k(\sigma-j)+K_2(k\omega)\sin\frac{2\pi}{m}k(\sigma-j)\right]\right\}+f_j =$$
$$= \frac{2}{m}\sum_{\sigma=0}^{m-1}\Omega(x_\sigma)\,\mathrm{Re}\sum_{s=0}^{n}K(is\omega)\,e^{is(j-\sigma)\frac{2\pi}{m}}+f_j, \tag{6}$$

$$A_k = \frac{2}{m}\sum_{j=0}^{m-1}\Omega\left[\sum_{s=0}^{n}A_s\sin\frac{2\pi}{m}sj + B_s\cos\frac{2\pi}{m}sj + f_j\right]\times$$
$$\times\left[K_1(k\omega)\sin\frac{2\pi}{m}sj - K_2(k\omega)\cos\frac{2\pi}{m}sj\right], \qquad (5)$$
$$B_k = \frac{2}{m}\sum_{j=0}^{m-1}\Omega\left[\sum_{s=0}^{n}A_s\sin\frac{2\pi}{m}sj + B_s\cos\frac{2\pi}{m}sj + f_j\right]\times$$
$$\times\left[K_1(k\omega)\cos\frac{2\pi}{m}sj + K_2(k\omega)\sin\frac{2\pi}{m}sj\right]$$

From (5) and (6) it is possible to approximate the periodic motion of a non-linear system. In the further parts of this paper, three ways are

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shown of carrying out this approximation with (5) and (6). The method of the trial hypothesis (trial ansatz) assumes a certain position of the points $x_0, x_1 \ldots x_{m-1}$ on the linear parts of the characteristic of the non-linear terms, whereby the systems of equations (5) or (6) become linear with respect to A_k, B_k or x_j. From this linear systems, the required quantities are determined, after which the correctness of the trial ansatz is checked. Furthermore, iteration methods may be applied to (5) and (6) directly, which are also briefly discussed. As the last method for approximation of motion of the system, the continuation of the solution with respect to the parameters is dealt with. This method is very useful, and in its application the parameter, according to which the solution is continued, may be either one of the parameters of the system investigated or a parameter from equations with known solutions, which was introduced for the purpose of continuing the solution. Some calculations were carried out by A. Al'tman and M. Yudkovich. There are 7 figures and 21 Soviet references.

SUBMITTED: June 18, 1960

Card 5/5

S/141/62/005/006/018/023
E140/E435

AUTHORS: Neymark, Yu.I., Kinyapin, S.D.

TITLE: On the establishment of periodic motion arising from an equilibrium state on a discontinuity surface

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika. v.5, no.6, 1962, 1196-1205

TEXT: The phase plane method is used to investigate the establishment of periodic motion due to change of parameters from an equilibrium state in a system described by n first order differential equations. The method is applied to a relay system and the phase trajectories of such a system in the neighborhood of the equilibrium point during the establishment of the periodic motion are determined. There are 2 figures.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete (Physicotechnical Scientific Research Institute at Gorkiy University)

SUBMITTED: May 16, 1962

Card 1/1

S/020/63/148/002/010/037
B125/B112

AUTHOR: Neymark, Yu. I.

TITLE: Relation between small changes of a system of differential equations and the corresponding point mapping

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 2, 1963, 281-283

TEXT: The following theorem is derived: The point mapping ‾ of the hypersurface S in itself is produced by the phase trajectories of the differential equations $dx_i/dt = X_i(x_1,x_2,...,x_n)$ $(i=1,2,...,n)$. Let M be a fixed point of T. Let the phase trajectory ‾ which passes through M^- cut the hypersurface without contacting it. Then the point mapping $\overline{T} = T + \cdot_o$ may be produced by the phase trajectories of differential equations of the type $dx_i/dt=X_i(x_1,x_2,...,x_n) + \omega_i(x_1,...,x_n;\cdot)$ in a limited neighborhood of the point M^- when δ is sufficiently small. $\cdot_o$ denotes an arbitrary and m-fold continuously differentiable mapping, and

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$\varphi_i(x_1, \ldots, x_n; \lambda)$ are functions m-fold continuously differentiable with respect to $x_1, x_2, \ldots, x_n$. These functions and their first m partial derivatives vanish for $\lambda = 0$.

ASSOCIATION: Issledovatel'skiy fiziko-tekhnicheskiy institut Gor'kovskogo gosudarstvennogo universiteta im. N. I. Lobachevskogo (Physico-technical Research Institute of the Gor'kiy State University imeni N. I. Lobachevskiy)

PRESENTED: July 7, 1962, by L. S. Pontryagin, Academician

SUBMITTED: June 30, 1962

Card 2/2

BRUSIN, V.A.; NEYMARK, Yu.I.; FEYGIN, M.I.

Some cases of the dependence of periodic movements of a relay system on the parameters. Izv. vys. ucheb. zav.; radiofiz. 6 no.4:785-800 '63. (MIRA 16:12)

1. Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete.

NEYMARK, Yu.I.

Averaging method from the standpoint of the method of point mappings. Izv. vys. ucheb. zav.; radiofiz. 6 no.5:1021-1032 '63.
(MIRA 16:12)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.

NEYMARK, Yu.I. (Gor'ky)

"Some methods of studying dynamical systems"

Report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow 29 Jan - 5 Feb 64.

NEYMARK, Yu.I.; FUFAYEV, N.A. (Gor'ky)

"Dynamics of non-holonomic systems"

Report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow 29 Jan - 5 Feb 64.

S/0040/64/028/001/0051/0059

ACCESSION NR: AP4013380

AUTHORS: Neymark, Yu. I. (Gor'kiy); Fufayev, N. A. (Gor'kiy)

TITLE: Equations of motion for systems with nonlinear nonholonomic relations

SOURCE: Prikladnaya matematika i mekhanika, v. 28, no. 1, 1964, 51-59

TOPIC TAGS: equation of motion, nonlinear nonholonomic relation, analytic mechanics, virtual perturbation, Appell-Gamel example

ABSTRACT: The authors prove that the equations of motion of a system with a nonlinear nonholonomic relation, obtained by Gamel, do not describe its behavior if one considers that it is a limiting case of a nonholonomic system with linear relations. Apropos the possibility of realizing nonlinear nonholonomic relations, various works on this subject do not actually contain examples of systems with nonlinear ideal nonholonomic relations which are essentially different from the example of P. Appell given by him in 1911. This example was carefully studied by Gamel, who set up equations of motion for it, starting from the conventional definition of virtual perturbations for systems with nonlinear nonholonomic

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ACCESSION NR: AP4013380

relations. The authors show that a more correct approach to the study of the system in the Appell-Gamel example leads to motions which are not described by the equations obtained by Gamel. Orig. art. has: 6 figures and 23 formulas.

ASSOCIATION: none

SUBMITTED: 08Jul63 DATE ACQ: 26Feb64 ENCL: 00

SUB CODE: MM NO REF SOV: 001 OTHER: 005

Card 2/2

NEYMARK, [illegible], [illegible]ILNIKOV, [illegible]

[illegible] of the genesis of [illegible] [illegible]. [illegible] vys. ucheb. zav.; radiofiz. 8 [illegible] [illegible] (MIRA 18:6)

[illegible] [illegible]skiy [illegible] [illegible]cheskiy instit[illegible] pri [illegible]kovskom universitete.

equation

ABSTRACT: It is shown that a nonholonomic system has a singularity in that its equilibrium states cannot be isolated, but form a manifold the dimensionality of which is equal to the number of equations of nonholonomic constraints. This singularity gives rise to zero roots of the characteristic equation. A theorem is formulated concerning the asymptotic stability of the manifold of equilibrium states. The theory is illustrated by means of an example of an axially symmetrical body, bounded from below by a spherical surface, which can rock without sliding in a spherical cup. This report was presented by A. Yu. Ishlinskiy. Orig. art. has: 2 figures and 16 formulas.

Card 1/2

ASSOCIATION: Gor'kovskiy gosudarstvennyy universitet im. N. I. Lobachevskogo (Gor'kiy State University)

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NR REF SOV: 004 OTHER: 002

Card 2/2

NEYMARK, Yu.I.; FEY[illegible], [illegible].1.

One type of bifurcations of relay systems. Izv. vys. ucheb. zav. radiofiz. 7 no.2:358-371 '64 (MIRA 18:1)

1. Nauchno-issledovatel'skiy fiziko-tekhnicheskiy institut pri Gor'kovskom universitete.