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Method of Calculating Information Protection from Mutual Influence of Users in Social Networks

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Abstract: Dynamic models of the information security system (DMoISS) in social networks (SN) are studied and the mutual influence between users (MIBU) was taken into account. Also, the stability of the security system (SoSS) was analyzed.

There is a practical interest in studying the behavior of the of SN information security systems (ISS) using parameters of the MIBU. DMoISS in SN in the mathematical sense of this term is considered. A dynamic system is understood as an object or process for which the concept of state is unambiguously defined as a set of certain quantities at a given moment of time and a given law describes the change (evolution) of the initial state over time.

SN is a set of users and connections between them. Individuals, social groups, organizations, cities, countries can be considered as users. Connections are understood not only as MIBU, but also as the exchange of various resources and activities.

Theoretical study of the dynamic behavior of a real object requires the creation of its mathematical model. The procedure of developing the model is to compile mathematical equations based on physical laws. These laws were formulated in the language of differential equations.

As a result of the research, it is established the influence of parameters of MIBU on parameters of SN ISS. Phase portraits (PP) of the data protection system in the MatLab/Multisim program are determined, what indicates of the SoSS in the operating range of the parameters even at the maximum value of influences.

This study is useful and important from the point of view of information security in the network since the parameters of MIBU significantly affect the protection rate (with different values - up to 100%).

The scientific value of the article lies in the fact that for the first time, on the basis of the study of the developed systems of nonlinear differential equations (NDE), it is shown the quantitative relationship between the parameters of the MIBU and the parameters of the SN ISS, as well as the SoSS is shown based on the study of the nonlinear equation of the second degree.

Index Terms: Social Network, Mutual Influence between Users, Security System, Nonlinearity, Differential Equations, Methodology.

1. Introduction

The subject of our research will not be objects in general, but DMoISS in SN in the mathematical sense of the term. A dynamic system is understood as an object or process for which the concept of state is unambiguously defined as a set of certain quantities at a given moment of time and a given law describes the change (evolution) of the initial state over time. Changes in the status of the ISS are described in the language of NDE. The position of the system status and its criteria are interconnected, which makes it possible to solve NDE under the given criteria.

Descriptions of dynamical systems for different problems, depending on the law of evolution, are also diverse: with the help of differential equations, discrete mappings, graph theory, markup chain theory, and so on. The choice of one of the descriptions determines the specific form of the mathematical model of the corresponding dynamic system [1, 2].

A mathematical model of a dynamical system is considered to be given if the parameters (coordinates) of the system are known, which determine its specific state and the law of evolution. Depending on the degree of approximation to the same system, different mathematical models can be presented.

A Theoretical study of the dynamic behavior of a real object requires the creation of its mathematical model. In many cases, the procedure for developing a model consists in drawing up mathematical equations based on physical laws. Usually, these laws are formulated in the language of differential equations. As a result, the coordinates of the system's state and its parameters are linked to each other, which allows you to start solving differential equations under different initial conditions and parameters.

The closest works in terms of content are [1,2]. These sources consider the quantitative criteria of trust and reputation and their impact on the criteria of the defense system. In [1,2], the DMoISS in SN were studied. In [3] it was investigated the spread of messages. The relationship between the criteria of SN user interaction and the criterion of ISS is shown. In [3-16], the numerical correlations between the criteria of SN users and the criteria of the ISS are not presented. This is the main omission of these works. Therefore, we formulate the main objectives of the research:

- research of the quantitative relationship between the parameters of MIBU and the parameters of information security of the SN.
- research of the stability of the SN ISS against existing influences based on PP.

The importance of the current research is to provide appropriate tools to social media advocates to assess the quantitative impact of MIBU parameters on protection parameters. Observations of the deviation of the defense system's oscillation range and PP will indicate the presence or absence of influences and their strength. This will allow social network defenders to take the necessary actions in relation to the criteria of real-time information defense systems.

2. Literature Survey and Problem Statement

In [1], a nonlinear mathematical model was developed and a model for protecting personal data from user relationships and data transfer intensity in SN was studied. It is concluded that the defense of information increases with the growth of trust. Disadvantage – the relationship between the criteria of MIBU and the criteria of iISShas not been studied.

In [2], a nonlinear mathematical model was developed, and a model of information defense systems was studied depending on the interdependence of SN users and the intensity of message dissemination in a SN. The disadvantage is that the relationship between the criteria of MIBU and the criteria of ISS was not investigated.

In [3], various criteria of SN are analyzed, including MIBU, but the connection between the criteria of MIBU and the criterion of the ISS is not shown.

In [4] it is noted that SN provide us with unlimited opportunities for communication, self-improvement, and business development, but they can also be harmful to both individuals and society. Addiction occurs, the brain gets very tired, eyesight deteriorates, and concentration decreases. In addition, SN can act as a platform for various frauds, criminal activities, and propaganda of extremist ideas. Disadvantage - the relationship between the criteria of MIBU and the criteria of ISS has not been studied.

In [5], the author examines the problem of studying the role and place of SN in society. In fact, the end of the twentieth century became a kind of singularity point for a new social object - the information society. According to the author, the defining elements of this society are computer communications and the Global Information Network. The influence of telecommunication technologies on modern society is carried out in two directions: First, the direct impact of information technology on human consciousness by expanding its cognitive and communicative capabilities, and second, the impact of information technology on the social organization of the network.SN in the global space of the

Internet create a new, subjectively oriented reality designed to reflect the mosaic of opinions, interests and desires of users. Disadvantage - the relationship between the criteria of MIBU and the criteria of ISS has not been studied.

The article [6] considers the phase transition of the connectivity of a SN graph, the connection between friends of the user, and the method of analyzing user influences. The disadvantage is that the relationship between the criteria of MIBU and the criteria of ISS was not investigated.

The article [7] investigates the quantitative indicators between the parameters of information protection and the parameters of its dissemination in SN. The results obtained in the article showed that the protection of personal data is inversely proportional to the volume of information dissemination with the security parameters remaining unchanged. The ISS.

In [8], the main parameters of SN in the context of the progress of modern society are considered. The disadvantage is that the relationship between the criteria of MIBU and the criteria of ISS was not investigated.

In [9], the main mutual influence parameters are shown, but there are no links between the mutual influence parameters and the protection parameters.

Article [10] discusses economic links and their impact on MIBU. The disadvantage is the lack of research on the relationship between the criteria of MIBU and the criteria of the ISS.

The article [11] reveals the features of non-formal and formal forms of education as structural components of lifelong learning. The possibilities of using SN in non-formal and formal education are highlighted. The systems of MIBU are indicated, but the dependencies of mutual influence are not given.

The article [12] considers the phenomenon of SN as a specific phenomenon of organization of society as an object of management. Today, due to its prevalence, richness of functions and complexity of structure, SN have become a significant factor of social organization/disorganization. The article analyzes the approaches of different countries to the use and monitoring of SN for state purposes. The disadvantage is that the relationship between the criteria of MIBU and the criteria of ISS was not investigated.

The article [13] examines information interaction in modern British and Ukrainian electronic communication. Disadvantage – the relationship between the parameters of MIBU and protection parameters is not researched.

Article [14] explores the prospects of using SN as a platform for educational process. The author analyzes, in particular, the relationships and MIBU, but there are no links between MIBU parameters and security parameters.

In [15], it is noted that a social network is a tool for disseminating social legal information. Disadvantage – the relationship between the parameters of MIBU and protection parameters is not researched.

In [16], it is noted that the technology of open-source analysis OSINT is emerging as a means of collecting and initially analyzing modern information flows. The book discusses in detail the mathematical foundations of recognizing information operations based on mathematical statistics, nonlinear dynamics, the theory of complex networks, information and mathematical modeling, and sociology. A separate section is devoted to the application of approaches from the theory of expert evaluation and decision support systems in recognizing information operations. The disadvantage is the lack of research on the relationship between the criteria of MIBU and the criteria of the ISS.

3. The Goal and Objectives of the Research

The purpose of the study is to develop a methodology for protecting information in SN, taking into account MIBU.

The closest in terms of meaning are: [1] - which takes into account the criteria of trust and reputation and their impact on ISS, [2] - the criteria of interaction between users and their impact on information defense systems. The disadvantage is that the relationship between the criteria of MIBU and the criteria of ISS has not been studied. This article is dedicated to solving this issue.

The study will take into account the criteria of connection between the criteria of MIBU and the criteria of the ISS in the design and development of SN ISS.

Main objectives of the research:

- to study the numerical relationship between the criteria of MIBU and the criteria of the ISS.
- to investigate the resilience of social media protection systems against possible influences based on a PP.

Components from were taken into account in the further equations (Table 1).

The article considers dynamic models of the ISS in SN with the study of its specific criteria and criteria of MIBU. The ISS based on fuzzy cognitive imitation is investigated. The study was conducted on the basis of the mathematical doctrine, the concept of fuzzy logic. This allowed us to correctly model poorly defined processes.

To study the DMoISS in SN, systems of NDE are used to reproduce ISS.

The following methods were also used: methods for obtaining solutions to NDE (method of cuts, group search for the corresponding equivalent characteristic equality, etc.); modeling of criteria in MatLab. The SoSS was analyzed by analyzing NDE and a professional complex model developed in MatLab/Multisim.

Table 1. Designation of some components

Symbol notation	Description of symbols
1	2
F	criterion of information security system
Fp	a criterion that reflects the relative quantitative performance of the resilience of the defense system
Jv	a criterion that reflects the importance of the rate of information emanation
Jk	a criterion that reflects the relationship between the amount of information and its leakage
Oij	positive influence between users
Gij	negative impact between users
U	the amount of information in the SN
Jd1	a criterion that reflects the impact of the information security system on information leakage
Jd2	a criterion that reflects the impact of the size of the social network on the information defense system
1	2
H	linear symbol
S	linear symbol
Fo	linear symbol
Uo	linear symbol

4. Proposed Methodology

4.1. Behavior of ISS in SN, Taking into Account the Value of the Defined Criterion - the MIBU

The purpose of the study is to develop a methodology for protecting information in SN, taking into account the MIBU, and since this issue is not resolved in [1-16], we will analyze the dependencies of the study [1, 2].

The study of the graphical component of the linear mechanism of ISS [1, 2] indicates its nonlinearity. Therefore, we introduce nonlinear symbols (2) into the system of equations (1):

$$\begin{cases} \dfrac{dU}{dt} = F_p Z + (J_v + J_K)U \\ \dfrac{dZ}{dt} = (O_{ij} - G_{ij})(O_{ij} + G_{ij}) - U(J_{d2} + J_{d1}), \end{cases} \tag{1}$$

$$\begin{cases} \dfrac{dU}{dt} = F_p Z + (J_v + J_K)U + H_2(U^2) + H_3(U^3) + ... \\ \dfrac{dZ}{dt} = (O_{ij} - G_{ij})(O_{ij} + G_{ij}) - U(J_{d2} + J_{d1}) + S_2(Z^2) + S_3(Z^3) + ..., \end{cases} \tag{2}$$

Dependency graphs (4) are shown in Fig. 2.

The differential of the security function is shown in Fig. 1.

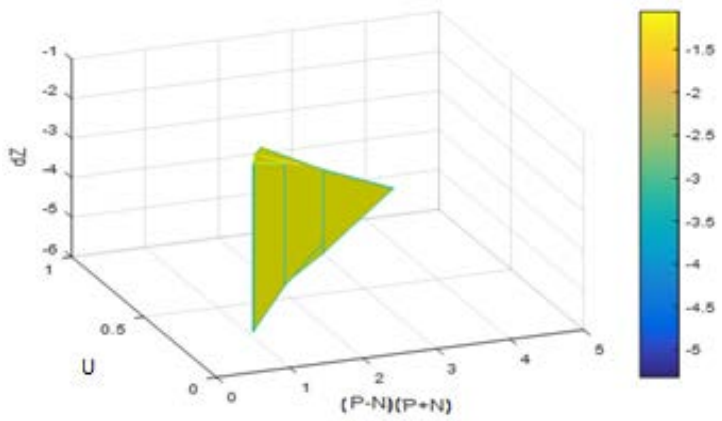


Fig.1. The differential of the security function

The nonlinearity of the ISS is considered to be weak, which implies solving system (2) by an approximate method. An analysis of Figure 1 shows that the defense system is resilient, in line with Lyapunov's findings.

$$U = U_1 + U_2 + U_3 ...,$$

$$Z = Z_1 + Z_2 + Z_3 + ...,$$

Let at

$$dU = 0;\ \frac{dU}{dt} = 0 \text{ and } dZ = 0;\ \frac{dZ}{dt} = 0.$$

$$U = U_0 \sin \omega t;\ \ Z = Z_0 \sin \omega t.$$

We will receive a system of equations:

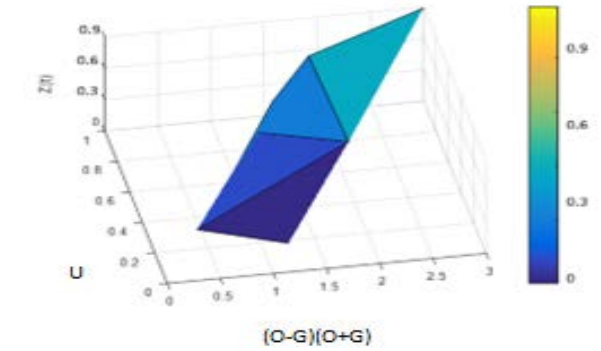
$$\begin{cases} \frac{dU}{dt} = F_p Z + (J_v + J_K)U - H_2(U_0{}^2 \sin^2 \omega t) - H_3(U_0{}^3 \sin^3 \omega t) - ... \\ \frac{dZ}{dt} = (O_{ij} - G_{ij})(O_{ij} + G_{ij}) - U(J_{d2} + J_{d1}) - S_2(Z_0{}^2 \sin^2 \omega t) - S_3(Z_0{}^3 \sin^3 \omega t) - ..., \end{cases} \quad (3)$$

We will rewrite the system and present it in this form (Fig. 2):

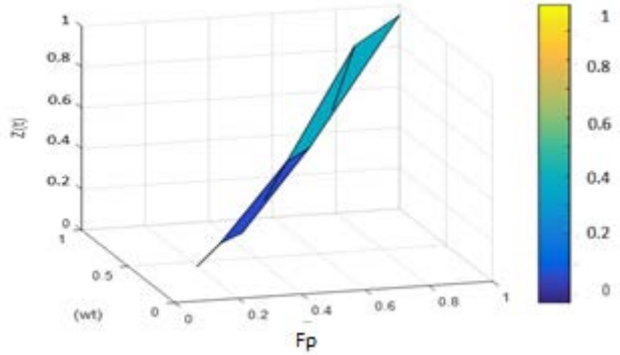
$$\begin{cases} \frac{dI}{dt} = \alpha Z + \beta_1 U - \sum_{k=2}^{\infty} H_k U_0^k \sin^k \omega t \\ \frac{dZ}{dt} = \beta_2 U + \gamma - \sum_{k=2}^{\infty} S_k Z_0^k \sin^k \omega t, \end{cases} \quad (4)$$

where $\alpha = R_p;\ \beta_1 = J_v + J_K;\ \beta_2 = -\left(J_{d2} + J_{d1}\right); \gamma = \bar{O}_{ij} - \frac{G_{ij}}{O_{ij}} + \bar{G}_{ij}$

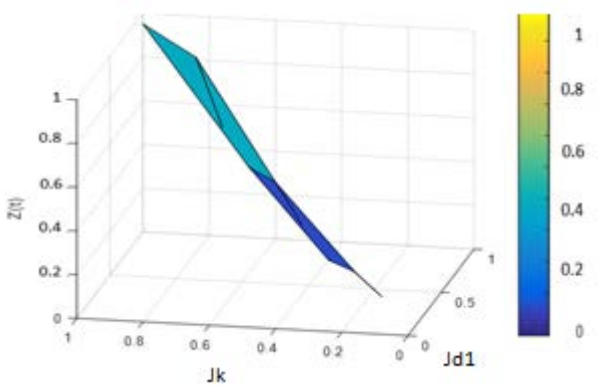
Dependency graphs (4) are shown in Fig. 2.



(a)



(b)



(c)

Fig.2. Dependency graphs (4): a – dependence of F on U and MIBU; b – wt On Fp; c – Jk on Jd1

Then we use the exception method:

$$\frac{dZ}{dt} = \beta_2 U + \gamma - \sum_{k=2}^{\infty} S_k Z_0^k \sin^k \omega t \Rightarrow U = \frac{1}{\beta_2}\left(\frac{dZ}{dt} - \gamma + \sum_{k=2}^{\infty} S_k Z_0^k \sin^k \omega t\right) \Rightarrow$$
$$\Rightarrow \frac{dU}{dt} = \frac{1}{\beta_2}\left(\frac{d^2Z}{dt^2} + \frac{1}{\omega}\sum_{k=2}^{\infty}\left(kS_k Z_0^k \sin^{k-1} \omega t \cos \omega t\right)\right). \quad (5)$$

Dependency graphs (5) are shown in Fig. 3.

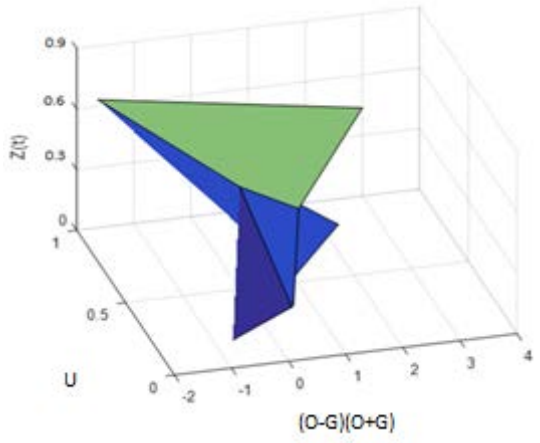
We substitute the values of the first equation (4) with the data from (5):

$$\frac{1}{\beta_2}\left(\frac{d^2Z}{dt^2} + \frac{1}{\omega}\sum_{k=2}^{\infty}\left(kS_k Z_0^k \sin^{k-1} \omega t \cos \omega t\right)\right) = \alpha Z + \frac{\beta_1}{\beta_2}\left(\frac{dZ}{dt} - \gamma + \sum_{k=2}^{\infty} S_k Z_0^k \sin^k \omega t\right) -$$
$$-\sum_{k=2}^{\infty} H_k U_0^k \sin^k \omega t - \beta_2 \sum_{k=2}^{\infty} H_k U_0^k \sin^k \omega t \quad (6)$$

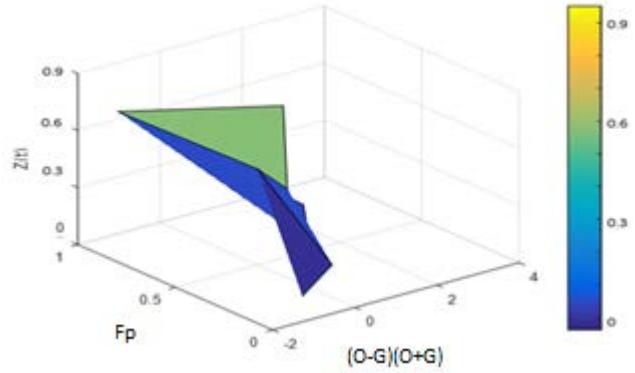
or:

$$\frac{d^2Z}{dt^2} - \beta_1 \frac{dZ}{dt} - \alpha\beta_2 Z = -\frac{1}{\omega}\sum_{k=2}^{\infty}\left(kS_k Z_0^k \sin^{k-1} \omega t \cos \omega t\right) - \beta_1\gamma + \beta_1 \sum_{k=2}^{\infty} S_k Z_0^k \sin^k \omega t -$$
$$-\beta_2 \sum_{k=2}^{\infty} H_k U_0^k \sin^k \omega t. \quad (7)$$

Dependency graphs (7) are shown in Fig. 4.

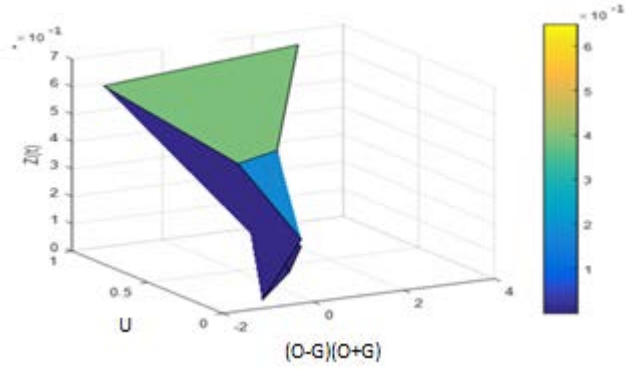


(a)

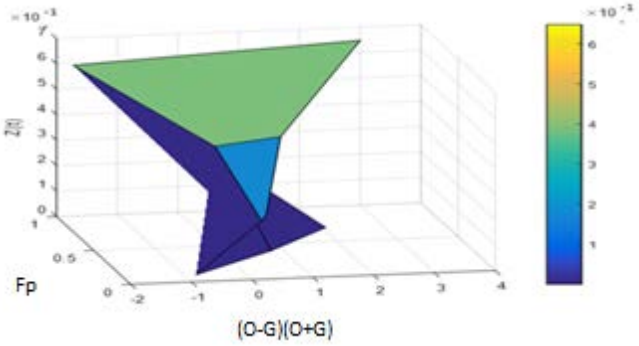


(b)

Fig.3. Dependency graphs (5): a – dependence of F on U and MIBU; b – the F on Fp and MIBU



(a)



(b)

Fig.4. Dependency graphs (7): a – dependence of F on U and MIBU; b – the F on Fp and MIBU

Now find a common solution of the corresponding homogeneous equation:

$$Z'' - \beta_1 Z' - \alpha\beta_2 Z = 0. \tag{8}$$

The characteristic equation has the form: $\lambda^2 - \beta_1\lambda - \alpha\beta_2 = 0$.

Consider the case of a positive discriminant of this equation:

$$D = \beta_1^2 + 4\alpha\beta_2 > 0 \Rightarrow \lambda_{1,2} = \frac{\beta_1 \pm \sqrt{\beta_1^2 + 4\alpha\beta_2}}{2}. \tag{9}$$

Hence:

$Z_{\text{hom}}(t) = c_1 e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} + c_2 e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}$, a common solution of a homogeneous equation.

In order to find the general solution of the inhomogeneous equation, we use the method of variations of arbitrary

stable: $Z_{\text{hom}}(t) = c_1(t)e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} + c_2(t)e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}$, where $c_1'(t), c_2'(t)$ are found from the system (Fig. 5):

$$\begin{cases} c_1'(t)e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} + c_2'(t)e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} = 0 \\ c_1'(t)\dfrac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} + c_2'(t)\dfrac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} = N(t), \end{cases} \tag{10}$$

where:

$$N(t) = -\frac{1}{\omega}\sum_{k=2}^{\infty}\left(kS_kR_0^k\sin^{k-1}\omega t\cos\omega t\right) - \beta_1\gamma + \beta_1\sum_{k=2}^{\infty}\left(S_kR_0^k\sin^k\omega t\right) - \\ -\beta_2\sum_{k=2}^{\infty}\left(H_kU_0^k\sin^k\omega t\right). \tag{11}$$

Dependency graphs (11) are shown in Fig. 5.

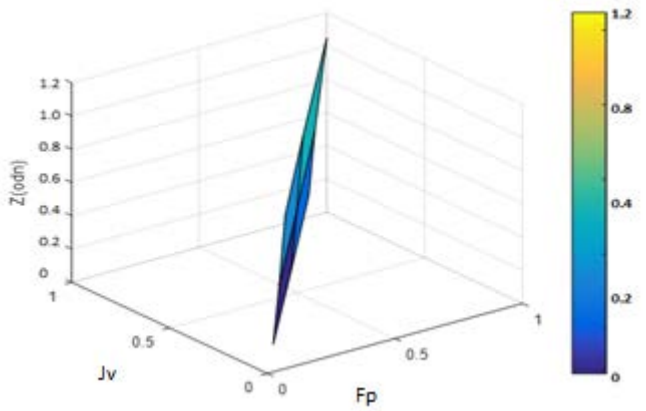


Fig.5. The graph of the dependence (11) of the protection indicator on the coefficient reflecting the influence of the information leakage rate and the coefficient reflecting the influence of information protection measures

From equations (10, 11) we get (Fig. 6):

$$c_1'(t)e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} = -c_2'(t)e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t} \Rightarrow$$
$$\Rightarrow c_2'(t)e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}\left(-\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}+\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}\right) = N(t) \tag{12}$$

or:

$$c_2'(t)e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}\sqrt{\beta_1^2+4\alpha\beta_2} = -N(t), \tag{13}$$

so, we get:

$$c_1(t) = \frac{1}{\sqrt{\beta_1^2+4\alpha\beta_2}}\int N(t)e^{\frac{-\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}dt; \tag{14}$$

$$c_2(t) = -\frac{1}{\sqrt{\beta_1^2+4\alpha\beta_2}}\int N(t)e^{\frac{-\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}t}dt. \tag{15}$$

Considering (13-15) we have:

$$Z(s)=\int_{t_0}^{t}\left(N(s)-e^{\frac{-\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}s}\frac{e^{\frac{\beta_1+\sqrt{\beta_1^2+4\alpha\beta_2}}{2}s}}{\sqrt{\beta_1^2+4\alpha\beta_2}}\right)\mathrm{ds}-\int_{t_0}^{t}\left(N(s)-e^{\frac{-\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}s}\frac{e^{\frac{\beta_1-\sqrt{\beta_1^2+4\alpha\beta_2}}{2}s}}{\sqrt{s\beta_1^2+4\alpha\beta_2}}\right)\mathrm{ds}. \quad (16)$$

Dependency graphs (16) are shown in Fig. 6.

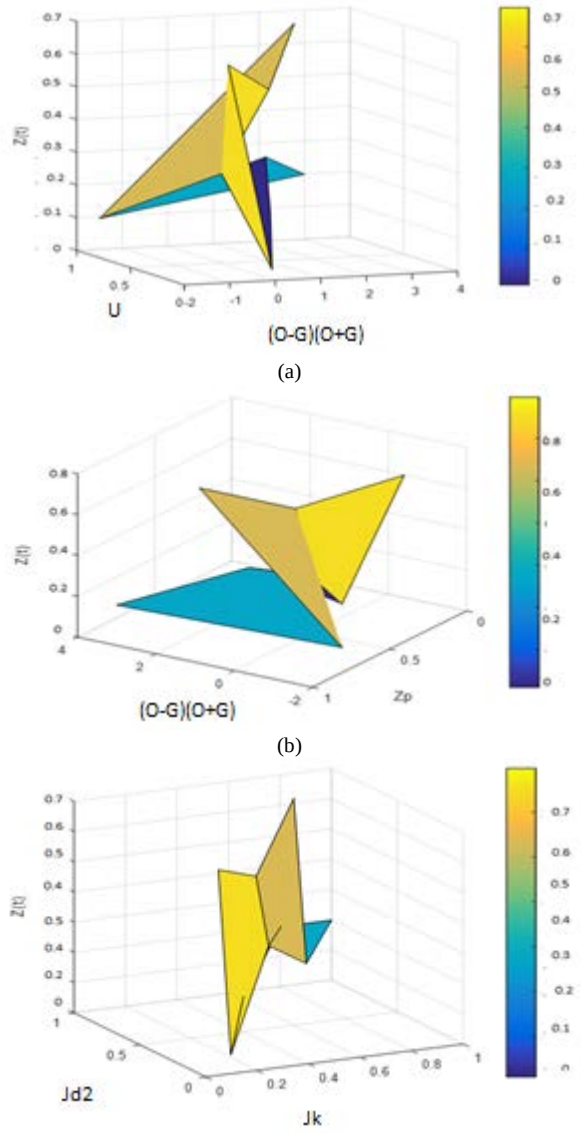


Fig.6. Dependency graph (16): a – F on U and BBK.; b – U on MIBU. and Fp; c – F - on Jd2 and Jk

4.2. Determining the PP of ISS

Initial equation:

$$\frac{d^2Z}{dt^2}-\beta_1\frac{dZ}{dt}-\alpha\beta_2 Z=-\frac{1}{\omega}\sum_{k=2}^{\infty}\left(kU_kK_0^k\sin^{k-1}\omega t\cos\omega t\right)-\beta_1\gamma+\beta_1\sum_{k=2}^{\infty}U_kK_0^k\sin^k\omega t-$$
$$-\beta_2\sum_{k=2}^{\infty}H_kU_0^k\sin^k\omega t. \quad (17)$$

The complex model developed in Matlab/Multisim is shown in Fig. 7.
The PP is presented in the form of an ellipse, indicating about the SoSS.

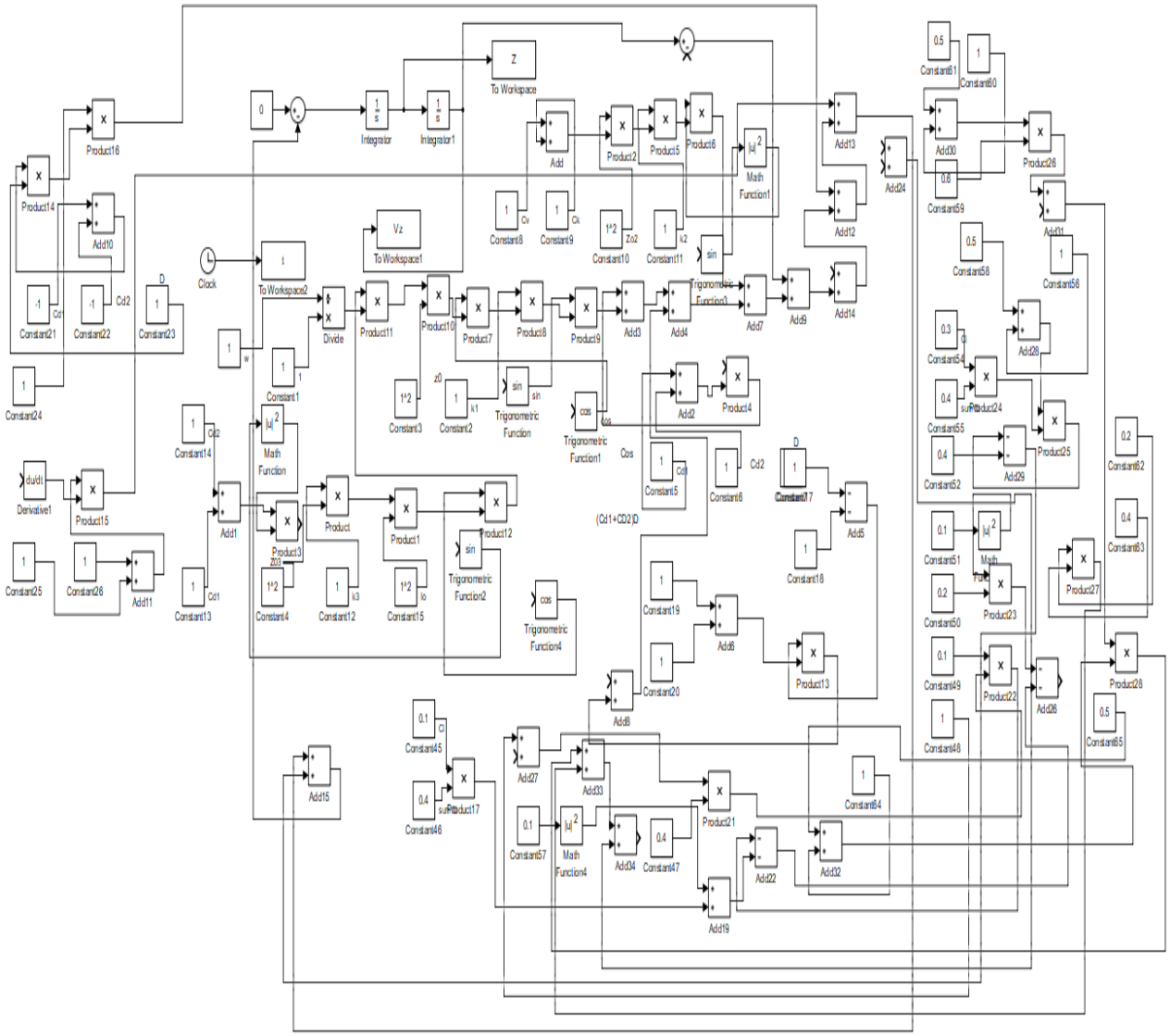


Fig.7. Block diagram of the phase portrait program in the Multisim program, taking into account the influences

The corresponding symbols to Fig. 7.

1/S	Integrator	+ / +	Variable or constant adder
Z	Data transfer element to workspace	/ / X	Multiplication or division of variables or constants
C	Constant	Sin	Trigonometric functions
dU/dt	Derivative	| U|	Ascension to a power or logarithm

The results of the program are presented in Fig. 8, 9, 10, 11.

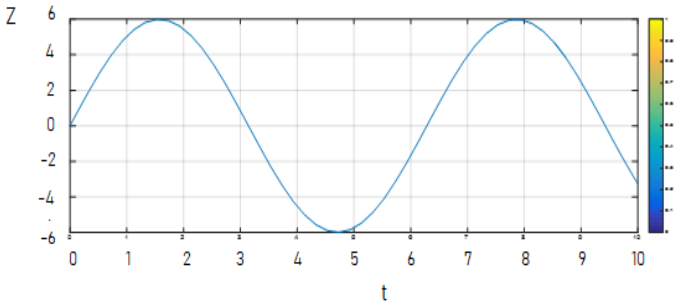


Fig.8. Dependence of Z on t

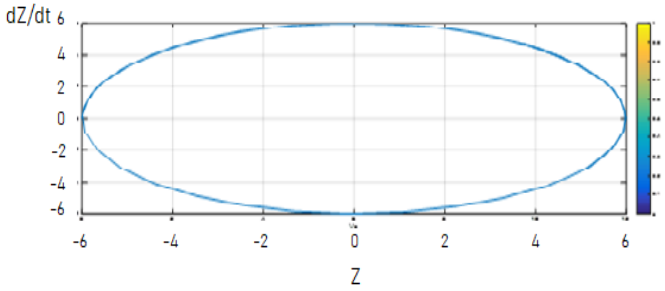
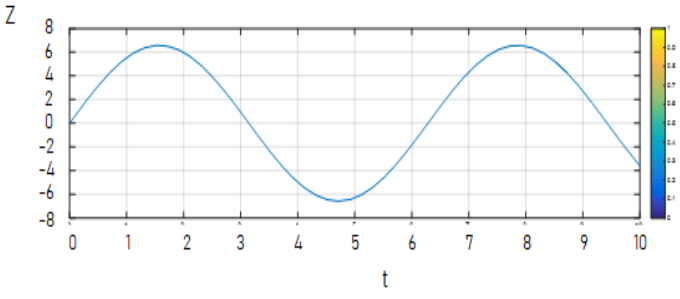
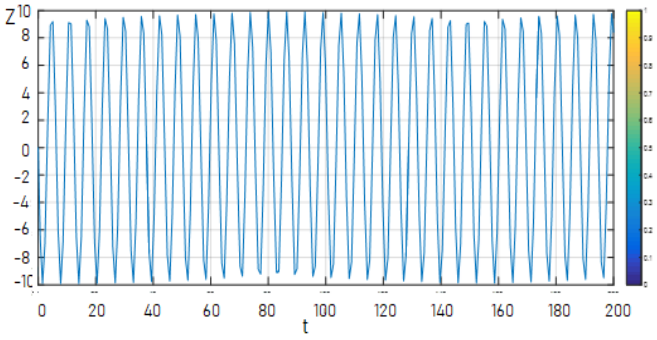


Fig.9. Phase portrait of the ISS, taking into account MIBU

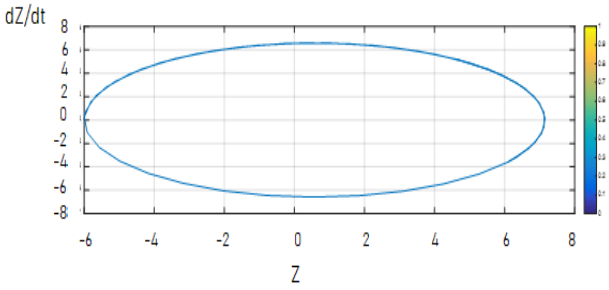


(a)

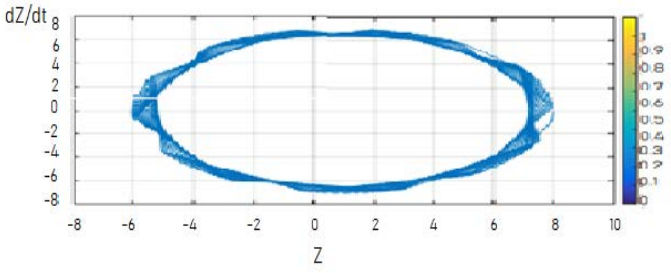


(b)

Fig.10. Dependence of Z on t: a – without influences; b – taking into account influences



(a)



(b)

Fig.11. PP of ISS on trust parameters taking into account influences: a – minimum influences value; b – maximum influences value

The search for the SoSS in a SN showed that the ISS is resistant to influences and MIBU. In other words, the ISS is reliable.

5. Discussion of the Results of the Study of SN ISS with MIBU

The study of DMoISS, taking into account the defined criteria and criteria of MIBU, made it possible to display a numerical assessment of the impact of individual criteria of SN, including the MIBU on the ISS (1, 4, 16) (Figs. 2 -4, 6). The provable mathematical system, the adopted theoretical concepts, which are confirmed by simulation modeling of the ISS with regard to influences, confirm the method.

Consideration of the SoSS (17) (Figs. 8, 10) and the PP (Figs. 9, 11) indicate the stability of the ISS.

The method allows obtaining quantitative criteria for the ISS from the criteria of the SN and the MIBU.

Currently, no other method can obtain such results. It is confirmed that the ISSis resistant to maximum impacts, including MIBU.

Providing defenders of SN with means and methods for calculating the quantitative impact of the criteria of MIBU on the criteria of the ISS is an economic (practical) benefit.

As a result, the necessary criteria of the ISS can be adjusted at the right time.

We see the prospect of research in identifying and using other specific criteria of the SN to identify their impact on the ISS.

6. Numerical Studies

The SoSS is shown in Fig. 1, the differential function is negative. The ISS is stable, Lyapunov's conclusion.

The scale values of the ISS criteria vary from 0 to 1, which indicates the large-scale effect of the criteria of MIBU (Figs. 2a, 3, 4, 6a, 6b).

The scale of the ISS flutter increases with the magnitude of the influences (Figs. 8, 10).

The SoSS is evidenced by the obtained closed curves without bifurcation points (Figs. 9, 11), although the nature of the oscillation’s changes.

The analysis of graphic images shows a significant impact of the SN criterion on the ISS.

7. Conclusions

1. The system of NDE, through analysis, allowed us to obtain quantitative results of the impact of the criteria of a SN and the criteria of MIBU on the ISS of a SN and their visual interpretation. The criteria for the MIBU on the ISS reach one hundred percent, which made it possible to begin analyzing the SoSS

2. The methodology for determining the SoSS in a SN at different values of impacts on the ISS was carried out using a comprehensive model in the MatLab/Multisim program. Interpretation of graphs of fluctuations in the ISS and PP proves the SoSS at different values of impacts.

It can be stated that this study of user interaction with the ISS is successful. Prospect for further research is to identify and use other specific criteria of the SN to identify their impact on the ISS.

Providing defenders of SN with the means and methods for calculating the quantitative impact of the criteria of MIBU on the criteria of the ISS is an economic (practical) benefit.

Tracking the parameters of oscillations in the ISS will allow timely taking appropriate security measures.

For the first time, numerical values have been obtained between the criteria of influence, including the MIBU and the criteria of the ISS, which is the success of this article.

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