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ROBUST METHODS, ALGORITHMS AND MEANS OF DIAGNOSTICS OF STATE OF SEA OIL-GAS CONSTRUCTION

Abstract

Algorithms of improvement of robustness of dispersion estimation, of auto- and mutual correlation functions and coefficients of Fourier series, for application as information signs, which allow in comparison with well-known algorithms to increase the range of trustworthiness of diagnostics of state of sea objects of oil production. For prediction of incipience of damage situations algorithms of interference analysis, which for the series of technical objects provide information about the beginning of invisible changes leading to serious failures are suggested. One of the possible variants is to realize the considered algorithms in hybrid control and diagnostics systems.

1. Introduction. One of the most important objects of sea oil-gas production is sea deep-water stationary platform (SDSP), which are complicated and expensive constructions. For the solution of problem of diagnostics of such objects, many serious difficulties occur. Though that construction costs thousands of dollars, in most cases safe diagnostics does not provide. At the same time the objects of considered class change their state with time. It is clear, that if this process is not under control and corresponding steps are not taken the operation with this object is impossible.

According to all said above, the organization of continuous control of state of the objects of oil-gas contractions is one of the actual problem. At the present paper the creation of hybrid system of diagnostics of sea objects of oil-gas production, including application of wide spectrum of analysis of measurable information methods, which allow compensate defects of some algorithms by using advantages of the others [1,2]. For increasing the reliability of diagnostics besides classical methods non-traditional algorithms are also used which allow to forecast changes of states of diagnose objects [1,3]. The diagnostics system includes besides means of measurement also the blocks of correlation, spectral, positional-impulse analyses and blocks of analysis of interference of hindrance of technological parameters (fig.1).

2. Statement of problem. The aggregate of inner properties of the object at some moment of time t determine the state of this object. The results of diagnostics is a basis for making decision about further exploitation of this object, about repair or technical service. For determination the state of the object it is necessary preliminarily to develop the system of diagnostics, which includes the series of conditions and the main thing - the list of all states of object, which can occur. The problem of diagnostics reduces to recognition of class of states, to which belongs the current state of investigated object. Consequently, to each class of states one should state in correspondence the sets of related information indicators, different from sets of analogous indicators of other states.

For such complicated and bulky constructions as SDSP, the preliminary determination of mentioned classes is impossible. At the same time the solution of this problem could be simplified, if we suppose that initial state of the object is normal and it is required to provide forehanded control and signaling about the changes of the object state. All this information is given to the staff. On fig.1 the system work in this mode. In this case the solution of problem simplified and the possibility to provide reliability and safety of exploitation of these objects arises [2,4].

At the same time for application of well-known algorithms for considered object the necessary conditions does not hold. Such situation is related to the fact, that when these algorithms are developed, the specific features of formation of real signals are not considered and the robustness of required estimations is not provided. There fore the algorithms of spectral and correlation analyses in most cases do not provide the diagnostics of changes of states of these objects at the early stages of defects and at the best cases they give the possibility of revelation of apparent defects [1,3,5].

The analysis of arising damage situations on these objects shows, that hidden defects such as wastage, beats, vibrations, breaks, bends, etc always precede the mentioned damage situations. The early revelations give possibility to predict changing state of investigated object. This is useful for prevention serious failures.

According to all said above, at the present paper the algorithm of improvement of robustness of diagnostics and prediction of states of technical objects is considered.

3. The analysis of interference as diagnostic data carrier. The analysis of damage situations at the sea contractions shows that hidden defects such as wastage, beats, vibrations, breaks, bends, etc., occur before serious failures [2,3]. Their early could be useful for caution and prevention of serious damages [3,4].

Therefore it is very important to take into account the features of formation of model of the total signal $g(t)=x(t)+\varepsilon_1(t)$ which goes from the objects of control:

$$g(i\Delta t)=x(i\Delta t)+\varepsilon_1(i\Delta t)+\varepsilon_2(i\Delta t)+\varepsilon_3(i\Delta t). \qquad (1)$$

Here $x(t)$ is a useful signal, corresponding to measurable technologic parameter. Function $\varepsilon_1(t)$ is due to slow changes of work conditions or characteristics of technological equipment, corrosion, wastage, thief-generation, the properties of raw material, daily changes of load, temperature, etc., $\varepsilon_2(i\Delta t)$ is formed as a result of various factors, for example, breaks, beats, bends, vibrations, etc., $\varepsilon_3(i\Delta t)$ is a combination of various random processes, which arises in sensitive elements, the channels of communication, measurable apparatus and transformers. Thus, for considered class of objects the interference is also a carrier of definite information about hidden changes which do not influence on the object state on the first stage. This interference signal has his own features as distinct from the main signal. So, for example, appearing of hidden changing, which further will be serious defects, even damage situations, very often attend by changing of one of component of hindrance $\varepsilon(i\Delta t)$. And it leads to changing of dispersion D_ε and other characteristics of hindrance $\varepsilon(i\Delta t)$. It is naturally, that usage of such hidden changing for prognostication of hidden defects, which leads to further serious changing in the state of controlled object, have very important in sense.

According to all said above, we will consider algorithms, which allow to predict hidden defects by using analysis of hindrance of states of technical objects. As it is seen from equality (2.1) the beginning of hidden micro-changing could lead to changing of dispersion D_ε and other characteristics of hindrance $\varepsilon(i\Delta t)$. For this aim when correlation between signal $x(t)$ and its hindrance $\varepsilon(i\Delta t)$ is equal to zero or different from zero, the dispersion of hindrance can be determined by following corresponding formulas [5,6]

$$D_\varepsilon = \frac{1}{n}\sum_{i=1}^{n}\left[\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}(i\Delta t) + \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}\left((i+2)\Delta t - 2\overset{\circ}{g}(i\Delta t)\right)\right] \quad (2)$$

$$D_\varepsilon^{*} = \frac{1}{n^{+}(2)}\sum_{v=1^{+}}^{n}\left[\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}(i\Delta t) + \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+2)\Delta t) - 2\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+1)\Delta t)\right], \quad (3)$$

where Δt is a step of digitization, $g(i\Delta t)$ digitize total signal, n is quantity of pair multiplications, n^{+} is quantity of positive multiplications.

Simultaneously for increasing of safe degree of production of controlled objects state we can use other algorithms, which allow to determine quantities, which could be used as informational indication.

4. Algorithms of improvement of robustic of estimations of dispersion of auto- and mutual-correlated functions. The procedure of increasing of safe prediction of state of controlled objects by improving robustic estimations of statistic characteristics, which was used as informational indicators and which can be done by the following way:

1) Firstly, we determine robustic estimation of dispersion of total signal $\overset{\circ}{g}(i\Delta t)$

$$D_g^R = \frac{1}{n}\sum_{i=1}^{n}\overset{\circ}{g}^{2}(i\Delta t) - \frac{1}{n}\sum_{i=1}^{n}\left[\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}(i\Delta t) + \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+2)\Delta t) - 2\overset{\circ}{g}(i\Delta t) - 2\overset{\circ}{g}(i)\Delta t\right] \quad (4)$$

2) Then we determine estimations of correctional function of centralized $g(i\Delta t)$ of signals correspondingly

$$R_{\overset{\circ}{g}\overset{\circ}{g}}(\mu) = \frac{1}{n}\sum_{i=1}^{n}\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+\mu)\Delta t) \quad (5)$$

$$R_{gg}(\mu) = \frac{1}{n}\sum_{i=1}^{n}g(i\Delta t)g((i+\mu)\Delta t) \quad (6)$$

3) After this we determine difference

$$\lambda(\mu=1) = R_{gg}(\mu=1) - R_{\overset{\circ}{g}\overset{\circ}{g}}(\mu=1) \quad (7)$$

and by using division of this difference by the quantity of negative pair multiplications n^{-} we determine mean micro error $\langle\Delta\lambda(\mu=1)\rangle$ of one multiplication $\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+1)\Delta t)$, i.e.

$$\Delta\lambda(\mu=1) = \frac{\lambda(\mu=1)}{n^{-}(\mu=1)} \quad (8)$$

4) By formula

$$\lambda_{\overset{\circ}{x}\overset{\circ}{x}}^{*}(\mu) \approx \left[n^{+}(\mu) - n^{-}(\mu)\right]\langle\Delta\lambda(\mu=1)\rangle \quad (9)$$

determines the quantity of improvement of providing of robosticity $\lambda_{\overset{\circ}{x}\overset{\circ}{x}}^{*}(\mu)$ for different values of μ of estimations of correlational functions.

5) Using quantities $\lambda_{\overset{\circ}{x}\overset{\circ}{x}}^{*}(\mu)$ we determine robustic estimations of correlational functions by formula

$$R_{\overset{\circ}{g}\overset{\circ}{g}}^{R}(\mu) = \begin{cases} R_{\overset{\circ}{g}\overset{\circ}{g}}(\mu) - \left[\lambda_{\overset{\circ}{x}\overset{\circ}{x}}^{*}(\mu) + D_\varepsilon\right] & \text{for } (\mu=0), \\ R_{\overset{\circ}{g}\overset{\circ}{g}}(\mu) - \lambda_{\overset{\circ}{x}\overset{\circ}{x}}^{*}(\mu) & \text{for } (\mu=0) \end{cases} \quad (10)$$

6) Determination of robustic estimations of mutual-correlational functions makes by the help of formula:

$$R^R_{g\eta}(\mu)=\frac{1}{n}\sum_{i=1}^{n}\overset{\circ}{g}(i\Delta t)\overset{\circ}{\eta}[(i+\mu)\Delta t]-\lambda^*_{\overset{\circ}{g}\overset{\circ}{\eta}}(\mu) \tag{11}$$

Thus, estimations $D^R_g, R^R_{\overset{\circ}{g}\overset{\circ}{g}}(\mu), R^R_{g\eta}(\mu)$ calculated by formulas (4), (10), (11) will be robustic and therefore allow to increase the range of impovement of diagnostics of states of controlled objects. Besides, the quantities $\lambda^*_{\overset{\circ}{x}\overset{\circ}{x}}(\mu)$ and $\lambda^*_{\overset{\circ}{g}\overset{\circ}{\eta}}(\mu)$, which determines by formula 9 and describes changing of characteristics of total hindrance, so as dispersion of hindrance D_ε ; and these quantities could be useful for prediction of beginning of hidden defects of corresponding elements of object, and finally it makes the main influence to immediate caution about serious damages.

5. Algorithms of improvement of robustic estimations of coefficints of Fourier series.

As it was indicated above, for diagnostics of states of controlled objects as informational indicators we could use algorithms of robustic required estimations will be more suitable if we will do it by the following way:

1. By formula

$$\langle\lambda_g\rangle=\frac{\sqrt{D_\varepsilon}}{\sqrt{D_g}} \tag{12}$$

determines the quantity of coefficient of mean-algebraic error $\langle\lambda_g\rangle$ of counts $\overset{\circ}{g}(i\Delta t)$.

2. By formula

$$\lambda_g(i\Delta t)=\langle\lambda_g\rangle\overset{\circ}{g}(i\Delta t) \tag{13}$$

determines the absolute error of counts. To these errors we asign the sing of increasing $\Delta\overset{\circ}{g}(i\Delta t)=\overset{\circ}{g}[(i-1)]-g(i)t$.

3. By formula

$$\lambda^{++}_{a_n}(i\Delta t)=\lambda^+_g(i\Delta t)\cos n\omega(i\Delta t),$$
$$\lambda^{--}_{a_n}(i\Delta t)=\lambda^-_g(i\Delta t)\cos n\omega(i\Delta t),$$
$$\lambda^{+-}_{a_n}(i\Delta t)=\lambda^+_g(i\Delta t)\cos n\omega(i\Delta t),$$
$$\lambda^{-+}_{a_n}(i\Delta t)=\lambda^-_g(i\Delta t)\cos n\omega(i\Delta t)$$

determines microerrors of all pair products.

4. By equalities

$$\sum_{i=i_1^{++}}^{N^{++}}\lambda^{++}_{a_n}(i\Delta t)-\sum_{i=i_1^{--}}^{N^{--}}\lambda^{--}_{a_n}(i\Delta t)\approx$$
$$\approx\sum_{i=i_1^{+-}}^{N^{+-}}\left|\lambda^{+-}_{a_n}(i\Delta t)\right|-\sum_{i=i_1^{-+}}^{N^{-+}}\left|\lambda^{-+}_{a_n}(i\Delta t)\right|$$

we verify the possibility of equalizing the sums of microerrors of positive and negative pair multiplications. In case of validity of this equality the traditional algorithms has to be applied.

5. According to the sum of positive and negative microerrors we determine the quantities of improvement of robusticity

$$\lambda_a^R = \left[\sum_{i=i_1^{++}}^{N^{++}} \lambda_{a_n}^{++}(i\Delta t) + \sum_{i=i_1^{--}}^{N^{--}} \lambda_{a_n}^{--}(i\Delta t)\right] - \left[\sum_{i=i_1^{+-}}^{N^{+-}} \left|\lambda_{a_n}^{+-}(i\Delta t)\right| - \sum_{i=i_1^{-+}}^{N^{-+}} \left|\lambda_{a_n}^{-+}(i\Delta t)\right|\right] \quad (14)$$

$$\lambda_b^R = \left[\sum_{i=i_1^{++}}^{N^{++}} \lambda_{b_n}^{++}(i\Delta t) + \sum_{i=i_1^{--}}^{N^{--}} \lambda_{b_n}^{--}(i\Delta t)\right] - \left[\sum_{i=i_1^{+-}}^{N^{+-}} \left|\lambda_{b_n}^{+-}(i\Delta t)\right| - \sum_{i=i_1^{-+}}^{N^{-+}} \left|\lambda_{b_n}^{-+}(i\Delta t)\right|\right] \quad (15)$$

6. Using quantities $\lambda_{a_n}^R$ and $\lambda_{b_n}^R$ we determine robustic estimations of coefficients of Fourier series of obtained estimations:

$$a_n^R = \frac{2}{N}\left[\sum_{i=1}^{N} \overset{\circ}{g}(i\Delta t)\cos n\omega(i\Delta t) - \lambda_{a_n}^R\right] \quad (16)$$

$$b_n^R = \frac{2}{N}\left[\sum_{i=1}^{N} \overset{\circ}{g}(i\Delta t)\cos n\omega(i\Delta t) - \lambda_{b_n}^R\right] \quad (17)$$

It is natural that described procedure of improvement of robustic estimations of coefficients of Fourier series necessary to repeat for all cosinusoids and sinusoids. It is obvious that determination of estimations a_n^R, b_n^R by formulas (16), (17) will arise the safety range of diagnostics of controlled object.

Simultaneously, the quantities $\lambda_{a_n}^R, \lambda_{b_n}^R$, which describe information changings in summing hidrance $\varepsilon(i\Delta t)$, with quantities D_ε, $\lambda_{\overset{\circ}{X}\overset{\circ}{X}}^*(\mu)$ and $\lambda_{\overset{\circ}{g}\overset{\circ}{\eta}}^*(\mu)$ also gives possibility to arise the safety range of prediction of beginning of hidden, impossible for determination by another methods changings.

6. Position-pulse-duration algorithms of prediction of changings of technical objects state.

As it was indicated above, algorithms of correlational and spectral analyses in most cases doesn't provides diagnostics of changings of object state at the earlier stages of defects and in the best cases give possibility to expose these defects only if they are very salient defects [2,6].

The analyses of possibilities of broad applicable algorithms show that for using the prediction in problems it is necessary that its errors will be comparable with errors of measurement facilities.

According to all said above the algorithms of representation of signal $x(t)$ by the help of position-pulse-duration components (PPDC) [2,6]. For this the error of measurement facilities is commensurable with errors of obtained results and the process of analyses relative to noted algorithms is simplified, and it gives possibility of solution of define class of prediction problems.

According to this algorithms, signal $x(t)$ expands to positional signals $q_k(i\Delta t)$ which takes values 0 or 1 and which have weights corresponding to the positions [2,6].

At each cycle the sum of all PPDC will be equal to

$$x(i\Delta t) \approx \sum_{k=0}^{n-1} q_k(i\Delta t) = x^*(i\Delta t) \quad (18)$$

Here at the time moments $i\Delta t$ the difference between real value of initial signal $x(i\Delta t)$ and the sum of signals $q_k(i\Delta t)$ will be equal

$$x(i\Delta t) - x^*(i\Delta t) = \lambda(i\Delta t) \quad (19)$$

For that [2,6] the sum of squares of deviations $\lambda(i\Delta t)$ at the moments $t_0, t_1, ..., t_1, ..., t_n$ will approximately zero, if we take into account its signs. And therefore the condition of providing the necessary adequacy of description of signal [2,6] can be represented in the form

$$\sum_{i=1}^{N} \lambda^2(i\Delta t) \leq \Delta x \tag{20}$$

From inequality (20) it follows that if changing of object state will leads to changings of corresponding parameters of this object more than Δx, then this will reflects on corresponding parameters of $q_k(i\Delta t)$. And at the initial stage of changinds of object state during the process of formation of parameters in the form of combination of corresponding time intervals of PPDC $q_k(i\Delta t)$ of corresponding cycle already will be determined the difference with analogous parameters at the previous cycles.

Thus, using the PPDC give a possibility of providing the detection of even microchangings of initial signals by the way of choosing of value Δx.

The algorithms of processing of $q_k(i\Delta t)$ at the practice is simply realized, because each position-random function take only two values, for this the analysis of random process of PPDC will be similar to analysis of cyclic process. The difference is that in this the time of observation of random process T is considered as a time of one period and it supposed that in the future this process will be repeated. From here for each PPDC can be determined the mean value of period $\langle T_k \rangle$. Then supposing that random signal $x(t)$ submits to normal law of distribution with mathematical expectation which equal to zero, the mean value of zero and unit half periods of signals $q_k(i\Delta t)$ for enough time of observation can be determined by formula

$$\langle T_k \rangle = \langle T_{k1} \rangle + \langle T_{k0} \rangle \tag{21}$$

where

$$\langle T_{k1} \rangle = \frac{1}{\gamma} \sum_{i=1}^{\gamma} T_{k1}, \quad \langle T_{k0} \rangle = \frac{1}{\gamma} \sum_{i=1}^{\gamma} T_{k0} \tag{22}$$

Here γ is the quantity of unit and zero half periods of PPDC during the time of observation; j is order numbers of signals PPDC of q_k-th position.

For enough time of observation T the estimations of periods $\langle T_k \rangle$ of PPDC will be nonrandom values [2,6]. Therefore these estimations can be used as informational identifications for prediction of possibility of passage of object to another, may be undesirable state.

The experimental investigations show that influence of hidrance $\varepsilon(i\Delta t)$ to junior signals $q_k(i\Delta t), ..., q_1(i\Delta t), q_0(i\Delta t)$ have more intensive character. Therefore for these signals the quantity of which is commensurable and is less than

$$\sqrt{D_\varepsilon} > |q_k(i\Delta t)| \tag{23}$$

the time parameters could be replaced by mathematical expectations of its quantity $\bar{n}_{q_k}$ for definite time interval T^*, or total quantity N_{q_k} for time of observation T.

It can be shown that for enough time period of observation T these estimations also will be nonrandom values.

7. Description of block-scheme of hybrid system of prediction.

At the present time in informational systems of control of sea constructions state besides the broad various problems connected generally with measurement, registration, processing of various information; also required the solution of problems of recognition, identification, diagnostics, prediction and etc. [3,5].

The system should provide not only control of current state of object, but also identification and prediction of future behavior of object. As it was above-mentioned, taking into account that solution of this problem with application of known algorithms have some difficulties. At the system on fig.1 was use the worked out at present work methods and algorithms.

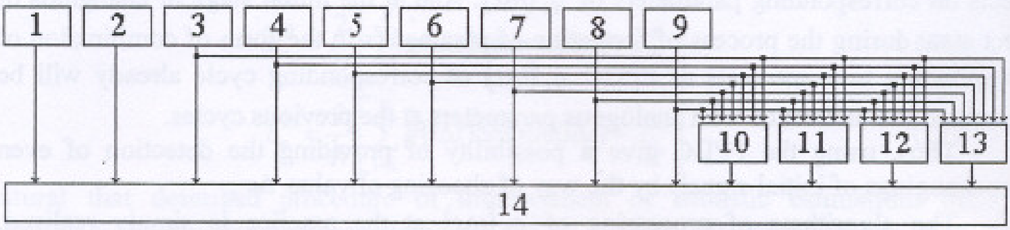

Fig.1. Block-scheme of hybrid system of prediction.

The system contain following blocks: 1. is the block of analysis of information received from specialists about sight observations, hydrolocation, undersea investigations of frogmen; 2. is the block of analysis of information of sensor-bystanders; 3. is the block of analysis signals of inclinometers and accelerometers which fix the slope angles and twisting; 4. is the block of analysis of signals of level meter which determine linear displacements of platform; 5. is the block of analysis of signals of vibration pickup which measure self-frequency of vibrations of elements of construction; 6. is the block of analysis of acoustical-emissive system with piezotransformer; 7. is the block of analysis of signals of strain sensor of deformations of elements of construction. 8. is the block of analysis of signals of speed and direction of mind sensor; 9. is the block of analysis of sensors of pressure at the cave of elements; 10. is the block of diagnoxtics which use algorithms of robastic correlational analysis; 11. is the block of diagnostics which use algorithms of robastic spectral analysis; 12. is the block of diagnostics which use algorithms of position-pulse-duration analysis; 13. is the block of prediction of changings of object state on the base of analysis of hidrance from sensors of technological parameters; 14. is the block of signaling and formulation of information for specialists.

The blocks 1-9 are work in the mode of control of corresponding technological parameters. At the time of measurement, if received results are in the given interval at the corresponding mode of exploitation of object, then these sensors fix normal state, otherwise if technical parameters exceed the limits of given regulation interval, then information gives to service staff or to specialists, which makes corresponding decision all blocks of analyses and control (block 1-9 on fig.1) identically work. Simultaneously these signals of these blocks (except of blocks 1 and 2) also obtained by blocks 10-13.

We consider the application of showed algorithms for prediction and diagnostics of controlled objects in details. At the first variant they applied for the solution of diagnostics problems. At the second variant prediction we mix with diagnostics.

The process of diagnostics in general form can be represented as the aggregate of three components: the set W of possible states of object; the set V of informational identifications, which provide information about state; and the rool of identification F, which compare each element of set W with element of set V and vise versa, each element from V with element of set W.

The element of sets W and V are vector quantities, they are characterized not by several numeric parameters. The rools of identification F are direct and inverse functions, which maps one set into another. The aggregate of signals obtained from objects of diagnostics makes the informational ensuring of system. For formation of V into the system of diagnostics the signals $g(i\Delta t)$ from corresponding sensors should be received for obtaining necessary informational identificators.

At the first variant blocks 10-13 work in training mode at the beginning and by measurable information $g(i\Delta t)$ for different states determine informational identificators, i.e. its robastic dispertional, correlational and spectral characteristics, and corresponding template sets W created.

In the second stage by defined combinations of robastic estimations. I.e. by informational identificators, is considered the possibility of solution on question does the change of object state take place or not; and is solved the problem by its identification. Simultaneously the process of training is continued and in case of new combinations of informational identificators the information about this fact developed in the form of corresponding template sets V.

Third stage id defferent from second by the fact that training stops and at each cycle by obtained combinations of estimations the object state identified. In case of combination of estimations of current state V, which are not coincides with template sets W, the information about changings in state of object is formulated and the problem of information is discussed.

Obtained results of diagnostics shows to specialists, which are these results for decision about further exploitation of object, about repair or technical service.

As it is seen from all said-above the represented on fig.1 variant differs from traditional by the fact, that because of robasticity of estimations, from which sets V and W were wade, the level of reliability of results of diagnostics increasing.

The second mode differs from first by the fact that in process of training except of estimations of total signal the estimations of combination of time intervals of signals $q_k(i\Delta t)$, dispersion of hindrance D_ε, the quantities $\lambda^*_{xx}(\mu), \lambda^*_{g\eta}(\mu), \lambda^R_{a_n}, \lambda^R_{b_n}$, which obtained as a result of analysis of total hidrance $\varepsilon(i\Delta t)$, are also determined and remembered. Naturally, that for stable state of object these quantities would be stable. Otherwise at the beginning of processes of hidden defects some changings of total hindrance occurs, and this reflects to mentioned quantities, which remembered in the form of corresponding template sets. Because of this in the process of exploitation in advance, i.e. earlier that object will change its state, appears possibility to predict and to cause specialists about danger situation.

8. Inference.

The analysis of algorithms, which applied for diagnostics of technical objects, have shown that the main limitation are about the fact that errors of determined estimations by these algorithms depends on changings of hindrance dispersion, on correlation between hindrance and useful signal and on its distribution law and etc. Therefore for various crash situations on many objects the main cause of inadequate decisions by informational systems to coring situations in most cases is about causes mentioned-above. Besides, these algorithms in most cases doesn't provides the diagnostics at the initial stage of arising serious damages and in best case give possibility to defect these damages only on visibly stage.

In considered system the mentioned limitations were removed in definite sense. It could be done using the fact, that for stable state of object if under influence of extension factors the characteristics of signals $g(i\Delta t)$ are changes, then because of improvement of robasticity of desired estimations, the corresponding informational indications are not changes and therefore the degree of accuracy of diagnostics of controlled objects rises. Taking into account that for series of objects the hindrance $\varepsilon(i\Delta t)$ is carrier of information for prediction on earlier stages the hidden changings in the state of controlled object, in system is provided usage of estimations of dispersion of hindrance, of estimations of position-pulse-duration characteristics and also the changing of quantities of provision the robastness of correlational functions and spectral characteristics $\lambda^{*}_{xx}(\mu), \lambda^{R}_{a_n}, \lambda^{R}_{b_n}$ for earlier prediction of possibility of changing of object state. The simplicity and availability of its realization are obvious from the principle of operation of informational system, described on fig.1.

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