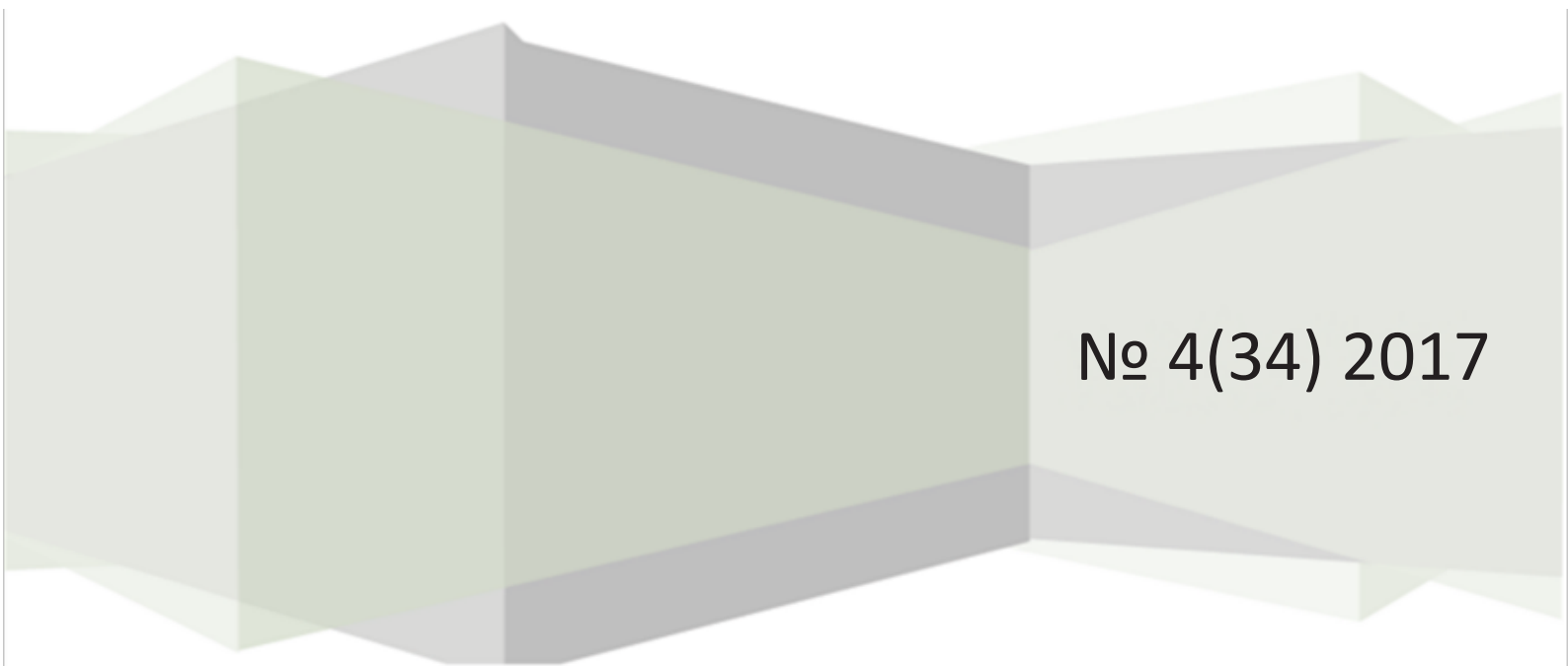


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**Materials of the IX International
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(Advanced Technology, Life Sciences)”**

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Method of Evaluation Using Analytical Models of the Stability of Ventilation Networks of Mines

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Key words and phrases: analytical model; stability index; analysis' aerodynamic characteristics; interrelation; ventilation; mine; scheme.

Abstract: The purpose of the research is to analyze methods for determining the stability indicators of a technical system on models both experimentally and analytically. The research aims to prepare the initial data for calculation on a PC, to construct a scheme of ventilation connections with the numbering of branches, to carry out calculation of aerodynamic characteristics, fan coefficients and their interrelation. Carry out calculation of aerodynamic characteristics, fan coefficients and their interrelation. The resulting analytical and simulation models can be successfully applied for a complete analysis of the stability of the jets of individual independent ventilation areas and small mines. A wider use of models is possible after simplifying the schemes for the proposed methods.

The preparation of the initial data for calculations on a PC is carried out in the same way as in the calculations traditionally [1; 2; 5]. For this purpose, a scheme of ventilation connections is constructed, the numbering of branches is made and all the main parameters (aerodynamic resistance, fan characteristics and their mathematical interrelation, etc.) are indicated. The calculation is carried out in several stages.

The first (preparatory) stage solves the problems of identifying diagonals and defining branches both traditionally and automatically. Due to the fact that only part of the diagonals are dangerous, there is no sense in identifying all the diagonals, but it is enough to determine only the most dangerous, in the first place, the diagonals between the jets of different signs. In the automation of this process, to simplify the analysis, all branches without exception can be adopted as diagonals, which are located between fresh and outgoing jets, which is determined by special numbering of nodes (nodes located on fresh jets are designated by odd numbers, on outgoing jets – even). As a rule, in real networks such branches are diagonals [3; 6].

For each variant, contour, node, and route tables are created, which are lists of branch numbers that form contours, nodes, or routes with the signs assigned to them, connecting the direction of the arrows of the graph with a circuit bypass or with a position relative to the node.

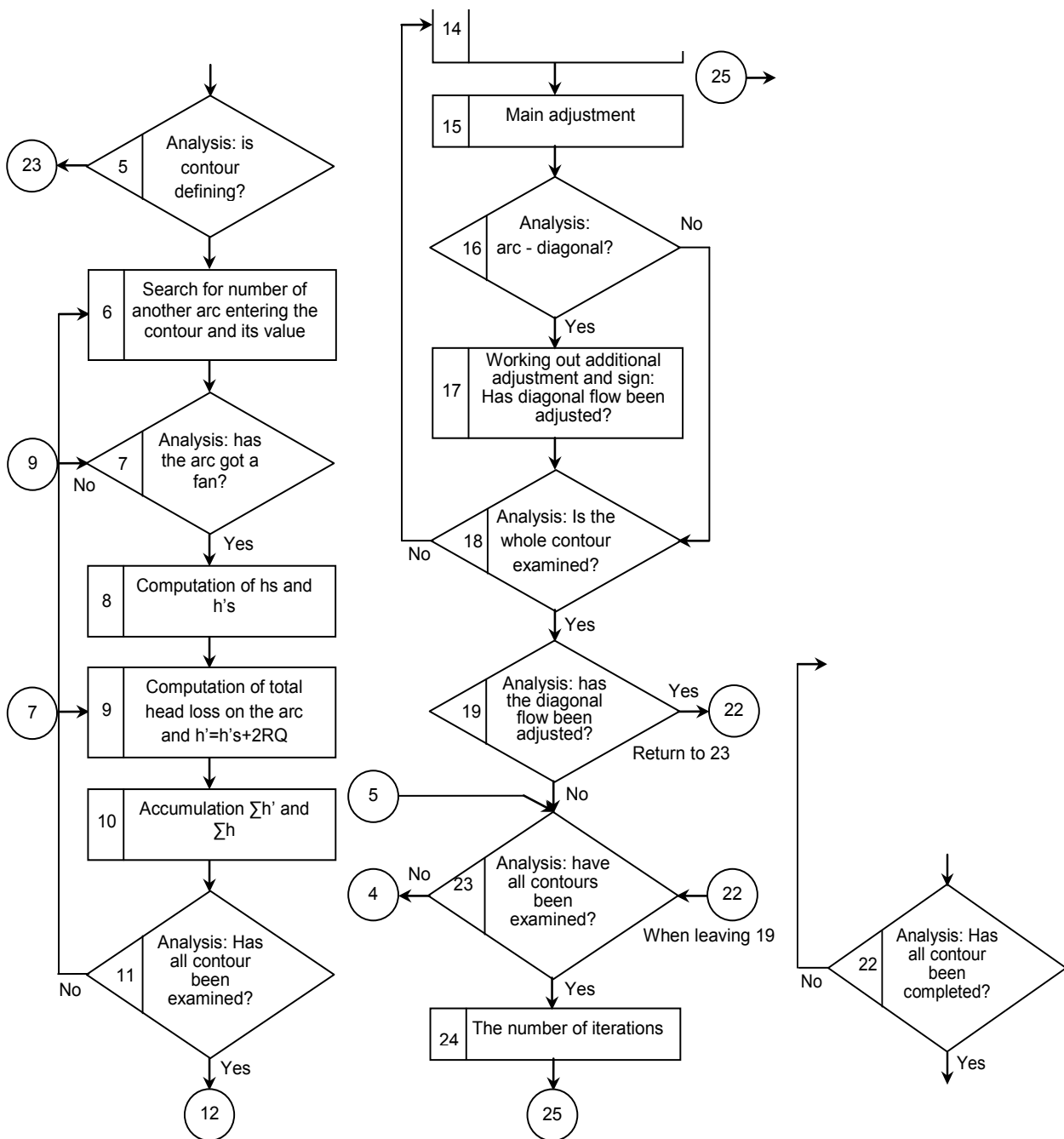


Fig. 1. Analysis of ventilation control on the analytical model

Tables of contours are used for calculation, the tables of nodes and routes are used for control.

At the second stage, the air distribution is calculated taking into account the constraints imposed by the essence of the problem. For this purpose, the method of simple iteration with decomposition of the network into components of limited complexity is most acceptable. Advantages of the method: simple computational scheme; the minimum amount of required

RAM, which is weakly dependent on the network; the minimum number of accesses to external memory.

In addition, the time to solve the problem using methods to improve the convergence is significantly reduced, which makes it possible to successfully use this method to calculate any real networks. All stability calculations are carried out for a particular network condition, defined by known parameters, and for the designed mines – after air regulation on the objects [1; 6].

In the third stage, after calculating the air distribution, the stability index of a certain diagonal is calculated by changing the resistance of a particular branch. For this, the depression of the determining branch is found according to the second law of the networks compiled for the determining contour, its aerodynamic resistance is determined at the moment of absence of air movement in the diagonal, and then the stability index. In this order, the calculations are repeated for each pair of diagonals – the defining branch, embedded in this variant of the contour division [1; 4].

Then, the stability of the other pairs of diagonal, the determining branch, embedded in the second variant of the contour separation is analyzed. The values of the flows, resistances, and contour tables are retained in the calculation after the first stage. Then a program is introduced based on the algorithm of decomposition of a network of limited volume, changing the mode of ventilation.

After initial start-up, it checks the correctness of the input, reads the resistances, debits, etc.

The account and adjustment block is the main one, its scheme is shown in Fig. 1. The results of operation of the block 1 are used in the operation of the block 5, which makes it possible not to calculate the correction AQ for the defining contour.

Block 2 sets the desired value of the flow in the diagonal, using blocks 20, 21 and 22 for this, which introduce the correction $AQ = -Q$ into the streams of the arcs of the defining contour. Blocks 3 and 4 make the necessary cleaning and sending for cycles on all contours and all contour components. Blocks 5 through 12 calculate the correction of the flows in the next loop. Block 13 together with block 26 allows you to analyze the accuracy achieved. Blocks 14–18 perform thread corrections. The block 19 together with the blocks 20, 21 and 22 performs the reconstruction of the predetermined flow in the diagonal. Block 23 transfers control to block 24 if iteration is completed in all directions, and to block 2 – if not completed. Blocks 24 and 25 allow you to complete the computational process until the specified accuracy is reached. Blocks 27, 28 and 30 compute the resistance of the branch being changed and send it to storage. Block 29 calculates the stability factor [1; 6].

Conclusion

The main initial data for the calculation are the scheme of the ventilation joints of the mine, all parameters of each branch and sources of traction. The scheme of ventilation joints of the mine includes not only the main workings, but also all possible ways of air movement through ventilation facilities, and the worked out space. The analysis of ventilation control with the help of analytical models gives the right choice of the ventilation scheme of the mines.

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Метод оценки с помощью аналитических моделей устойчивости вентиляционных сетей шахт

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Ключевые слова и фразы: анализ; аналитическая модель; аэродинамические характеристики; взаимосвязь; вентиляция; показатель устойчивости; схема; шахта.

Аннотация. Цель исследования – анализ методов определения показателей устойчивости технической системы: на моделях, опытным путем, аналитически. Задачи: подготовить исходные данные для расчета на ПЭВМ, построить схему вентиляционных соединений с нумерацией ветвей, а также провести расчет аэродинамических характеристик, коэффициентов вентиляторов и установить их взаимосвязь. Результаты исследования: полученные аналитические и имитационные модели могут успешно применяться при полном анализе устойчивости струй отдельных независимых вентиляционных участков и небольших шахт. Более широкое использование моделей возможно после упрощения схем в соответствии с предлагаемыми методами.

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Evaluation of the Alternating Wind Drift of an Airplane under the Influence of Color Measurement Noise

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Key words and phrases: drift angle; slip angle; Kalman filter; color noise; conjugate gradient method.

Abstract: The aim of the paper is to develop a method for estimating the drift angle of a medium-haul aircraft, which occurs under the influence of a lateral wind, possibly alternating with a Kalman discrete filter (**KF**). To increase the efficiency of the estimation, color measurement noises are taken into account, the matrix conjugate gradient method (**MCGM**) is used in the KF. The obtained methodology provides a higher accuracy of estimation than the traditional Kalman filter algorithm, in the calculation example, the root-mean-square error (**RMS**) of the error is reduced by 4 times.

Introduction

One of the significant perturbations acting on the aircraft in flight is the lateral wind. In accordance with the flight operations manuals, from the beginning of long flights navigators built navigation triangles using data on the airspeed vector and meteorological data about the speed and direction of the wind, directing the vector of the ground speed in a given direction. Automated measurement and partial compensation of the influence of wind drift are also realizable under the action of a gusty and alternating wind, they are relevant for aviation. In the flight-navigation complexes of trunk airplanes, there are regular systems for estimating wind drift based on direct measurements. The methods and implementing systems of indirect estimation of wind drift from signals of satellite and (or) inertial navigation systems with the Kalman filter (**KF**) are also effective and are intended for redundancy of standard systems for integration with them in order to improve the reliability and (or) accuracy of measurements, or even for input into standard systems. The efficiency of the KF for the processing of white noise measurement signals is known from numerous works.

To improve the accuracy of estimating the wind drift, it is rational to use a KF built with the allowance for color measurement noise. Below we use a KF based on the matrix conjugate gradient method for the wind drift estimation algorithm [4], a method published in 2016 and proved effective in processing signals with measuring color noise.

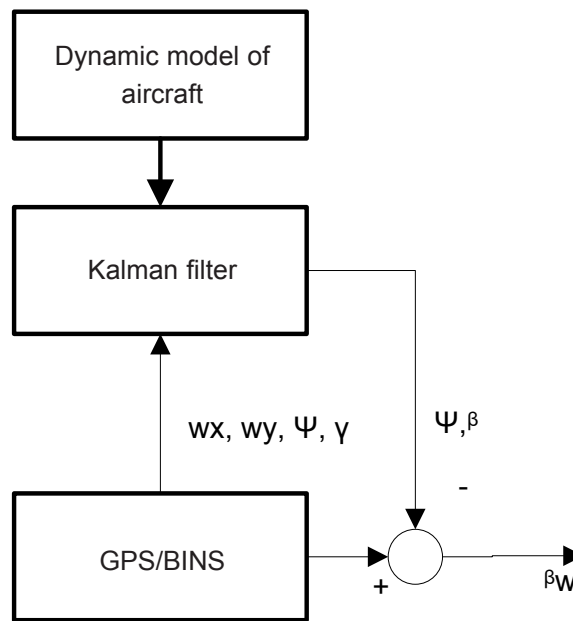


Fig. 1. Block diagram of the wind angle estimation algorithm

Mathematical model and model of measurement of the Kalman base filter

We apply the system of differential equations of the lateral motion of the aircraft as a control object [1; 2], in the operator matrix form, having the form:

$$\dot{x} = Ax + w, \quad (1)$$

$$\dot{A} = \begin{bmatrix} \overline{Z^\beta} & \sin \alpha & \cos \alpha & \frac{g}{V} \cos \vartheta & 0 \\ \overline{M_x^\beta} & \overline{M_x^{\omega_\delta}} & \overline{M_x^{\omega_y}} & 0 & 0 \\ \overline{M_y^\beta} & \overline{M_y^{\omega_\delta}} & \overline{M_y^{\omega_y}} & 0 & 0 \\ 0 & 1 & -tg \vartheta & 0 & 0 \\ 0 & 0 & \sec \vartheta & 0 & 0 \end{bmatrix}, \quad (2)$$

$$x = [\beta \quad \omega_\delta \quad \omega_y \quad \gamma \quad \psi]^\top, \quad (3)$$

where $\overline{Z^\beta}, \overline{Z_x^{\omega_x}}, \overline{Z_\beta^{\omega_y}}, \overline{Z_\beta^\gamma}, \overline{M_x^\beta}, \overline{M_x^{\omega_x}}, \overline{M_x^{\omega_y}}, \overline{M_x^{\delta_y}}, \overline{M_y^\beta}, \overline{M_y^{\omega_x}}, \overline{M_y^{\omega_y}}, \overline{M_y^{\delta_i}}$ are coefficients of the mathematical model of motion of medium-range aircraft; γ is bank angle; ψ is yaw angle of aircraft; ω_x, ω_y are angular velocity of rotation of the aircraft around the axes Ox, Oy .

The measurement model for the vector y is described by equation:

$$y = Hx + v, \quad (4)$$

$$H = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}. \quad (5)$$

Algorithm for measuring the drift angle

The drift angle β_W can be obtained as the difference between the path angle Ψ and heading angle taking into account yaw angle ψ and the slide angle β :

$$\beta_W = \Psi - \psi + \beta. \quad (6)$$

The drift angle β_W is determined by the KF using equations 1–7, the algorithm illustrated in Fig. 1.

Color measurement noise problem

A discrete system with measurement errors of the type of colored noise is represented by equations:

$$\begin{aligned} x_{k+1} &= \Phi_{k+1,k} x_k + w_k, \\ y_k &= H_k x_k + v_k, \\ v_k &= M_k v_k + \zeta_k. \end{aligned} \quad (7)$$

$$\begin{aligned} E(w_k) &= E(\zeta_k) = 0, \\ E(w_k w_k^T) &= Q_k, \\ E(\zeta_k \zeta_k^T) &= R_k. \end{aligned} \quad (8)$$

where x_k is state vector, Φ_k is state transition matrix, w_k is process noise vector, y_k is measurement vector, H_k is measurement matrix, v_k is measurement error, M_k is color noise transition matrix, ζ_k is white noise error, $E(x)$ is expected value x , Q , R are covariance matrices, respectively, w_k and ζ_k .

The system and equations of measurement cannot directly apply to the standard KF, because the measurement error has a color noise. For the application of KF with color measurement noise, the state vector can be supplemented with color measurement errors. In this case, the system of equations (7), without taking into account the measurement error in the extended system, takes the form:

$$\begin{aligned} x_{k+1}^a &= \Phi_{k+1,k}^a x_k^a + w_k^a, \\ y_k &= H_k^a x_k^a, \end{aligned} \quad (9)$$

where

$$\begin{aligned} x_k^a &= \begin{bmatrix} x_k^T & v_k^T \end{bmatrix}^T, w_k^a = \begin{bmatrix} w_k^T & \zeta_k^T \end{bmatrix}^T, \\ \Phi_k^a &= \begin{bmatrix} \Phi_k & 0 \\ 0 & M_k \end{bmatrix}, Q_k^a = \begin{bmatrix} Q_k & 0 \\ 0 & R_k \end{bmatrix}, \\ H_k^a &= \begin{bmatrix} H_k & I \end{bmatrix}. \end{aligned}$$

The standard KF equation with their allowance will take the form:

– extrapolation phase:

$$\begin{aligned} \hat{x}_{k+1}^{a-} &= \Phi_k^a \hat{x}_{k-1}^{a+}, \\ P_k^- &= \Phi_k^a P_k^+ \Phi_k^{aT} + Q_k^a; \end{aligned} \quad (10)$$

– correction phase:

$$\begin{aligned} K_k &= P_k^- (H_k^a)^T [H_k^a P_k^- (H_k^a)^T]^{-1}, \\ \hat{x}_k^{a+} &= \hat{x}_k^{a-} + K_k (y_k - H_k^a \hat{x}_k^{a-}), \\ P_k^+ &= (I - K_k H_k^a) P_k^-. \end{aligned} \quad (11)$$

Covariant innovation $H_k^a P_k^- (H_k^a)^T$ is the number, P_k^- that converges, so updating the state measurement \hat{x}_k^{a+} is somewhat divergent. For this reason, we choose the matrix method of the conjugate gradient to find the inversion from $H_k^a P_k^- (H_k^a)^T$.

Algorithm of the conjugate gradient method

The conjugate gradient method is used to solve a linear system, the matrix conjugate gradient method (**MCGM**) is its extended form intended for searching for an inverse matrix. MCGM is used to solve the matrix equation (12):

$$AC = I, \quad (12)$$

where C is inverse matrix for A .

Prior to the iteration process, the initial approximation C_0 is chosen:

$$R_0 = I - AC_0, \quad (13)$$

$$P_1 = P_0. \quad (14)$$

The k-th iteration of the method

The k-th iteration of the solution is defined as

$$\begin{aligned} \alpha_k &= \frac{\|R_{k-1}\|^2}{P_k (AP_k)}, \\ C_k &= C_{k-1} + \alpha_k P_k, \end{aligned}$$

$$\begin{aligned}
 R_k &= I - AC_k, \\
 \beta_k &= \frac{\|R_k\|^2}{\|R_{k-1}\|^2}, \\
 P_{k+1} &= R_k + \beta_k P_k.
 \end{aligned} \tag{15}$$

A stop criterion

Since the minimized functional is quadratic, the process must respond to the n -th iteration, when $\|R_{k-1}\| < \varepsilon$. After obtaining the matrix C , the inverse matrix A is determined. When using MCGM for search of $H_k^a P_k^- (H_k^a)^T$ in (12) we assume that $A = H_k^a P_k^- (H_k^a)^T$, then $C = [H_k^a P_k^- (H_k^a)^T]^{-1}$.

Innovative covariance adaptation of the Kalman filter

The matrix of the transition of the color model of the measurement error to the noise variance of the white Gaussian type cannot be known. Therefore, the adaptation must be applied to the filter. We select the innovative covariance of the adaptation logic and its equations in the following way (11).

Predicting a state:

$$\hat{x}_k^{a-} = \Phi_k^a \hat{x}_{k-1}^{a+}. \tag{16}$$

Calculation of innovation:

$$\eta_k = y_k - H_k^a \hat{x}_k^{a-}. \tag{17}$$

Assessment of innovative covariance:

$$\bar{C}_k = \frac{1}{N-1} \sum_{i=k-N+1}^k \eta_i \eta_i^T. \tag{18}$$

Calculation of the error covariance multiplier α :

$$\alpha_k = \max \left\{ 1, \frac{\text{trace}(\bar{C}_k)}{\text{trace}(H_k^a P_k^- (H_k^a)^T)} \right\}. \tag{19}$$

Calculation of error covariance:

$$P_k^- = \alpha_k \left(\Phi_k^a P_k^+ \Phi_k^{aT} + Q_k^a \right) \tag{20}$$

Simulation results

We consider a linear, stationary mathematical model of an airplane as a control object with a lateral stabilization system of the fifth order, with the navigation system BINS/GPS giving signals of angular velocities ω_x , ω_y and angles of drift, yaw, path, and heading for use in estimating the

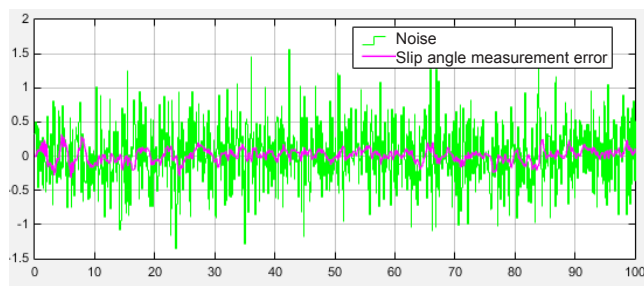


Fig. 2. Graph of noise and the slip angle measurement error

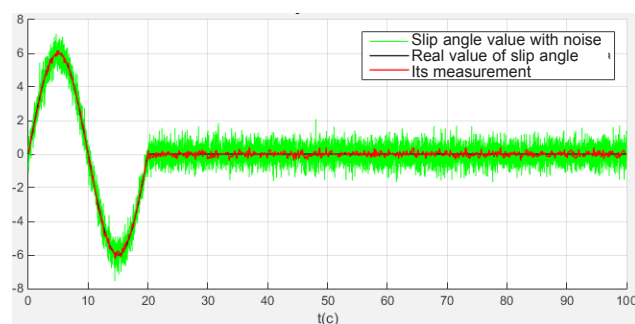


Fig. 3. Slip angle and its measurement using a standard KF

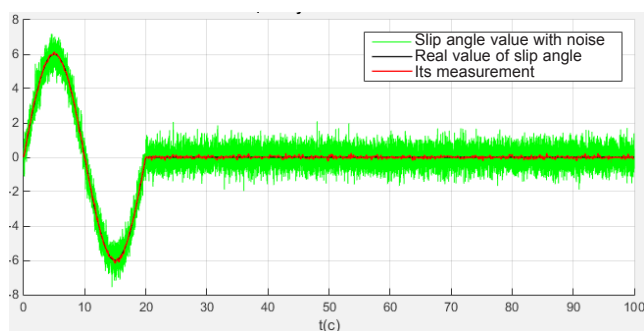


Fig. 4 Slip angle and its measurement using a KF MSGM

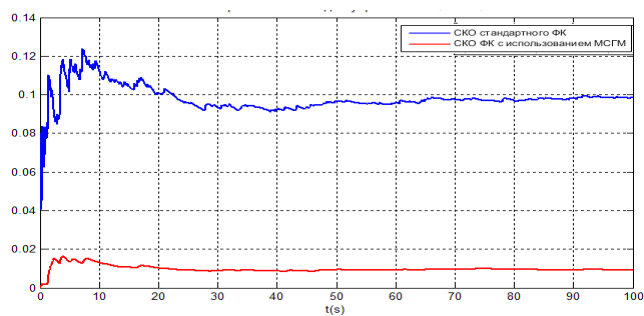


Fig. 5. Comparisons of standard deviation between a standard KF and KF MSGM

slip angle and drift angle to KF. The estimation and measurement error in the slip angle with measuring color noise is illustrated in Fig. 2–5.

As can be seen from the graphs, under the influence of color measurement noise, the KF MCGM gives us greater accuracy than the traditional KF.

Conclusion

A standard KF and a KF MCGM were constructed to estimate the slip angle and the drift angle of the aircraft using signals from the BINS/GPS as measurements. In the case of errors in measuring the type of color noise, the matrix conjugate gradient method was used to calculate the covariant innovation of the Kalman filter. The simulation results showed that, the KF MCGM increased the accuracy of estimating the angles of slip and drift of the aircraft, compared to the standard KF.

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**Оценка знакопеременного ветрового сноса самолета
при воздействии цветного шума измерений**

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Ключевые слова и фразы: метод сопряженного градиента; угол скольжения; угол сноса; фильтр Калмана; цветной шум.

Аннотация: Целью работы является развития метода оценивания угла сноса средне-магистрального самолета, возникающего под влиянием бокового ветра, возможно знакопеременного, с помощью дискретного фильтра Калмана (ФК). Для повышения эффективности оценивания учитываются цветные шумы измерения, в ФК используется метод матричного сопряженного градиента. Полученная методология обеспечивает более высокую точность оценивания, чем традиционный алгоритм калмановской фильтрации, в расчетном примере среднеквадратическое отклонение ошибки уменьшается в 4 раза.

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Influence of Building Materials on the State of Ecology

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Key words and phrases: chemical element, concentration, environment, pathology, biological experiment.

Abstract: The article explores the features of using various finishing materials in interiors of public and residential buildings. The analysis of harmful or hazardous substances emitted by interior materials is made. A large number of toxic substances are found in low-quality, cheap construction materials. For the purposes of environmental safety, it is necessary to use polymer materials and products that meet the requirements of the current GOSTs and specifications and have satisfactory sanitary and hygienic characteristics.

Sanitary and hygienic standard, which assesses the danger (or safety) of building materials is the maximum permissible concentration (**MPC**). MPC is understood as such a maximum concentration of chemical elements and their compounds in the environment, which, with daily effect for a long time on the human body, does not cause pathological changes or diseases established by modern methods of research at any time of life of this and subsequent generations.

The first MPCs were established from the calculation that there is certain limiting value of the harmful factor below which staying in a given zone (or using the product) is completely safe. Therefore, the MPC values established on the basis of experimental data on toxicity and other attendant circumstances are not the same in different countries and are periodically reviewed [1].

At present, calculation methods, results of biological experiments, as well as materials of dynamic observations of the health of persons exposed to harmful substances are used to establish MPCs. Especially, recently, methods of computer modeling, predictions of biological activity of new substances, and biotesting at various sites have been widely used.

Toxicity of building materials is assessed by comparing their composition with the maximum permissible concentrations of toxic substances and elements. The hazard class, the composition of harmful substances and their quantitative content are of paramount importance. From the point of view of toxicity, the main source of environmental hazard in residential buildings are polymer building materials. Specialists of one of the environmental companies in Moscow for the eight years of their work have produced more than 3,500 measurements of indoor air quality, and 67 % of all cases have detected harmful chemicals from which construction materials originated, 30 % of which were construction materials, and in 70 % were finishing materials [2].

Phenol is dangerous because it is volatile, and can evaporate at normal temperatures. In the form of vapors or dust, it penetrates the body through the respiratory tract, mucous membranes and skin and causes disturbances in the functions of the nervous system. Phenol belongs to the category of serum alcohols required in the manufacture of many building materials that are part of linoleum and floor coverings, as well as bitumen, resins, tar, lacquers, synthetic and polyester paints.

Formaldehyde is generally listed as a carcinogen; it negatively affects genetics, reproductive organs, respiratory tract, eyes, and skin. Has a strong effect on the central nervous system and is the first member of the homologous series of aliphatic aldehydes.

The sources of formaldehyde are some types of particle board materials, polymeric materials for finishing the floors, interior decoration of walls, decorative plastic, decorative plywood, some varnishes and paints, all painted things and surfaces

Materials based on urea resins, such as particle boards release formaldehyde in 2.5–3 times and higher than the permissible level. In a free state, formaldehyde is an irritating gas with a general toxicity. It suppresses the action of a number of vital enzymes in the body, leads to diseases of the respiratory system and the central nervous system

Materials based on phenol-formaldehyde resins (**PFR**), such as wood fiber, particle board and cellulose fiber release formaldehyde in 2.5–3 times and more than the permissible level. Concentration of formaldehyde in residential premises equipped with furniture and building structures containing EAF may exceed the MPC by 5-10 times. A particularly high excess of the permissible level is noted in prefabricated panel houses. The toxicity of the released substances largely depends on the brand of resin [3].

Polyvinylchloride materials (**PVC**) are products are made of polyvinyl chlo-ride – a dangerous poison that can destroy the nervous system and cause cancer. The release of vinyl chloride into the environment is enhanced even with a slight heating. In the apartment, it is most often found in the form of linoleum (excluding some expensive brands), vinyl wallpaper, plastic window frames, and plastic toys.

PVC linoleum has a general toxicity, and during operation they can create on their surface a static electric field of up to 2,000–3,000 V/cm. When using polyvinyl chloride tiles in the air of the premises, phthalates and brominating substances are found. Phthalates are added to floor coverings to add flexibility and elasticity to them, they are released when liquids get into them.

The styrene-containing rubber linoleums release styrene. Styrene is a highly toxic substance that is released continuously into the environment for a long time. The phenomenon of evaporation of styrene occurs as a result of the process of depolymerization of polystyrenes and expanded polystyrenes (foams). MPC (the maximum permissible concentration of the average daily) in the Russian Federation is 0.002 mg/m³ [4].

As for paint and varnish materials, it should be noted here the release of aromatic hydrocarbons. When examining more than 50 brands of paints from different manufacturers, in 31 % of cases, experts noted the isolation of toluene and xylene used as solvents. Toluene irritates the eyes, with regular exposure, functional disorders of the nervous system are noted, and xylene, which is also an additive to pesticides, causes irreversible skin diseases. The most dangerous are solvents and pigments (lead, copper, etc.). In addition, paint and varnish coatings pollute the air environment of residential premises with toluene, xylene, butyl methacrylate, etc.

Isocyanurates are dangerous toxic compounds that penetrate into the living quarters of polyurethane materials (seals, joints, etc.). The harmful effects of isocyanurates, leading to asthma, allergies and other diseases, is enhanced by heating polyurethane materials with

sunlight or heat from heating batteries.

Another environmental threat, emanating from polymeric building materials is fire-fighting substances – fire retardants contained in plastics with low combustibility. The compounds of harmful substances that are released from them cause allergy, bronchial asthma, etc. The detailed studies have shown that polymeric building materials can be a source of release of harmful substances such as benzene, toluene, xylene, amines, acrylates, etc.

When choosing construction or finishing materials, you should carefully study the manufacturer's firm, quality certificates. Practice shows that, a large number of toxic substances are in low-quality, cheap building materials, whose manufacturers save on production technology [5].

In construction for reasons of environmental safety, only those polymeric materials and products (facing coatings, adhesives, mastic, etc.) that can meet the requirements of the current GOSTs and specifications and can be used are satisfactory.

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Влияние строительных материалов на состояние экологии

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Ключевые слова и фразы: биологический эксперимент; концентрация; окружающая среда; патология; химический элемент.

Аннотация: Цель статьи состоит в рассмотрении особенностей применения различных отделочных материалов в интерьерах зданий общественных и жилой застройки; Используются расчетные методы, результаты биологических экспериментов, широко используются методы компьютерного моделирования.

В результате, большое количество токсичных веществ находится в низкокачественных, дешевых строительных материалах. В целях экологической безопасности нужно применять полимерные материалы и изделия, которые отвечают требованиям действующих ГОСТов, ТУ и обладают удовлетворительными санитарно-гигиеническими показателями.

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UDK 69

Features of Construction of Houses in Tropical Countries

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Key words and phrases: bioclimatic housing; blocked houses; multifunctional residential complex; comfortable living environment; climatic zones; rational planning decisions; through ventilation; system of sun protection.

Abstract: The article deals with the peculiarities of the layout of residential buildings in hot climate. Planning types in tropical countries are formed historically. The use of traditional planning methods in modern design allows increasing the economy of housing, while maintaining comfortable living conditions. Based on the identified planning methods that are most effective for use in the natural conditions of tropical countries, it is possible to create a standard database for the design of residential buildings of different floors, taking into account local conditions.

The housing design has a great influence on people, their health, culture, and worldview. Therefore, an important task for the architect is to create a comfortable living environment.

The practice of housing design always required solving the problem of not only shaping the appearance of houses, but also creating a comfortable internal space that would protect a person from the adverse effects of the natural environment. Especially relevant these problems are in a hot climate.

Typical features of the layout of residential buildings in a hot climate have developed historically. The inner courtyard with a bypassed covered gallery creates an additional shaded space, prevents the sunlight from getting directly to the walls of the house, which reduces their overheating. A greened courtyard symbolizes life and is a protected space with an improved microclimate of a bunch between various rooms of the house and nature.

The most effective form of housing is a bioclimatic house. The climatic conditions affect a person in a complex manner [4]. Let me consider the features of the formation of housing architecture in the context of the characteristics of climatic zones. In this case, climatic zones – hot dry climate and hot humid climate - are of interest.

For zones with a hot dry climate, a closed recessed form of the building, oriented in the opposite direction from the sun, is typical. The plan of the building should be compact; the living quarters should be opened in the shaded courtyard. These features include minimizing the number of light apertures; massive enclosing structures; a complex system of natural ventilation combined with the collection and storage of rainwater; accumulation of cold and heat; use of geo-active and geothermal power systems [4, p. 120–121].

In areas with a hot humid climate, the most common type is a building that is open to the environment and elevated above the ground. They are characterized by the following features: the use of lightweight structures; organization of a simple system of natural ventilation; multilayered sun-protective shell; abundant gardening and flooding of intra-forest spaces; use of geo-energetic elements and rainwater harvesting systems [4, p. 121].

For multi-storey buildings, the following solutions are of principle importance: giving the maximum functionality to the apartment areas (balconies, loggias, terraces), which allows solving the problem of openness – the closeness of the internal space; improvement of enclosing structures [5].

Rational planning solutions for housing for tropical countries were developed by the famous Brazilian architect Oscar Niemeyer. He paid attention to the design of individual low-rise buildings, as well as multi-storey residential buildings [7].

While observing the cost-effectiveness of decisions, Oscar Niemeyer always strived to create spatial diversity and comfort in specific conditions of a hot and humid climate. He used the following planning techniques.

Niemeyer places kitchens and other servicing rooms in the depth of the building. They are illuminated with the help of a second light. Ventilation is made through special exhaust chutes. Bathrooms are designed combined. Living rooms have elongated proportions in order to maximally remove tenants from external walls. Loggias are widely used. Therefore, Niemeyer designs the walls of the house with solid glazing and additional sun protection. Loggias, thus, protect the internal premises from overheating.

Niemeyer attached particular importance to pillars on the open ground floor. With the participation of engineers, he developed designs that increase the stairwell. The building raised on the supports has additional airing in the lower level [7, p. 150–161].

O. Niemeyer's experience of designing blocked houses is quite interesting. The principles of providing through ventilation and application of sun protection systems are also used here. The blocks have terraces, protected by pergolas and a lattice along the main facade. On the terrace there are day-time rooms, thus receiving protection from direct sunlight and overheating.

Individual houses are represented by mansions and villas. Their layout, in general, is solved by the architect quite in an individual manner. Each room is ventilated by a cool, heat-softening air.

Let me consider one of the typical layouts. The house has a functionally simple and logical layout. The main room (lounge) occupies the entire width of the building. Three small bedrooms face east – the ocean. The auxiliary rooms face west. In front of each room there are isolated terraces with wooden sunshades.

In the modern architecture of the United Arab Emirates, this type of housing has become very popular as a multifunctional residential complex. The temperature and humidity characteristics of the UAE climate adversely affect the comfort of housing. Therefore, the most effective protection of residential premises from overheating is also important here [2, p. 105–106]. To solve this problem, the following methods are used: competent selection of materials and structures, careful calculation of the size of window openings and their optimal location, artificial air conditioning, active air exchange, sun protection, etc. [6]. Planning solutions also allow providing protection of living quarters from unfavorable climatic factors.

Conclusion

Using these data, a base can be created for effective design of housing of different storeys.

At the same time, the requirements of the optimal orientation of residential premises, through ventilation of apartments must be strictly observed. With a large width of the housing, the use of mine ventilation is recommended, which allows for more compact and economical layouts.

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Особенности строительства жилых домов в тропических странах

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Ключевые слова и фразы: биоклиматическое жилище, блокированные дома, многофункциональный жилой комплекс, комфортная жилая среда, климатические зоны, рациональные планировочные решения, сквозное проветривание, системы солнцезащиты.

Аннотация: В статье рассматриваются особенности планировки жилых пространств в условиях жаркого климата. Планировочные типы в тропических странах складываются исторически. Использование традиционных приемов планировки в современном проектировании позволяет повысить экономичность жилья, сохраняя при этом комфортные условия проживания. На основе выявленных приемов планировки, наиболее

эффективных для использования в природных условиях тропических стран, возможно создание типовой базы для проектирования жилых домов разной этажности с учетом местных условий.

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UDK 33

Theoretical Aspects of Real Estate Valuation in Modern Conditions

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Key words and phrases: real estate valuation; subject of valuation; approaches to valuation; market value; market price.

Abstract: The purpose of the article is to study modern problems of real estate valuation. As a result of the research, the definitions of the object of real estate valuation are given, the rationale for the application of the principle of the most effective use of real estate evaluation, as well as the economic valuation of real estate objects aimed at finding an equilibrium market price is proposed.

In modern conditions, it is important to decide what to consider as the object of real estate valuation. It should be noted that in special literature this issue has not received a complete conceptual development. There are only separate opinions, which do not have strict systematization and theoretical generalizations.

In the economic valuation of the real estate object, the objective that is set to the valuator is also important. There can be different and several objectives of the real estate valuation, and each of them differs not only in the economic content, but also in such essential features as the duration of the valuation, the massiveness of the valuation, the required initial information, and so on.

Differences in the valuation purposes also involve the use of different sources of information, and different valuation procedures. For example, in one case it is necessary to find a more real value for a specific place and time, the cost of an object, and in another case, it is required to calculate the compromise value acceptable for all participants of the transaction. There are also cases when the real estate object value should have a maximum liquidity as an asset or when the price parameter is the most responsive to the overall economic conditions of development in the foreseeable future.

In our opinion, consideration of the real estate valuation problems is relevant because on 01.01.2015 in Russia a tax on real estate and the size of rates was introduced; the tax base itself requires a special approach to determining their level and size, a more detailed study of the issues of the fair price of the "tax", taking into account its differentiation according to various criteria.

One of the long-standing and often discussed problems among specialists is the consistency of values obtained in the process of determining the value of real estate.

The consistency of valuations implies the possibility of comparing, combining the resulting valuations into a single integrated valuation, which the appraiser must present to the customer.

If we put the problem this way, then its solution will not be found.

We believe that the consistency of valuations should be solved in the format of the interests of customers. Let us explain this thesis: for example, if the valuation is carried out to determine the market value for the purpose of selling the real estate object, then its final value will vary around the price formed under the influence of supply and demand for similar real estate. In any case, the equilibrium price of real estate will be established on the basis of contractual relations concluded between market participants. At the same time, the valued price will be that value, which was obtained in the comparative approach.

If the purpose of the valuation is to attract investments, then the value of the valued assets must be the one that is calculated on the basis of the income approach. In this case, it is important for an investor to have the most profitable investment of his capital.

A cost-based approach is preferable for accounting operations, especially, when setting an object for balance sheet accounting, when calculating the amount of depreciation, when including it in the cost of the finished product, when revaluing real estate to determine the present value, for net valuation of the enterprise's assets, and in other cases.

To date, there is no provision in the valuation theory for the consistency of valuations. Of all the available approaches, one can single out the following:

- 1) absence of a problem;
- 2) the problem does not just exist, it is actualized;
- 3) suggested recommendations for its solution.

A number of authors do not recognize the problem of harmonizing values. Quite a different position is expressed by those authors [4], who admit several results of values. This point of view implies the achievement of a certain validity and accuracy of the evaluation, the values of which are in the range of values obtained by different methods [5]. From a practical point of view, this approach is the most appropriate.

To improve the accuracy of values, it is recommended to use various statistical techniques, for example, the calculation of the sampling error from the results obtained; also using cluster analysis approaches, it is possible to calculate distances by values and their deviations from the mean. In this case, to achieve representativeness, it is necessary to have a number of evaluation indicators obtained not only by different approaches and methods, but also by different appraisers. We believe that for such a solution to the problem, it is most likely to study the correlation of values from various factors that affect it.

Thus, the valuator offers the customer several valuation results, at least three that are obtained on the basis of the three approaches. The choice of the final valuation depends on the customer, as only he/she knows the true purpose of the property valuation. Our position is confirmed by the statements of the arbitration courts' representatives. For them, these values are always subjective and do not constitute an exceptional demonstrative "force" value in judicial proceedings.

Our position on the problem of is as follows: the lack consistency is a natural and normal result. As the practice shows, the same real estate objects have different values made by different valuers. More consistent valuations are obtained on the basis of the cost-based approach, since they are based on the accounting data. As you know, accounting of costs for the creation and acquisition of the property is regulated in accordance with the Regulation on Accounting (RA 6/01).

In [6] the author proposes a system of justification, "the purpose of reducing the results of which is to determine the advantages and disadvantages of each of the methods used and the choice of a single valuation". At the same time, comparison of valuation methods is carried out

by such criteria as:

1. The ability of the method to show the actual and current aspirations of participants in market transactions.
2. The quality of the information that serves as the basis for the analysis.
3. The ability of the method to correlate changes in the market conditions and the value of money.

According to many authors, these criteria are the most consistent with the method of capitalization of income. The practice of the valuation does not allow agreeing completely with this position. The purpose of the valuation specified in the Valuer Report does not always correspond to the true motives of the customer. However, the valuator is interested in receiving an appropriate reward by doing the work in such a way that the client is satisfied.

In our opinion, it is preferable to use the discounting method. However, in this case the error of the received valuations cannot be avoided due to the influence of objective factors, including the political factors.

In the literature and publications on problematic issues of real estate valuation, it is often questioned why three approaches and different methods should be applied, since they involve the use of additional resources (time, money, labour). In the end, one result of the valuation will still be accepted, and others will not be needed. We agree with those who consider such a viewpoint to be erroneous. It does not provide the right to choose the customer for a particular valuation option, based on the true objectives of the evaluation. In addition, the variability of assessments allows reducing the degree of responsibility of the appraiser for the acceptance by the customer of a particular valuation. In other words, the last word should be the manager, i.e. for those who, by their status, make responsible decisions.

In favor of the variance of the valuations, there are opinions of other authors who believe that the advantage (under specific conditions) of one method means that other methods should not be taken into account. And after all it seems reasonable to consider, that the estimated information received by any method contains not only an erroneous component, but also a correct component. And it is not reasonable to ignore this correct component.

In some publications on the theory of valuation, the issue of a consistency is either omitted, or non-constructive recommendations that practically do not help the valuator to make an informed decision are given.

Thus, in [7] its authors call the coordination “the exam of conscience” ... But this exam rests on scientifically based procedures. Thus, the valuator should use statistical techniques to develop a probability distribution, determine the range within which the sought-for value of the valuation should be located and present it to the client. Harmonization is not a process of averaging results; it is logical reasoning and making an informed decision, taking into account the factors available at the time of assessment.

Summarizing, one can say with certainty that the theory of valuation requires its further development, complementation with new technologies in statistics, qualimetry, etc.

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Теоретические аспекты оценки недвижимости в современных условиях

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Ключевые слова и фразы: оценка недвижимости, предмет оценки, подходы к оценке, рыночная стоимость, рыночная цена.

Аннотация: Целью статьи является изучение современных проблем оценки недвижимости. В результате исследования даны определения предмета оценки недвижимости, предложено обоснование необходимости применения в оценке принципа наиболее эффективного использования недвижимости, а также проведение экономической оценки объектов недвижимости, ориентированных на установление равновесной рыночной цены.

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The Influence of Security Challenges in the Nigerian Business Environment

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Key words and phrases: Security, Nigeria, business environment, economy, Government.

Abstract: In Nigeria like other countries, security challenges have profound negative effect on the business environment. In this study, we considered 8 hypothesis including threats that could negatively impact on the Nigerian business environment. This was executed with the use of questionnaires applied to stakeholders in the Nigerian business environment. The result shows that terrorism ranks number three on the list after the statistical analysis of T test with the use of SPSS statistics software. Corruption was also proven in the literature review as one of the causes of security challenges. The study also has a qualitative aspect which compares the top and bottom 5 countries on the list of Global Peace Index in 2017 and 2014 with the performance of their economies. Good governance devoid of corruption but with the application of innovative security apparatus will go along way to address the problem of security challenges.

Introduction

A number of factors have influence on the ease of doing business in all countries. One that is fundamental and has a big impact is security, especially in countries that are ravaged with terrorism, civil disobedience and civil wars. Security is evidently the pillar upon which every meaningful development could be achieved and sustained. The development strides in most Western Capitalist States that place premium on security lend credence to this assertion. Whilst Nigeria is endowed with abundant resources, negligence to numerous challenges of insecurity of the environment appears to have created porous security condition that engendered violence and retards development. The concept of security is not alien and has been central even in the primitive societies. The need for security necessitated the social contract in which people willingly surrendered their rights to an organ (government) who oversees the survival of all. For decades, issues relating to security tend to occupy the centre stage in the development discourse. With the end of the cold war, there have being attempts to shift conceptualization of security from a state-centric perspective to a broader view that places premium on individuals, in which human security that embodies elements of national security, human rights and national

development remain major barometer for explaining the concept (Nwanegbo et al., 2013).

With over (400) ethnic group, belonging to several religious sects, Nigeria since independence has remained a multi-ethnic nation state, which has been grappling and trying to cope with the problem of ethnicity and ethno-religious conflicts (Salawu, 2010). The Islamic terror group of Boko Haram which are bent on enforcing Islamic caliphate in the North Eastern part of the country is a direct out put of the cultural difference in Nigeria and the unwillingness of some of these cultural groups to respect their differences and stay together. Thus, Boko Haram can be said to be a destructive political tool with a cosmetic pretension of being religious. The bombing of Nigeria Police Force Headquarters in Abuja on June 16, 2011, the U.N house in Abuja on August 26, 2011 at the beginning of their operations and other high profile bombings attest to this assertion.

An effective management of the country's structural development predicated on national transformation is what can ensure changes in all sectors of the economy. Thus security challenges expressed in the form of insurgency, kidnappings, theft, abduction and other issues will always be a bottle neck to economic development, not only for their negative impact in preventing people to move freely but also for the diversion of government attention and resources from substances of meaningful developments to procurement of arms, ammunition and maintaining military presence in some places. The Way forward is a system that gives room for good governance, prudence in financial management, a just judiciary that is devoid of corruption and also for the operation of a system that embraces merit but exuded nepotism.

National security must include a healthy market-based economy, with a strong base of globally competitive products and services that produce jobs. This economy must include sound government policies to promote responsible choices and reduces debt, and grand strategies for energy and environmental sustainability, science and technology leadership (at least in some areas), human capital capabilities, manufacturing, and the industrial base (Ronis, 2011). Military strength requires an economic underpinning, and a part of economic security is maintaining a level of general economic output that allows diversion of adequate resources to military uses. At a more micro level, economic security will also require maintenance of the industrial capability to design and to produce successive generations of technologically sophisticated weapons (Neu and Wolf 1994).

Literature review

Some scholars define security as the act of being safe from harm or danger which comes from a system that defend, protect and preserve values such that there are no threats to acquired values. It can also be seen in the light of peaceful relationship with governing authorities in a territories which is done by upholding national laws and the defiance of internal security threats in all parts of the country. It can also be seen as the effort of the government to ensure freedom from danger or fear such that the citizens can legitimately promote their interest and their well being which comes by internal security system (Nwagboso, 1202; Adejumo, 2011; Adebakin, 202). Security can also be seen as is the absence of fear and the freedom to express oneself in such a way that threats that could arise from human activities that could be destructive to a person's occupation or activities either targeted directly or indirectly from another target.

A number of factors can be itemized as the causes of security challenges in the country. One of such is internal security disorder. The job of maintenance of security in the country has been delegated to some government officials at levels of governance, namely: minister of interiors, minister of defense, state government and the local government Boss who directly

and indirectly supervises the activities of the Nigerian police to maintained order in the society. Rather than theses government officials and the security apparatus to be proactive and be one or two steps ahead of hoodlums, they seem to be reactionary in their activities, sometimes it could even be concluded that they are not aware of the happenings in their surroundings.

Nweze (2004) identified the sources of security threats in Nigeria to include: militarism, and military experiences, ethnic/religious pluralism, unemployment, poverty and failure of governance, socio-economic inequalities and demographic factors, small arms and ammunition trafficking, migration and indigene question in Nigeria. Nigeria's socio-economic status in Africa, illegal alien issues, globalization, porous security heritage, external influence, the breakdown of institutional infrastructure are obviously another set of causes of insecurity in Nigeria. The foundations of institutional framework in Nigeria are very shaky and are partly responsible for the deterioration of state governance and democratic accountability, which paralyzes existing set of constraints including the formal and legitimate rules nested in the hierarchy of social order. The state of insecurity in Nigeria can also be linked to government failure. This is manifested in the inability of the government to deliver public services and provide the basic needs of the masses. Lack of basic necessities in Nigeria is responsible for the creation of a pool of frustrated people who are easily ignited by any event to become violent. It is argued that Nigeria has the wherewithal to provide for her people, but corruption of public office holders has made this impossible. Nigeria is referred to as a "paradox of plenty" by a scientist, a very rich country with very poor people. With this kind of situation, insecurity of lives and properties is bound to rise. (Achumba et al. 2003; Igbuzor, 2011; Hazen & Horner 2007).

The border of Nigeria is loose and is not adequately secured especially in the northern part of the country, the Islamic militant groups have taken advantage of this several times as they would attack communities and there after flew to neighboring countries. Porous borders exacerbate health crises and facilitate the spread of international crime (Donohue, 2011). Almost all countries that have witnessed war or terrorism acts on international scale suffers economic consequences. The participation of Pakistan in the US-led war on terror had adverse effect on its economy, the industrial growth and export potential weaned. It's difficult for a militarized country or region to take full advantage of its industrial potentials, interms of sourcing raw materials, and developing the value chain.

The advantage gained in improving national security or advancement in the military as response to security threats would rather negatively impact on economic growth (Hussain, 2011). There should be no excessive self interest in a country's approach to national security, there should be the need for a broader view that gives room for common interest and the linkage among national securities that should receive greater attention. Traditional role of intelligence services is to provide information to governments about threats to national security. Intelligence services as a group have normally focused on military, political, and potential terrorist activities. A typical intelligence service also devotes a good deal of effort to keeping track of other intelligence services. In addition, however, intelligence services have also been involved in the provision of economic intelligence. Sometimes this merely involves the compilation and analysis of publicly available information, but it may also involve economic espionage (Potter, 1998).

The first approach to tackling the problem of security challenges is to identity the causes or sources of insecurity. There after a distinction should be made between different causes as the approach to solve a particular problem may be different to the approach that may be most suitable for another (Kennedy, 2003). Here are evidences of commitment by the government to address the security challenges in Nigeria including the enactment of a law to deal with terrorist-Anti-Terrorism Act in 20, the installation of Computer-based Closed Circuit Television cameras

(CCTV) in Abuja though the system failed as some major components of the installations were stolen. There was more effort to equip the police especially by state governments; investigation of criminal activities has also received more attention. However, all these efforts have not improved the rating of Nigeria significantly in local and international ranking of Nigeria on Global Peace Index (Achumba, 2013; Azazi, 2011; 2012, Aluforo, 2011).

To be successful overtime, a business must be in tune with its environment. Environmental changes have significant impact on business operations and sustainability, as a result of the state of insecurity in the country. Enterprise can make significant effort in combating security challenges in the country; this can come through what they can do to impact positively on the environment where they operate, and also cooperation with law enforcement agencies to provide intelligence report. When a firm is socially responsible and does not exploit the community where it is operating, it may not experience some of the elements in the insecurity environment. The change that the society expects of businesses and what management believes is its role in society must be given priority by the management. As such, businesses should not pursue profit only but should also consider social needs which should include both ethical and discretionary responsibilities. The problems of pollution, product safety, job discrimination should also be taken seriously. Multi-national companies and large businesses can also assist the government in sponsoring the provision of traffic lights on major streets in our cities and the electrification of towns and villages especially where they are operating. In addition, business owners, managers and employees should be security conscious and should deliver security through their everyday actions and decisions (Oluwarotimi, 2012; Kufour, 2012; Dionco-Adetayo and Adetayo, 2003; Achumba, 2013).

Due to inability of government to provide adequate security, there is need for civil society to advance the importance of security in Nigeria. With active involvement of civil society in security management, it is most likely that we could have less violence, human right abuses and social injustice. They have to play the roles of critic, catalysts and advocates of public interest. They are most likely to raise public awareness on disastrous effects of insecurity. Religious organizations in Nigeria can also play very prominent roles to ensure security in the country since their teachings are the basis of value development in the modern world. The role of values cannot be overemphasized since values govern behaviours. Where social values and norms governing human rights in both private and public places are distorted, violated and comprised, the people and government live in atmosphere of instability and insecurity (Robert-Okar, 2014; Clifford, 2009). Ronis (2011) gave the following as what should be done in a complex adaptive system, for future of national security system to possess certain inherent qualities that will be critical to success. It must:

- share information and collaborate horizontally;
- accommodate unanticipated needs and partnerships;
- ensure agility in the face of uncertainty;
- incorporate ad hoc structures and processes;
- maintain a long-term view.

It is difficult to separate geopolitical, social, and economic phenomena. We tend to see all these elements in interacting as a system of systems. In fact, in most instances, we are viewing complex systems of complex systems, and that is the challenge we all face. Table 1 shows statistics of crimes committed in Nigeria between year 200 and year 2008. There is no indication that the trend of crimes in Nigeria will reduce in the distance future. The situation now is even more critical than what is recorded in year 2012.

Table 1. Statistics of Crime in Nigeria from 2000–2008

	Year	Theft	Armed Robbery	Kidnapping	Assassination	Fraud
1	2000	29,127	1,877	243	1,255	7,927
2	2001	40,796	2,809	349	2,120	10,234
3	2002	35,231	3,889	337	2,117	9,134
4	2003	33,124	3,497	410	2,136	9,508
5	2004	37,289	3,142	349	2,550	9,532
6	2005	46,111	2,074	798	2,074	9,580
7	2006	41,901	2,863	372	2,000	6,395
8	2007	21,082	2,327	277	2,007	5,860
9	2008	23,927	2,340	309	1,956	5,058

Table 2. Characteristics of Respondents

		Frequency	Percent
Age group	61–100	6	9.5
	46–60	11	17.5
	36–45	25	39.7
	26–35	18	28.6
	18–25	3	4.8
	Total	63	100.0
Categories of investors	Managers in manufacturing companies	14	22.2
	Services	5	7.9
	Contractors	16	25.4
	SMEs	28	44.4
	Total	63	100.0

Research Methodology

The research method employs quantitative and qualitative research methods. The quantitative research involved the use of a structured 70 questionnaires given out of which 63 representing 90 % were returned. The population sample was randomly selected targeting local, contractors, operators of Small and Medium size Enterprises and Managers in manufacturing companies. A total of 8 hypotheses were tested by this research, the computation of the data gathered from the field research is shown in Table 3 below. At 95 % significance level and 60 degree of freedom, the result of T-test statistic is computed with SPSS. Beside deductions from literatures reviews, data from Global Peace Index and GDP data form International Monetary

Table 3. One-Sample Test

	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Inefficient bureaucracy	35.988	62	.000	3.807	3.60	4.02
Poor application of laws	32.110	62	.000	3.474	3.26	3.69
Corruption	69.783	62	.000	4.426	4.30	4.55
Infrastructure	27.411	62	.000	3.617	3.35	3.88
Poor supply of electricity	47.221	62	.000	4.331	4.15	4.51
Terrorism	35.984	62	.000	4.140	3.91	4.37
Difficulty in getting credit	30.288	62	.000	3.807	3.56	4.06

Table 4. Characteristics of Respondents

	Mean	Rank
Corruption	4.48	1
Poor supply of electricity	4.38	2
Terrorism	4.19	3
Inefficient bureaucracy	3.86	4
Difficulty in getting credit	3.86	5
Infrastructure	3.67	6
Poor application of laws	3.52	7

Fund (IMF) where also analyzed to check the influence of security challenges of nations economy globally.

Findings and discussion of findings

The following are the hypothesis tested by the research.

1. Security threats is an impediment to free movement.
2. Nigeria government bureaucratic process is inefficient.
3. There is unfair interpretation and applications of laws.
4. The Nigeria investment climate is characterized with corruption which has a negative impact.
5. Infrastructures like roads, railways, Airports and Sea-ports are inadequate.
6. The supply of electricity is poor.
7. The fear or occurrence of terrorism is high.
8. It's difficult to get credit facilities.

Table 3 shows the T-test statistical analysis of the various negative factors subjected to respondent appraisals. Table 4 shows the ratings of these factors depending on the degree to

Table 5. Comparison of Countries peace status with Economic status

Country	GPI 2017 Ranking	GPI 2014 Ranking	2017 GDP in \$bn	2014 GDP in \$bn	Movement of GDP
Top five					
Iceland	1	1	24,848	17,179	up (45 %)
New Zealand	2	4	200,837	199,028	up (1 %)
Portugal	3	18	211,696	229,995	down (8 %)
Austria	4	3	409,316	439,073	down (7 %)
Denmark	5	2	324,146	352,297	down (8 %)
Bottom five					
Yemen	159	111	25,663	43,229	down (41 %)
South Sudan	160	N/A	2,915	15,100	down (81 %)
Iraq	161	138	192,660	255,896	down (25 %)
Afghanistan	162	135	21,056	20,352	up (3 %)
Syria	163	77	77,460	Data not available	
Case study					
Nigeria	149	151	394,818	568,496	down (31 %)

which the respondent felt they have impact on the Nigerian business environment. Only terrorism and poor supply of electricity are rated above terrorism. The mean value of terrorism is also very high at 4.19. As stated in the literature review, corruption is also a major cause of insecurity in a country. The analysis lays credence to the fact that insecurity which can be caused by terrorism or corruption have a significant influence on a country's business environment. Following the result of the analysis, the null hypothesis was accepted for all the factors listed that could negatively affect the Nigeria business environment.

Table 5 shows the top five and bottom five countries on the rating of Global Peace Index (GPI), including Nigeria which is the focus of this research as well as their GDP figures in 2017 and 2014. Iceland which is rated first in 2014 retained first position in 2017, not only that, its GDP increased by 45 % in the period. Generally, the top five countries have their peace rating improved in the period and their economy is also relatively stable, the drop in GDP figure which could be as a result of varying global economic challenges only let to a drop of less than 10 % in Austria, Portugal and Denmark. The five bottom countries all have security challenges mostly from terrorism and civil wars. Yemen, South Sudan and Iraq have their GDP went down by high margin within the period, with the figure for South Sudan as high as 81 %. The degree to which the GDP of Syria went down could not be ascertained as the GDP figure for year 2014 is not available. In the case of Nigeria, even though the GPI improved from 2014 to 2017, the decline in GDP figure in the period is 31 %, like in the bottom five countries, security challenges especially terrorism has been a very big challenge in the last 10 years in Nigeria, though the country's economy experienced recession in recent years.

Conclusion

Good governance will in no small measure address some of the sources of security threats and also suppressed the motivation behind them. Good governance can be said to be the panacea for insecurity in the country. The government should be made accountable to the people, this way everybody is carried along and no set of people will feel in secured or will be motivated to go through back door to get a share of the country resources. Peace and security are direct products of good governance and necessary conditions for vibrant economy. A way to achieve good governance is to get people that are effective, visionary, transparent, credible and trustworthy into leadership position. Political leaders should see people as the ultimate beneficiary of good governance. Attention on human capital development which can come inform of employment opportunities, provision of educational infrastructures, affordable medical cares etc should be pursued. Concerted effort to tackle corruption is also seen as a great remedy for insecurity, as corruption magnifies all forms of inequalities. The fight against corruption is believed to be able to result in an egalitarian society while there is justice, fairness, and equal rights for all.

Enterprises can engage youths in the localities where they operate in providing jobs in terms of direct jobs or indirect jobs. The job of securing a peaceful business environment should not be left in the hands of government alone. All hands must be on deck.

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Влияние проблем безопасности в нигерийской деловой среде

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Ключевые слова и фразы: безопасность; бизнес-среда; Нигерия; правительство; экономика.

Аннотация: В Нигерии, как и в других странах, проблемы безопасности оказывают глубокое негативное влияние на бизнес-среду. В этом исследовании мы рассмотрели 8 гипотез, которые могут негативно повлиять на бизнес-среду Нигерии. Исследование

было выполнено с использованием анкетирования заинтересованных участников бизнес-среды Нигерии. В результате исследования было установлено, что терроризм занимает третью позицию в списке. Коррупция также является одной из причин проблем связанных с безопасностью. Было проведено сравнение 5 стран из списка Глобального мирового индекса в 2017 и 2014 годах с показателями их экономики. Эффективный менеджмент, отсутствие коррупции, применение инновационных систем безопасности будет способствовать решению проблем безопасности.

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