The results of the comparative analysis of software

Logistic types	Software							
	IBM	Roadnet Transportation Suite	DNA evolutions	JDA	Axapta Retail	Epicor	SAP	Oracle
Purchasing	+			+	+	+	+	+
Production	+					+	+	+
Distribution				+	+	+	+	+
Warehouse	+			+	+	+	+	+
Transport	+	+	+	+			+	+

As follows from the table below, the distribution and production logistics are the least automated areas. At the same time for production logistics there are specialized solutions that are optimized for a specific type of production. Most of the research focused on the automation of processes (via the formation of databases and continuous updating of information). Based automation solutions reduce the time and simplify the processing of the information to provide its easy storage and retrieval of the necessary data at any time.

Automation is a necessary condition for the transition to the next stage of the process control companies - optimization based on the use of special methods. Using optimization methods enables the formation of solutions not only in the current situation, but in a variety of scenarios, provides flexible scheduling, the ability to quickly make the right decisions in a changing environment.

Conclusion. The reduction of all types of costs associated with the management of material flows, the cost of transportation, warehousing, order management, purchasing and inventory management, packaging, reduction of logistics risks allow the company to free up funds for additional investments in new production technologies and equipment, storage facilities, information and computer system, advertising, market research, etc. Optimal logistics solutions can be prepared by management of the company, not only by the criterion of minimum total cost, but also on key business factors as the time of execution of the order and the quality of customer service.

Nowadays on the software market in the Republic of Belarus there are warehouse and transport management systems. But there are just several solutions wich provide function of planning distributaion of goods and this software is very expensive. However, there is a need for such software in order to optimize distribution logistics processes in trade.

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SIMULATION OF ELECTROMAGNETIC WAVES INTERACTION WITH HYDROCARBON DEPOSITS

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Examines the process of interaction of electromagnetic wave with the electrodynamic model of the environment of hydrocarbon deposits on the basis of the existing theory of the interaction of electromagnetic wave and plasma environments.

To highlight the material objects on a background of the environment in practice usually used reflection characteristics serving as a tool to optimize the electrical parameters of the probing signal. Researched hydrocarbon deposit can be represented in the form of an anisotropic inhomogeneity on the track connection.

In general, the spatial orientation of the external normal to the interface and the wave vector $\vec{k}$ is arbitrary (fig.1) and the interaction of electromagnetic wave with a local inclusion in the propagation path of radio waves can be represented as the mode of oblique incidence of a plane wave with vertical polarization on the surface of the infinite with anisotropic impedance (in the approximation of large characteristic dimensions of heterogeneity compared with the wavelength of the probe signal).

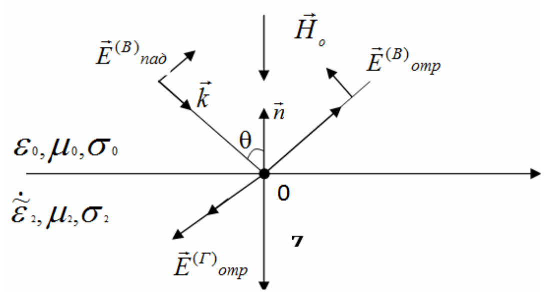

Fig. 1. The geometry of the problem for the electromagnetic wave with vertical polarization fields

The emergence of cross-polarization components in the structure of the field reflected from the anisotropic inhomogeneity of the plane wave with a given linear polarization makes it necessary to study a pair of Fresnel coefficients $R_{ВВ}, R_{ВГ}$ for the vertical and $R_{ГГ}, R_{ГВ}$ for the horizontal polarization of the incident wave. In the case of vertical polarization for electromagnetic waves selected coordinate system the following relations:

$$E_x = E_{x_{пад}} + E_{x_{отр}} = \dot{E}_o(1-\dot{R}_{ВВ})\cos\Theta \tag{1}$$

$$E_y = -E_o\dot{R}_{ВГ} \tag{2}$$

$$H_x = \frac{E_o}{Z_o} R_{ВГ}\cos\Theta \tag{3}$$

$$H_y = \frac{E_o}{Z_o}(1+\dot{R}_{ВВ}) \tag{4}$$

and impedance boundary conditions:

$$E_x = -Z_o(\dot{Z}_{11}H_x - \dot{Z}_{12}H_y), \tag{5}$$

$$E_y = -Z_o(\dot{Z}_{21}H_x - \dot{Z}_{22}H_y), \tag{6}$$

$$\dot{Z}_{11} = \dot{Z}_{22} = -\frac{1}{j2\sqrt{\dot{\varepsilon}_R\dot{\varepsilon}_L}}\left(\sqrt{\dot{\varepsilon}_R} - \sqrt{\dot{\varepsilon}_L}\right), \tag{7}$$

$$\dot{Z}_{12} = \dot{Z}_{21} = \frac{1}{2\sqrt{\dot{\varepsilon}_R\dot{\varepsilon}_L}}\left(\sqrt{\dot{\varepsilon}_R} + \sqrt{\dot{\varepsilon}_L}\right) \tag{8}$$

where E_o, Θ – the amplitude of the incident wave and the angle of incidence of the electromagnetic wave with respect to the outer normal $\vec{n}$,

$E_{x,y}$, $H_{x,y}$ – the projection of the incident and reflected waves on the respective coordinate axes,

Z_o – the characteristic impedance of the medium surrounding the anisotropic heterogeneity.

Fresnel coefficients are found by simultaneously solving:

$$\dot{R}_{ВВ} = \frac{\dot{a}_1\cos\Theta + \dot{a}_3(\cos^2\Theta - 1)}{\dot{a}_2\cos\Theta + \dot{a}_3(\cos^2\Theta + 1)} = \left|R_{ВВ}\right| \cdot \exp(j\varphi_{ВВ}), \tag{9}$$

$$\dot{R}_{ГГ} = \frac{\dot{a}_4\cos\Theta - \dot{a}_2(\cos^2\Theta + 1)}{(1+\dot{a}_1)\left[\dot{a}_2\cos\Theta + a_3(\cos^2\Theta + 1)\right]} = \left|R_{ГГ}\right| \cdot \exp(j\varphi_{ГГ}), \tag{10}$$

$$\dot{R}_{ГВ} = \dot{R}_{ВГ} = \frac{2(\dot{a}_2 - 1)\dot{a}_3 \cos\Theta}{\dot{a}_2 \cos\Theta + \dot{a}_3(\cos^2\Theta + 1)} = \left|R_{ВГ}\right| \cdot \exp(j\varphi_{ВГ}), \quad (11)$$

$$\dot{a}_{1,2} = \sqrt{\varepsilon_R \varepsilon_L} \mp 1, \quad (12)$$

$$\dot{a}_3 = \sqrt{\varepsilon_R} + \sqrt{\varepsilon_L}, \quad (13)$$

$$\dot{a}_4 = \varepsilon_R + 2\varepsilon_R \varepsilon_L + \varepsilon_L, \quad (14)$$

where $R_{ВВ}$, $R_{ГГ}$, $R_{ВГ}$, $R_{ГВ}$ – modules,

$\varphi_{ВВ}, \varphi_{ГГ}, \varphi_{ВГ}, \varphi_{ГВ}$ – phase of reflection coefficients.

Expression takes into account the structure of the resulting reflected wave in cross polarization distortions, which leads to displacement of the beam trajectory to the direction of propagation of the incident wave. In the case of circular polarization, the received electromagnetic wave will have a generally elliptical polarization.

The reflectivity of the medium above the hydrocarbon deposits under the influence of electromagnetic waves with linear polarization mode pulse action can be evaluated by contrast reflection coefficients between the anisotropic medium, and the underlying surface by the formula:

$$\Delta R = 20\lg\left|R_p - R_{ВВ}\right| \quad (15)$$

The coefficient of the underlying medium R_p with finite conductivity ε_p and permittivity σ_p for an electromagnetic wave with vertical polarization is given by:

$$\dot{R}_p = \frac{\dot{\varepsilon}_p \sin\Theta - \sqrt{\dot{\varepsilon}_p - \cos^2\Theta}}{\dot{\varepsilon}_p \sin\Theta + \sqrt{\dot{\varepsilon}_p - \cos^2\Theta}} = R_p \exp j\varphi_p, \quad (16)$$

where $\dot{\varepsilon}_p = \varepsilon_p - j\frac{\sigma_P}{\omega\varepsilon_0}$ - the complex permittivity of the underlying surface.

Was analyzed the interaction of pulsed signals with a layered medium of hydrocarbon deposits. The essence of the study was to: define the characteristics of the reflected signal from the layer depth h, which was determined by the input impedance $Z вх$.

The basic formula for calculating the input impedance of a layered medium:

$$Zвх = \frac{(Z_2 + Z_1) + (Z_2 - Z_1) * \exp(-2 * j_2 * h)}{(Z_2 + Z_1) - (Z_2 - Z_1) * \exp(-2 * j_2 * h)} * Z_1, \quad (17)$$

where h – the depth of the medium.

Values Z_1, Z_2 и j_2 defined as:

$$Z_2 = \sqrt{\frac{\mu_0}{\varepsilon_3 * E_0}} \quad (18)$$

$$Z_1 = \sqrt{\frac{\mu_0}{\varepsilon_2 * E_0}} \quad (19)$$

$$j_2 = j * 2 * \pi * f * \frac{\sqrt{\varepsilon_2}}{c} \quad (20)$$

where $j = \sqrt{-1}$;

$c = 3*10^8\ м/с$ – speed of light;

$\mu_0 = 4 * \pi * 10^{-7}$ - magnetic constant;

$\varepsilon_3 = 2.5$ - permittivity corresponding oil;

$\varepsilon_0 = 8.85*10^{-12}$ - electric constant;

$\varepsilon_2 = 10$ - dielectric constant of the corresponding sand and silt fraction;

f – frequency radio pulse probing.

To calculate the input resistance of the medium were taken certain parameters of h and f, which would reflect the real possibilities of modern technology radars and mining. For example, counting the resistance of the medium at depths of over 5000 meters impractical due to the inaccessibility of hydrocarbon deposits which are located there. The frequency range is taken into decameter radio waves 5-15 MHz.

Calculations were made in the program MatLab, suitable for work with signals and their schedules. The program was introduced the above formula and a predetermined range of depth h and frequency f. The result was a three-dimensional array, displaying quantitative environmental resistance of hydrocarbon deposit to depths of 1000-5000 meters in increments of 1,000 meters for frequencies of 5-15 MHz in 1 MHz steps (Table). For an array was plotted graphically displays the results of the study (Fig. 2).

Dependence of resistivity on the depth of the medium and frequency radio pulse of the probe, Ohm

f, MHz / h, m	1000	2000	3000	4000	5000
5	63	127	104	69	224
6	60	236	60	230	60
7	62	150	85	82	158
8	71	78	229	66	87
9	91	60	112	220	77
10	127	69	60	87	191
11	186	117	81	64	60
12	236	230	220	207	194
13	213	163	121	93	76
14	150	82	61	63	89
15	104	60	77	194	155

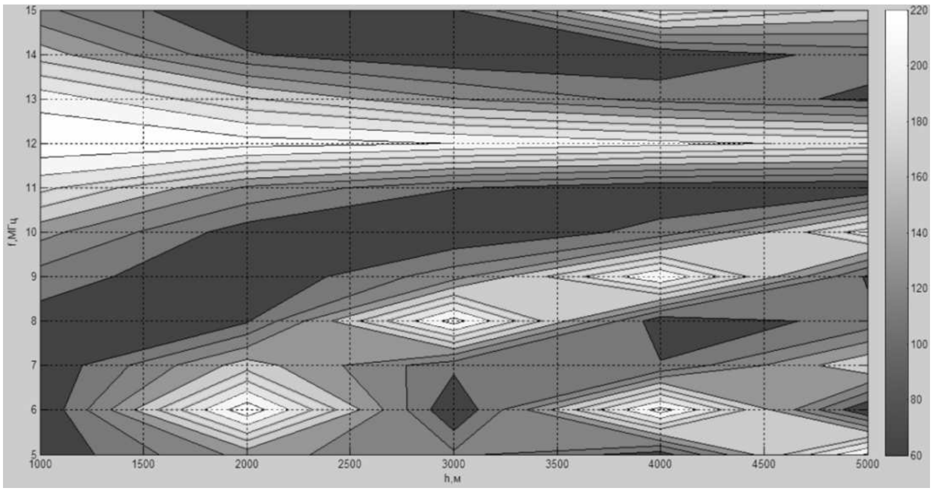

Fig. 2. Map of resistance depending on the depth of the medium and the frequency of the radio pulse, Ohm

The analysis presented by the graph shows that the greatest resistance to 200 ohms, the environment, the parameters corresponding to the sand and silt fraction, has at frequencies of 11-13 MHz for all depths. The peaks of the resistance of the medium are also observed on the coordinates:

– 2 km – 6 MHz;
– 3 km – 8 MHz;
– 4 km – 6 and 9 MHz.

In other areas the frequency and depth of the medium results show an average resistance of 100 ohms.

In this article we were calculated describing the propagation of pulse signals in environments of hydrocarbon deposits. It was also modeled the interaction radiopulse signals in a layered medium, calculated parameters of the input impedance of a layered medium, a map of the resistance depending on the depth of the medium and the frequency of the radio pulse.

This investigation may be useful for detection of hydrocarbon deposits by comparing the values of the input resistance of the medium layered over them, which has been calculated in the course of this research, with respect to the received practice, that may be useful in a real geological exploration.

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ANALYSIS OF FINE STRUCTURE VOWEL SOUND OF THE SPEECH SIGNAL USING WAVELET TRANSFORM

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The paper presents the comparative analysis of some mother wavelets and the investigation of the effect of varying of the frequency characteristics and the type of mother wavelet on the results of the wavelet analysis of stressed and unstressed isolated Russian language vowels of various speakers. The descriptiveness of wavelet representation of time-frequency domain of a signal is investigated on the basis of complex Morlet wavelet when changing the scale factors a и b.

A number of published works study the primary features of the speech signal: pitch frequency (a necessary criterion for determining the presence of speech in noise) and formants (the source of information not only about the speech signal, but also about the individual signs of the speaker). Known analysis methods of speech sounds are based on the spectral model of a stationary signal. However, in the speech signal the most informative features are changes of its time-frequency characteristics. To implement the analysis of both frequency and temporal characteristics of the signal it is necessary to use basic functions having properties of time-frequency localization - wavelets.

Effective methods of wavelet analysis of the fine structure of the speech signal were considered by L. Falek, A. Amrouche, L. Fergani, H. Teffahi, A. Djeradi, S. Rasskazova and others. In work [1] by V. Solov'ev, O. Rybal'skij, V. Zheleznyak, a three-dimensional Skeylogramm has been received on the basis of Morlet with the experimentally established constant parameter width of the wavelet. It represents a fragment of the phoneme "a" of the Russian language as a set of multifractal structures. However, the use of permanent settings for all wavelet transforms may significantly affect the interpretation of the results, because when you change the characteristics of the test signal you can obtain incomplete information of its fine structure. Thus, a more detailed analysis needs choosing the type of mother wavelet and its parameters. We repeated the experiment results with constant wavelet parameters for other stressed and unstressed isolated vowels of the Russian language of various speakers. And we further investigated the influence of the change of frequency characteristics and the type of mother wavelet on the results of wavelet analysis. We compared some mother wavelets and investigated descriptiveness of the wavelet representation of time-frequency domain of the signal when changing the scale factors a and b.

From the comparative analysis of known wavelet functions [2-4] (Gaussian type, "Mexican hat", Morlet and Meer) of the fine structure of the vowel sounds of the Russian language their time-frequency transformations are obtained [5]. These wavelets have a minimum of properties, which provide full opportunities in the technique of transformations, and have properties of time-frequency localization. Of all the investigated wavelet functions, complex Morlet wavelet has a narrower Fourier transform and more prolonged in the time domain (fig. 1). The presence of a dominant frequency allows varying selectivity of the complex Morlet wavelet in the frequency domain.

In the time domain complex Morlet wavelet is a complex exponent modulated by a Gaussian function. But in the frequency domain complex Morlet wavelet is shaped by Gaussian window with a central frequency f_0 and width B. Thus, the frequency range covered by the complex Morlet wavelet window is limited to an