THE MODELS OF CHANGING AND GIVING INFORMATION IN INTEGRATED INFORMATIONAL-ANALYTICAL SYSTEMS

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Annotation. The problems were looked through in this article on working out the mathematic models of the algorithms of changing and giving information in integrated informational-analytical systems. It is worked out the mathematic models of mutual connectional components by the help of connectional functions of informational systems. Besides that, here given the structure of organization the generalized components of informational-analytical system.

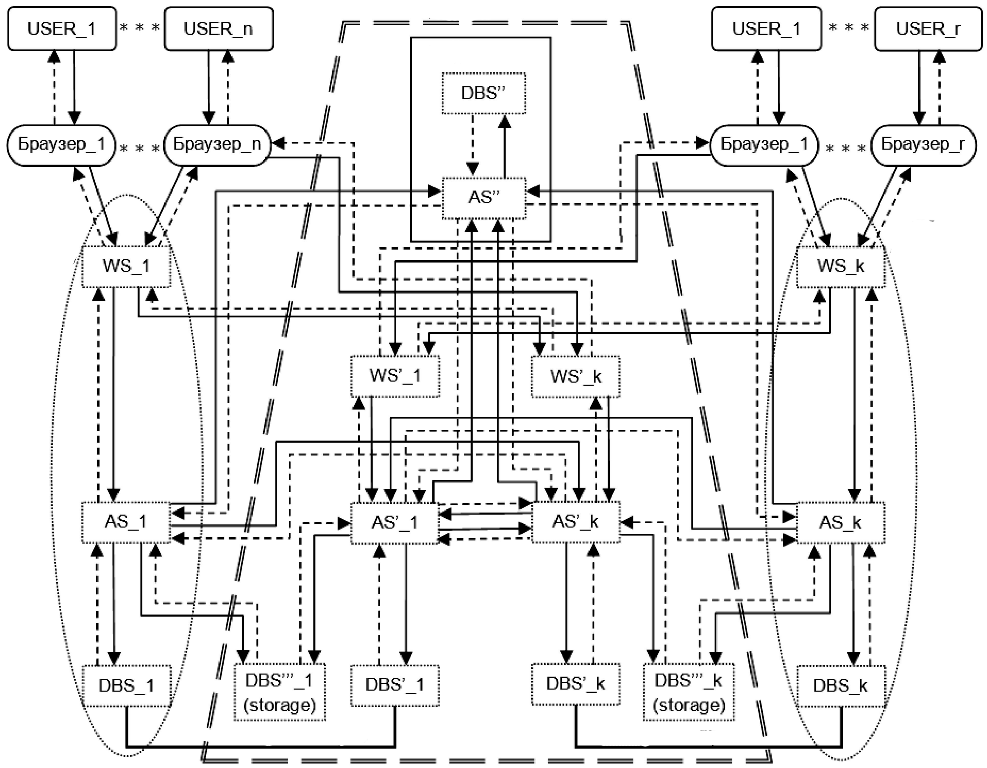
Key words. Informational-analytical system, integration, database, interface, CAD/CAM/CAE and PDM.

There is an importance of effectively use of automated projecting systems in the project constructed stages of industry in the world and there is need to update such systems while realizing the modern technologies and equipments in industry. Presently, the automating constructional-technological preparing stages of industry are one of the important problems of every sphere of industry. It is the one of the important duty to create the integrated informational-analytical systems of managing the technological processes built in the base of modern integrated software complexes of CAD/CAM/CAE and PDM (Computer Aided Design/Computer Aided Manufacturing/Computer Aided Engineering and Product Data Management), it gives opportunity to economize the resources and reducing the human factor for whole process of industry in developed countries [1].

There is an opportunity to divide the processes of projecting and modeling the components of changing and giving information in integrated informational-analytical systems into several stages, they are: identifying the structure of apparatus, identifying the configuration of aprior network, working out the mathematic and electron models and projecting the main system. It is required to create the mathematic and electron model of main system and working out the optimizing measure of solving the each of these problems [2].

The structure of integrated systems consists of the organization the mutual connected software and complicated components. These organizations require the increasing the functionality of the software of self-realized algorithms and at the same time reducing the time of working on information.

We make an imagination the structure of organization the generalized components in integrated information-analytical system in 1-picture. This organization of components is the core of software and it gives an opportunity to connect the technologies of CAD/CAM/CAE-PDM and CALS into the elements of Industry-4.0.



1-picture. The organization of generalized components of integrated informational-analytical system (the core of program).

Here we can see from the organization of the components of the core of program, that there is an importance the passing distance to WS_k' from WS'_q and to WS_k from WS_1 in the process of passing into another subsystem from one subsystem. The AS_1 and AS'_1 also AS_K and AS'_k components make the function of generation integrally according each other. At the result there it is provided the single system in passing from one subsystem to another.

Here $\omega_{a\tau l}(S)$, $\omega_{c\tau l}(S)$ is the Laplas expression. This expression is appropriate for reverse and forward flow the information of function of probability of continuous cycles of giving the command to the equipment or server by *A* user.

$\omega^*_{aTl}(S)$, $\omega^*_{cTl}(S)$ - are the analogical functions of generation among the period among the systems of giving information in the opposite direction and to the C center of A user.

Let be the random variable without $T \geq 0$ optional negative, we put the helping amount *P(T)* by distribution law appropriately or continuously. We can get next given expression by determining the expression of Laplas of the function of *P(T)* with $\omega(S)$.

$$\omega(S) = \int_0^\infty e^{-ST} P(T) dT .$$

Let be (*i = 1, 2, ..*) *i*-ordered moment of probable variable, the mathematic exceptance of *l* level of *T*-majority by $\overline{T}^l$. In this case,

$$\overline{T}^{l} = M\left[T^{l}\right] = \int_{0}^{\infty} T^{l} P(T)\, dT$$

we will opportunity to write as expression.

We get next given expression by [3] function of transformation of Laplas, by determination of *L[...]* to reduce the mistake in generation, reducing the time of working into information:

$$\overline{T}^{l} = \lim_{T \to \infty} \int_{o}^{T} \xi' P(\xi)\, d\xi = \lim_{S \to \infty} \left\{ sL\left[\int_{0}^{T} \xi' P(\xi)\, d(\xi) \right] \right\} = \lim_{S \to \infty} \left\{ S \frac{1}{S} L\left[T' P(T)\right] \right\} = \lim_{S \to \infty} L\left[T' P(T)\right] =$$

$$= \lim_{S \to \infty} \left\{ (-1)' \frac{d^{(l)}}{dS^{l}} \left[L(P(T))\right] \right\} = \lim_{S \to \infty} (-1)' \frac{d^{(l)} \omega(S)}{dS'} = (-1)' \frac{d^{(l)} \omega(S)}{dS'} \uparrow_{S=0} .$$

The before given expression shows, there is opportunity to calculate T change moment with any random variable by identifying the coefficients from this series for expressions with S degree in different degrees and widening the $\omega(S)$ function in the Taylor's line close to $S=0$,

$$\omega(S) = \omega(0) + \frac{1}{1!}\omega^{(1)}(0)S + \frac{1}{2!}\omega^{(2)}(0)S^{2} + \ldots = 1 - \overline{T}^{l} S + \frac{1}{2!}\overline{T}^{l} S^{2} - \ldots = 1 + \sum_{i=l}^{\infty} \frac{(-1)^{i}}{i!} \overline{T}^{l} S^{i} .$$

We get opportunity to identify the indicator of the configuration for connection with different subsystems, generation and parameters of the system of giving information by the help of before given expressions [4].

We get the $\overline{\tau}^{2}_{al}$, $\overline{\tau}^{2}_{cl}$, $\overline{T}^{2}_{al}$, $\overline{T}^{2}_{cl}$, $\overline{T}^{*2}_{al}$, $\overline{T}^{*2}_{cl}$ $\overline{\Theta}^{2}_{al}$, $\overline{\Theta}^{2}_{cl}$ relations by secondly ordered differentiating the equality relatively S argument, changing the S=0 and identifying the RMS value of entered random variables $\overline{\tau}_{al}$, $\overline{\tau}_{cl}$, $\overline{T}_{al}$, $\overline{T}_{cl}$, $\overline{T}^{*}_{al}$, $\overline{T}^{*}_{cl}$ $\overline{\Theta}_{al}$, $\overline{\Theta}_{cl}$:

$$\left.\begin{aligned}
\overline{\tau}^{2}_{al} &= \overline{T}^{*\,2}_{al}\left(\overline{u}_{al}\, t_{al}\right)^{2} + \overline{t}^{2}_{al}\left(\overline{u}_{al}\, \overline{T}^{*}_{al}\right); \\
\overline{\tau}^{2}_{cl} &= \overline{T}^{*\,2}_{al}\left(\overline{u}_{cl}\, t_{cl}\right)^{2} + \overline{t}^{2}_{cl}\left(\overline{u}_{cl}\, \overline{T}^{*}_{cl}\right); \\
\overline{T}^{*\,2}_{al} &= \frac{1}{p_{t}}\overline{T}^{2}_{al} + \frac{2\left(1 - p_{l}\right)}{p^{2}_{l}}\left(\overline{T}_{al}\right)^{2}; \\
\overline{T}^{*\,2}_{cl} &= \frac{1}{p_{t}}\overline{T}^{2}_{cl} + \frac{2\left(1 - p_{l}\right)}{p^{2}_{l}}\left(\overline{T}_{cl}\right)^{2}; \\
\overline{T}^{2}_{al} &= (\overline{T})^{2} + q_{1} + q_{2} - q_{3} - 2p_{l}(1 - p_{l})\left(\overline{\Theta}'_{l}\overline{\Theta}'''_{l} + \overline{\Theta}'_{l}\overline{\Theta}''_{2} + \overline{\Theta}'_{l}\overline{\tau}_{cl} + \overline{\Theta}''_{2}\overline{\tau}_{al} + \overline{\tau}_{al}\overline{\tau}_{cl}\right); \\
\overline{T}^{2}_{cl} &= (\overline{T})^{2} + q_{1} + q_{2} - q_{3} - 2p_{l}(1 - p_{l})\overline{\Theta}''_{l}\left(\overline{\Theta}'_{l} + \overline{\Theta}'''_{l} + \overline{\tau}_{cl} + \overline{\tau}_{al}\right); \\
q_{1} &= \sum_{r=1}^{n} \Pr\left(\overline{\Theta}'^{2}_{l} + \overline{\Theta}'''^{2}_{l} + \overline{\Theta}''^{2}_{l} + \overline{\tau}^{2}_{ar} + \overline{\tau}^{2}_{cr}\right); \\
q_{2} &= \sum_{r=1}^{n} \Pr\left(1 - \Pr\right)\left(\overline{\Theta}'_{l} + \overline{\Theta}'''_{r} + \overline{\Theta}''_{r} + \overline{\tau}^{2}_{ar} + \overline{\tau}^{2}_{cr}\right)^{2}; \\
q_{3} &= \sum_{r=1}^{n} \Pr\left(\left(\overline{\Theta}'_{l}\right)^{2} + \left(\overline{\Theta}'''_{r}\right)^{2} + \left(\overline{\Theta}''_{r}\right)^{2} + \left(\overline{\tau}_{ar}\right)^{2} + \left(\overline{\tau}_{cr}\right)^{2}\right); \\
\overline{\Theta}^{2}_{al} &= \overline{t}^{2}_{al} + \frac{1}{3}\overline{T}^{*\,2}_{al} + \overline{t}_{al}\, \overline{T}^{*}_{al}; \\
\overline{\Theta}^{2}_{cl} &= \overline{t}^{2}_{cl} + \frac{1}{3}\overline{T}^{*\,2}_{cl} + \overline{t}_{cl}\, \overline{T}^{*}_{cl}.
\end{aligned}\right\} .$$

Here, $\bar{t}^2_{al}$, $\bar{t}^2_{al}$ is the RMS value of duration of giving to C centre from A subscriber and appropriately to this opposite direction.

There is an opportunity of usage in solving the mathematic exercises of mutual integration of informational systems from before given mathematic models. Besides that there is possibility the usage of these mathematic models for creating the blocks of connection to Industry 4.0 of CALS technologies and CAD/CAM/CAE-PDM from algorithmic components.

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