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The Structurally Functional Scheme Multi-Agent of Systems of the Analysis and Assessment of Risks of Emergence of Fire-Dangerous Situations on Subjects to Information Processing and Storage of Documents in Educational Establishment

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Abstract: In research questions of the analysis and assessment of risks of emergence of fire-dangerous situations on subjects to information processing and storage of documents in educational institution are considered.

Key words: Fire-dangerous situations, educational institution, multi-agent systems, risk, structurally functional scheme, reception campaign

INTRODUCTION

Process of documents acceptance of entrants during a reception campaign is an integral part of work in the modern educational organization. The value of education documents is extremely important. In the conditions of automation of processes of a reception campaign the major factor is informatizations of workplaces of screening committees. Operational work with visitors during the reception campaign, introduction of information on entrants and work with the database, smooth operation of the website, all this attracts increase in an Automated Workplace (AWP). For example, at Southwest state university during the receiving campaign (Pykhtin *et al*., 2015) >30 computers for operation with visitors and 2 servers for the storage of the database and the website reflecting the course of transfer of entrants in real time are used. Capacities of the server which is used for bystry processing hundreds of requests at the same time and stores the database and content of the website permanently increase that carries to increase in power of power supply units of the modern computers. For convenience most often work with visitors is conducted in the uniform room so, placement of 30 computers in one room, and load of electric networks. In turn load of electric networks is a prime source of the increased danger in buildings and therefore, safety of such rooms has to be on special control.

The selection committee has to be provided not only the modern classes of fire extinguishers intended for fire extinguishing of documents and the computer, otherwise the probability of damage of the equipment and documents is high (Ovchinkin, 2012).

Except the danger of damage of the equipment storing in itself information on the course of a reception campaign there is more significant danger of damage or destruction of documents. Originals of documents shall be stored in fire-resistant safes that shall reduce risk of spoil or loss of information on papers.

Potential fire danger on subjects to information processing and storage of documents in educational institution demands new approaches to the analysis of a fire-dangerous situation, search of ways and methods of anticipatory recognition of risks, first of all, of possible malfunctions of electric networks or (and) violations of their service conditions. Due to the possible accidents, accidents and technological violations safety level in educational institution is defined by the size of risk of emergence of the emergency situation changed under the influence of the external environment. Control of safe conditions is inseparably linked with the solution of tasks of the analysis and assessment of risks of emergence of a fire-dangerous situation in educational institution (Lyubimov and Solomanidin, 2005).

MATERIALS AND METHODS

Recently automated systems of collection, monitoring of data and a risks assessment of a fire danger situation in educational institution are characterized by accounting of a set of various indicators of assessment of a fire-dangerous situation having the hidden regularities or contradictory tendencies of change in time.

The commonly accepted methods and models of the analysis based on analytical handling of the current data on assessment fire danger situation, a probabilistic risks

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assessment of emergence of fire-dangerous situation are ineffective owing to standard accounting of system changes in the previous counting of time. Questions of early forecasting of emergence of fire-dangerous situation and development of anticipatory measures partially are implemented by the existing hardware and software of monitoring of the fire-dangerous situation.

Researches on development of multi-agent system of the analysis and risks assessment of emergence of fire-dangerous situations taking into account detection of the hidden regularities is an urgent task which solution will allow to reduce risk of emergence of a fire-dangerous situation reasonably.

Functionally operating sample of system of monitoring of fire-dangerous situation allows: to measure and archive data on the current change of characteristics of the operating electric network; to predict development of fire-dangerous situation; to perform the early prevention; to perform alarm functions for the operator; to manage a condition of network if for standard time there doesn't come reaction of technical service on decision making about management of a condition of network. Structurally operating sample of a monitoring system of fire-dangerous situation contains.

The central part (a kernel, the dispatcher subsystem) consisting from: the server or a notebook in case of mobile version of system of fire-prevention monitoring of electrical networks; peripheries (display, printer, keypad, uninterruptible power supply unit, means of reception-transmission of data (modem).

Peripheral part: reprogrammable controllers; modem; sensors (current, tension, temperature of wires, sparking, etc.); periphery of the controller (Analog-to-Digital Converter(ADC), Digital and Analog Converter (DAC), input/output device); feed arrangement.

RESULTS AND DISCUSSION

The main list of the signals arriving on signal inputs of peripheral modules according to a certain subset of basic functions of system is exposed to conversion, generally in the digital form by means of the ADC procedures. After accumulating of selection necessary (and admissible on time) amount on each of information parameters of a signal, their handling for the purpose of elimination of artifacts and admittance cards of measurements with the subsequent compression and estimation of the current parameter values for the purpose of forming of signs of the working dictionary x_p when accounting use as its components only informative signs as result of the effective, not displaced and solvent estimates is made. The block algorithm (Frolov, 2013) of functioning of the independent module can be presented as shown in Fig. 1.

Taking into account experience of creation of peripheral subsystems of information monitoring and according to the block algorithm given in Fig. 1, it can be developed by system Structurally Functional Scheme (SFS) it is presented as shown in Fig. 2 where BBRD the block of a binarization of differential data; BPKO the block of search of the combined sample (Mirtalibov *et al*., 2015).

In compliance with conceptually the explained principles of creation of a block algorithm (Fig. 1a) and the structurally functional diagram (Fig. 2), displaying the functional and structural organization of elements of system of information monitoring, two-way communication with stationary software and hardware tools of Control Station (CS) shall be provided. In an analysis result of numerous options of creation of systems of information monitoring with two-way communication preferable from the point of view of reliability, noise immunity, the cost and energy consumption is GPRS channels, fiber optic means of communication and means of a short-range digital radio channel (Wi-Fi, etc.). At the same time the forward channel serves for data transfer from peripheral Information Measuring System (IMS) on remote Information Center (IC) and reverse for control from this center as the modes of functioning of peripheral subsystems and their reconfiguration (in the hardware and program aspects) in case of adaptation and evolution of a monitoring system in the conditions of uncertainty concerning characteristics of an external environment (controlled networks of educational institution) (Mirtalibov *et al*., 2015).

Peripheral information measuring system as well as the hardware center of Control Station assumes operation in four main modes: on a separate command request; in a standby mode; in the priority mode; in the mode of the highest precedence. Except the basic modes program and algorithmic means of Control Station assume formation of the office modes.

At the same time, teams of a peripheral subsystem are formed by the corresponding independent modules and given on system of local connection with reception of "receipts confirmations" on the reverse channel. From the point of view of architectural creations, we can distinguish: organizational structure; hardware-software structure; topological structure; algorithmic structure; structure of data exchange.

If to take into account new determination of a concept such as macrostate of a difficult technical object,

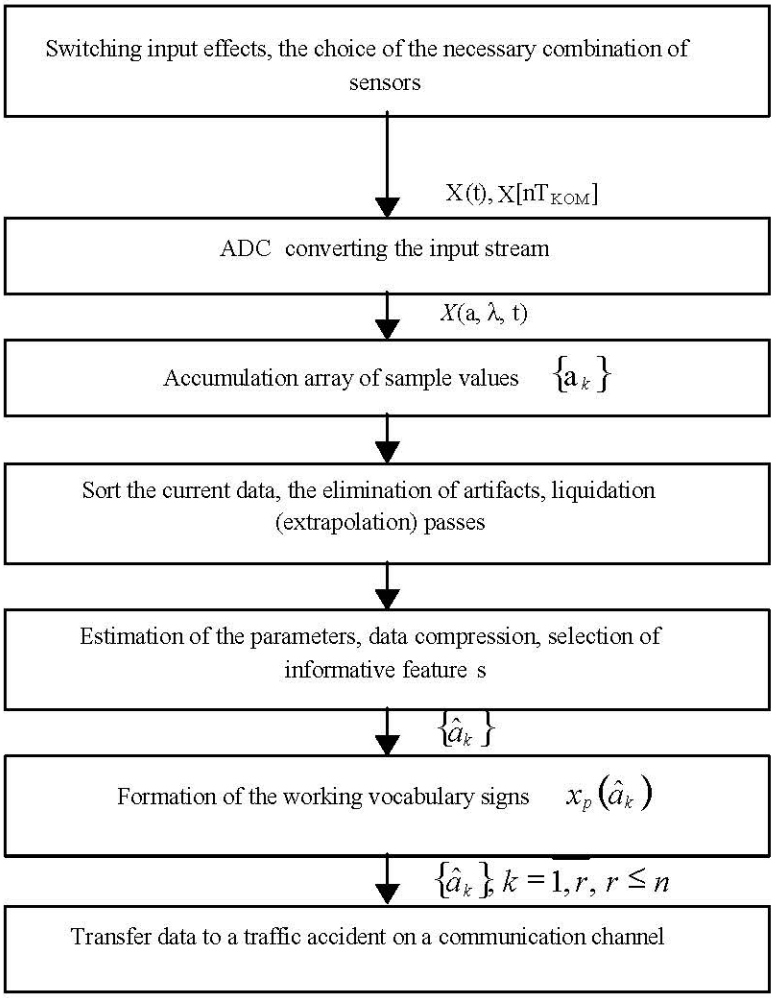

Fig. 1: A block algorithm of functioning of system

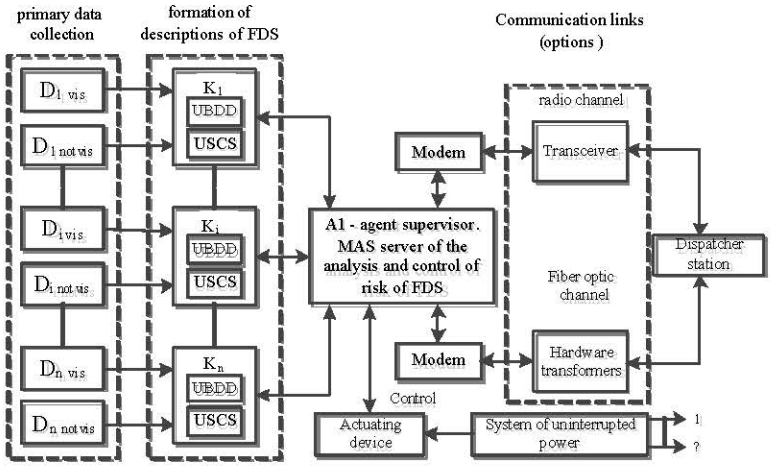

Fig. 2: Functional and structural diagram MAS of the analysis and control of risk of FDS

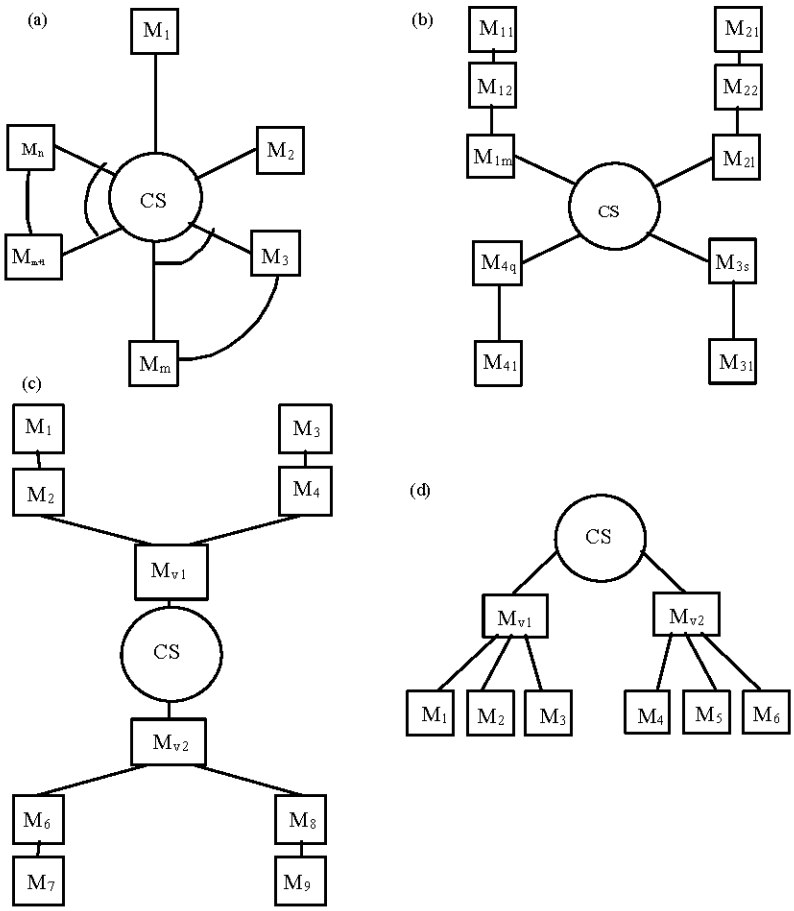

Fig. 3: Variants of the initial configuration of monitoring systems; a) the radial structure of the system; b) chain-like structure of the system; c) hybrid structure of the system, variant 1; d) hybrid structure of the system, variant 2

then from this, in case of the accounting of character of the relations on some interval of time between elements also the concept of a structural status of system and its structural dynamics as process of reconfiguration under action follows: process of building of system additional hardware and software; process of connection of a "hot" or "cold" reserve; process of reconfiguration of communications; process of reconfiguration of structure in territorial aspect.

The intellectual aspect of the considered task consists in creation on the basis of multinuclear computers of control station and their fire protection system of elements and the principles of artificial intelligence.

According to character of a territorial distribution structure of monitoring systems their initial architecture which afterwards is easily reconfigured by one of the above-considered methods is shown in a Fig. 3. Control of reconfiguration in an automatic mode can be executed in two cases: the functional working need of situation-dependent or information orientation; text check of standard ways of routing when reconfiguring the information and hardware fields.

Depending on to what components of system the operating influence is directed, it is possible to consider three types of managements: parametrical management; coordinate management; structural management.

Except standard methods of situational management the system of monitoring and her components can be in process of functioning in some time points in various states: malfunction, refusal (not working capacity), failure.

Functions of reconfiguration of system assume: formation of a situation of boundary, critical or emergency type; the decision (system program) on impossibility of additional methods of obtaining information or permission of an contingency situation in case of this set of properties of the functioning

monitoring system; need for reconfiguration of an equipment room and/or information local area network in connection with change of territorial layout of controlled objects, their properties or their types (types).

The need for reconfiguration of elements of system can be also caused by need of structural adaptation when using, for example, of means of a "cold" or "hot" reserve. The problem of optimum control of reconfiguration of system of monitoring can be considered as management of structure and parameters of non-stationary system with limited time of observation (within the operating influence).

Basing on that idea, system of monitoring it is possible to divide as: systems with variable parameters; systems with non-stationary entrance teams; the systems combining both above-mentioned properties.

As the operated reconfigurable systems as a rule, satisfy (submit) to the theorem of superposition, they can be considered conditionally linear systems which characteristics, generally are defined by transitional function g (t, t_1) as basic for creation of a control algorithm and the system representing an output signal (command answer) in time point of t at impact on the corresponding element of system of the operating influence in time point of t_1. According to the theorem of superposition the output signal of system represents the amount of responses to input commands (step by step, package, one-fold), i.e.,:

$$v(t) = \int_{-\infty}^{t} g(t,t_1)\Delta(t)dt_1 \quad (1)$$

Where:

v(t) = An output signal (reaction) of reconfigurable system

Δ(t) = Function single (pulse, step-by-step) the operating influence

The real reconfigurable system can't react to entrance commands which aren't not sent, for example with control station on its entrance therefore, the upper limit of integral (Eq. 1) is equal to t. However, for virtual option of the system representing operators of directed impact (for example, extrapolation, forecasting of development of the situation) expression (Eq. 1) can be written down as:

$$v(t) = \int_{-\infty}^{+\infty} g(t,t_1)\Delta(t_1)dt_1 \quad (2)$$

Such system of an invariant in relation to the shift of a working interval of time, i.e.,:

$$v(t) = \int_{-\infty}^{+\infty} g(t,t_1)\Delta(t_1)dt_1 \quad (3)$$

CONCLUSION

Novelty of this structurally functional scheme is determined by the modularity of execution of certain agents resulting in working in shifts of specific implementation of agents of A2 of forming of emergency situations on the basis of structural and linguistic, statistical, neural and other approaches. At the same time, the structure and the nomenclature of agents of A1 and A3 is sustained within the set information and managing communications and standard elements of collection and final handling for the person making the decision according to information on a fire-dangerous situation.

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