

## Model Of Diagnostic Solutions Of Intellectual Support Security Systems

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**Abstract:** Complex model of acceptance of diagnostic decisions of security systems is considered the questions of development which are consists of a multivariate matrix probability model for acceptance of diagnostic decisions and set of logical models considering for the set of the uniform classes of diseases.

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Let the group of symptoms  $C_i$  which completely define  $B_i$  disease that is if the patient has  $C_i$  group of symptoms then he has  $B_i$  disease. In general  $C_i$  can be described in the form of a vector - a line:

$$C_i = \{P_{i1}^*, P_{i2}^*, \dots, P_{in}^*\} \quad (1)$$

Here according to numbers of index of  $P_{ij}$  should correspond with index numbers of the  $S_j$ .

Probable information of a symptomatic complex on all diseases for the selected uniform classes of diseases can be presented as the form of the following matrixes:

$$P = \{P_{ij}\}, i=1,2,\dots,m; j=1,2,\dots,n. \quad (2)$$

Now with the help of (1) we'll form the following shape of matrix for uniform classes of diseases:

$$P^* = \{P_{ij}^*\}, i=1,2,\dots,m; j=1,2,\dots,n. \quad (3)$$

Here  $P_{ij}^*(S_i / B_j)$  equal  $S_i$  is probable of existing symptoms  $B_j$  is during disease, which is defined by physician- experts. Each  $P_{ij}^*(S_i / B_j)$  are

defined thus  $P_{ij}^* = \sum_{q=1}^K P_{ijq}^{**} \cdot \alpha_q / \sum_{q=1}^K \alpha_q$  in case if use the ideas of many experts.

Here  $P_{ijq}^{**}$  is probabilistic assessment,  $q$  - of expert,  $\alpha_q$  - weight of experts,  $K$  - a number of experts. In  $n$  count the weight of experts equally, i.e.  $\alpha_q = 1 / (q=1,2,\dots,K)$ .

For a level assessment of coherence of experts opinion in this operation it is possible to use dispersion of the following dispersion:

$$\sigma_{ij}^2 = \sum_{q=1}^K (P_{ij}^* - P_{ijq}^{**})^2 \alpha_q / \sum_{q=1}^K \alpha_q.$$

Now it is possible to define an average error of

$$m_{ij} = \sqrt{\frac{\sigma_{ij}^2}{K-1}}$$

an arithmetic average:

Usually, in medical researches it is possible to read a level of coherence of opinion of experts of

$$\frac{m_{ij}}{P_{ij}^*} \cdot 100 \leq 5\%$$

sufficient, if

Now using matrixes (2) and (3) we make, a logical matrix  $L = \{l_{ij}\}$ ,  $i=1,2,\dots, m$ ;  $j=1,2,\dots, n$  are elements which accept values 0 or 1 according to a condition  $|P_{ij} - P_{ij}^*| < \varepsilon$ ,  $\varepsilon$  is admissible here

$$l_{ij} = \begin{cases} 1, & \text{if } |P_{ij} - P_{ij}^*| \leq \varepsilon \\ 0, & \text{if } |P_{ij} - P_{ij}^*| > \varepsilon. \end{cases}$$

Here  $l_{ij} =$

Now if  $\varepsilon$  is identical for all  $i$  and  $j$ , then it is set as one number which is defined by the expert. If  $\varepsilon$  isn't identical for all  $i$  and  $j$ , then its value is defined for all diseases and symptoms and is set in the form of the table.

Further, the following amounts are defined:

$$N_j = \sum_{i=1}^n l_{ji}$$

Now the probability of suffering of the patient with a disease of  $B_j$  can be defined as follows:

$$P_j = N_j / m.$$

Further, comparing values among themselves  $P_i$  ( $j=1,2,\dots, m$ ) is defined the greatest value of probability of a disease of  $B_i$  and the diagnosis is set.

Now we will consult questions of development of logical models of information processing for acceptance of diagnostic decisions.

Creations of a logical model of acceptances of diagnostic decisions is based on information processing and the knowledge gained from the expert.

Therefore on processes of computer implementation this model should imitate the thinking of the specialist of the selected uniform classes of diseases.

Therefore for creation of such system, it is necessary to study thinking process of the physician specialist of the selected uniform classes of diseases.

It is known that the system of artificial intelligence, creations for the solution of tasks in specific problem area, is called ES.

Therefore here ES the logical model of object-oriented is developed for the solution of the task of medical diagnostics for selected uniform classes of diseases.

Let it be the uniform classes of diseases of a cardiological disease is selected instead of quality specific data domain of ES, on the example of differential diagnosis of a myocardial infarction.

The solution of the task the logical structure of differential diagnostics is executed in several steps.

Now we will consider process of creation of a logical model of information processing for uniform classes of diseases of "Myocardial infarction". The logical model in a schematic look has the structure given in a figure. As a result of operation of this model of reasoning we receive the following results: Diagnosis IM, diagnosis exception of IM or recommendation of additional research. Additional researches are connected or to sufficiency of information, or from incompleteness of B3.

Further analogical schematic model of a reasoning is developed for uniform classes of diseases "Headache". It is possible to construct a logical model of reasoning and for other uniform classes of diseases, analogically.

Thus, the mathematical model of hybrid intellectual support systems of acceptance of diagnostic decisions offered a complex consists from one matrix and probabilistic model and sets of logical models of uniform classes of diseases.

1. Multi-dimensional probable matrix model allows accept a joint decisions from a certain probability according to the diagnosis of the patient.

2. The logical model of information processing is constructed by synthesis of process of reasoning by the physician experts and its opportunity depends on the content of BZ.

3. Accuracy of results of a probability model depends on a level of coherence of idea of physician experts.

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