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DETERMINATION OF INTERRELATED PARAMETERS IN SYSTEMS

Abstract. The method for finding the parameters that are at-cause and effect link between a cyclic.

Keywords: system, the set of parameters, matrix, graph causality oriented cycle

Problem. We denote by $X=\{x_1, x_2, \dots , x_n\}$ a set of parameters (events), then - the elements of a system. In [1] describes algorithms for determining the presence of specific elements of the systems. In this work it is necessary to develop a technique that can detect the presence in it of elements, some of which indicate the presence of some other and, thus, such dependence is cyclic.

The main results. Present system as oriyentova tion graph $G(V,E)$, where E corresponds to a set of nodes of elements x_1, x_2, ..., x_n, and a set of edges V – connections between them. If this box there is an edge from any vertex to another, between elements that meet the top, there is a connection. Since the elements are interconnected in such a way, then this graph is a graph of causality [1].

In order to identify the parameters of the system means that the set-ists $T=\{t_1, t_2, \dots , t_m\}$, each of which detects the presence of system elements relevant subsets Y_1, Y_2, … , Y_m, $\forall\ Y_i \in X$. Based on the results of the test experiment put in correspondence with each test $T=\{t_1, t_2, \dots , t_m\}$ vector symptom $S=\{s_1, s_2, \dots, s_m\}$, and, $\forall\ s_i=0$, if the test indicates the presence of T_i ele-ments subsets Y_i in system and $\forall\ s_i=1$ otherwise.

In [1] the algorithms of the structural elements of the list L, present in the system

$$L = \bigcap_{i \in s_i = 0} Y_i \setminus \bigcup_{j \in s_j = 1} Y_j \,, \tag{1}$$

$$L = \bigcup_{i \in s_i = 0} Y_i \setminus \bigcup_{j \in s_j = 1} Y_j \,. \tag{2}$$

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First L is calculated according to the algorithm (1), and, if it goes empty set is used method (2).

The first case corresponds to the presence in the system, most likely one or perhaps several elements of the list L, and the second – the certificate points to the presence in it of several elements.

In [1] also presented a methodology that allows such identifying exactly the element that it is impossible to light at the box-ness and causality cycles. Of Procedure describe their location.

Let $a \in V$ – arbitrary vertex of the graph G, and $¥^{+}(a)$ and $¥(a)$ – the set of vertices forward and backward transitive closing of this graph with respect to vertex a. If $¥^{+}(a) \cap ¥(a) \neq \varnothing$ ($\varnothing$ – empty set), then the graph G, there are no cycles that have at the top a [2]. Obviously, if a property is true for all vertices, it has focused (in our case) cycles.

The operation $\cap$ intersection $¥^{+}$ and $¥$ can be done using a matrix of routes R [2] of G. Because of that row i of the matrix R is a $¥^{+}(i)$, and its i-th column – $¥(a)$ the operation of logical multiplication i-th row in the i-th column causes of $¥^{+}(i) \cap ¥(i)$. Thus, in order to find $¥^{+}(i) \cap ¥(i)$ for every $i = 1, \ldots , n$, where n – the size of the matrix R must perform component-wise logical multiplication operation i-th row in the i-th column, or what is the same, perform the operation $R_1 = R \otimes R^T$, where R^T – transposed matrix R.

Obviously, if R_1 – zero matrix, then the graph G has no oriented cycles, but otherwise each element $r_{i,j} = 1$ indicates that the vertices i and j belong to some oriented cycle of this graph.

Later, you can specify the cycles of the adjacency matrix S [2] graph G, if we consider only those elements whose coordinates correspond to elements of the matrix R_1, equal to unity, the matrix R_1 must "impose" matrix S, which means operation $S_1 = S \otimes R_1$.

However, we found both S_1 as $S_1 = S \otimes R_1$, but $R_1 = R \otimes R^T$, i.e. $S_1 = S \otimes R \otimes R^T$. Obviously, $S \otimes R = S$, how the end result, we have $S_1 = S \otimes R^T$, and this, in turn, suggests reducing the proposed procedure.

Example. In order to confirm the results obtained consider the graph shown in Fig. 1. First make operation $R_1 = R \otimes R^T$.

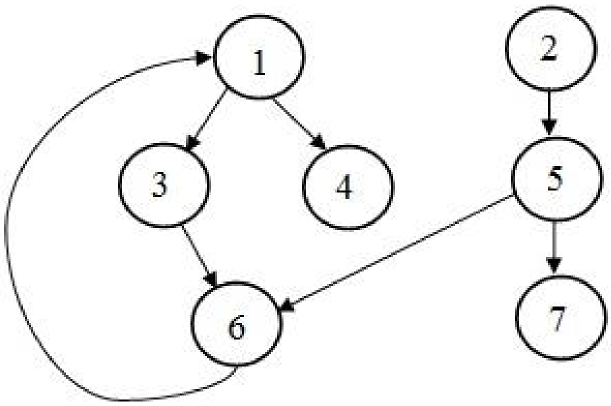

Figure 1 – Focuses cyclic graph

$$\begin{bmatrix} 1011010 \\ 1011111 \\ 1011010 \\ 1011010 \\ 1011011 \\ 1011010 \\ 0000000 \end{bmatrix} \otimes \begin{bmatrix} 1111110 \\ 0000000 \\ 1111110 \\ 1111110 \\ 0100000 \\ 1111110 \\ 0100100 \end{bmatrix} = \begin{bmatrix} 1011010 \\ 0000000 \\ 1011010 \\ 1011010 \\ 0000000 \\ 1011010 \\ 0000000 \end{bmatrix}$$

$R_1 \neq 0$. In the graph is a cycle of elements 1, 3, 4, 6. We find it by doing surgery $S_1 = S \otimes R_1$.

$$\begin{bmatrix} 0011000 \\ 0000100 \\ 0000010 \\ 0000010 \\ 0000011 \\ 1000000 \\ 0000000 \end{bmatrix} \otimes \begin{bmatrix} 1011010 \\ 0000000 \\ 1011010 \\ 1011010 \\ 0000000 \\ 1011010 \\ 0000000 \end{bmatrix} = \begin{bmatrix} 0011000 \\ 0000000 \\ 0000010 \\ 0000010 \\ 0000000 \\ 1000000 \\ 0000000 \end{bmatrix}$$

Now execute shortcut $S_1 = S \otimes R^T$.

$$\begin{bmatrix} 0011000 \\ 0000100 \\ 0000010 \\ 0000010 \\ 0000011 \\ 1000000 \\ 0000000 \end{bmatrix} \otimes \begin{bmatrix} 1111110 \\ 0000000 \\ 1111110 \\ 1111110 \\ 0100000 \\ 1111110 \\ 0100100 \end{bmatrix} = \begin{bmatrix} 0011000 \\ 0000000 \\ 0000010 \\ 0000010 \\ 0000000 \\ 1000000 \\ 0000000 \end{bmatrix}$$

The results – obtained similar before.

Conclusion. Thus, in this paper, using graph theory, the method which can detect the presence in it of elements, some of which indicate the presence of some other and, thus, such dependence is cyclic, which makes it impossible to identify them with up to one particular item.

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