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INFORMATION SECURITY ANALYSIS ALGORITHM IN CLOUD TECHNOLOGY

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ABSTRACT. There are different approaches to information security modeling in cloud technology. Unlike other modeling devices, the Petri network (PN) is a more universal device. This is justified by the fact that the information used is modeled by the PN and an assessment of security is made by analyzing the main properties of the PN outside the system.

KEYWORDS*: Security, server, browser, cloud service, provider, Petri network*

INTRODUCTİON

Here, processing technology, algebraic PN's are used to analyze the storage and protection of information. The main difference between the algebraic PN and the ordinary PN [4,5] is that it has the ability to perform full-value addition, subtraction, multiplication and residual division operations. The availability of these capabilities allows the ability to model the dynamic, discrete processes of the network to be compared with the first-order predicates of symbol logic. The practical advantages of such models make it possible to model multivariate polynomials and tabular functions.

The main advantage of algebraic PN and its various extensions is that it has more opportunities in the field of research and modeling of parallel processes. Given the formation of algebraic PS on the basis of closed categories with special properties, it is used in the synthesis of classical analysis and comparison methods of algebraic network systems as a mathematical modeling apparatus. This advantage allows the results of the modeling process to be widely applied in practice.

Fuzzy algebra PN is defined by the following five [1,2,3]:

$$N=(P \cup F, T, A, V, \mu_0{}^R),$$

here, $P=\{p_1,p_2,\ldots,p_n\}$– is a finite set of positions of type p; $F=\{f_1,f_2,\ldots,f_m\}$ - is a finite set of positions of type f; $T=\{t_1,t_2,\ldots,t_r\}$– is the finite set of transitions; A- finite alphabet; $V:[(P \cup F)\times T] \cup [T\times(P \cup F)] \rightarrow A^*$- is a description of the marked arcs that connect the positions with the links and the links with the positions; $\mu_0{}^R:P\cup F \rightarrow A^* \times [0,1]^{\ell}$ - A^* - is the initial marking of the positions of the words, A^* - A is a free monoid; ℓ=card $X^f(a)$, $a \in P \cup F$.

Fuzzy algebra of PN the initial marking for each position is described by the following procession:

$$\mu_0^R(a) = \langle x_1 x_2 \ldots x_k, R(x_1)R(x_2)\ldots R(x_k)\rangle.$$

Fuzzy algebra in PN the permissibility of the passages is analogous to the rules of the algebraic PN and is determined by the first element of the procession. $\mu^R(a)$ Development of a t- transitions , which is allowed for marking $\mu_1^R(a)$ the first element of the procession is the algebra, which is analogous to the PN. The second element of the procession is calculated by the following formula:

$$R=(V(t,a)) = min\{R(V(y,t)) \mid y \in G^+(t)\}, \quad a \in P \cup F$$

The activity of information security in cloud technology in accordance with the automation scheme is as follows:

To use the system, an authorized user obtains access by entering the password he has entered correctly. With the help of PN positions and links, it is possible to determine whether the user entered this password correctly or not. When the system starts, the condition is checked, and if the password is entered by a real user, the system is opened for use. If the password is entered incorrectly, then the system is compromised by a malicious person. In this case, there will be no connection to the system and the system will not be opened for that malicious user. In this sequence, an automated system for modeling information security in cloud technology using fuzzy algebraic PN is created.

The operation and analysis algorithm of the fuzzy algebra PN is as follows:

1. The beginning of the algorithm
2. Plenty of links $(m+n)\times r$ dimensional $G^{-}=[(F\cup P)\times T]$ creation of input incident matrix:

$$g^{-}_{ji} = \begin{cases} s, & \text{if to } j \text{ is } i \text{ there is an arrow directed to the transition} \\ \varepsilon, & \text{else} \end{cases}$$

there, $i=\overline{1,r},\quad j=\overline{1,m+n}.\quad j=\overline{1,m}$ when, f arcs of type position, $j=\overline{m+1,m+n}$ when, p the arcs of the type position are expressed.

3. Plenty of links $r\times(m+n)$ dimensional $G^{+}=[T\times(F\cup P)]$ creation of output incident matrix:

$$g^{+}_{ji} = \begin{cases} s, & \text{if to } j \text{ is } i \text{ there is an arrow directed to the transition} \\ \varepsilon, & \text{else} \end{cases}$$

here, $i=\overline{1,r},\quad j=\overline{1,m+n}.\quad j=\overline{1,m}$ while, f arcs of type position, $j=\overline{m+1,m+n}$ while, p the arcs of the type position are expressed.

4. The distribution function of the set of transitions $r\times(m+n)$ dimensional W^{-} creation of input membership matrix:

$$W^{-}_{ji} = \begin{cases} W(s), & \text{if to } j \text{ is } i \text{ there is an arrow directed to the transition;} \\ 0, & \text{else} \end{cases}$$

here, $i=\overline{1,r},\quad j=\overline{1,m+n},\quad W(s)\in[0,1].$

5. $1\times(m+n)$ ölçülü μ creation of initial marking:

$$\mu_j = \begin{cases} s, & \text{if the position is marked } s \text{ word} \\ \varepsilon, & \text{if the position is not marked} \end{cases}$$

here, $j=\overline{1,m+n}$. $\mu_j(j=\overline{1,m})$ elements determine the positioning of the f-type position, $\mu_j(j=\overline{m+1,m+n})$ the elements determine the p-position positioning.

6. Creation of the matrix of the degree of belonging of the distribution function of the initial marker:

$$e_j = \begin{cases} W(\mu_j), & \text{if } j\text{- position is marked} \\ 0, & \text{if } j\text{- position is not marked} \end{cases}$$

here, $j=\overline{1,m+n};\quad W(\mu_j)\in[0,1].$

7. Search for a permitted passage. Every $t_i(i=\overline{1,r})$ the processing condition for the transition is checked:

a) G^{-} all input positions of the t_i transition from the input matrix are assigned. All $g^{-}_{ji}\neq\varepsilon(j=\overline{1,m})$, for is g^{-}_{ji} to is μ_j the presence of a left striker is conditionally checked:

$n_1 = card(g^-_{ji})$ the length of the elements is calculated and from the first position of the elements of μ_j marking $p=copy(\mu_j, 1, n_1)$ the word is selected. If $p \neq g^-_{ji}$, to index i unit increases $i=i+1$ and the transition to the item is made 7.b.

b) All $g^-_{ji} \neq \varepsilon (j = \overline{m+1, m+n})$ a mirror word is compiled for: $\tilde{\mu}_j = \varepsilon$ və $n_1 = card(\mu_j)$, $\tilde{\mu}_j = \tilde{\mu}_j \circ copy(\mu_j, k, 1)$, $k = \overline{n_1, 1}$ characters are moved according to the formula;

c) $g^-_{ji}, (j = \overline{m+1, m+n})$ in the mirror is checked to see if the word is left-handed: is $n_1 = card(g^-_{ji})$ to $\tilde{\mu}_j$ from the first position of the word mirrored $p=copy(\mu_j, 1, n_1)$ the word is selected. If $p \neq g^-_{ji}$, to i index $i=i+1$ unit increases.

8. If $i>r$ to a deadlock is reported, else the transition to the item is made 9.

9. The transition to the item is made 7.a.
10. Calculation of the elements of the new marking matrix:

$$\mu'_j = \begin{cases} copy(\mu_j, n_1+1, m_1-n_1) \circ g^+_{ij}, j = \overline{1,m}; \\ copy(\mu_j, 1, m_1-n_1) \circ g^+_{ij}, j = \overline{m+1, m+n}, \end{cases}$$

here, $m_1 = card(\mu_j), n_1 = card(g^-_{ji})$.

11. New marking is accepted after the current marking: $\mu_j = \mu'_j, (i = \overline{1, m+n})$

12. Creating a matrix of the degree of belonging of the distribution function of the new marker:
a) The distribution function of the set of transitions W^+ calculation of the elements of the output degree matrix:

$$W^+(i,k) = min\left| W^-(j,i)^\ell \right| \text{ all } W^-(j,i) \neq 0, \quad \text{here, } i = \overline{1,r}; k = \overline{1, m+n};$$

all $W^-(j,i) \neq 0$, here, $i = \overline{1,r}; k = \overline{1, m+n}$;

b)

$$e_j = \begin{cases} W^+(j,k), & \text{əgər } \mu_j \neq e; \\ 0, & \text{əgər } \mu_j = e; \end{cases} \qquad j = \overline{1, m+n}; \ell = card(\mu_n).$$

here,

13. The transition to the item is made 7. The process continues until the desired marker is obtained.
14. The end of the algorithm.

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