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Verification the Related Data Base by the Layered Radial-Basis Neural Network

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***Abstract:** The verification method of the information in the related data bases by the theory of layered radial-basis neural networks given in this article. The method consists of three levels: clustering the data by Kohonen network, learning and usage of radial-basis neuron network, marking the reliability of the rows in the table of data base. The software worked out by the invers method in the basis of radial-neuron basis. The suggested data base by the method of verification gives opportunity to work out the models of integrated informational systems, algorithms and software.*

***Keywords::** radial-basis neuron networks, related data base, verification, neuron networks, learning, Kohonen networks, clustering.*

I. INTRODUCTION

Presently, the amount of practical and scientific interest increasing to the artificial neuron network, in the working out the algorithms and software, models of integrated informational systems in the basis of layered radial-basis neuron networks in the spheres of neurocomputers and neuro informatics. This effect to this sphere and other typical spheres for instance, education, industry, managing the economical spheres, development the directions of telecommunication and also to increase to new stage of quality. It becomes one of the most important problems, to create the new methods and forms of study, working out the single informational area and less developed process (study process) by the theory of mathematical modelling of Institutions by implementation informational communicational technologies in educating system.

The verification of data bases (DB) is checking out compatibility the information by the single indicators of identifier, marking their reliability and identifying the indicator of durability to the influence of environment. It is important the verification to prevent the bad results of wrong usage of information.

II. RESULTS AND DISCUSSIONS

The aim of verification is to increase the reliability of information by identifying the unreliable information.

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The verification has an important role in saving information and software of informational system in database.

It is important to know the verification object and the meaning of data base to identify the indicator of verification of data base. The database monitoring system helps only the integrity of data base [1], but it cannot deeply monitor the reliability of data base. The indicators of the labor and time factors have the importance in monitoring the every process because the human factor highly demanded in monitoring the reliability of data bases. At the result, it is demanded the usage with the limited informational system.

The one of main methods of providing the reliability of information in data bases is controlling the entrance by the saved processes or triggers presented by the data base or the software link. If there are unreliable lines in data base, it demands the human labor and huge amount of time to identifying and fixing them.

The method of verification based on the neuron networks theory suggested in this article, helps in identifying the reliability of entrance collection (lines) to the table of data base [3, 4]. It is well known that, intellectual informational system gives an opportunity to make an electronic the information, gives the traditional human labor to computer system.

The artificial neuron networks (ANN) is the mathematic models based on service and organization the biological neuron networks, for instance it is software and apparatus realizations. ANN's are the system of artificial neurons which connected and affect each other.

The theoritical base of related data base consists of the theory of relations. The related algebra is the result of each operation, also the collection of operations in each connected relations. Thus, the verification of data base is monitoring the relations at the result of each connected operations used in every questions or communications.

There is the data base presents the generality of relations. Let us look through the n – relation which is the tables of $D_1 \times D_2 \times \ldots \times D_n$ related data base of the $D_1, D_2, \ldots, D_n \ (n \geq 1)$ collection. The each element of $R = \{r_1, r_2, \ldots r_j, \ldots r_m\}$ relations is the multiplication of the elements of $D_1 \times D_2 \times \ldots \times D_n$ collection: the j − element $\langle a_{j,1}, a_{j,2}, \ldots a_{j,n} \rangle$, $a_{j,1} \in D_1, a_{j,2} \in D_2, \ldots, a_{j,n} \in D_n$ of the R relations. We can present the relation in the form of table (1 table), it's column (areas, attributes) match to appearing the domains of relations and the lines (writings) match to the collections of n results which taken by the domains of resources. We assign parameters $d(r_j)$ to each r_j elements, the reliability of this element equals to the $0 \leq d(r_j) \leq 1$.

If we look through next given exercise, here given the table which consists of some (comparatively small) reliable information and each these tables equal to $r_j \in R\ d(r_j) = 1$. Taking under attention to the continuously renewing this table, it is important to identify the $d(r_{m+1})$ reliability for new r_{m+1} line in table.

Table 1. The view of R relations into mutual connection.

r_1	$a_{1,1}$	$a_{1,2}$	$\cdots$	$a_{1,n}$	$d(r_1)$
r_2	$a_{2,1}$	$a_{2,2}$	$\cdots$	$a_{2,n}$	$d(r_2)$
	$\cdots$	$\cdots$	$\cdots$	$\cdots$	$\cdots$
r_{m+1}	$a_{m+1,1}$	$a_{m+1,2}$	$\cdots$	$a_{m+1,n}$	$d(r_{m+1})$

We will limit ourselves to monitoring the relations in electronic data because of simple explanation of the identifying method of reliability of input collection. If necessary it is allowed to take of areas in the type of line or change with numeric codes. The information about the collection of domain objects (the instance of this object) belonged to this class saves in the table of data base.

But, it is allowed to separate into groups of similar objects, from the objects in other groups as possible, in the group of this aggregate and these will separate from cluster. The first stage of verification is consists of identifying the clusters.

The Kohonen networks uses to identify the teaching without teacher the dependence of any element to cluster and advantages [4]. The amount of clusters matches with the amount of neuron of the T exit layer and identifies by the methods in [5].

The network configuration shown in picture 1, $x_1, x_2, ..., x_n$ is the entrance of network, n is the number of elements in network; w_{ik} is the weight of connection between k neuron of the entrance layer with l neuron and $k = 1, 2, ..., T$; $out_1^1, out_2^1, ..., out_T^1$ is the exit amount of last neurons (***Fig 1***).

The result of cluster by the Kohonen network for each couple must be (r_i, C_k), $C_k - r_i$ is the cluster depended to the element. These collections of couples are used in learning the radial-basis neuron network.

We identify the activate functions of neurons in each layer, the amount of neurons, the hiding layers in each layer and the amount of layers in entrance and exit layers to use the radial-basis network.

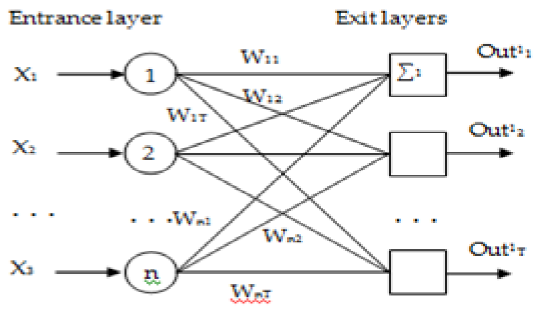

Fig 1. Kohonen neuron network

The amount of neurons in entrance layers identifies by the n number of columns of the analyzed table. The amount of neurons in hiding layer identifies separately for each occasion, but the previous researches show the amount of neurons in entrance layer a lot of 1,5 and 2 times than exit layer. The amount of neurons in exit layer is match to the amount of previously identified clusters T by the help of Kohonen network. The radial-basis neuron network is given in ***Fig 2***.

The present condition of neuron determined as the weight sum of its entrances,

$$S_u^L = w_{jo} + \sum_{i=1}^{n} x_i w_{iu}^{L-1},$$

$$x_i = \phi\left(\|x - c\|_1, \delta\right),$$

$$w_{iu} = w_{iu}^{n-1} - \eta \cdot \frac{\partial E}{\partial \varpi_k^{t-1}};$$

here given the x_i is the amount of entrance, w_{ij}^L is the weight of connections. Besides that, $x_i = a_{ji}$, $j = \overline{1, m}$, $L = 2,3$ is the number for the first floor neurons, u is the amount of neurons in floor.

Let the condition function of neuron in exit given as $y = f(s)$. The f nonlinear function is called as activate function and it may get another form. The most spread function is the saturation and nonlinear function that is called as logistic function or sigmoid (the S function):

$$f(s) = (1 + e^{-as})^{-1}$$

It is shown from the sigmoid expression, the amount of neuron is between the [0,1]. We may create the next expression using the important properties of sigmoid function:

$$f'(s) = \alpha f(s)(1 - f(s))$$

The result of activate function is used in learning the network. We may use the reverse-spreading algorithm for the mistake of two cross by the every layer to solve this problem: they are forward and back.

The entrance vector is fed by the entrance layer of neuron network with direct transition, than it spreads from layer to layer through network. At the result the collection of exit signals

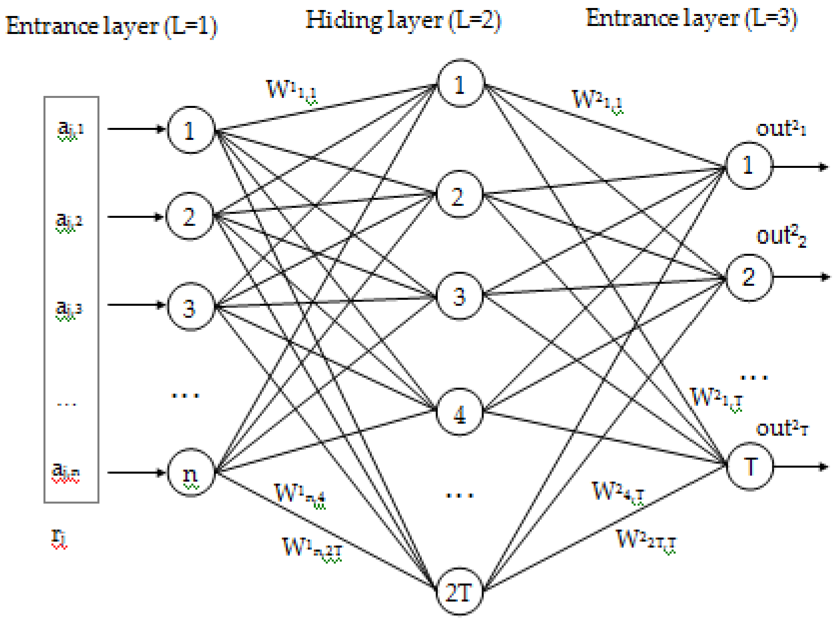

Fig 2. The scheme of radial-basis neuron.

formed which is true answer for entrance amount of network. The every synaptic exact weight identifies at the time of direct transition.

The weight of neuron network adopts by the rule of Delta in going back at the time of any iteration:

$$\Delta w_i = v\delta x_i$$

here given δ is the mistake in the exit of hiding neuron, v is the coefficient of the amount of learning, x_i is the amount by the entrance connections

It is possible to calculate the new weight by identifying its amount for i connection:

$$w_i(h+1) = w_i(h) + \Delta w$$

Here given the h is the amount of learning iteration. The weight of connections adopt for bring the exit signal to necessary signal as close as possible. The every stage of learning is in h – level equals to this amount.

It is allowed to create the network which gives opportunity to classification the objects of information in the analyzed table at the result of learning the radial-basis network with the method of reverse-spreading of mistake by the taken couple (r_j, C_k) collection.

It is allowed to use formation the objects which is not entered to the reliable data base from learnt network for spreading to the previously unknown samples of selected knowledges that is the collecting function of neuron networks.

In these occasions, It is determined with the maximum exit amount of neurons of exit layer, that is the level of reliability for dependence of given sample for depending to any of one classification.

$$d(r_{m+1}) = \max(out_1^2, out_2^2, ..., out_T^2)$$

$$u(x) = \sum_{i=1}^{m} w^{(i)}\phi^{(i)}(x) = \sum_{i=1}^{m} w^{(i)}\sqrt{\left(r^2 + a^{(i)2}\right)}$$

$$\psi_1(2) = \max\left\{0, 1 - \left(\frac{\|x(2) - c_1(1)\|}{2r}\right)^2\right\},$$

Here out_i^2 is result of i neuron of the layer of network; $\max$ is function of calculation of maximum amount; d is the remarking of reliability.

The little amount of d expresses the not enough dependence to classification with the amount of level of reliability of given sample that is gives mistakes and uncertainty. These parameters may use as the amount of reliability.

$$out_k^2 = \begin{cases} 1, if \ \ r_j \in C_k; \\ 0, if \ \ r_j \notin C_k. \end{cases}$$

Thus we may divide this method into 3 main levels. The general view of these three levels are given in the Fig 3.

Additionally to given problem, it is allowed to look through the problems of verification also tables of data base with multi lines, that is important to calculate because of unknown amount of reliability.

If we separate the reliable lines by the given method, checking them in the hand and choosing the necessary lines from table at the level of preparation of verification, than the suggested method gives opportunity to easy verification.

III. CONCLUSION

To sum up, the suggested method gives opportunity to solve the problems on verification the related data base. Presently, it is proceeding the software monitoring by the help of reverse-spreading of mistake with the opportunity of monitor the parameters and order of learning and creating the radial-basis of given configuration. The mathematic result of given problem gives opportunity for following creation the software for practically use of taken software and numerous experiences.

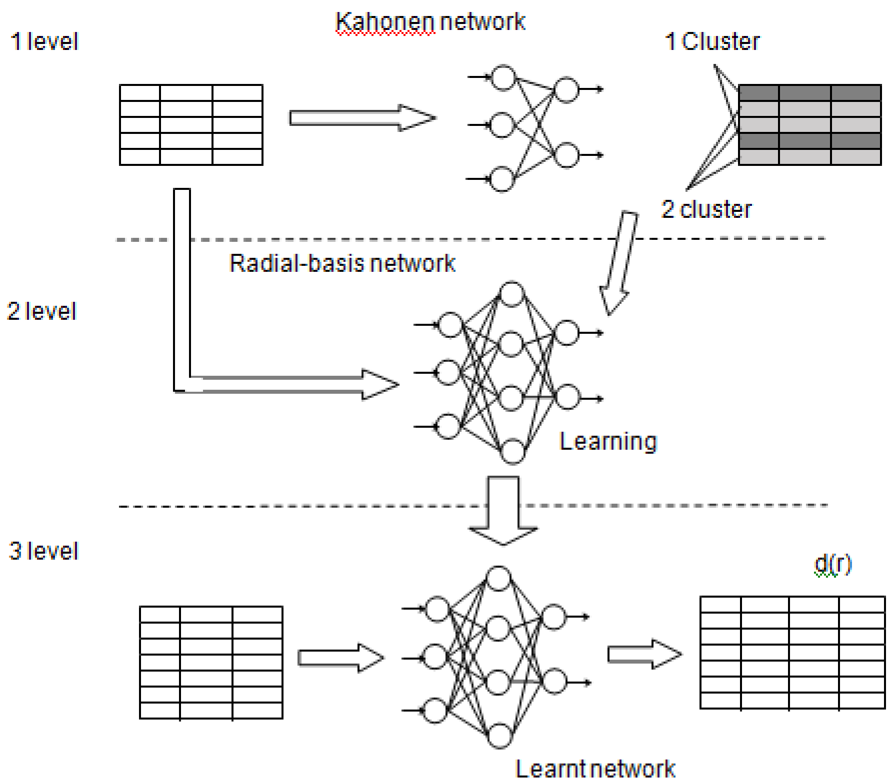

Fig 3. The general view of the method of verification the data base.

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