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The research about micromachining accuracy control based on fuzzy evaluation algorithm

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Summary

The calculation method of nonlinear artificial neural network based on fuzzy evaluation algorithm is introduced. This method is used to evaluate the precision of micro machined machining and to find the influence factors of the precision of micromachining. The traditional machining precision control mainly adopts the linear control strategy, but the micromachining involves the mechanical characteristics of the micro field, and many linear machine adding precision control methods cannot effectively control the precision of the micromachining. Using fuzzy evaluation method, large data cluster training method can be used to fit the control curve of micromachining accuracy. The nonlinear mapping of the fuzzy evaluation algorithm is realized by the large sample training method, and the objective and effective parameter evaluation and precision control of the machining precision in the micro machined field are realized. It is proved that the fuzzy evaluation algorithm can accurately evaluate the precision of micro machined machining. Learning through large data samples can effectively improve the topology practicability and rationality of the algorithm.

KEYWORDS

accuracy control, fuzzy algorithm, micromachining, machining accuracy, nonlinear cluster training

1 | INTRODUCTION

Fuzzy evaluation algorithm is a subset of neural network algorithm. It is a type of intelligent algorithm based on the current hot big data, and is also a prototype of AI. As a nonlinear theory, it has a good ability to solve all kinds of large delay and non quasi state problems, and it can adopt the characteristics of autonomous learning and massive data optimization. Micro machine is a new discipline characterized by its small size or minimal operation scale. It is a component or structure that can be made with microelectronics and microelectronics. It can be divided into several independent functional units. The physical or chemical signal of the transmission is converted from sensor to electrical signal, and after signal processing, it acts with the outside. The characteristics of micromachinery include sturdy structure, small size, high precision, and light weight. Its structural feature size is micron to nanometer, the precision is up to nanoscale, the whole volume is 1 mm, grade or smaller, the weight can be light to nanometer, the performance is stable, and the reliability is high. It is almost not affected by heat, noise and deformation, low energy consumption, high sensitivity, and high efficiency, and the average energy consumption is only a fraction of that of traditional machinery. There are three main kinds of micromachining technology. The first is to make use of traditional mechanical processing, represented by China and Japan, to make small machines by large machines, and then to make micro machines by small machines. The second is to use chemical corrosion or integrated circuit technology as the representative of the United States to work silicon materials and form silicon-based MEMS devices; the third is to produce silicon based devices. It is a method of forming deep micro structure by electroforming and casting with X ray lithography technology. The second methods are compatible with the traditional IC technology. It can realize the system integration of micromachinery and microelectronics and is suitable for mass production. It has become the mainstream technology of MEMS. As the LI GA technology can be used to process various metals, plastics, and ceramics, the fine structure of high depth width ratio can be obtained, and the processing depth can reach several hundred microns. Therefore, UGA technology is also a more important MEMS processing technology. Micro gear, micro motor, micro accelerometer, and micro fluid meter have been developed and manufactured by using LGIA technology. The first processing method can be used for machining some micromechanical devices for special occasions, such as micro robots, mini operating tables, etc. In this paper, the precision control of the first kind of MEMS is discussed. Because the size of

the micro machined parts is very small, the traditional macro precision control method cannot effectively control the micron and nana scale micro mechanical surface precision, so it is urgent to solve such problems in practical application.[1]

The precision of micromachining refers to the degree to which the actual geometric parameters (dimensions, shapes, and surface positions) of parts are in conformity with the ideal geometric parameters of the parts after micromachining. The actual parts cannot be completely identical with the ideal parts. The degree of deviation between the actual geometric parameters of the parts, and the geometric parameters of the ideal parts after processing is called the machining error. Machining accuracy and machining error are two different aspects to evaluate the geometric parameters of the parts. In actual production, the accuracy of processing is to be evaluated and expressed by the size of the machining error. "Machining precision including dimensional precision, shape precision, and position precision" guarantees and improves the addition precision. In fact, it is also to limit and reduce the error of processing. The purpose of studying processing precision is to study how to control all kinds of errors within the prescribed tolerance range and master the influence of various factors on the processing precision, so as to find the measures to reduce the machining error and improve the machining accuracy from ensuring the performance requirements of the products and lowering the cost of production. Processing is absolutely accurate, provided that the specified tolerance requirements are met. To ensure the machining, quality of parts is to make the actual machining error small. In this paper, the fuzzy evaluation algorithm is introduced to control the precision of micro machined machining, including the network level, the number of nodes in each layer, the training function, the training algorithm, the training times, and the improvement of the error adjustment step RBF network.

2 | FUZZY EVALUATION ALGORITHM IN MICROMACHINING PRECISION CONTROL

The core calculation of fuzzy comprehensive evaluation is to realize the transformation from "index membership to target membership." However, the existing methods of membership conversion are not designed from the point of view of target classification, which cannot reveal which part of the index membership is useful to the target classification and which part is not used. This redundancy value, which does not work for target classification, is also used to calculate the membership degree of a target. In fact, the membership degree conversion is a kind of information fusion technology, and the key link to realize information fusion is to excavate the knowledge information about the target classification hidden in the membership degree of each index. For this reason, a filter is designed by mining this knowledge information, which can remove redundant values that do not play a role in target classification, and achieve membership conversion without redundant data interference.

The reason for the rapid development and extensive application of neural network is that it has such advantages,[2] ie, strong robustness and fault tolerance, because information is distributed in the neurons stored in the network; parallel processing methods, each unit of the network can carry out similar processing at the same time and it makes the calculation fast; self-learning, self-organizing, and self-adaptive, the connection between neurons is varied and the connection between each element has a certain plasticity, so that the neural network can handle systems that are uncertain or unaware[3]; it can fully approximate any complex nonlinear system and has a strong ability to integrate information; and it can deal with quantitative and qualitative information at the same time. It can well coordinate various input information relationships and is suitable for dealing with complex nonlinear and uncertain objects. Neural network is a kind of nonlinear mapping artificial neural network, and most of them adopt three layer structure.[4] BP model learning can be divided into two steps. In the first step, it is propagated through the existing connection weights. After the transfer function of each neuron node, the actual output is obtained. The node function usually uses the sigmoid function[5-7]

$$F(x) = \frac{1}{1+e^{x}}. \tag{1}$$

In the second step, the general error of each neuron in the output layer is calculated first. These errors are propagated to the input layer by layer to obtain the reference error of the neurons in each layer, thus adjusting the corresponding connection weights and thresholds, and the adjustment of the weights and thresholds can be determined by the following types[8]:

$$W_{ji}(t+1) = W_{ji}(t) + \Delta W_{ji}(t+1) + \alpha \Delta W_{ji}. \tag{2}$$

The adjustment of weights and thresholds can be derived from the gradient descent method

$$\Delta W_{ji} = \eta \delta_j \theta_j. \tag{3}$$

The above process is repeated repeatedly, and the cost function can be formed when the sample is enough, so that the deviation is within tolerance range[9-12]

$$E = \frac{1}{2} \sum_{p} \sum_{j} (t_{pj} - v_{pj})^2 = \sum_{p} E_P. \tag{4}$$

When the node j is the node of the output layer, ie, when the node j is the hidden layer node, delta repeats the process until the sample set deviation reaches the allowable value. The deviation of the sample set refers to the least square sum, ie, the cost function, as follows: The research of fuzzy neural network has become an attractive research direction in the world. The so-called fuzzy neural network is a new network system, which is produced by the combination of fuzzy theory and neural network. It is a kind of russification of the traditional neural network model in some degree. One of its notable features is that each node of the network is different from the two value state of the traditional BP neuron, which can be valued in the [0, 1] interval. In this case, each node can express the fuzzy concept. Fuzzy neural network has the function of neural network and expert system integration. When using neural network to solve the problem of fault diagnosis, there is an obvious tendency to integrate qualitative knowledge in

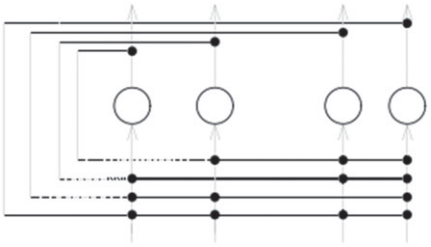

FIGURE 1 Feedback neural network. As shown in Figure 3, one of the typical feedback neural networks is the single layer interconnection feedback neural network model. The model is the foundation of complex feedback neural network

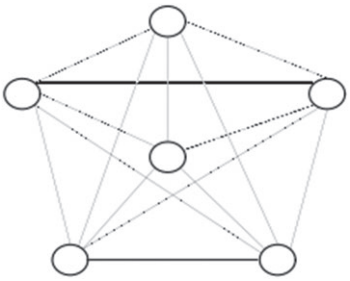

FIGURE 2 Single-layer interconnection feedback model

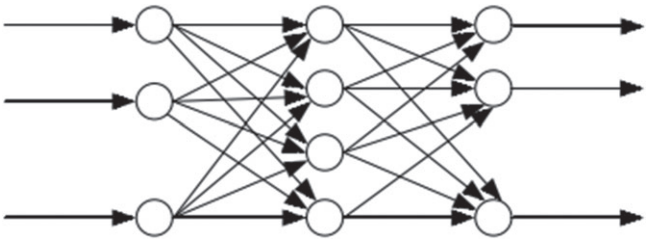

FIGURE 3 Structure of FNN. As shown in Figure 2, Hopfield neural network is the simplest and widely used model in the feedback network, mainly because it has the function of associative memory. Another important application of Hopfield neural network is to solve the problem of fast optimization

the framework of neural network.[13-15] Therefore, fuzzy neural network has become a hot topic of research. Fuzzy neural network usually adds a fuzzy layer to the general feed-forward neural network to complete the calculation of an input membership function. Figure 1 shows the project diagram of fuzzy neural network. Figure 1 represents the neural network structure of neural networks. Figure 2 shows the running mode of the fuzzy neural network node.

There are many kinds of artificial neural network models, and there are many kinds of classification methods. Here, we introduce two common types of classification. One is the classification according to the topology of network connection, and the other is the classification according to the information flow inside the network. As for the connection form of neural network, feedforward network and feedback network are two typical models. Feedforward network, as shown in Figure 3, refers to the processing direction of network information from the input layer to the hidden layer and then to the output layer. The nodes in the network are roughly divided into two types, ie, one is the input node, which refers to the external introduction of information to the first hidden layer; the other is a node with processing capability, which includes the hidden layer and the output layer node. The output of one layer in the feedforward network is the input of the next layer; the processing of information is directional, and there is no feedback in general, so this kind of network is easily connected in series to form a layer feedforward network. The multilayer feedforward network can be represented by a loop free graph, in which the first layer of the network is the input layer, the second layer of the network is the first hidden layer, and the rest is the analogy. Therefore, when it comes to a neural network with a single layer calculation, it refers to a feedforward network with the input layer and the output layer; when it refers to a single hidden layer network, it should be a feedforward network with the input layer, the hidden layer, and the output layer. From the point of view of learning, feedforward network has very strong learning performance; its structure is simple and easy to program. From the point of view of the system, feedforward network is a static nonlinear mapping, and the complex nonlinear processing ability can be obtained through a simple complex mapping. However, from the point of view of computation, there is a lack of dynamic behavior. Therefore, most feedforward networks are learning networks, and their pattern recognition ability and classification ability are generally stronger than that of feedback networks. The typical feedforward networks have BP networks and perceptron. The feedback neural network is a nonlinear dynamic system, so it is not able to achieve a stable state at the beginning of work. It must take a period of time to stabilize.

TABLE 1 Fuzzy evaluation table for precision control of micromechanical turning

parameter	Parameter value fuzzy quantization				Fuzzy quantization of parameter weight				
	Parameter evaluation value Ds			P	Parameter weight value Rs			Synthesis	
	d1	d2	d3		d1	d2	d3	e	E
e1	89.2	83.1	86.5	86.3	1.0	1.0	0.5	0.8	1.34
e2	90.2	91.2	95.4	92.3	1.0	0.5	1.0	0.8	1.34
e3	69.8	72.5	68.5	70.3	0.5	0.25	0.5	0.4	0.67
e4	45.3	70.5	63.2	59.7	1.0	1.0	1.0	1.0	1.65
e5	92.5	93.2	94.8	93.5	0.25	0.25	0.25	0.25	0.42
e6	90.5	96.2	88.7	91.8	1.0	0.5	1.0	0.8	1.26
e7	65.3	69.2	64.5	66.3	1.0	1.0	1.0	1.0	1.65
e8	82.4	89.8	70.9	81	0.25	0.5	0.5	0.4	0.67
e9	45.3	70.5	63.2	59.7	1.0	1.0	1.0	1.0	1.65
e10	91.5	95.4	89.7	92.2	0.25	0.25	0.25	0.25	0.42
e11	88.3	86.5	95.2	90	0.5	0.25	0.25	0.3	0.5
e12	92.5	93.2	94.8	93.5	0.25	0.25	0.25	0.25	0.42
e13	65.3	69.2	64.5	66.3	1.0	1.0	1.0	1.0	1.65
e14	59.2	72.3	63.5	65	0.5	0.5	1.0	0.7	1.17
e15	93.6	92.7	95.5	93.9	0.25	0.25	0.25	0.25	0.42
e16	65.3	69.2	64.5	66.3	1.0	1.0	1.0	1.0	1.65
e17	82.4	89.8	70.9	81	0.25	0.5	0.5	0.4	0.67
e18	91.5	95.4	89.7	92.2	0.25	0.25	0.25	0.25	0.42
e19	88.3	86.5	95.2	90	0.5	0.25	0.25	0.3	0.5
e20	82.5	88.6	82.8	84.6	0.5	1.0	1.0	0.8	1.34

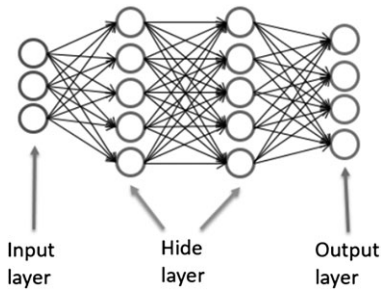

FIGURE 4 The fuzzy Evaluation Topology for Micromachining Precision Control

Hopfield neural network is the simplest and widely used model in the feedback network, mainly because it has the function of associative memory. Another important application of Hopfield neural network is to solve the problem of fast optimization.

At present, the mature network has a perceptron. Self-organized competition artificial is neural network, radial basis function network, and so on. Table 1 sets the parameters for the experiment. According to the above parameters, the fuzzy evaluation algorithm model is shown in Figure 4. Figure 4 shows artificial neural network self-organizing perception structure.

Perceptron: Perceptron is a feedforward (forward transmission) network, and all nodes are linear. The perceptron is effective in solving the classification problem. It can well divide the linear and separable input components. The design of the perceptron network is completely limited by the problem that needs to be solved. It has a single layer closed value neural network. The input node and the number of neurons are determined by the input vector. The training time is sensitive to the mutation vector. However, the mutation input vector does not prevent the network from reaching the target. When the perceptron solves the actual problem, it must be effective when the input vector is linear, which is difficult to get. Although the perceptron has the above limitations, it puts forward the idea of self-organizing learning and has a convergence algorithm for the problem that can be solved, and gives a strict proof of the number of studies and the research on the nature of the algorithm. Research is still one of the clearest algorithms in various algorithms up to now.

Adaptive linear element: The main difference between the adaptive linear element and the perceptron is that the neuron has a linear activation function, which allows the output to be an arbitrary value, not only only 0 or 1 as a perceptron. In addition, it uses the W-H learning rules, also called the minimum mean square rule to train the weights, so that the speed of convergence and the higher precision can be obtained faster than the perceptron. The adaptive linear network can only learn the linear relationship between the input/output vectors and can be used for the pattern association and the linear approximation of the function. The design of the network structure is limited by the problem to be solved. The number

of inputs and the number of neurons in the output layer are limited by the questions. Multilayer linear networks do not produce more powerful functions. From this point of view, single line networks are not limited to multilayer linear networks; the nonlinear relationships between input and output cannot be accurately designed with a linear network, but a linear network can produce a linear approximation with the smallest error square and the smallest. The purpose of adaptive linear elements is to model association with linear approximations. In addition, it is also suitable for signal processing filtering and prediction.

Backpropagation BP network: Backpropagation network is a multi-layer network that generalizations the W-H learning rules and weights training for nonlinear differentiable functions. BP network has one or more hidden layers. In addition to the previous models, the main differences are also on activation functions. The activation function of BP network must be differentiable everywhere, so it cannot use the closed value function {0,1} or symbolic function of the two value type. The BP network often uses S type logarithmic or tangent activation function and linear function. BP network is mainly used in the following.

1) Function approximation: using input vectors and corresponding output vectors to train a network to approximate a function.
2) Pattern recognition: using a specific output vector to associate it with the input vector.
3) Classification: classifying input vectors in suitable ways defined.
4) Data compression: reduce the dimension of input vectors for ease of transmission or storage.

In the actual application of artificial neural network, 80%, one 90% artificial neural network adopts BP network. It is also the core part of the forward network, which embodies the most important part of the artificial neural network. The structure of the back-propagation network is not entirely constrained by the problem to be solved. The number of input neurons and the number of output neurons in the network are determined by the requirements of the problem, and the number of hidden layers between the input and output and the number of neurons in each layer is determined by the designer; it has been proved that the two layer S / linear network can train any input and output if the S layer has enough nerve element.

Hopfield network

The feedback network, also known as the self-associative memory network, aims to design a network to store a set of equilibrium points so that when a set of initial values is given to the network; the network will eventually converge to the balance point of the design by running it by itself. J. H field proposes a feedback artificial neural network model with mutual connection, and the concept of / energy function 0 is introduced into the research of symmetric Field networks. The stability criterion of the network is given, and the constraint optimization problem is used, such as the solution of the TSP problem, and the realization of the A/D conversion. He realized the associative memory function of information by using multiple attractors and their attracting domains of multivariate field networks. In addition, there is an obvious correspondence between field network and electronic analog circuit, making the network easy to understand and easy to implement. Moreover, its operations are essentially different from Boolean algebra operations, which are very attractive to the new generation of electronic neural networks. The field network has been successfully applied to many situations, and there are often new applications. The specific application directions are mainly focused on the following aspects: image processing, signal processing, data query, fault tolerance calculation.

Self-organized competitive artificial neural network

The basic idea of self-organizing competition artificial neural network is that the competition of each neuron in the network competition represents the classification of input patterns. In addition to the competition method, there is a way to win by restraining means, ie, the network competition layer contends the opportunity for the input model, and only one neuron becomes the winner of the competition, and the connection rights related to the winning neuron are adjusted in the direction that is more beneficial to it; the winning neuron can inhibit all other neurons. In addition, there is a way of lateral inhibition, ie, each neuron only inhibits its own neighboring neurons, but it does not inhibit neurons away from them. Therefore, the self-organizing competitive neural network self-organizing and adaptive learning ability further broaden the neural network in pattern recognition.

Radial basis function network

The radial basis function network structure is a forward network consisting of an implicit layer (radial base) and an output layer. The hidden layer uses radial basis function as the activation function of the network, and the radial basis function is a Gauss-type function. The RBF network has the characteristic of optimal approximation. It can be proved that the three layer forward neural network can approximate the continuous function with arbitrary accuracy under the condition that the hidden nodes can be set freely according to the needs. The training methods of network include Peggie method and Darken method. Orthogonal least squares and clustering and Givens least squares iterative method. The orthogonal least square method OLS is simple and fast, and it is a common method of training RBFN network at present. The RBF network is used to approach the function. Compared with the BP network, the former is more likely to approximate the local characteristics of the function, and the latter is approximated by a global function.

Micromachining precision and machining error are two different aspects to evaluate the geometric parameters of parts. In actual production, the accuracy of machining is evaluated and expressed by the size of the machining error. Machining accuracy includes dimensional accuracy, shape accuracy, and positional accuracy. Ensuring and improving machining accuracy is actually limiting and reducing machining errors. The purpose of studying processing precision is to study how to control all kinds of errors within the range of prescribed tolerances and master the influence of various factors on processing precision, so as to find measures to reduce machining errors and improve processing precision. In order to ensure the performance requirements of the product and reduce the cost of production, it is not necessary to process each part to be absolutely accurate, and

as long as the required tolerance requirements are met, the machining quality of the parts is guaranteed to make the actual machining error small. In general, size. There is a certain relationship between geometry and position accuracy. When determining the diameter of the axis, the roundness and cylindricity of the cylindrical surface must be taken into account. When the distance between the two planes is determined, the plane's flatness and the parallelism between the two planes must be taken into account. Generally speaking, geometric shape precision, mutual position accuracy, and dimensional accuracy should be adapted to "high dimensional precision requirements, ie, its geometric precision and mutual position precision requirements are high; second, shape precision should be higher than size accuracy; and position accuracy should be higher than the scale precision in most cases." The precision and error are explained and calculated in the macro field of control theory, but it lacks of robustness for micromachining in microscopical fields, and the fuzzy evaluation algorithm can effectively solve the problem.

3 | PRECISION CONTROL ALGORITHM FOR MICRO MACHINED MACHINING

In this paper, the application of fuzzy evaluation method is studied in the context of turning accuracy control of a complex micro part. First, a fuzzy control mathematical model based on the machining method is established, and then the robustness of the model is improved by model self-learning. The machining datum and the standard value of processing turning quantity are established by optical means. By comparing the deviation between the calculated results and the standard values of the fuzzy evaluation model algorithm, the validity of the algorithm's self-learning of big data is judged. The machining accuracy parameters of the micro machined parts can be divided into many types. If there is an elliptical error in the wool, the tool should be adjusted to a certain amount of back knife when machining. In each rotation of the workpiece, the amount of eating of the back knife changed, the depth of the maximum back knife amount in the direction of the long axis of the ellipse was A, and the depth of the minimum back knife amount in the direction of the ellipse short axis was B. We assume that the hardness of the blank is uniform. Because the cutting depth is different, the cutting force is different, the cutting force F is the largest, and the corresponding deformation y is the largest; the cutting force is the smallest and the corresponding deformation Z is the smallest. The elliptical error still exists in the workpiece. That is to say, when the turning has a roundness error, the workpiece produces a corresponding roundness error due to the change of the force deformation of the process system, and the larger the V, the larger the G, which is called the error re mapping. The fuzzy evaluation algorithm is set up according to the above parameters.

1) Define boundary and capacity assessment objectives
   Objective evaluation of all aspects of precision control and final results in the machining process are micro machined parts.
2) Determine the grade and variable of evaluation
   Because of the micro state of the micromachining, its evaluation level is quite complex, and its variables are also very numerous. In this step, the qualitative index is quantified to get the scoring standard, and the weight index value of the index is determined by the investigation method; Ai is defined as the last stage weight vector.
3) The evaluation matrix is determined by the mode of numerical conversion
   The general form of numerical conversion is to standardize data and transform them into a form of comparison and direct operation by means of weighted averages. The expression of the evaluation value matrix is Ds, and s represents the s of the multiple evaluation parameters in the matrix represents the parameters of each item in the matrix, and the specific parameter value is the parameter, which is used to evaluate the value of item J in the s evaluation item

$$D_{i,j}^{s} = \begin{bmatrix} d_{1,1}^{s} & d_{1,2}^{s} & & d_{1,n}^{s} \\ d_{2,1}^{s} & d_{2,2}^{s} & \cdots & d_{2,n}^{s} \\ \vdots & \vdots & & \vdots \\ d_{m,1}^{s} & d_{m,2}^{s} & \cdots & d_{m,n}^{s} \end{bmatrix}. \tag{5}$$

4) Determine the weight matrix of the membership degree

The weight matrix is an important parameter for the fuzzy comprehensive evaluation model of micromachining precision. In the process of determination, the application characteristics of the model should be fully considered, and the membership degree and the number of experts should be determined

$$X_{i,e} = \sum_{j=0}^{m} f_e(d_{ij}). \tag{6}$$

This formula represents the $X_{i,e}$ index in the membership of class E, and f_e M is the number of experts, which represents the membership function of class E evaluation level. It represents the I index, which belongs to category $R_{i,e}$ e evaluation level. The formula (3) is the formula for calculating the membership weight of item parameters

$$R_{i,e} = \frac{X_{i,e}}{\sum_{k=1}^{z} X_{i,k}}. \tag{7}$$

Among them, Z is the number of parameters in the steps mentioned in step 2, and I in Formula (3) represents the relative weight belonging to category e. R represents the membership weight evaluation matrix, M represents the number of index parameters, and the $R_{i,j}$ R parameter in the

matrix indicates that the vector index I belongs to the corresponding membership degree in level j

$$R = \begin{bmatrix} r_{1,1} & r_{1,2} & \cdots & r_{1,z} \\ r_{2,1} & r_{2,2} & \cdots & r_{2,z} \\ \vdots & \vdots & & \vdots \\ r_{m,1} & r_{m,2} & \cdots & r_{m,z}. \end{bmatrix} \tag{8}$$

5) Matrix transformation and vector operation

The matrix change is represented by the available E

$$E = (A_1, A_2, \ldots, A_n)\,[R_1, R_2, \ldots, R_n]^T = (e_1, e_2, \ldots, e_z)\,. \tag{9}$$

The operation of the element e in the type is as follows:

$$e_i = \sum_{j=1}^{m} A_i \cdot r_{i,j}. \tag{10}$$

The result of this step is more than the result vector and the operation model of the comprehensive evaluation, but the value of the entrepreneurial ability calculated by the model is higher, and the other model cannot save more evaluation content compared with the model algorithm.

6) The solution and analysis of the results of the model operation

The expression of the result vector EA is shown in formula (7), which can reflect the final evaluation value

$$EA = (e_1 \cdot v_1 + e_1 \cdot v_2 + \cdots + e_z \cdot v_z)\,. \tag{11}$$

This formula v_i represents the evaluation score corresponding to class I evaluation grade. EA represents the evaluation value after normalization of evaluation results.

The above method can solve the problem of general fuzzy evaluation. This paper proposes to improve the evaluation calculation by using big data self-learning method. The ultimate goal of the Delta learning rules is to minimize the target function based on a EK (n) to make every output in the network approximate the due output in a statistical sense. The Del learning rule becomes a typical optimization problem. The most commonly used objective function is the mean square error criterion, which is defined as the mean square error sum

$$J = E\left[\frac{1}{2}\sum_{k} e_k^2(n)\right]. \tag{12}$$

The expression 1 of the parameter is as follows:

$$\xi(n) = \eta e_k(n) e_k^2(n). \tag{13}$$

The expression 2 of the parameter is as follows:

$$\omega_{kj} = \eta e_k(n) \mathrm{X}_j(n). \tag{14}$$

The expression 3 of the parameter is as follows:

$$r = d - W_j^t X. \tag{15}$$

When the output vector O and the expected output d have output error E, the error function is as follows:

$$E = \frac{1}{2}\sum_{k=1}^{j}\left\{d_k - f\left[\sum_{j=0}^{m}\omega_{jk} f(net_j)\right]\right\}^2 = \sum_{j=0}^{m}\left\{d_k - f\left[\sum_{j=0}^{m}\omega_{jk} f\left(\sum_{j=0}^{m} v_{ij} x_i\right)\right]\right\}^2. \tag{16}$$

Based on the above method, a fuzzy comprehensive evaluation algorithm for micromachining accuracy control based on big data learning can be established. The workpiece is clamped onto the lathe to get a good top (to prevent the parts from moving) and to connect the power and connection of the lathe and the stiffness tester of the process system. The radial error of workpiece is recorded by laser measuring instrument and recorded. The switching switch of the stiffness tester is switched to the cutting force measurement, and the sensor receiver is connected to the interface of the tool base to start cutting and measure the cutting force in the cutting process. After cutting, the rolling wheel on the cutter seat is aligned with the cutting surface of the workpiece after cutting, and the switch of the stiffness tester switches to the displacement measurement. The sensor connects the sensor to the interface of the roller seat, opens the machine, and records the radial error of the cutting surface of the workpiece. If you want to continue cutting on the original cutting surface, start a new experiment and pass the cycle. Set up the parameter table.

The experimental data obtained are selected as follows: the system stiffness defect d1/nm), the radial error D2 (nm) before cutting, the radial error after cutting D3 (nm), the feed D4 (nm), the percentage el, Ze, and E3 of the three processing quantities.

The design of RBF network is implemented on the MATLAB software "because of the powerful numerical simulation and simulation function of MATLAB, making the designer to easily call and debug the selected network, so that the designer can be free from the tedious programming and concentrate on thinking and solving the question, thus improving the efficiency and solving the quality of the problem." In this paper, 270 sample data sets are selected to train the network, and the width of the base function is achieved in the network training, ie, 1, and the clustering learning algorithm training network is implemented. The training results are as follows.

Parameters obtained by network training:

{c, nr] = Zjwnne (P,t,r).

C = 1.0e + 004.

The 270 test samples are tested on the network, and the test results are compared. It can be seen that the study of the fuzzy evaluation method to reduce the MEMS error re mapping is feasible, and the network can be popularized as soon as the network is trained. It has good generality, and the results are objective. The fuzzy evaluation network avoids the cumbersome and lengthy calculation of the BP network. This method has good generality.

4 | CONCLUSION

The fuzzy evaluation algorithm has been introduced to control the precision of micro machined machining, including the network level, the number of nodes in each layer, the training function, the training algorithm, the training times, and the improvement of the error adjustment step RBF network. Artificial neural network technology based on fuzzy evaluation method provides a new method to reduce machining error and control the precision of micromachining. It has important practical significance, but different neural network algorithms have different error of learning error for the same sample set, so the suitable network needs to be selected in the application. In order to get the ideal effect, compared with the traditional method to reduce the error of micromachining error, the RBF network successfully solved the modeling problem of the nonlinear uncertainty relationship between the micro machined parameters, and the RBF network has the characteristics of accuracy, speed, and simplicity. The results show that the parameters are optimized in the interval of the training samples. The achievement is satisfactory. The realization of the direction "can further improve the RBF network from the enhancement of the adaptability of the RBF neural network, ie, to speed up the parameter determination of the RBF network. In the artificial neural network, the whole function of the brain should be applied to the artificial neural network."

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