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Adaptive Multi-layer Distributed System Based on Neural Network

Ernesten Foosh*

New Valley University, Egypt

**corresponding author*

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Abstract: with the popularization and development of computer and network information technology, network information and the Internet communication of all kinds of information is distributed in all areas of the network, which makes the multi-tier distribution is the development of the system from the host system for the server application, multilayer distributed system has gradually become the mainstream of computer and network information technology. In order to solve the problems in the multi-layer distributed system based on neural network adaptation, this paper first introduces the basic structure of the multi-layer distributed system and the steps of the approximation function of RBF neural network adaptation, and then briefly describes the development tools and software Settings of the multi-layer distributed system based on neural network adaptation. Finally, the architecture of neural network adaptive multi-layer distributed system is designed and discussed. Finally, the application of neural network adaptive and other algorithms in multi-layer distributed system is compared with experimental data. The experimental results show that the multilayer distributed system based on neural network adaptive in the application of noise signal to the noise cancellation effect of sawtooth wave and output letter manic ratio up to 26.23, 26.02 in the rectangular wave, 24.79 in the sine wave, so it can be seen that the multilayer distributed system based on neural network adaptive of superiority.

1. Introduction

Multi-layer distributed system is a kind of multi-object oriented distributed system developed with computer and information technology. With the further development of computer network communication technology, many software systems need to operate under different user software platforms, hardware facilities, communication protocols and different operating systems.

Nowadays, more and more researchers and scholars pay attention to the practical research of

neural networks and other algorithms and technologies in multi-layer distributed systems, and a lot of research results have been achieved. Dabiri S uses neural network scheme and has the characteristics of automatic input. Therefore, Dabiri S uses CNN architecture to travel only according to the original GPS mode, which mainly includes walking and bicycle. Dabiri S's main research achievement is to design the output mode of CNN, which can not only adapt to the CNN scheme, but also represent the basic action trajectory of moving objects, which can be divided into velocity, acceleration, acceleration and carrying rate. By preprocessing the GPS logging data, the quality of GPS logging data is improved. Using a clean input layer, evaluate various CNN configurations to get the best CNN architecture. Through the collection of the best CNN configuration, the highest accuracy of 84.8% is achieved [1]. Rezaei V believes that the existing research results are only in the control structure and information layer in the business server. Rezaei V In the fuzzy situation of multiple intelligent systems,Rezaei V proposed two methods to design the distributed asymmetric control structure. Through the use of formulas,Rezaei V develops a matrix function method for the mismatched case and a model for the fit. In different experimental environments, Rezaei V proved all motion state indices of the two-layer cooperative multi-intelligence distributed system. Rezaei V verified the applicability of the idea in experiments [2].Kirchhoffer H believes that neural network computing can be designed as a method of storage and processing, which can be coded in various systems. It can be used either as a stand-alone coding structure or in conjunction with the flow and structure of the internal neural network algorithm. In order to improve the applicability of the algorithm, the network storage and processing methods operate according to the data tensor, so as to ensure timely and accurate calculation, whether the information is provided in time or not. The standard for neural networks includes efficient computational coding, and preprocessing methods for neural network parameters such as splicing, unification, and global expansion.In the case of transparent coding, the compression efficiency of NNR reaches more than 97%, that is, it does not reduce the classification quality [3]. Although the existing research on neural networks and multi-layer distributed systems is very rich, there are still some problems in the research of adaptive neural networks in multi-layer distributed systems.

So in order to solve the multilayer distributed system based on neural network adaptive existence insufficiency, this article first from the interface layer, business layer and data layer three layer service model to illustrate the basic building blocks of multilayer distributed system and introduces the RBF neural network adaptive nonlinear function, the second for the connection between the neural network and multilayer distributed system, This paper discusses the design of the development tools and software of the multi-layer distributed system based on neural network adaption and analyzes the architecture flow of the multi-layer distributed system based on neural network adaption. Finally, the designed multi-layer distributed system based on neural network adaptive is applied to noise signals, and through the comparison and analysis of specific experimental data, the final experimental results show that the multi-layer distributed system based on neural network adaptive design has certain feasibility.

2. Research on Multi-Layer Distributed System Based on Neural Network Adaptation

2.1. Basic Structure of Multi-Layer Distributed System

Multi-layer distributed system is developed from the original one-layer to two-layer distributed system to the current three-layer or even more layer distributed system. A new layer is added to the two-layer application service layer, thus forming a multi-layer distributed system, which is mainly

composed of interface layer, transaction layer and data access layer [4]. The specific functions are as follows,as shown in Figure 1:

(1) Interface layer: the link used by system users, which is mainly responsible for linking users and system programs. It has the function of receiving user request, feedback result, and sending the result [5].

(2) Transaction layer: It is the data processing center of the system and processes the data received by the application server [6].

(3) Data layer: it is responsible for the management of the connected data, such as storage [7].

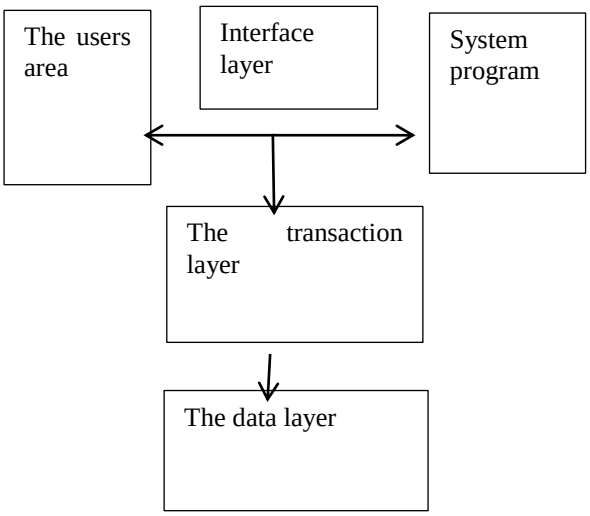

Figure 1. Basic structure of a multi-layer distributed system

2.2. Neural Network Self-Adaptation

Neural network is a kind of three-layer forward network, which mimics the structure of neural network which is locally adjusted by human brain and covers the receiving area mutually. Therefore, neural network is also a local approximation network, which has been proved to be able to approach continuous function with arbitrary accuracy [8]. The following is a brief description of the approximation characteristics of the network [9].

In this paper, neural networks will be used to approximate unknown nonlinear functions [10]. In a compact set, a continuous nonlinear function $\varpi(m): U^1 \to U^n$ It can be approximated by the following neural network:

$$\varpi_w(r,m) = R^N G(m) \tag{1}$$

Where $R \in U^{fxt}$ is arbitrary weight matrix,,B is the number of neurons, $G\ (m) = \left[g_1(m),...g_f(m)\right]^N$ is the basis function vector, ϖ is the width of Gaussian function, and $m \in \Omega_2 \subset U^1$ is the input vector [11].

In a compact set Ω,The accuracy of RBNN can be derived from all linear and nonlinear

function regions [12]. Given a smooth nonlinear vector function, $\varpi(m) \in U^t$ has an ideal weight matrix R^*, and on the compact set $\Omega_m \subset U^1$, the ideal RBF neural network can The ideal RBF neural network can continuously approach the nonlinear quantitative function $\varpi(m)$:

$$\varpi(m) = R^{*N} G(m) + \lambda_z \tag{2}$$

Among them, $R \in U^{fxt}$ is the optimal weight matrix of the neural network, B is the number of neurons, and $\lambda_{m\in} U^t$ is the approximation error, satisfying $\|\lambda_m\| \le \lambda_n$ [13].The amount of error of the neural network represents the smallest possible deviation between $R^{*N} G(m)$ and the linear equation $\varpi(m)$ [14]. The optimal matrix shape R^* is a hypothetical parameter, just for the convenience of analysis [15].This weight matrix is unknown, but can be estimated [16]. In a compact set, the alternative R^* is:

$$R^* = tub_{r\lambda H^{fxm}} \min\left\{\sup\left\|\varpi(m) - R^T G(m)\right\|\right\} \tag{3}$$

The neural network approximation error λ_m can be reduced by increasing the number of adjustable weights and the number of neurons. The wide application of neural network shows that if the number of neural network nodes B is large enough, then in a compact set, $\|\lambda_m\|$ will be arbitrarily small.

3. Investigation and Research on Multilayer Distributed System Based on Neural Network Adaptive

3.1. Setting of Development Tools for Multi-Layer Distributed System Based on Neural Network Adaptation

Delphi is the main product of Inprise(formerly Borland) development tools, is a leader in the field of object-oriented design, Delphi is a powerful and flexible rapid application development tool (RRDeveper)Delphi uses the industry's fastest compiler, leading database technology, flexible and changeable multimedia development environment and strong support for distributed applications. Enable developers to easily competent for complex application development, improve production efficiency [17].Delphi7.0 is the main development tool of neural network adaptive multi-layer distributed system architecture design and application server.

3.2. Application Software Settings of Multi-Layer Distributed System bBased on Neural Network Adaptation

In this paper, the design and development of multi-layer distributed system software based on neural network adaption is carried out. For S3C2440 processor, the standardized Linux system needs to be tailored and configured, and then it is fixed in NANDFLASH and other memory chips [18]. Embedded Linux system has the characteristics of multi-task type, high stability and wide application, and Linux is an open source system, which does not require user payment, etc., so it is the first choice for the study and research of operating system in this paper. In this paper, the

development of multi-layer distributed system software based on neural network adaptation mainly includes the following four parts, as shown in Table 1:

Table 1. Software configuration

Software functions	Data migration	The kernel cutting	File creation	Data is stored
Configuration	Bootloader	Kernel	YAFFS2	NANDFLASH

4. Application Research of Multi-Layer Distributed System Based on Neural Network Adaptation

4.1. Architecture Design of Multilayer Distributed System Based on Neural Network Adaptive

In this paper, a multi-layer distributed system structure based on neural network adaptation is used to realize it, which not only exerts the advantages of neural network adaptation, but also reflects the various functions of the multi-layer distributed system structure. The specific structure is shown in Figure 2:

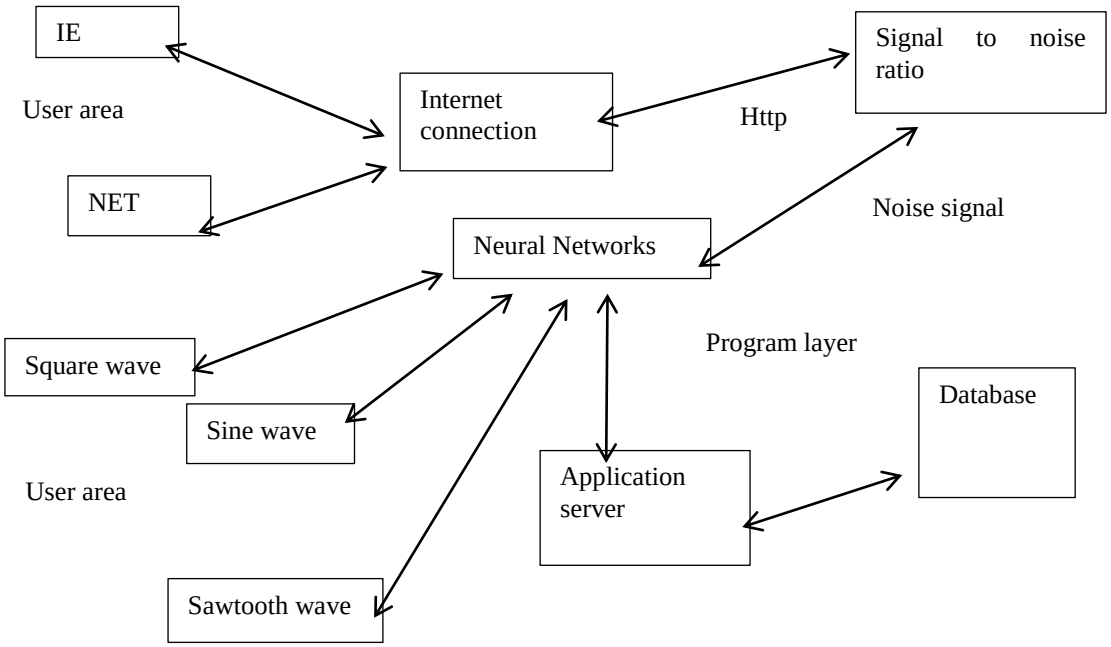

Figure 2. Multilayer distributed system architecture process

As can be seen from Figure 2, whether it is a server in a multi-level distributed system architecture using neural network adaptation, or a browser client in a single-level distributed system architecture, the application server in the middle layer can provide them with It supports and encapsulates the most common enterprise logic and business objects on the web server, so as to isolate the interface and logic, and reuse the business environment and enterprise logic. In specific

application, it includes four layers in the whole network: information layer, information access layer, function layer and presentation layer.

4.2. Application of Multilayer Distributed System Based on Neural Network Adaptive in Noise Signal

In the case of linear or nonlinear correlation between two noise signals, the number of nodes in the hidden layer of the neural network is set to 8, the transfer function of the hidden layer is the tansig function, and the transfer function of the output layer is the purelin function. The learning rate is 0.08, the expected error is 0.002, and the maximum number of iterations is 5000. The neural network uses HG, DGH, OM and CDD algorithms for comparative analysis. The momentum factor in the DGH algorithm is set to 0.6. When the two noise signals are linearly correlated, after the noise cancellation system of the neural network with different learning algorithms, the output signal-to-noise ratio of 6 times is shown in Figure 3 and Table 2, and the output signal-to-noise ratio is taken as the average value of 12 identical experiments.

Table 2. Comparison of neural network adaptation and other algorithms

Output SNR value	HG	DGH	BFG neural network	OM	CDD
Square wave	22.56	22.63	26.02	22.45	22.37
Sawtooth wave	21.63	21.22	26.23	24.32	25.02
Sine wave	22.96	22.56	24.79	23.24	24.36

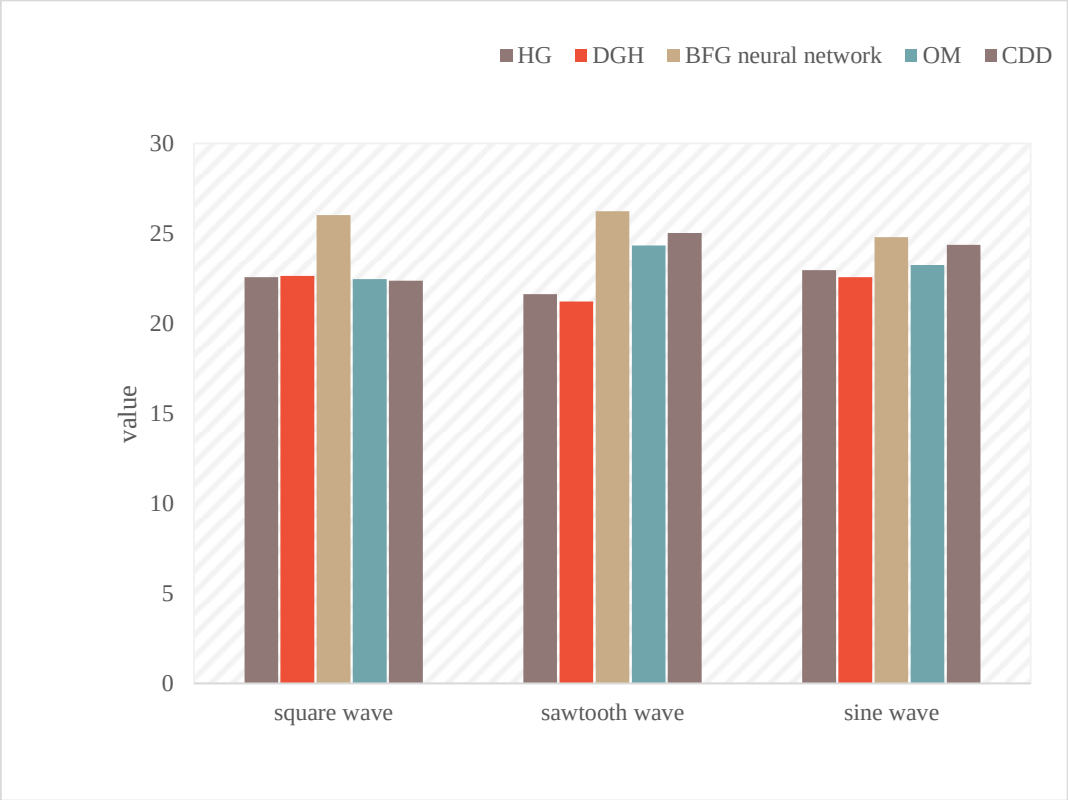

Figure 3. Comparison of neural network adaptation with other algorithms

It can be seen from Table 2 and Figure 3 that when the input signal-to-noise ratio is very small, the three algorithms of neural network adaptation, LM and OSS are significantly better than other algorithms in the noise cancellation effect under the linear correlation of the two noise signals, and with the signal The noise ratio is getting smaller and smaller, and the noise processing of various algorithms is more and more different. Among them, the output signal-to-noise ratio of the neural network adaptive algorithm is relatively high. Therefore, the multi-layer distributed system based on neural network self-adaptation can provide a reliable guarantee for the stability and security of the system.

5. Conclusion

Therefore, in order to enrich the application research based on neural network adaptation in multi-layer distributed systems, this paper first briefly introduces the interface layer, transaction layer and data layer of multi-layer distributed systems, and introduces the non-adaptation of neural network adaptation. On the analysis and discussion of linear function equations, the development tools and software of multi-layer distributed systems based on neural network adaptation are investigated and designed. Secondly, the design and analysis of the architecture system process of the neural network adaptive multi-layer distributed system is carried out. Finally, the experimental data analysis is carried out for the application of the neural network adaptive multi-layer distributed system designed in this paper in the noise signal. The final experimental results The applicability of the multi-layer distributed system based on neural network adaptation in this paper is verified.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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