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An Intelligent Control Method Based on the Artificial Neural Network Model

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Abstract: The topology structure of the artificial neural network is an intelligent control model, which is used for the intelligent vehicle control system and household sweeping robot. When setting the intelligent control system, the connection point of each network is regarded as a neuron in the nervous system, and each connection point has input and output functions. Only when the input of nodes reaches a certain threshold can the output function of nodes be stimulated. Using the networking mode of the artificial neural network model, the mobile node can output in multiple directions. If the input direction of a certain path is the same as that of other nodes, it can choose to avoid and choose another path. The weighted value of each path between nodes is different, which means that the influence of the front node on the current node varies. The control method based on the artificial neural network model can be applied to vehicle control, household sweeping robots, and other fields, and a relatively optimized scheme can be obtained from the aspect of time and energy consumption.
Keywords: Artificial neural network; Model; Control method; Optimization scheme

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1. Parameters and methods

1.1. Experimental parameters

The experimental platform is MATLAB R2016 simulation software. It is assumed that the neurons in the artificial neural network model have two sets of parameters: input and output, and the input end has 60 random numbers. When the threshold value of the output terminal is 0.53 (that is, when the threshold value of the input exceeds 0.53), the neuron can have an output. There are three curves, respectively representing three samples: theory, practice and test. Enter yes in the theoretical sample SamIn = sort(59*rand(1,SamNum)+1); The output result is SamOut = 0.5447*SamIn.^0.1489. There is randomness at the input end in the actual sample TargetIn=1:60. Output has Targ etOut=[0.53173198482933,0.599828865,0.644564773...]. For the test sample, the value of the input end is found by training, and the value of the output end is calculated by the hidden layer, which is similar to the structure of dendrite-axon-synapses in neurons, and the formula is .

1.2. Experimental methods

1.2.1. Test preparation

The network networking mode is divided into two types: one is the ordinary networking mode to calculate the energy consumption and the time required for operation of the network; the other is to test the data according to the intelligent control method of the artificial neural network model.

1.2.2. Calculation method

The output range radius of the node in the input layer is set to R = 1 km, and the output range after being weighted by the input end and the hidden layer is a circle with a diameter of 2R, with the time of 20 minutes as the horizontal coordinate and the output direction as the vertical coordinate.

1.2.3. Determination method

The output direction of the network and the number of output nodes are measured by the theoretical value measurement and the actual data input. The measurement process is determined by three measurements to determine the same value. Finally, the theoretical and actual values are compared to draw a graph.

1.3. Data processing

The algorithm data processing of the experimental model is set and processed by MATLAB R2016a. Different input data plus different weights make the output angles and directions different. Different output values are marked with different colors to get different experimental result sets, so that comparative research can be conducted.

2. Results and analysis

2.1. Experimental method

As shown in **Figure 1**, the output direction of the network and the number of nodes that can be output increase continuously with the change of time. However, when the time is 12 minutes, the number of nodes decreases slightly after reaching the number, and then rises continuously with time. It can be seen from **Figure 2** that the two curves change with the change of obstacle time, and as in **Figure 1**, the output direction and output network node increase continuously after the node reaches the threshold. **Figures 3** and **4** show the training and testing and error.

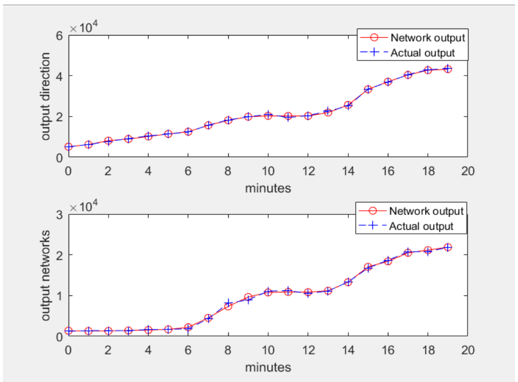

Figure 1. Output direction and output network in a period of time

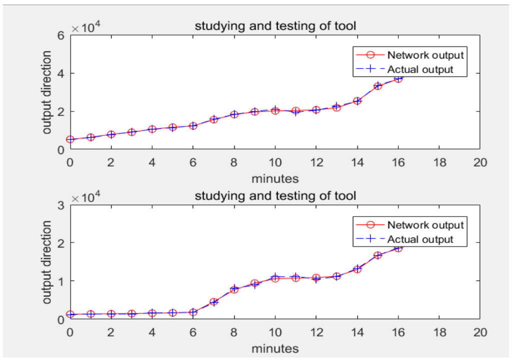

Figure 2. Output direction and output network in a period of time

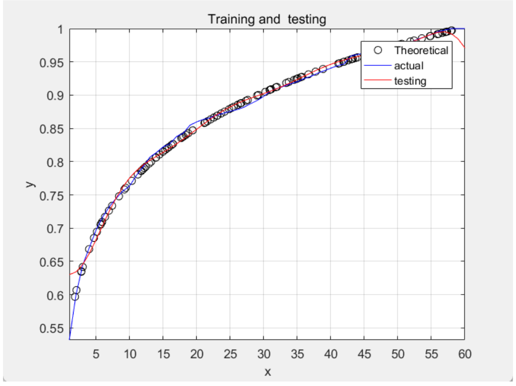

Figure 3. Training and testing

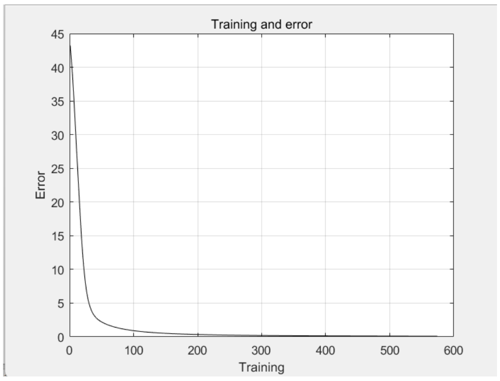

Figure 4. Test sum and error

2.2. Impact of networking on energy consumption of mobile nodes

The network model of an artificial neural network can effectively control the transmission efficiency of the network, reduce the congestion caused by the input and output of the network, decrease the transmission cost of the network, and thus lower the total energy consumption of the network [1].

2.3. Effect on the transmission efficiency of mobile devices

In the networking model of an artificial neural network, the output direction of nodes can be multiple, and each node can also receive input from other nodes. When the input received by the node from other nodes reaches a certain threshold value, the node outputs only when each output direction of the node also generates different weights for the preceding node. Therefore, the node can choose the direction of output with smaller values through the weight selection of the normalized function, thus improving the output efficiency of the network [2].

3. Discussion

In this paper, we compare the results between the traditional mobile node networking model and the artificial neural network networking model. In the networking mode of the artificial neural network model, the transmission direction of the network nodes of the artificial neural network model is found through the comparison of the networking systems of different networking models. The intelligent algorithm is used to select different output directions and transmission paths to reduce the collision of the transmission network nodes during the transmission process and improve the fan-in and fan-out rate of the network. Therefore, to improve the transmission performance of the network and the utilization rate of energy consumption, the experimental results show that the intelligent control method using the artificial neural network model is more effective in improving the performance of the network.

The transmission efficiency is also an advantage of the intelligent control method of an artificial neural network. The intelligent control method is used to select the optimal path and improve the transmission efficiency and the optimal direction selection in the aspects of computing the multi-dimensional network, complex path selection, and network intrusion nodes [3].

4. Conclusion

According to the research results, the nodes of the artificial neural network model can receive input from other nodes in different directions, and only choose output when the input value reaches the threshold value. Different network nodes can choose the output direction and output path of different weights through the intelligent control algorithm of the artificial neural model, and the output direction will produce different weights for the input of the pre-node. The input path selection of different nodes is weighted by the hidden network layer. The intelligent control method of the artificial neural network model has great application to household sweeping robots and vehicle intelligent control systems [4].

Disclosure statement

The authors declare no conflict of interest.

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