Research on Road Landscape Scale Design Based on the Neural Network Algorithm

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Abstract. There had high traffic accidents rate in China. The accident rate was on an upward trend every year. The cause of the accidents frequently occur, including the driver's driving level, the safety performance of the car and the design of the road landscape scale. Therefore, in order to reduce the accident rate, this paper presented the research of road landscape scale design based on neural network algorithm to reduce the accident rate. The scale of the landscape was designed by neural network algorithm, and then transforming variables, size and other design elements were processed. The paper had selected the road as a pilot at random, with the most humane scale design as the standard for regional design investment. Through comparing the monitoring of pilot locations, we found that the rate of traffic accidents had been effectively reduced.

1. Introduction
With the continuous development of road traffic construction in china, the road extending in all directions was easy for people to travel and happen various kinds of traffic accidents [1]. Domestic scholars were also trying to use computer technology to continuously improve the existing road landscape standards, and achieve the desired result [2]. Thus, we can think of the neural network algorithm applied to the traditional design of the road landscape to improve the driving safety. The scale of road landscape was different from other industries in scale design. It was to express the more complicated and abstract graphics in our mind through certain means. Among the traditional means of expression, artificial drawing was as the most common one. While ensuring the accuracy of expression, it was a difficult task that we had to deal with because of the heavy workload and the difficulty of data processing [3].

Through the application of neural network algorithm, we could solve the above problems to a great extent. Computer technology was extremely informative and based on a more detailed approach to overall layout, construction, etc. [4]. The development of the scale design of modern road landscape was constantly developing in the direction of complication and refinement. In the design of the traditional road landscape scale, it was more and more difficult to edit, make or modify the road. However, with the advent of computers and with the corresponding application of three-dimensional and other technologies, it was possible to carry out real-time modification and reconstruction in the process of design, which greatly saved the design time and greatly reducing the difficulty of design.

Roadscaling techniques originated in the 1960s in Europe and the United States, when rapid industrial growth brought traffic to its heyday [5]. With the initial application of computer technology, people were more aware of the simple manual drawing design workload, the use of intelligent optimization of the actual structure of the design and expression. In the 1980s, with the maturity of
computer technology, the field of application was also becoming wider and wider. The design of road-scale standards with CAD as the core had been widely used [6]. The software incorporates the basic design of the graphic design into the database and provides some data to support for the design of the road landscape dimension, which could be easily compared to the corresponding modeling process [7].

Nowadays, with the advent of intelligent computer technology, the overly simple design in the traditional model could no longer meet people's needs [8]. Therefore, based on the above requirements, a more intelligently optimized road landscape scale was designed. The design of road landscape scale based on intelligent optimization had more operable elements, so as to express the conception image in mind as possible [9]. Road landscape scale design software not only could express the people's imagination, but also had strong artificial intelligence optimization, which could make us more obscure design concepts to enrich and innovate. Although our country started relatively lately with the use of intelligent optimization technology, the demand for design of road landscape scales gradually increased because of the rapid development of traffic routes, which eventually reduced the incidence of traffic accidents [10].

2. Project design

2.1. Neural network algorithm construction

The use of neural network was one of the most close to the driver's psychological and physiological reaction algorithm and using neural network model to the driver's reaction could make the most realistic algorithm expression. In this paper, we used the forward neural network model and the improved BP network to improve the design and control of the road landscape scale. The neural network based on fuzzy theory and genetic algorithm and the network of RBF were built. In the background of its extreme chaos, it was designed to accept and control weak signals and measurements, and then we got the feedback network data. We used Hopfield network and its identification character applications to support and improve the road landscape design node and fault diagnosis and troubleshooting functions in the integration wavelet neural network and identification to obtain the optimal value for design acquisition.

Integrating the integration of neural network algorithm, the architecture of neural network was carried out, and then the road landscape scale design was input into the architecture by neural network algorithm. According to each design standard, specification requirements and the output of information data for landscape design information, model would receive the data to digest, and finally we completed the construction of the entire model. In this process, the algorithm of neuro-fuzzy model was adopted. First, the number of neural network data was obtained by the following formula, and the title of the neural network was designed. The specific design was used to classify the data of landscape design under the jurisdiction. By using computer data pairs, it was automatically structured to provide the preconditions for further work. Based on this neural network design, for the unit data fitting, we would regard \( Q \) as the sum of the target data, and then \( F_i \) was the driver reaction coefficient, \( BW \) was the number of categories observed, and \( C \) was the driver's psychological state coefficient. \( S \) represented the neural network coefficient, and \( M \) represented the vertical coordinate value. Through the checking of the following formula, the driver reaction coefficient classification and integration scheme was obtained.

\[
\begin{align*}
C(F_i) - M(F_i) &= BW(F_i) \\
C(F_i) &= 3 \times Q(F_i) + 0.2 \times S(F_i) \\
C(F_i) - M(F_i) &= BW(F_i) - Q(F_i) \\
Q(F_i) &= 1.2 \times (2 - S(F_i)) + 2.7 \times C(F_i)
\end{align*}
\]

In below formula, the main consideration was that each neural network data could be applied. From \( L \) to \( Y \), they represented the driver's psychological and physiological reaction in this neural network technology design number. As these algorithm elements were involved in the calculation of the formula,
the driver's reaction coefficient would be able to get the most solid expression, and the test. The data would be more accurate. In addition, $F$, $X$, $\omega$ represented the different reactions that drivers made in different environments. In the event of an accident, the driver responds to the psychological and physiological reaction to the emergency response, and we would use the algorithm values as a representative into the formula for calculation.

When $Q(F) = S(F)$, the following formula will appear:

$$L(Y, F(X, \omega)) = \begin{cases} +1, & Y = F(X, \omega) \\ -1, & Y \neq F(X, \omega) \end{cases}$$

$$F(X) = \begin{cases} 0, & Y = F(X, \omega) \\ -2, & Y \neq F(X, \omega) \end{cases}$$

In the following formula, $\gamma$ represented the reaction coefficient of the driver, $k$ was the emergency reaction coefficient, $P$ represented the magnitude of the response, $g_i$ and $\beta_j$ represent the psychological and physiological responses. In the design, thinking about the synergy of two aspects, we would calculate the weighted way, and ultimately obtain the most reference results in order to ensure maximum driver's safety. Weight function expression could be expressed as:

$$\gamma(Y_i) = \sum_{j=1}^{k} g_j^2 + \sum_{i=1}^{p} \beta_j^2$$

In order to ensure the normal operation of this algorithm, this paper used dynamic DHTML language to judge its structure and broadcasted the landscape design resources based on the required neural network. Finally, the filtering result of the algorithm was uploaded to the design and processing part through packing, and the design model was used to screen the landscape design information and finally we integrated the processing. The specific process was as shown in the following figure.
2.2. landscape scale design model

After the completion of the neural network model framework, the next thing to consider was to match the road landscape scale design model with the driver's physiological response. After neural network model was used to express the physiological response of driver, the driver started to be matched with the driver's physiology reaction to the design of road landscape scale and we found out the optimal scale result through continuous matching. That was, according to the driver's reaction, different scale information was input into the neural algorithm to find out the most sensitive scale of the driver's reaction, and then we would derive the algorithm and use the model to collate it. Secondly, we carried out data processing and the main need to be done was to integrate the information from different landscape design neural network design. We would deal with it by the algorithm effectively, when all aspects was consistent, we would achieve the smooth operation of each algorithm for the driver life safety protection. Finally, it was imported into each information algorithm design page, and the design content and information collected by each algorithm and the algorithm generation requirements were displayed on the overall algorithm results so that designers could conveniently operate through the information algorithm terminal.

| Composition of neural network algorithm | Building landscape model composition |
|----------------------------------------|-------------------------------------|
| Model total data system bi,x           | Standard data of neural models pop  |
| Unit cluster data body                 |                                    |
| 3.6                                    | 2.3                                 | 0.71  |
| Longitudinal coefficient              |                                    |
| 7.1                                    | 3.5                                 | 0.60  |
| Difference sequence                   |                                    |
| 8.2                                    | 7.6                                 | 0.77  |
| Optimal numerical value               |                                    |
| 6.7                                    | 4.3                                 | 0.82  |

As shown in Table 1, in the integration phase of the neural network algorithm factor processing, $b^i$ represented the driving safety factor, $i$ represents the cross-classification of data, and $x$ represents the design dimensions of the road landscape. The specific algorithm was as follows:

\[
(b_{21}b_{20}b_{19}\ldots b_{b_{0}})_{2} = (\sum_{i=0}^{21}b_{i}.2^{i})_{10} = x'.
\]  

(4)

First of all, through the above formula, the preliminary results of driving safety factor were obtained. The corresponding optional micro-data and the number of road landscape scales were designed. The specific design was used to classify the options under the jurisdiction and we used the landscape design nerves network algorithm design data to automatically regulate it in order to carry out the work for the next step to provide the preconditions. Based on this data design, for gene data fitting, we would regard $x$ as the sum of driving risk factors and $x'$ was the design scale of the optional number. Through the following formula checking, the conclusion of the integration of genetic data integration program was:

\[
x(i) = \sum \frac{F_{x}-C(i)}{2^{0.4}}
\]  

(5)
After the integration of the micro-level data was completed, the last part was divided into small data with gene as a standard unit. M represents the total volume of the cluster data volume, W was the number of micro-scale data types, and \( F \), \( X \) represented the road landscape design neural network coefficient. We combined them with the system architecture of the three levels. Through the gradual fitting, the complex data would eventually be disassembled and rearranged, and finally the optimal solution would be obtained according to the corresponding problems. The final integrated data calculation method was shown below.

\[
M(F_i) = \sqrt{W_i \cdot 0.3(W_{rel} - X_i) / 0.513W_i}
\]  

When all angles of the design elements were entered into the system, which had been verified by the algorithm, we would build the final decisive process. We used the formula obtained by the different road scales to discover the degree of response of the driver, and we would centralize them. We used the above built neural network model to simulate the human body to make the most real reaction and amplitude, and ultimately we established the most suitable driver found, and made the response landscape design standards. The specific design flow chart shown in Figure 2 below.

![Design flow chart](image)

In the end of the design, in order to ensure that the design reaches a predetermined level, the algorithm could also be based on the operation of the protection. We would computing and integrate information through the data, focusing on the input algorithm with the information overlap. In the data computing and collection, we took the above structure of the landscape design neural network algorithm to generate the framework for the design of the input from the content of the algorithm classification design, and it would be divided into three major aspects. They were landscape design to generate design Data, driver reaction level and professional technical data. It was fit with the design data generated by the landscape design neural network algorithm to get the range of the design material produced by the landscape design neural network algorithm. Landscape design neural network algorithm generation framework as the middle of the convergence of its design accuracy requirements must also meet the principle of algorithm
construction. We must determine its accuracy. Finally, finishing the work of this part, the input of design factors would be collected and then we could see above, through computer technology to be an algorithm to complete the design of road landscape standards based on the realization of the driver's life safety and security.

3. Analysis and discussion

In the above algorithm, the landscape scale design had been completed, and the calculation accuracy of the algorithm had also been guaranteed. Taking into account the design for the car driver, we should be responsible for the driver's life safety. Therefore, a simulated driving test would be carried out. By inputting the optimal solution obtained above, the designed road landscape scale would be simulated and constructed. On the premise of ensuring the personal safety of the tester, the designed road scale out of the simulation. We selected the location of a road in the construction of the suburbs. The four lanes of the road for the highway, the standard for the road landscape and decorative design were all the results of the above design. In order to ensure the safety of the driver and the accuracy of the test, five sets of tests were carried out by professionals and simulated vehicles, and a fixed point camera was used to collect the driving situation of the vehicle by traveling one round trip in this section, and we acquired the feelings of drivers. The specific data was shown in Table 2 below:

| Factor                  | Aesthetic degree | Design difficulty | Design factor | Accuracy | Fractal level |
|-------------------------|------------------|-------------------|---------------|----------|---------------|
| Neural network model    | A1               | 0.2               | 0.2           | 3.3      | 4.3           |
|                         | A2               | 0.4               | 1.6           | 4.4      | 4.6           |
|                         | A3               | 0.4               | 2.1           | 2.6      | 5.4           |
| Traditional HP algorithm| A4               | 1.2               | 0.6           | 5.5      | 6.1           |
|                         | A5               | 2.3               | 1.6           | 6.3      | 7.1           |
|                         | A6               | 1.6               | 1.3           | 8.0      | 7.2           |
|                         | A7               | 2.2               | 2.2           | 5.2      | 6.7           |
| HPStream algorithm      | A8               | 0.5               | 1.3           | 9.2      | 7.2           |
|                         | A9               | 0.7               | 2.1           | 7.1      | 6.1           |
|                         | A0               | 0.6               | 1.3           | 4.6      | 6.2           |

From the results of the above simulation tests, we could see that after the completion of the conditions for the virtual driving, the driver had traveled the required distance on this section of the road according to the test requirements, and at each contrast point of the design, we would make objective and subjective evaluation. This design used the control variable method so that by comparing the landscape dimensions existing in the original road with selected ones of the best designs, we found that the driver's reaction to several landscape dimensions designed this time and the effect of feeling. Compared with the original landscape size, we made a different evaluation. The results showed that the design of the scale could effectively mobilize the driver's ability to respond, and could provide measures to respond to the reaction time and it was based on humanity designed by the feasibility of the program. In the safety test for the landscape scale, we found that when the driver into the edge of the landscape, the driver's psychological and physiological response could be mobilized to the maximum, which can ensure maximum driver's life safe, and provide safe and comfortable driving experience.
In the above test, we selected the standard design of road landscape as the basis, which was divided into four kinds of situations to be discussed. They were the driver's personal safety, driver's driving experience, the driving safety distance of the road and the landscape scale for the factor of avoiding accidents. The above four kinds of elements were the key reference objects of this design, which could immediately check the data information at the same time and examine its demonstrated ability. During the testing process, simulated driving test to the driver's psychological and physiological reaction acquisition need to achieve a higher stability standard, mainly due to its simulation system dispersion coefficient calculation, write-in and read-out to integrate the details at the flaw and it would not miss the important information in the program. For different variables of the test, the driver simulated driving program could capture the excellent stability of the driver's movements in this objective test results for the driver's reaction to make the best objective evaluation, and then it would protect the accuracy of this test by combining with the subjective evaluation of the driver.

At the same time, during the testing process, several optimal solutions derived from this design were put into the same variable test. Finally, it was found that the driver's psychological and physiological reaction was the most severe, but it could not fully protect the driver's processing time. It also had a certain degree of negative impact on his driving experience. Among them, widely accepted by the testers was the median in the optimal solution. That was the median design of the scale. While maintaining the other variables remain unchanged and while drivers were driving on the median scale, it could achieve the best driving experience, and the road conditions could be optimized to grasp. When we meet an emergency, it could be able to set aside a sufficient response time at the same time. Through the section of the road simulation form, we finally established the optimal value of the program. Through this design, we would be to obtain the optimal design value of the road landscape scale. When we pass the test we
would find that we could invest the construction of the highway. The use of this solution could greatly reduce the incidence of traffic accidents. At the same time it could improve driver's driving experience.

4. Conclusions
The incidence of traffic accidents in our country was among the highest in the world. The accident rate in each year was on the rise. Incidents frequently occur, including the driver's driving level, the safety performance of the car and the design of the road landscape scale. Therefore, in this paper, the goal of reducing the accident rate was to design the scale of the landscape by neural network algorithm, and by transforming variables, size and other design elements. We selected the road as a pilot at random, with the most humane scale design as the standard for regional design investment. And we structure the designed road landscape scale artificially to ensure the safety of testers on the premise of the design of the road scale simulation lofting. We selected the location of a road in the construction of suburbs. The road was a standard four-lane highway. The road landscape standards and decorative design all use the results of the above design. In order to ensure the safety of the driver and the accuracy of the test, five sets of tests were carried out by professionals and simulated vehicles, and the driver's own feelings were collected. Finally, the feasibility of this program was confirmed. In the process, further efforts were needed to balance the landscape dimensions of different roads with respect to driver factors at different driving levels.

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