*Forest Chemicals Review*
*www.forestchemicalsreview.com*
*ISSN: 1520-0191*
*September-October 2021 Page No. 785-798*
*Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021*

# GRBF: A Neural Network Model for Evaluating the Impact of Community Opening on the Surrounding Road Traffic

**Shigan Yu, Xiaoling Ru*, Jiajia Yu, Zhiru Li, Dajian Yu**
Fuyang Normal University, Fuyang 236041, Anhui, China
*Corresponding Author

***Abstract:***

With the rapid development of economy and the urbanization of population continue to increase, government management department promotes opening community in order to improve traffic conditions. In view of the shortcomings of the existing methods, this paper puts forward the GRBF neural network model. First of all, this paper uses analytic hierarchy process to establish a multi-index evaluation system. Secondly, a generalized radial basis function (GRBF) neural network based on geometric knowledge is proposed to evaluate the impact of community opening on surrounding road traffic by using neighborhood heuristic algorithm and recursive least square algorithm. Evaluation indicators and data were derived from surveys of different social classes in the community. Therefore, the analysis results can prove the impact of community opening on road traffic, and three representative communities are selected as examples to explain the advantages of the model in this paper. The experimental results show that GRBF model is better than other similar methods in evaluating the impact of community opening on road traffic, and is more operable. The research results can provide more valuable reference for the government to improve the traffic environment.

***Keywords:*** *Neural network, Model, Algorithm, Evaluation.*

---

## I. INTRODUCTION

With the rapid development of economy and the urbanization of population continues to increase, increasing the scale of cities, road traffic become more congestion. In order to improve traffic conditions, the government promotes the completed residential communities and units are to be opened gradually in residential area. This policy has caused wide attention and discussion.

Some people think that the road network density and the road area should be increased and the traffic capacity will naturally be improved, but to a certain extent, opening community will increase the traffic flow in and out of the neighborhood, meanwhile, the traffic speed of the main road will become slower,

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

and the existing roads in the city limit the capacity of traffic and reduce the traffic efficiency.

Huang, J.W.[1] established the maximum flow model and flow-density models without accurately assessing the impact of community opening on road traffic. Hu J.W. and Fang, w.[2] proposed a mathematical model to evaluate influence without compared to the community environment before opening up, which only consider few factors such as pedestrian, bicycle and non-motorized vehicle. Li, Y. H.[3] developed only a simple mathematical model of vehicle traffic. The neural network has extensive application in computer vision, natural language processing, model evaluation, etc. and it has the function of characteristic training for input data[4-6]. So the neural network model can be designed to evaluate the influence of community opening on the surrounding road. Compared with previous models, the GRBF neural network model proposed in this paper is more efficient and more operable. The specific contributions of this paper are summarized as follows.

(1)The paper analyzes the factors affecting the road traffic in the neighborhood and establishes the evaluation index system;

(2)The paper selects the four major evaluation indexes which contain road connection degree, reachability, district branch saturability and road congestion degree, then a complete GRBF neural network model is established using the hard C-average algorithm, "neighborhood" heuristic algorithm, recursive least square method and the MATLAB as training tool, thus the paper further develops the influence range of each index on the surrounding traffic.

(3)Three representative community types were selected to study the impact of each type on road traffic before and after the opening of the community using the established GRBF neural network complete model structure and quantitative analysis method.

(4)According to the analysis results of the existing residential areas, reasonable suggestions are put forward to the traffic department and the relevant government departments from the aspects of traffic speed, road construction structure, traffic light design method, parking lot planning and community opening management, so as to improve the traffic situation and people's satisfaction, and make corresponding contributions to the society.

The other part of this paper makes the following organization arrangement. The factor of evaluation model will be introduced in the section 2. Section 3 establishes a complete model GRBF neural network structure through the MATLAB for training. Section 4 illustrates the effect of each type community on road traffic before and after the community opening. Section 5 gives the conclusion and Section 6 describes the future work. The concrete structure flow is shown in the fig 1 in this paper.

*Forest Chemicals Review*
*www.forestchemicalsreview.com*
*ISSN: 1520-0191*
*September-October 2021 Page No. 785-798*
*Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021*

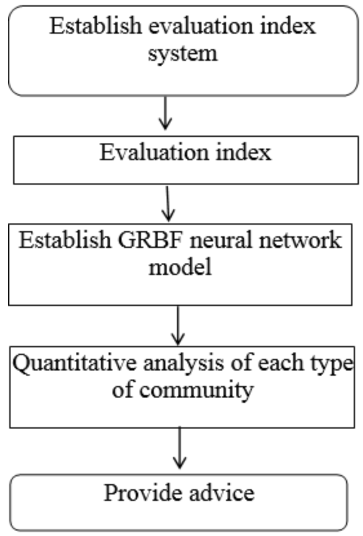


Fig 1: structure flow

## II.THE FACTORS OF EVALUATION MODEL

In order to evaluate the impact of community opening on surrounding traffic as accurately as possible, the comprehensive evaluation index should reflect the actual situation of community and surrounding road network structure, and be easy to collect and calculate.

In this paper, four main evaluation indexes are selected, which contain main road traffic index, road connection degree and reachability, district branch saturability and road congestion degree [7,8]. The evaluation index is defined as follows.

### 2.1 Main Road Traffic Index T

Main road traffic index T refers to the unit time and traffic flow of vehicles on main roads in a certain length. The higher the index T is, the more convenient the transportation connection is, but the investment in urban roads will increase accordingly. If the number of index T is small, it will cause various motor vehicles to detour or increase the proportion of the area, bringing inconvenience to residents. Therefore, the main road traffic index T can reflect the level of surrounding road construction and the reasonable balance of community construction layout, which is one of the ideal indexes to evaluate road structure. The traffic index T of main roads in surrounding areas is calculated according to formula (1), where V is the community area, D is the affected distance of main or secondary roads, and L is the length of main roads.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

$$T = \frac{V}{(\mathrm{d}+1)L} \tag{1}$$

2.2 Road Connection Degree J and Reachability K

Road connectivity J refers to the connectivity and distribution density of surrounding bus stops. Greater connectivity makes the transit system more convenient, but it also leads to corresponding travel delays. According to the statistics of public transport psychology, the number of transfers, travel time and travel distance are the issues that people consider when choosing public transport. As a result, the index reflects how people choose to travel and is directly linked to communities.

The road connectivity J and accessibility K of surrounding communities are calculated according to formula (2)-(4), where n and Mi represent the number of communities and branches respectively, n(i) represents the neighbor node of i, and C(i) represents the group number of node i.

$$\boldsymbol{J} = \frac{\sum_{i=1}^{\mathrm{n}} \boldsymbol{M}_i}{\boldsymbol{N}} \tag{2}$$

$$K = | A_{\mathrm{j}}^{i} | \tag{3}$$

$$A_{\mathrm{j}}^{i} = \{\mathrm{m} \mid m \in n(i) \cap C(m) = C(j)\} \tag{4}$$

2.3 District Branch Saturability S

Saturation is an important indicator to reflect road traffic conditions. At present, the index involved in this paper only refers to the saturation of roads or intersections within a certain interval. There are many modeling methods about saturation, but it only reflects the traffic conditions of roads in a local city or region. On the basis of analyzing the influencing factors of road network, the relationship between road network traffic space capacity and road capacity, traffic demand and road traffic volume is discussed. In addition to the average method, the index can also be calculated by the ratio of the total number of vehicles to the actual capacity of vehicles on the road network, and the calculation results reflect the service level of the community road network.

Traffic capacity (CAP) is related to capacity (C), and the functional relationship between traffic demand (D) and traffic volume (V) is shown in formula (5)-(6). Therefore, the saturation of the community road network can be obtained as formula (7).

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

$$C = f_1(CAP) \tag{5}$$

$$V = f_2(D) \tag{6}$$

$$S = \frac{V}{C} = \frac{f_2(D)}{f_1(CAP)} \tag{7}$$

2.4 Road Congestion Degree

Congestion can be divided into four dimensions: congestion degree, congestion intensity, congestion time and congestion scope. Therefore, as a dependent variable, people's perception of the degree of traffic flow can be divided into severe congestion, moderate congestion, mild congestion, stable and very stable. Logistic regression model can be used to establish an evaluation model of congestion rate to study the relationship between the sequential variables of road traffic congestion intensity and influencing factors of road operation state. Road congestion index Y, as a continuous measure of road congestion rate, includes five grades: P1 represents severe congestion; P2 indicates moderate congestion. P3 is mildly unblocked; P4 means smooth; The P5 is very smooth. Therefore, the corresponding cumulative regression model contains four logistic functions, as shown in Equation (8)-(11), which are used to evaluate the intensity of traffic congestion. Where P5 is the reference level for comparison, P1+P2+P3+P4+P5=1, X1 is road traffic speed; X2 is the delay ratio; X3 represents the number of stops per unit time; X4 represents the stopping time in unit time; X5 is the inlet density (signal density); These logical relations can be expressed in formula (12).

$$\ln\left(\frac{P1}{1-P1}\right) = \beta_{01} - \sum_{k=1}^{5}\beta_k x_k, \tag{8}$$

$$\ln\left(\frac{P1+P2}{1-P1-P2}\right) = \beta_{02} - \sum_{k=1}^{5}\beta_k x_k \tag{9}$$

$$\ln\left(\frac{P1+P2+P3}{1-P1-P2-P3}\right) = \beta_{03} - \sum_{k=1}^{5}\beta_k x_k \tag{10}$$

$$\ln\left(\frac{P1+P2+P3+P4}{P5}\right) = \beta_{04} - \sum_{k=1}^{5}\beta_k x_k \tag{11}$$

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

$$\ln\left(\frac{P(y \le j) \mid x}{1 - P(y \le j) \mid x}\right) = \beta_{0j} - \sum_{k=1}^{5} \beta_k x_k \tag{12}$$

## III. THE PROPOSED NEURAL NETWORK MODEL

Because neural network model has many advantages in solving evaluation problems[9-11], this paper chooses it as an evaluation tool. In order to evaluate the impact of community opening on the surrounding roads, a multi-objective integrated system method is established, and the specific implementation technology is introduced.

### 3.1 RBF Neural Network Model

RBF [12-14] neural network is usually composed of a forward neural network with a single hidden layer, whose output is the radial basis function. The input of each radial basis function of a neural network is the distance between the input vector and its center position. Fig 2 shows the model structure of the RBF neural network, including $n_i$ input and no output elements and c radial basis functions.

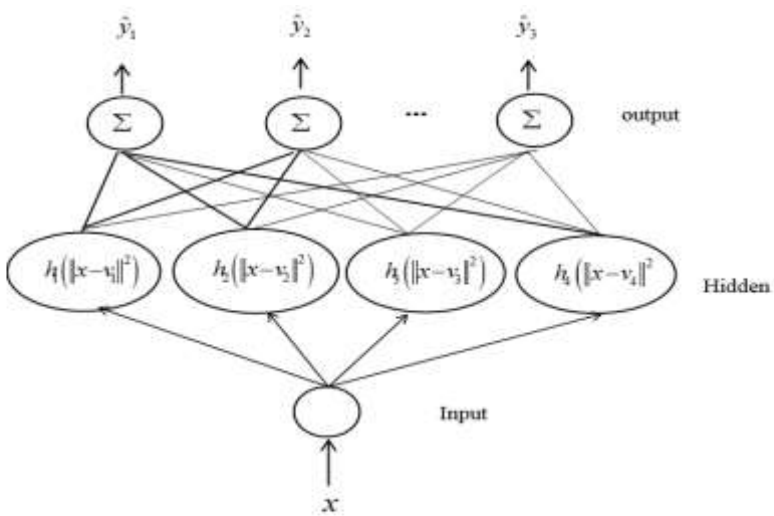


Fig 2: structure of RBF neural network

In fig 2, $x \in X \in R^n$ is the input vector, $v_i \in R^n$ is the prototype of the input vector. Given a set of prototypes: $v_i \in R^n, 1 \le j \le c$, the output of each radial basis function is formula(13), Where, ||•|| is usually Euclidean norm. Because of the decomposition easily, the gaussian function is the most commonly used

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

in the radial basis function, whose width is σ. The RBF network consists of c radial basis functions and the output is linear relation, then the i-th output unit is $\hat{y}$ as formula (14)-(16).

$$h_i = h_j\left(\|x - v_i\|\right), 1 \le j \le c \tag{13}$$

$$\hat{y}_i = w_i^T = \sum_{j=0}^{c} w_{ij} h_j, 1 \le i \le n_0 \tag{14}$$

$$w_i = [w_{i0}, w_{i1}, ..., w_{ic}]^T \tag{15}$$

$$h = [1, h_1, h_2, ..., h_c]^T \tag{16}$$

Therefore, the RBF network has an output vector $\hat{y}$ as formula (17). For each input vector $x \in R^{n_i}$ ,the $\hat{y}$ is shown in formula(18), w is weight matrix, which can be defined as formula(19).

$$\hat{y} = Wh \in R^{n_0} \tag{17}$$

$$\hat{y} = [\hat{y}_1, \hat{y}_2, ..., \hat{y}_{n_0}]^T \tag{18}$$

$$W = [w_1, w_2, ..., w_{n_o}]^T \tag{19}$$

3.2 GRBF Neural Network Model

The number of neurons in RBF multilayer neural network needs to be considered. Learning slows down when there are too many hidden layers. Therefore, on the basis of the original RBF neural network algorithm, this paper selects a hybrid algorithm for the construction and training of RBF neural network, which is called Generalized Radial Basis Function (GRBF) neural network. Since GRBF inherits the advantages of RBF neural network, the number of hidden layer neurons is no longer limited by input data points, but determined by the training algorithm, and the number of training samples is not a specific requirement. The higher the sample size, the higher the accuracy. GRBF adjusts all parameters according to the principle of minimum sum of squares of error, which is essentially a nonlinear optimization problem. The learning algorithm of GRBF neural network can be designed as Algorithm 1

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

**Algorithm 1: Learning algorithm of GRBF neural network**

Step1: set c=2, initial prototype $v_j, 1 \le j \le c$;

Step2: update prototype $v_j, 1 \le j \le c$;

Step3: update width of RBF;

Step4: initialize the weights of the neural network;

Step5: update the weight of neural network;

Step6: if the neural network error meets the requirements, then stop training, or continue;

Step7: set c=c+1, go to Step2.

Step2-step 7 is a complete growth cycle for each of these steps. If a neural network consists of a (c) radial basis function, then it has passed the (c-2) growth cycle. This learning algorithm is compatible and accurate with any supervised or unsupervised learning algorithm.

### 3.3 Calculation of Index Used in GRBF Neural Network Model

This paper aims to evaluate influence of community opening on the surrounding roads through road congestion analysis, so the traffic network of traffic congestion is selected as the research object. 7 routes, 20 sample sections and 10 intersections are selected from the selected road network. The traffic volume of corresponding roads can be investigated and measured as shown in Table I.

**TABLE I. Specific parameters of each line**

| road section | Length(km) | Lane number(one-way) | design speed/(km/h) |
|---|---|---|---|
| XXX1 | 1.6 | 3 | 80 |
| XXX2 | 0.8 | 3 | 50 |
| XXX3 | 0.8 | 3 | 60 |
| XXX4 | 1.6 | 3 | 60 |
| XXX5 | 0.8 | 2 | 40 |
| XXX6 | 0.7 | 2 | 30 |
| XXX7 | 0.9 | 1 | 30 |

The evaluation indexes of GRBF model are calculated from the table I as follows.

(1) Saturability. According to the actual traffic volume of the entrance lane that can be obtained from the survey data in Table I, 2145/1.5 = 1430. By referring to the specifications of urban road engineering design, the capacity of the entrance lane can be checked, that is, 1350 * 3 = 4050, so its saturation is 1430/4050 = 0.378.

(2) Average delay. Through actual investigation, the average speed of vehicles during 17:30-19:00 is

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

about 31.17 Km/h, while Table I shows that the speed of this section is 60 Km/h. Since this section is 1.6 km long, the average delay is 1.6 / (60-31.17) = 3.33 (min).

(3) Driving speed rate: The average driving speed of vehicles on the sample sections during the peak period is

31.17km/h, so the driving speed rate is 1/31.17=0.032 h/km.

(4) Traffic congestion factor: According to the survey data, the average speed of vehicles on road section 1 in peak period can be calculated as 31.17km/h, while table I shows that part of the length is 1.6km. Therefore, the average passing time of vehicles on this section is 1.6/31.17 = 0.0513(h). As the design speed of this section is 60km/h, the time for vehicles on this section to pass at the highest speed is 1.6/60=0.0267 (h) = 1.6(min), so the traffic congestion factor of this section is 0.0513*60/1.6 =1.924.

The index values of the remaining individual samples can be calculated in the same way. The index values of these samples can be used as the input parameters of the GRBF neural network model and trained for many times to obtain the input and output values of GRBF.

In this paper, hard C-means algorithm and HCM algorithm are used to determine the position of the basis function, and adjacent edge heuristic algorithm is used to determine the width of the basis function. The recursive least square method (ELEANNE2 algorithm) is used to determine the weights of neural networks. The GRBF neural network model is designed and trained by MATLAB neural network toolbox. By calling the kernel function in the neural network toolbox and writing the corresponding subroutine according to the selected calculation method, the complete GRBF neural network model structure is finally established.

## IV. GRBF MODEL APPLICATION AND ANALYSIS

Communities A, B and C with different characteristics as shown in Fig 3 are selected, and the GRBF model is applied to these three communities. Sampling method and analytic hierarchy process are adopted to evaluate the impact of community opening on road traffic. By rating the importance of each of the above factors on a scale of 1 to 10, different social strata of the community such as educators, administrators, company employees and students are surveyed. The values of the survey are distributed discretely, and the average and comparison matrices are used to calculate the weight vector. Finally, the influence of road traffic on community opening can be judged by comparing the congestion index before and after community opening.

**Community A:** Only one main road is open, and the road is 600 meters long. The average speed of

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

the vehicle is 30km/h. The front doors connect directly to the back, and the sidewalks are distinct from the alleys. Through sampling survey and data analysis, the factors obtained are shown in Table II.

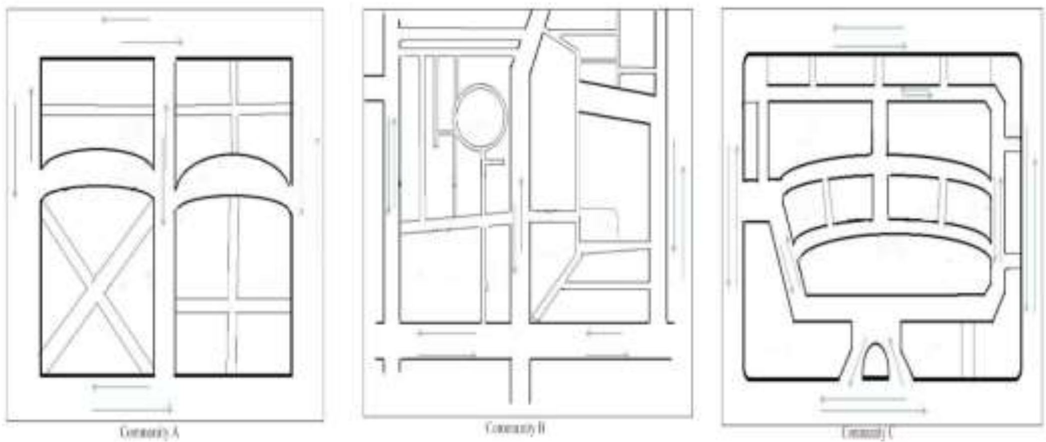

Fig 3: community A, B, C

**TABLE II. The average score of each factor**

| factor | Road number | Confluence branch number | Main road and community distance | Number of peak |
|---|---|---|---|---|
| score | 6 | 7 | 4 | 2 |
| factor | Time interval | Branch network density | Number of lanes in the community | Street status |
| score | 9 | 1 | 2 | 2 |
| factor | Lane width | intersection | Community environment | External factors |
| score | 9 | 2 | 3 | 2 |

Firstly, The GRBF model and analytic hierarchy process are used to calculate corresponding indexes as follows.

(1)The maximum eigenvalue of the computed matrix A is $\lambda_{max}=5$ and the corresponding normalized eigenvector is $\omega^1=(0.2857, 0.3333, 0.1905, 0.0952, 0.0952)$;

(2) get $CI^{(1)}=0$, $CR^{(1)}=0<0.1$, Matrix A meets the consistency test requirement.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

(3) The weight vector of the criterion layer to the target layer is $\omega^1$.

Secondly, the scheme layer sort and consistency test are as follows.

(1)The maximum eigenvalue of the computed matrix C1, C2, C3, C4, C5 is $\lambda_{max}=3$, the corresponding normalized eigenvector are as follows.

$\omega^{(1)}=(0.0588, 0.5294, 0.4118)$,

$\omega^{(2)}=(0.45, 0.1, 0.45)$,

$\omega^{(3)}=(0.3889, 0.1111, 0.5)$,

$\omega^{(4)}=(0.2, 0.4, 0.4)$,

$\omega^{(5)}=(0.3122, 0.3122, 0.3755)$;

(2) Consistency index of matrix C1, C2, C3, C4, C5 is $CI_k^{(2)}=0$, so random consistency ratio is $CR_k^{(2)}=0<0.1$, so every matrix C1, C2, C3, C4, C5 meets the consistency test requirement;

(3) Adjust the normalized eigenvector $\omega^{(1)}$, $\omega^{(2)}$, $\omega^{(3)}$, $\omega^{(4)}$ and $\omega^{(5)}$ respectively. The weight vector of the scheme layer to the criterion layer can be obtained as follows.

$\omega^{(1)}=(0.0588, 0.5294, 0.4118, 0, 0, 0, 0, 0)$,

$\omega^{(2)}=(0, 0, 0.45, 0.1, 0.45, 0, 0, 0)$,

$\omega^{(3)}=(0, 0.3889, 0, 0.1111, 0.5, 0, 0, 0)$

$\omega^{(4)}=(0.2, 0, 0, 0, 0, 0.4, 0.4, 0)$,

$\omega^{(5)}=(0, 0, 0, 0, 0, 0.3122, 0.3122, 0.3755)$.

The total ranking weight of scheme layer to the total target layer is $\omega=(0.0358, 0.2253, 0.2676, 0.0545, 0.2452, 0.0678, 0.0678, 0.0357)$, $CI^{(2)}=0$, $CR=0<0.1$, the total weight meets the consistency test requirement. Therefore, the weight of scheme layer to the total target layer is $\omega$.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2021 Page No. 785-798
Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021

It was estimated that the congestion level was around 0.67 when the community A was not open. According to the total sorting weight ω, road confluence, time interval and lane width are extracted as the main evaluation indexes, which are as follows: ω={0.2253, 0.2676, 0.2452}, Congestion index $b_k$=1-max{$b_1$, $b_2$, $b_3$, $b_4$, $b_5$ };

Through calculation, b=0.5877. Since 0.5877 < 0.67, the opening of the community is conducive to road traffic.

**Community B:** There are more leisure facilities, complex terrain and many intersections in such communities, but crosswalks and driveways are completely independent from each other, as shown in Fig 3. It was estimated that the congestion level was around 0.55 when the community B was not open. By using the same method to calculate the congestion index of community A, it can be concluded that the congestion index of community is 0.37. Since 0.37<0.55, therefore, the opening of community B is beneficial to road traffic.

**Community C:** There are few leisure facilities, few entrances and exits, many intersections and many lanes in community C, but the connection between sidewalks and lanes is relatively close. The congestion level was estimated at about 0.8 before opening of Community C.

According to the same calculation method as community A, it can be concluded that the congestion index of Community C is 0.789. Since 0.798<0.8, the opening of community C is beneficial to road traffic from the relationship between the number and size, but the traffic congestion level before and after the opening of community C is very similar, and the human and resource costs cannot be ignored in open communities, so this kind of community is not suitable for opening.

## V. CONCLUSION AND SUGGESTION

According to the previous analysis of three typical residential applications, some communities are suitable for opening up. Therefore, there are many problems to be solved when opening up communities. From the experimental results, the GRBF model presented in this paper has better efficiency and operability. Considering the actual situation, the following suggestions are put forward.

(1) Urban planning departments may draw a section of the community as a staging area for vendors, and make a reasonable arrangement for them in the form of rental or buyout. Regulate the operation order of the open community.

(2) After opening community, there will always be a large number of vehicles into the community

with limited capacity, inevitably, community will be parked in disorder. Therefore, the traffic management department should transfer the open community into the management area.

(3) In the Crowded conditions of community, it will be bound to cause issues of health and safety to a certain extent. The management can take plan to charge a fee used for garbage disposal and community maintenance.

(4) From the above GRBF model, we can know the factors influenced the community surrounding road traffic are affecting each other. For example, the lane widths that influence the distance between the main road and community have effect on number of Confluence branch.

Therefore, community opening will lead to the vehicle density and congestion, and thus affect the community surrounding roads traffic and according to the geographical location and area of the community, urban planners should take corresponding measures to open up the community.

## VI. FUTURE WORK

Community opening is a multidisciplinary research field involving sociology, transportation and urban planning. In the work of this paper, only a few main factors of simplification are considered, but many factors need to be considered in the actual implementation process.

In the future, the application model will be improved through the following aspects. First of all, the biggest impact of community opening is on the residents of the community, which also involves security, property management and the will of residents, which need to be further studied. Secondly, the surrounding community has a variety of functions, covering a wide range of areas such as catering, business, office, entertainment, education and so on. It is a large and complex area of traffic and people flow. There are many human factors that have not been considered. So there is still a lot of work to do to make the model more reasonable.

## ACKNOWLEDGEMENT

We express our deep gratitude to the anonymous reviewers for their valuable comments and Suggestions. The work reported in this paper was supported in part by Excellent Young Talents Project of Anhui Province under Grant gxyq2019175, in part by Quality project of Anhui Province with Grant number 2020mooc386, 2020xsjxms182, and 2020zdxsjg260, in part by Talent research launch start-up project under grant 2019 kyqd0018.

*Forest Chemicals Review*
*www.forestchemicalsreview.com*
*ISSN: 1520-0191*
*September-October 2021 Page No. 785-798*
*Article History: Received: 22 July 2021 Revised: 16 August 2021 Accepted: 05 September 2021 Publication: 31 October 2021*

## REFERENCES

[1]Huang J. W. "Research on the Influence and Optimization of Open Community on Road Traffic," *4th International Conference on Information Science and Control Engineering (ICISCE)*, 2017, pp.1193-1201.

[2]Hu J. W., Fang, W. "A Mathematical Model of Residential Community Open-Up Strategy for Smart City," *International Conference on Intelligent Transportation, Big Data & Smart City (ICITBS)*, 2016, pp.137-140.

[3]Li Y. H. "Research on the Relationship between Community Opening and Road Traffic Based on Traffic Flow," *Advances in Engineering*, *2016*, vol.126, pp.1574- 1580

[4]Zhou, F. Y. "Review of Convolutional Neural Network," *Chinese Journal of Computers*, 2017, vol.40, pp.1-23

[5]Geoffrey Hinton, Salakhutdinov R. R. "Reducing the dimensionality of data with neural networks." Science, 2016, pp.504-507

[6]Yan, X. C. "Multi-loss regularized deep neural network." IEEE Transactions on Circuits and Systems for Video Technology, 2015, pp.2273-2283

[7]Peng, Y. "Development Study on Opening Model Residential Quarter," *Chongqing University*, 2008, pp.147-152

[8]Xu, X. N. "Research on Evaluation of City Road Running Condition Based on Neural Network." *Chang'an University*, 2014, pp.215-218

[9]Moore B. J., Berger T. and Song D. "Validation of a Convolutional Neural Network Model for Spike Transformation Using a Generalized Linear Model," 2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), 2020, pp. 3236-3239, doi: 10.1109/EMBC44109.2020.9176458

[10]Yang S. et al., "Scalable Digital Neuromorphic Architecture for Large-Scale Biophysically Meaningful Neural Network With Multi-Compartment Neurons," in IEEE Transactions on Neural Networks and Learning Systems, vol. 31, no. 1, pp. 148-162, Jan. 2020, doi: 10.1109/TNNLS. 2019. 2899936

[11]Fan J., Mu D. and Liu Y. (2019) "Research on Network Traffic Prediction Model Based on Neural Network," 2019 2nd International Conference on Information Systems and Computer Aided Education (ICISCAE), pp. 554-557

[12]Skala V. and Cervenka M. "Novel RBF Approximation Method Based on Geometrical Properties for Signal Processing with a New RBF Function: Experimental Comparison," 2019 IEEE 15th International Scientific Conference on Informatics, 2019, pp. 000451-000456

[13]Slama S., Errachdi A.and Benrejeb M. "Model reference adaptive control for MIMO nonlinear systems using RBF neural networks," 2018 International Conference on Advanced Systems and Electric Technologies (IC_ASET), 2018, pp. 346-351

[14]Gaoyuan L., Mei W. and Ashraf A. "Improved RBF Neural Network Control System Design for Helicopter of Large Envelope," 2018 International Conference on Control and Robots (ICCR), 2018, pp. 46-51, doi: 10.1109/ICCR.2018.8534495