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BP neural network model-based masses spontaneous sports organizations development exploration

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ABSTRACT

For years, China government has made huge efforts in promoting people's spiritual cultural levels aspect, but effects are still not remarkable. Masses spontaneous sports organizations are basic countermeasures to improve the status, on one hand, it reduces government economic investment, on the other hand, it meets demands of people physical exercises, the paper takes Beijing city five parks as research objects, makes study on intra-park masses spontaneous sports organizations development status. Utilize BP neural network model, targeted at Sunrise park, Temple of heaven park, Beihai park, Yuyuantan park and Purple bamboo park these five parks internal masses spontaneous sports organizations members weekly exercises times and weekly exercises duration, it makes analysis, analysis result shows that Temple of heaven park and Beihai park internal masses spontaneous sports organizations are going well, while Sunrise park and Purple bamboo park internal masses spontaneous sports organizations are not going well.

KEYWORDS

Masses spontaneity; Sports organizations; BP neural network; National fitness; Public health.



INTRODUCTION

In recent years, with the improvement of people material standard of living, people's demand on physical health, spirit of joy also increasingly gets higher. No matter in big cities or small towns, spontaneous masses sports organizations are becoming more and more, the organizations development levels affect people's living quality.

In 2013, Zhao Li-Yong in the article "Shanxi province Licheng country small towns spontaneous masses sports organizations status and development countermeasures research", highlighted spontaneous masses sports organization is one of imports components of basic level sports organizations, it had positive effects on promoting local social cultures, people's quality and economic levels. The article comprehensive applied multiple research methods, took Shanxi Licheng country's spontaneous masses organizations as research objects, and went deeper into investigation and research. Research result showed, the region masses spontaneous sports organizations dominants in quantity, based on medium and small scale, number of people was between 30 and 100 people, participated group of people cultural extents were generally lower, gender distributions were imbalanced. The region spontaneous masses sports organizations' sports events were relative single, organization principals education backgrounds were generally higher that had certain economic base but aging extents were higher. The region masses spontaneous sports organizations lacked of professional sports guider, lacked of fixed daily office sites, but activities places were relative fixed that basically met masses activities demands. In organizations' fund aspect, main sources were from memberships' fees in every organizations, main usage was increasing fields apparatus. Though each masses organizations could operate, they still had some problems, such as, regulations and policies that organizations relied on were not sound, management system was not complete, fund sources were insufficient, lacked of professional sports instructor, monitoring sectors monitoring was not enough. Therefore, the author pointed out that every grade department should strengthen masses spontaneous sports organizations monitoring strength, established overall sports organization system, every sports organization should positive establish social sports guiding backbone teams, government should encourage masses to organize sports organizations.

In 2011, Song Ya-Qi in the article "China urban community spontaneous masses sports organizations research—take Huilongguan league football match as an example", highlighted that due to government sports aspect supply could not meet masses sports demands, it generated spontaneous masses sports organizations. Author stated masses sports development after opening-up and reform from multiple perspectives, by sociology and psychology and other knowledge to make theoretical analysis of masses spontaneous sports organizations causes and development status. The article took Huilongguan region league football associations as investigation objects, from economics, sociology, psychology multiple perspectives, targeted at Beijing Huilongguan region league football match organizations formation and development social backgrounds and their relationships, it made analysis. Analysis result showed that masses spontaneous sports organizations development limitation factors were management system, management awareness, management system, activity fund and sports guiding. With respect to this, author pointed out that took social Medias as platforms, widely advertised masses sports, strengthened masses sports scientific research ability, and formulated masses sports management system that adapted to China's national conditions.

In 2009, Li Wei in the article "Jiazuo city spontaneous masses sports activities organizations research", comprehensive applied multiple research methods, took Jiazuo city spontaneous masses sports activities organizations as research objects, targeted at their development process, status features and development rules to make research. Research results showed that higher sports technology, spirit of enthusiastic serving to public, possessing sufficient sports demands and proper fields were spontaneous masses sports activities organizations formed essential conditions. External influence factors' materials supplying was main influence factors.

The paper took Beijing city as an example, researches on Sunrise Park, Temple of Heaven Park, Beihai park, Yuyuantan park and Purple bamboo park internal masses spontaneous sports organizations development status.

DATA COLLECTION AND PROCESSING

Masses spontaneous sports organizations development merits mainly reflect in two aspects, one is masses spontaneous sports organizations internal members daily exercises time, the time is longer shows development gets better, two is masses spontaneous sports organizations internal members' weekly exercises number of times, the times are more that shows the development gets better. The model will mainly consider from the two aspects, evaluates Sunrise Park, Temple of Heaven Park, Beihai park, Yuyuantan park and Purple bamboo park internal masses spontaneous sports organizations development status.

Evaluated parks data collection

The data collection totally selects Beijing city five parks that are respectively Sunrise Park, Temple of Heaven Park, Beihai Park, Yuyuantan Park and Purple Bamboo Park. In every park, respectively random sample different groups spontaneous sports organizations internal exercisers, informants fills in questionnaires on daily morning exercising time and weekly morning exercising number of times two questions, and ensure questionnaire both return rate and effective rate to be 100%. For activities time investigation result, sort out statistical data and get TABLE 1, for weekly activities times investigation results, sort data and get TABLE 2. Red fonts' numbers are solved number of objectives.

TABLE 1 : Masses spontaneous sports organizations internal members daily exercise duration (min)

| Sunrise Park | Temple of Heaven Park | Beihai Park | Yuyuantan Park | Purple Bamboo Park |
|--------------|-----------------------|-------------|----------------|--------------------|
| 30 | 50 | 60 | 50 | 60 |
| 30 | 60 | 50 | 40 | 80 |
| 50 | 90 | 90 | 60 | 50 |
| 60 | 80 | 80 | 80 | 90 |
| 90 | 90 | 70 | 40 | 40 |
| 60 | 90 | 40 | 60 | 80 |
| 40 | 80 | 60 | 50 | 50 |
| 60 | 60 | 90 | 50 | 60 |
| 45 | 45 | 80 | 30 | 40 |
| 30 | 60 | 60 | 40 | 30 |
| 50 | 90 | 80 | 60 | 50 |
| 30 | 50 | 90 | 40 | 60 |
| 60 | 80 | 60 | 70 | 40 |
| 90 | 50 | 30 | 60 | 30 |
| 45 | 30 | 40 | 80 | 30 |
| 51.33 | 67.00 | 65.33 | 54.00 | 52.67 |

From TABLE 1, we can see that Temple of Heaven Park and Beihai Park masses sports spontaneous organizations exercises duration is longer, Sunrise Park, Yuyuantan Park, Purple Bamboo Park masses sports spontaneous organizations exercise durations are shorter. The conclusion is preliminary conclusion, is defined according to red fonts (each item average value).

TABLE 2 : Masses spontaneous sports organizations internal members weekly exercise times (times)

| Sunrise Park | Temple of Heaven Park | Beihai Park | Yuyuantan Park | Purple Bamboo Park |
|--------------|-----------------------|-------------|----------------|--------------------|
| 5 | 7 | 4 | 3 | 5 |
| 6 | 7 | 5 | 4 | 2 |
| 4 | 6 | 6 | 2 | 4 |
| 4 | 5 | 7 | 3 | 6 |
| 3 | 7 | 5 | 5 | 3 |
| 7 | 6 | 5 | 7 | 1 |
| 2 | 5 | 6 | 4 | 3 |
| 2 | 4 | 6 | 3 | 2 |
| 4 | 5 | 5 | 5 | 3 |
| 5 | 3 | 5 | 4 | 5 |
| 2 | 5 | 6 | 6 | 5 |
| 4 | 6 | 5 | 7 | 7 |
| 6 | 4 | 4 | 5 | 3 |
| 3 | 3 | 2 | 4 | 2 |
| 2 | 3 | 3 | 2 | 3 |
| 3.93 | 5.07 | 4.93 | 4.27 | 3.60 |

In TABLE 2 red fonts are average values of every item that is used as evaluation basis data.

Feature values data collection

The evaluation divide five parks into two parts, one part is masses spontaneous organizations well operated parks; the other is masses spontaneous organizations poor operated parks. For feature values selection, we select partial neighborhood committee data as basis, through sorting statistical data; it gets TABLE 3, TABLE 4.

TABLE 3 : Masses spontaneous organizations poor operated organizations

| | | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Masses spontaneous sports organizations internal members daily exercise duration (min) | 30 | 50 | 40 | 45 | 35 | 40 | 45 | 50 |
| Masses spontaneous sports organizations internal members weekly exercise times (times) | 5 | 3 | 2 | 4 | 4 | 3 | 3 | 2 |

TABLE 4 : Masses spontaneous organizations well operated organizations

| | | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Masses spontaneous sports organizations internal members daily exercise duration (min) | 50 | 60 | 90 | 60 | 70 | 60 | 90 | 80 |
| Masses spontaneous sports organizations internal members weekly exercise times (times) | 7 | 5 | 7 | 6 | 5 | 7 | 6 | 5 |

From TABLE 3, 4, we cannot clearly see masses spontaneous organizations operating merits; it can use TABLE 3, TABLE 4 data as BP neural network model feature values of discriminating of evaluation objects.

BP NEURAL NETWORK MODEL

Neural network model concept

Neural network model is originated from neurobiology. Its computation process is similar to biology nerve cell reaction process, as Figure 1.

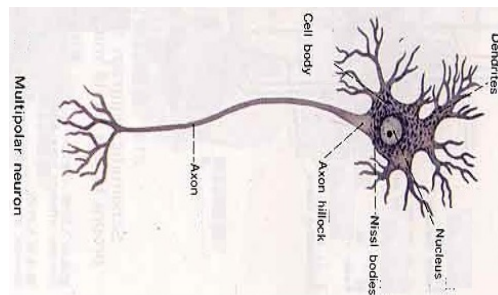


Figure 1 : The structure of neurons

In neural network, lots of different nerve cells included axon end can enter into the same nerve cell Dendron and form into a large number of synapses. All synapses of different origins released neurotransmitters can exert on same nerve cells' membrane potential changes. Thereupon, nerve cells space comprehensive information ability that is nerve cell can integrate input information of different origins in Dendron. Base on the ability, people simulate nerve cell reaction process and create artificial nerve cell model, as Figure 2 shows, symbols definition in Figure 2 is as TABLE 5 shows.

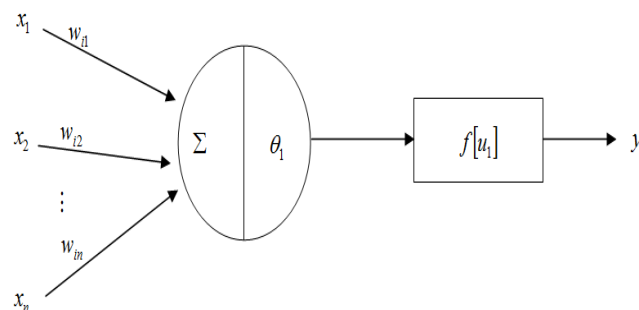


Figure 2 : The schematic of mathematical models of neurons

TABLE 5 : Mathematical model’s symbol definition

| Symbol | Definition |
|------------------------|--|
| x_1, x_2, \dots, x_n | Nerve cell input part that is information released by previous level |
| θ_i | Nerve cell threshold value |
| y_i | Nerve cell output |
| $f[u_i]$ | Excitation function |

$f[u_i]$ decides that output form that arrives at threshold value θ_i under common effects of inputting x_1, x_2, \dots, x_n . Figure 3 shows two kinds of excitation functions images. The paper adopted models use the second kind excitation function.

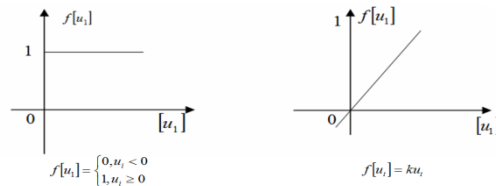


Figure 3 : Typical excitation functions

Among them:

$$u_i = \sum_j w_{ij}x_j - \theta_i \tag{1}$$

So:

$$y_i = f[u_i] = f\left(\sum_j w_{ij} - \theta_i\right) \tag{2}$$

(Formula (2) is individual nerve cell full mathematical model expression.

BP neural network model computational steps

BP neural network is a kind of multiple layer forward network, adopts minimum mean square error computational way. When apply counter propagation algorithm into feed forward multiple network, utilize *Sigmoid* as excitation function, use following steps to make recursion solving on w_{ij} that is network weight coefficient. In case every layer has n pieces of nerve cells, for the k layer the i nerve cell, then it has n pieces of weight coefficients $w_{i1}, w_{i2}, \dots, w_{in}$. In addition, select one more w_{jn+1} to express θ_i . When input sample x , take $x = (x_1, x_2, \dots, x_n, 1)$.

① Align value to w_{ij} . To every layer w_{ij} , align a very little nonzero random number, and meanwhile $w_{jn+1} = -\theta_i$. Due to the model utilizes Matlab to operate, the alignment process is computer’s random process, and just because of that, same programming codes in different running processes, the results may appear differences.

② Input sample value $x = (x_1, x_2, \dots, x_n, 1)$, and corresponding expected output $y = (y_1, y_2, \dots, y_n, 1)$.

③ Calculate each layer output, for the k layer the i nerve cell output x_{ik} , it has:

$$y_i^k = f[u_i^k] \tag{3}$$

Among them,

$$u_i^k = \sum_j w_{ij}x_j^{k-1} - \theta_i^k \tag{4}$$

In formula, $x_{n+1}^{k-1} = 1$, $w_{i(n+1)} = -\theta$

④Solve each layer computation error d_i^k , for output layer, it has $k = m$, then it has:

$$d_i^m = x_i^m (1 - x_i^m) (x_i^m - y_i^m) \quad (5)$$

For other layers, it has:

$$d_i^k = x_i^k (1 - x_i^k) \left(\sum_j w_{ij} x_j^{k-1} - \theta_i^k \right) \quad (6)$$

⑤Correct w_{ij} and θ_i , it has:

$$w_{ij}(t+1) = w_{ij}(t) - \eta d_i^k x_j^{k-1} \quad (7)$$

⑥After solving each layer each weight coefficient, it can judge whether it conforms to requirements according to established criterion. If it don't conform, then return to the step ③, on the contrary, end computing.

Matlab computing and computed result

In *Matlab* running program codes, regard the program running selective training error being 10^{-2} as stop calculation condition. Due to masses spontaneous sports organizations internal members daily exercises duration and masses spontaneous organizations internal members weekly exercises times data are both between $0 \sim 100$, selected stop calculation condition is proper. In following schematic diagram, “*” represents masses spontaneous organizations well operated parks, “o” represents masses spontaneous organizations poor operated parks.

Due to TABLE 3、TABLE 4 provide two kinds of masses spontaneous organizations feature values, utilize *Matlab* to draw the two kinds of municipal district distribution status is as Figure 4. According to Figure 4 distribution status, define discriminant straight line, and then define discrimination result schematic diagram as Figure 5 shows.

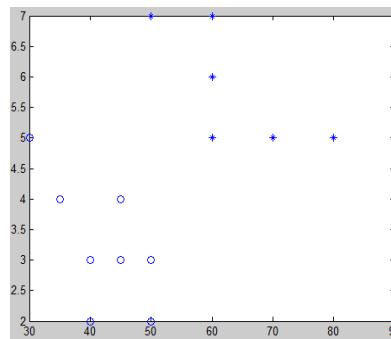


Figure 4 : Distribution of the two sports organizations indicators

From Figure 4 distribution status, we can see the two kinds of sports organizations have obvious borders, therefore it can define discrimination straight line $(45,7)$ 、 $(65,2)$. Figure 5 is discrimination result schematic diagram.

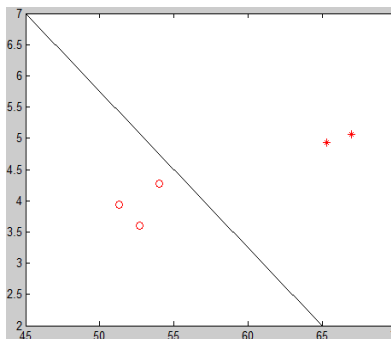


Figure 5 : The schematic of discrimination results

From Figure 5, it is clear that Temple of Heaven Park, Beihai Park are masses sports organizations well operated parks, other three parks masses spontaneous sports organizations are poor operating, from which Sunrise Park and Purple Bamboo Park are worse. Combine with practical conditions analysis, Sunrise Park lies in the middle part of Sunrise district, though traffic is well-developed, nearby office buildings are more, though nearby residents are also mostly office workers and works are busy, carrying out long time masses sports activities people are little. Temple of Heaven Park and Beihai Park lie in old Beijing urban districts, nearby residents that go in for physical exercises are more.

CONCLUSION

Neural network implements reflection process from input information to output result. Neural network has ability of handling with multiple kinds of input information; it lets complicated problems to be simple and easier operating in solving process. However, if there is a large number of data to be analyzed, neural network may not truly reflect practical status due to too much computation process. In addition, neural network should reasonable estimate training errors, once the error estimation is improper, it may occur to computed result incorrect.

The paper applies *BP* neural network model in evaluating masses spontaneous sports organizations problems, by analyzing Sunrise Park, Temple of Heaven Park, Beihai Park, Yuyuantan Park and Purple Bamboo Park these five parks, result shows that Temple of Heaven Park, Beihai Park are well-operated parks in masses spontaneous sports organizations, other three parks masses spontaneous sports organizations operate poor, from which Sunrise Park and Purple Bamboo Park are wore, combine with practical conditions, it can discover obtained conclusions have rationality.

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