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## Cluster analysis-based national traditional sports international exchange and transmission research

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### ABSTRACT

In the general background of world cultural diversity, Chinese martial arts have become representative of Chinese national traditional sports. Martial arts transmission degree represents Chinese national traditional sports events transmission status. Martial arts organization status even reflects martial arts transmission degree. World martial arts championship as top event in martial arts, its organizing status is an important reference frame. The paper selects previous world martial arts championships data, these data includes number of organizing sessions, amount of participated countries, number of participating people and competition host cities these four variables. According to experiences, it preliminarily judges amount of participated countries to be indicator. Utilize correlation analysis method, it researches on amount of participated countries and other three variables relations, it further defines amount of participated countries and number of participating people as indicators, and influence factor is competition host city. Divide host city into domestic and foreign country such two kinds, use cluster analysis to get two clusters centers, make comparison of the two and get conclusion when martial arts competition is organized in foreign countries, transmission effect is better.

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### KEYWORDS

National tradition;  
Correlation analysis;  
Cluster analysis;  
Transmission effect;  
Mathematical model.

### INTRODUCTION

In recent years, Chinese traditional culture has been gradually going abroad and reaching out to the world. Martial arts as Chinese valuable cultural heritage, it has always been praised by people. In media platform, Chinese martial arts have appeared on big and small screens. Foreigners feel mystical about it and therefore generate learning interests in martial arts.

In 2008, Wang Jia-Zhong in the article "The Jing-Chu Cultural Research", from multiple perspectives of

Jing-Chu culture development history, regional features and others, he made research and pointed out that Jing-Chu martial arts had health care, interestingness, fashion and others multiple features. In 2012, Hu Yan-Li, in the article "Chinese martial arts international transmission mode research", she divided martial arts transmission ways into four kinds, it included education, athletics, intermediary, and business transmission. Combined with practical status and utilized communication knowledge to analyze four modes, and got the conclusion: the basic path of martial arts transmission was education,

but it hindered by objective factors. In 2013, Shi You-Kuan in the article “Sports cultural international transmission practice investigation and ideals exploration”, from the perspective of anthropology, sociology and history to research on sports culture international transmission problems, he proposed multiple kinds of suggestions to propel to international transmission. In 2012, Liu Yong in the article “Chinese martial arts cultural international transmission status and development strategy research”, he applied multiple kinds of research methods to analyze Chinese martial arts culture transmission status in international, in view of five continents participating amounts, international major martial arts events had three, in view of each country organizing status, martial arts popularity degree in all countries around world was lower, and meanwhile the article stated transmission obstruction and future development strategy. In 2013, Li Zheng and others in the article “Chinese national traditional sports research in North America”, they pointed out when students learned martial arts, they could understand Chinese culture and fortify their health.

The paper on the basis of formers research, applies cluster analysis into traditional sports research. It preliminarily assumes that many participated countries means Chinese martial arts have good transmission effects in international; otherwise, transmission effect is bad. Use correlation analysis to further define indicators, the papers used data is participated countries status and number of participants' status statistics in previous world martial arts championships from year 1991 to 2011.

## MODEL ESTABLISHMENTS

Figure 1 is a scene that foreigners learn martial arts. For martial arts itself, it arouses foreigners great interests. The paper will analyze martial arts affected transmission factors from objective perspective.

### Data processing

TABLE 1 data comes from previous world martial arts championships statistics.

Above data is world martial arts championships status, it includes number of sessions, number of countries, number of people and host city four variables. In

order to easier carry out data processing in *SPSS* software, it digitizes all variables. Host city in China is marked as 1, and host city out of China is marked as 2. Processing result is as TABLE 2.



Figure 1 : Foreigners learn martial arts

TABLE 1: Previous world martial arts championships status table

Number of sessions	Number of countries	Number of people	Host city
1	31	490	Beijing
2	45	600	Kuala Lumpur
3	55	880	Baltimore
4	59	700	Roman
5	59	362	Hong Kong
6	30	800	Yerevan
7	58	300	Macao
8	65	800	Hanoi
9	89	1200	Beijing
10	87	1300	Toronto
11	83	900	Ankara

### Cluster analysis

Cluster analysis also calls group analysis; it is a kind of multiple statistical methods in researching classification problems. Class actually is a set of similar elements. If it wants to cluster similar elements as one class, generally it should combine qualitative and quantitative analyses to make classification. In general, it selects elements numerous common indicators, analyzes elements indicators values to distinguish gap among elements, and so arrives at the purpose of classification. Because in real life, there are many classification problems, cluster analysis researches also become very important. Cluster analysis includes hierarchical clustering, K-means

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TABLE 2 : Table after digitizing

Number of sessions	Number of countries	Number of people	Host city
1	31	490	1
2	45	600	2
3	55	880	2
4	59	700	2
5	59	362	1
6	30	800	2
7	58	300	1
8	65	800	2
9	89	1200	1
10	87	1300	2
11	83	900	2

clustering, and two step cluster. The model on the basis of combining with correlation analysis, it uses hierarchical cluster analysis method.

Hierarchical cluster analysis, from the absolute meaning, its process is roughly divided into two steps, step one is assigning class number of cluster, step two is defining cluster center.

Step one : due to the model relies on data of world martial arts championships status table, in the data table, it includes host city which has distinction between host city at home and abroad, therefore defined two classes initial class central point in *SPSS* software. Software itself can select two representative sample data as initial class center according to samples data practical status.

Calculate all samples data points to two cluster central points' Euclidean distance, *SPSS* according to  $k$  pieces of cluster central points' shortest distance principle, dispatch all samples into each cluster central point located class and form into a new  $k$  class, and fulfill one time iteration process.

Euclidean distance calculation formula is:

$$\text{EUCLID} = \sqrt{\sum_{i=1}^k (x_i - y_i)^2} \quad (1)$$

In formula(1),  $k$  represents every sample has  $k$  pieces of variables;  $x_i$  Represents initial sample value in  $i$  variable;  $y_i$  represents the second sample value in  $i$  variable.

Step two: *SPSS* Define  $k$  pieces of cluster central point again. calculates every variable's variable value mean, and regards mean point as cluster center; Finally repeatedly calculate above two steps' calculation process, till it arrives at set iteration times or ends iteration judgment requirements.

Iteration process is as Figure 2 show, code name can refer to TABLE 3.

### Model establishment process

In data table, it has four variables, variable one is number of sessions, variable two is number of participated countries, and variable three is number of participating people, variable four is host city. Preliminary thinks that world martial arts championships influence factor is number of participated countries, use *SPSS* to make correlation analysis.

Correlation refers to objective variables exactly existing but not completely corresponding in amount such kind of dependence relationship. In the relationship, to every variable every value, it can have another variable's several values to correspond to it. Meanwhile, some variables with correlations can be showed as causal relationship that one or several variables' changes are the causes of another variable's changes, it can be controllable and set value that is called independent variable; when another variable changes, independent variable changes result is not a fixed value, then call it as dependent variable.

To variable one (number of sessions) and variable two (number of participated countries), it makes correlation analysis and gets result as TABLE 4. By TABLE 4 data, it is clear that variable one and variable two are uncorrelated.

To variable three (number of participants) and variable two (number of participated countries), it makes correlation analysis and gets result as TABLE 5. By TABLE 5 data, it is clear that variable three and variable two are correlated.

To variable four (host city) and variable two (number of participated countries), it makes correlation analysis and gets result as TABLE 6. By TABLE 6 data, it is clear that variable four and variable two are uncorrelated.

According to above correlation analysis result, combine with practical status, it defines martial arts trans-

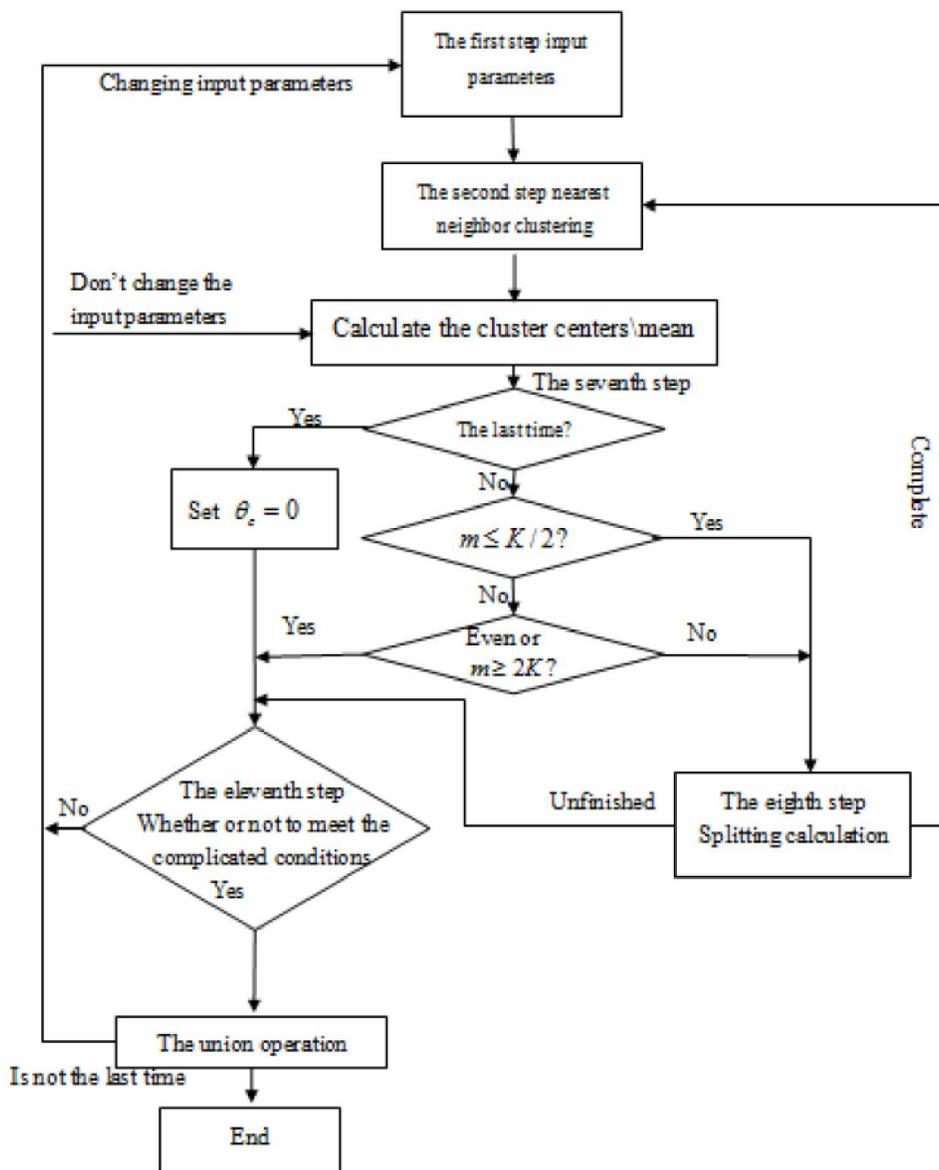


Figure 2 : Cluster analysis flowchart

TABLE 3 : Figure 2 symbols explanatory table

Symbol	Explanation
$K$	Expectant amount of cluster centers
$\theta_n$	One cluster minimum sample amount , less than such number will not be used as a independent cluster

mission influence factors. Due to variable two and variable three are correlated, both number of participated countries and number of participants are transmission indicators. Variable one and variable four are uncorrelated to variable two, so take number of sessions and host city as influence factors. However, in daily life when competitions' number of sessions is defined, competitions' host city is also defined. To sum

up, define martial arts transmission influence factor as competition host city.

Make cluster analysis of data, define initial cluster center as TABLE 7.

This cluster totally has eleven groups of data, cluster members as TABLE 8 show.

Define final cluster center, as TABLE 9 show.

According to TABLE 9, it is clear that final cluster

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TABLE 4 : Variable one and variable two correlations

	VAR00001	VAR00002
Pearson correlation	1	.804**
VAR00001 Significance (bilateral)		.003
N	11	11
Pearson correlation	.804**	1
VAR00002 Significance (bilateral)	.003	
N	11	11

\*\* . In .01 levels (bilateral), it is significant correlated

TABLE 5 : Variable three and variable two correlations

	VAR00002	VAR00003
Pearson correlation	1	.033
VAR00002 Significance (bilateral)		.924
N	11	11
Pearson correlation	.033	1
VAR00003 Significance (bilateral)	.924	
N	11	11

TABLE 6 : Variable four and variable two correlations

	VAR00002	VAR00004
Pearson correlation	1	.634*
VAR00002 Significance (bilateral)		.036
N	11	11
Pearson correlation	.634*	1
VAR00004 Significance (bilateral)	.036	
N	11	11

\*. In 0.05 levels (bilateral),it is significant correlated.

TABLE 7 : Initial cluster center

	Cluster	
	1	2
VAR00002	58.00	87.00
VAR00004	300.00	1300.00

centers are two pieces. The first cluster center represents host city in the central point of China, number of participated countries is 49.57, and number of participants is 578.86. The second cluster center represents host city in the central point of foreign countries, number of participated countries is 78.5, and number of participants is 1070. To easier intuitional compare, it makes Figure 3 number of participated countries pie chart, Figure 4 number of participated people pie chart.

Combine with Figure 3 and Figure 4, it is clear no

TABLE 8 : Cluster membership table

Case No.	VAR00001	Cluster	Distance
1	1.00	1	90.777
2	2.00	1	21.631
3	3.00	2	191.448
4	4.00	1	121.509
5	5.00	1	217.062
6	6.00	1	222.007
7	7.00	1	278.984
8	8.00	1	221.680
9	9.00	2	130.423
10	10.00	2	230.157
11	11.00	2	170.060

TABLE 9 : Final cluster center

	Cluster	
	1	2
VAR00002	49.57	78.50
VAR00004	578.86	1070.00

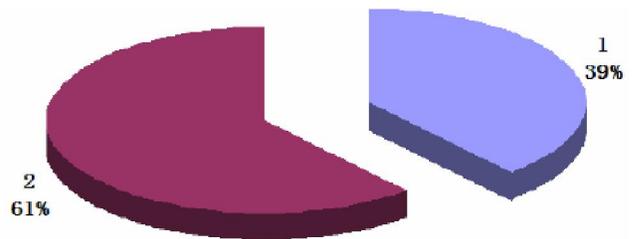


Figure 3 : The number of participated country

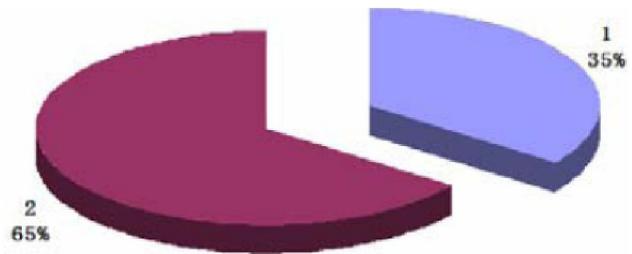


Figure 4 : The number of participated people

matter the number of participated people or the number of participated countries, both are higher in foreign countries. Therefore it can get conclusions that when competition's host city is abroad, martial arts transmission degree is higher.

CONCLUSIONS

Cluster analysis generally is used in pollution moni-

toring, assets management and other fields. Correlation analysis normally is used in business operation, crop growth and other fields. The paper introduces correlation analysis and cluster analysis into martial arts transmission field. Correlation analysis is used to define four variables' relations that let variable relations' defining becomes more objective. The purpose of cluster analysis is to define two cluster central points; it can get two different types relations by comparing central points' parameters. The paper relies on lots of data, use graph to present analysis process and result, the result is reasonable and intuitional that easier to readers' understanding.

Correlation analysis well solved variables existing combination correlated problems, but it restricts in two groups of variables analysis. Though cluster analysis is easier operating, the result is intuitional, and application range is wide. But when it needs to handle with more samples amounts, it has certain difficulties to get conclusions. Because similarity coefficient relies on research objects status to establish indicators that reflect their inner relations, it may find some connections in practice process, but analyze from objective theory, such kind of connections may not hold up.

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