City spontaneous sports events' square dance development research in the background of public services

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ABSTRACT

With rapid development of Chinese economy, accompanying with national fitness awareness popularization, square dance such a suitable masses spontaneous event for all the old and young people has gradually sprung up, and is well received, such kind of sports event and dance forms combinative ways let square dance to gradually be popularized and civilian, especially in the quickening life pace's city center, square dance becomes a main entertainment program for masses at night. The paper carries on regional analysis of square dance according to honeycomb model, and then makes fuzzy comprehensive evaluation on the square dance development. After fuzzy comprehensive evaluation, it gets that Chinese square dance development result is excellent, its future development pace is steady and also has good development trends.

KEYWORDS

Square dance; Honeycomb model; Fuzzy evaluation; Public services; Sports.

INTRODUCTION

Square dance gathers fitness and shape common features, and under rhythmic or gentle music, gathers masses participation strength, carries out abundant dance activities in the square or city center, that is to say, the kind of folk spontaneous fitness event is Chinese city sports culture representative activity, is also city culture's epitome. The key to the popularity degree is public spontaneous conducting; it can fit public with zero distance. In the background of public services, city spontaneous sports development is now increasingly expanding, especially for square dance such a newly developed fitness way and is loved by all people regardless of age and sex.

Square dance fuses each kind of dance, its dance steps are simple, and movements are concise that let it to be loved by common people, is an effective path for people getting rid of pressures in modern life.

MODEL ESTABLISHMENTS

When applies central place theory into discussing square dance space layout, at first it will use central place model. The paper makes following hypothesis that central place model has discussed central place provided sports services, and it is established in the center of dense population; low level sports central place features are it can reduce sports land and precise, relative high level sports squares branches are fewer, and cover large areas, available design range is wide.
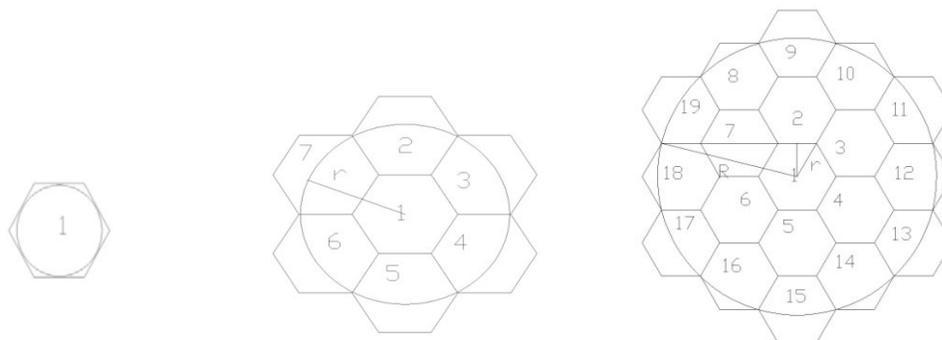
Honeycomb model

In view of numbers of people that need sports services, due to coverage area is a round. On the condition that radiation radius r is the same, calculate three shapes regions' neighboring region distances, regional area, crossover region width and crossover region area as TABLE 1 show.

TABLE 1 : Three kinds of graphs comparison

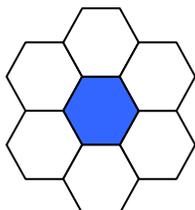| Regional shape	Regular triangle	Square	Regular Hexagon
Neighboring region distances	r	$\sqrt{2}r$	$\sqrt{3}r$
Regional area	$1.3r^2$	$2r^2$	$2.6r^2$
Crossover region width	r	$0.59r$	$0.27r$
Crossover region area	$1.2\pi r^2$	$0.73\pi r^2$	$0.35\pi r^2$

From TABLE 1, it is clear that regular hexagon shape is the nearest ideal round, it can effective meet cover region, which is most proper. So that takes regular hexagon center as honeycomb structure, extends outside, as following process shows:
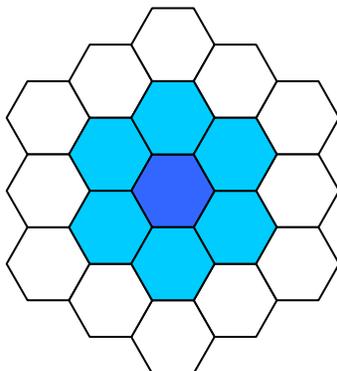

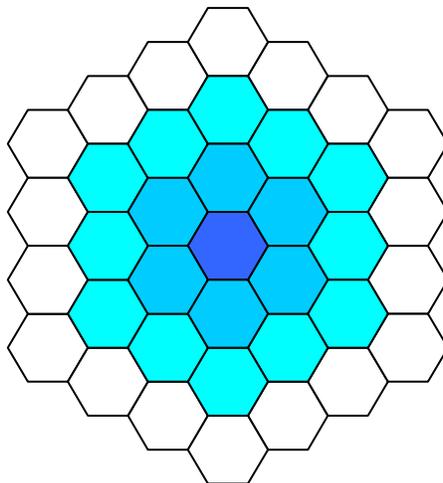From the paper, we can find diameter d and number N relationships:

$N = 1$

$N = 2 + 3 + 2$

$N = 3 + 4 + 5 + 4 + 3$
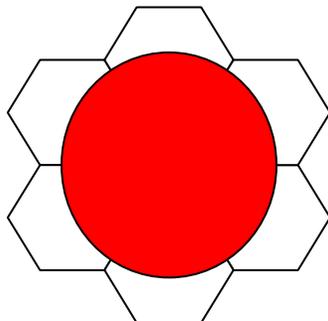
$N = 4 + 5 + 6 + 7 + 6 + 5 + 4$

Figure 1 : Hexagon model

As Figure 1 show, round region border lies in the outermost layer hexagon center, it can get by rules that:

$$N = 12n^2 + 30n + 19$$

Among them, N is overspread round region required numbers of hexagons. n is equal to :

$$n = \frac{D}{d}$$

Among them, D is round region diameter, d is hexagon inscribed circle diameter. According to coverage model, it analyzes China's square dance development.

Fuzzy comprehensive evaluation model

Utilize fuzzy comprehensive evaluation, and steps are as following:

(1) Establish factor set U ,

$$U = \begin{pmatrix} U_1 & U_2 & \cdots & U_k \end{pmatrix}$$

(2) Establish judgment set V (evaluation set),

$$V = \begin{pmatrix} V_1 & V_2 & \cdots & V_n \end{pmatrix}$$

According to general evaluation system, define evaluation grade domain

$$V = \{V_1, V_2, V_3, V_4\}$$

$$= \{very \ good \ , \ good \ , \ normal \ , \ bad\}$$

(3) Establish evaluation matrix fuzzy mapping from U to V , obtained fuzzy relation as following matrix show,

At first, to factors any one u_i , make a evaluation $f(u_i)(i = 1, 2, \cdots, n)$, then it can get U to V obtained fuzzy relation f , that

$$f : U \to F(U)$$
$$u_i \mapsto f(u_i) = (r_{i1}, r_{i2}, \cdots, r_{im}) \in F(V)$$

It gets fuzzy relations by fuzzy mapping

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

Fuzzy relation R every line will reflect the line influence factors to object judgment degree, meanwhile, R every column will reflect the column influence factors to object judgment degree.

$$\sum_{i=1}^{n} r_{ij} \quad j=1,2,3,\cdots,m$$

(4) Establish weight set, $A=(a_1,a_2,\cdots,a_n)\in F(U)$, it meets conditions,

$$\sum_{i=1}^{n} a_i =1 \quad a_i \geq 0$$

$$B=A\cdot R$$

$$=\left(a_1,a_2,a_3,\cdots,a_n\right)\cdot\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

$$=\left(b_1,b_2,b_3,\cdots,b_n\right)$$

In V, fuzzy combination is evaluation set B. To sum up, actually change model is as Figure 2 shows:
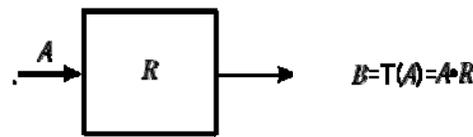

Figure 2 : Change model

According to Figure 2 shows, it gets fuzzy comprehensive evaluation change model, and can establish corresponding every factor grade evaluation transformation function, evaluation factors u1, u2, u3, u4, u5 membership functions can be expressed as following TABLE 2, establish square dance evaluation system, and get TABLE 2.

TABLE 2 : Square dance sports evaluation indicator system

Square dance equipped facility U_1	Personnel cultivation U_2	Organization cultivation U_3	Square dance revitalization U_4
Square dance tourism fitness item u_{11}	Coaches cultivation u_{21}	Competition u_{31}	Undertaking promotion u_{41}
Sightseer u_{12}	Standardized management u_{22}	Activity u_{32}	Undertaking development u_{42}
Square dance learning u_{13}	Techniques optimizations u_{23}	Lecturing u_{33}	Traditional undertakings' revitalization u_{43}
Daily construction u_{14}	Cultivation expense u_{24}	View and emulate u_{34}	
Square maintenance and clearing up u_{15}			

By TABLE 2 listed factors, it gets evaluation set.

$$U_1=\left\{u_{11},u_{12},u_{13},u_{14}\right\}$$

$$U_2=\left\{u_{21},u_{22},u_{23},u_{24},u_{25}\right\}$$

$$U_3 = \{u_{31}, u_{32}, u_{33}\}$$

$$U_4 = \{u_{41}, u_{42}, u_{43}, u_{44}\}$$

By collecting data and analyzing, it gets four factors importance degree ranking statistics as TABLE 3 shows.

TABLE 3 : Four factors importance degree ranking statistics

Classification	Rank 1	Rank 2	Rank 3	Rank 4
Square dance equipped facility U_1	23	6	5	0
Personnel cultivation U_2	0	0	15	18
Organization cultivation U_3	4	9	12	10
Undertaking revitalization U_4	3	21	9	0

By TABLE 3 sorting,it gets square dance equipped facility U_1, personnel cultivation U_2, organization cultivation U_3, undertaking revitalization U_4 four aspects ranking matrix.

$$U_2 = \{23, 7, 4, 0\}$$

$$U_2 = \{7, 18, 8\ 0\}$$

$$U_3 = \{4, 9, 12, 10\}$$

$$U_4 = \{3, 0, 9, 21\}$$

Obtained weighted vector from rank 1 to rank 2:

$$\beta = \{\beta_1, \beta_2, \beta_3, \beta_4\} = \{0.4, 0.3, 0.2, 0.1\}$$

$$U_i^* = U_i \cdot \beta^T$$

$U_1^* = 12$, $U_2^* = 9.7$, $U_3^* = 6$, $U_4^* = 5$

The paper makes normalization processing:

$U_1^* = 0.35$, $U_2^* = 0.3$, $U_3^* = 0.2$, $U_4^* = 0.15$

It gets:

$$\bar{A} = \begin{pmatrix} 0.35 & 0.3 & 0.2 & 0.15 \end{pmatrix}$$

The paper gets remarks membership by square dance sports undertakings, as TABLE 4 show.

TABLE 4 : Remarks membership

Evaluation way	Set scores interval			
	0-60	60-80	80-90	90-100
Very good	0	0	0.05	0.95
Good	0	0.05	0.9	0.05
Normal	0.05	0.9	0.05	0
Bad	0.95	0.05	0	0

By square dance sports undertakings each indicator obtained evaluation, the paper gets TABLE 5.

TABLE 5 : Square dance sports undertaking each indicator obtained evaluation value

Each layer indicator	Evaluation value	Each layer indicator	Evaluation value
Square dance tourism fitness item u_{11}	Very good	Competition u_{31}	Very good
Sightseer u_{12}	Good	Activity u_{32}	Normal
Square dance learning u_{13}	Normal	Lecturing u_{33}	Good
Daily construction u_{14}	Good	View and emulate u_{34}	Normal
Square maintenance and clearing up u_{15}	Normal	Undertaking promotion u_{41}	Good
Coaches cultivation u_{21}	Very good	Undertaking development u_{42}	Very good
Standardized management u_{22}	Very good	Traditional undertakings' revitalization u_{43}	Normal
Techniques optimizations u_{23}	Normal		
Cultivation expense u_{24}	Good		

By above model, it gets single layer indicator weight factor fuzzy set is:

$$U_1^* = \{U_{11}, U_{12}, U_{13}, U_{14}, U_{15}\} = \{0.25, 0.25, 0.2, 0.15, 0.15\}$$

$$U_2^* = \{U_{21}, U_{22}, U_{23}, U_{24}\} = \{0.54, 0.1, 0.24, 0.14\}$$

$$U_1^* = \{U_{31}, U_{32}, U_{33}, U_{34}\} = \{0.4, 0.3, 0.1, 0.2\}$$

$$U_1^* = \{U_{41}, U_{42}, U_{43}\} = \{0.3, 0.4, 0.3\}$$

By TABLE 5, and combine with TABLE 4 remarks membership, the paper gets square dance equipped facility U_1, personnel cultivation U_2, organization cultivation U_3, undertaking revitalization U_4 each aspect evaluation set:

$$\text{Square dance equipped facility } U_1 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0.05 & 0.9 & 0.05 & 0 \end{pmatrix}$$

$$\text{Personnel cultivation } U_2 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

$$\text{Organization cultivation } U_2 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \end{pmatrix}$$

$$\text{Undertaking revitalization } U_4 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

$$B_i = A_i \cdot R_i$$

Make normalization processing with obtained B_i , it gets fuzzy evaluation matrix.

$$\bar{B} = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} 0.15 & 0.22 & 0.14 & 0.43 \\ 0 & 0.2 & 0.36 & 0.5 \\ 0.07 & 0.46 & 0.35 & 0.12 \\ 0.14 & 0.2 & 0.3 & 0.36 \end{pmatrix}$$

It gets comprehensive evaluation value :

$$Z = U^* \cdot B = \begin{pmatrix} 0.35 & 0.04 & 0.26 & 0.29 \end{pmatrix}$$

Because $0.35 > 0.29 > 0.26 > 0.04$, after fuzzy comprehensive evaluation, score phase is within 90-100 score interval, it gets that Chinese square dance development result is excellent, its future development pace is steady and also has good development trends.

CONCLUSION

Square dance gathers fitness and shape common features, its dance steps are simple, and movements are concise that let it to be loved by common people, such sports and dance forms

combinative way let square dance gradually to be popularized and civilian, especially in the quickening life pace's city center, square dance becomes a main entertainment program for public at night.

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