The influence of mascot's modeling characteristics on emotional image

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Abstract. We intends to investigate the impact of the characteristics of mascots modelling on the emotional imagery based on the theory of perceptual engineering. Specifically, we used the method of semantic difference image cognitive analysis on representative samples by virtue of SPSS software, which completes principal component analysis and regression analysis, typical vocabulary screening, as well as extraction of projects and category of the project modelling using morphological analysis in combination with the theory of science I analysis the correlation coefficient. Eventually, we will translate user's perceptual demand description into rational modelling characteristics, so as to acquire a better understanding of the correlation between mascots modelling characteristic and emotional image, all of which provide certain reference basis for designers.

1 Introduction

Considered as an important bearing way of design in modern society, mascots have been paid more and more attention by people. Excellent mascot design is recorded in people's mind for a long time with its distinctive shape and vivid image, and it has become the brand and corporate image symbol to be remembered. Study of the mascot in the design market are stays at the level of the design on the surface, with the number of mascots set to feature emotional study remaining relatively small. Moreover, the current research is targeted to theoretical narration with strong subjectivity, and some researchers design experiments to explore the emotions expressed by mascots, but their analysis stays at the level of qualitative analysis, lacking in quantitative analysis shown by experimental data and emotional tendency, the inner link of which deserves further exploration. Based on Kansei engineering, this paper constructs a correlation model between perceptual images and modeling elements to provide theoretical support for mascot modeling design, thus effectively guiding the innovative design of mascots, and thereby win better brand communication effect.

This paper takes the mascot design as the research object and quantifies the type I theory as the principle to study the correlation between the perceptual image of the mascot and its modeling elements, so as to endow the product with a special style and form, which eventually satisfy the psychological needs of contemporary consumers.

2 Kansei engineering

Perceptual (Kansei) originated from Japanese the word "カンセィ" transliteration, it refers to the psychological feelings of consumers and product image cognition. Combined with the engineering technology, perceptual technology is a kind of people-oriented engineering technology, it adopt the method of engineering human feelings and quantify people's emotional information so as to find out the relationship between the perceptual and the engineering quantity, and it translate the perceptual information into the design of the specific form, in order to develop and design products subject in line with the consumer demand.

In daily life, when people observe objective things around them, most of them will have certain psychological activities, and the feelings brought by such activities directly affect the satisfaction of people's inner needs when they understand things. The modeling features of the mascot design are the carrier of the audience's emotional cognition of the mascot. Through the analysis, observation, understanding of the design needs and the application of this in the designing, the designer creates the products that meet people's needs and expectations, and gives people a sense of beauty. Therefore, the basic appeal of design is emotion, only the psychological needs of consumers and use of the feeling of factors combined in the design of each step and link, can designers really effectively solve the design problem. It is the research paradigm of Kansei engineering that all kinds of emotions and feelings brought by products through semantics can be expressed.
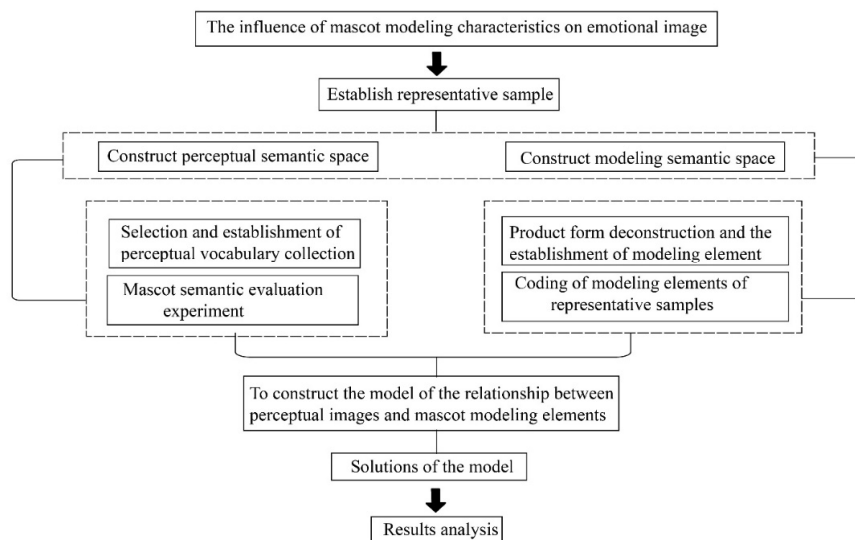
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Figure 1. Research flow chart

3 Research procedures

3.1.Establish representative samples

Mascot categories are numerous and complex, usually with animals or plants as the form of divergence. In order to get a better quantitative analysis, we choose an animal prototype for research. As a common mascot prototype, panda is unique and symbolic enough to convey brand awareness. After many investigations, the mascot with panda as the prototype is selected for emotional research.

A total of 46 images were collected by designing websites, periodicals, magazines, etc, and 21 mascot samples were selected after excluding samples that are too homogeneous or fuzzy. Under the condition of studying the modeling features, the interference factors such as color and volume are excluded, the image is processed in grayscale, and the brightness is adjusted to better maintain the visual consistency of the samples, and the general shape is classified and discharged, so as to facilitate the later modeling extraction [1], as shown in figure 2.
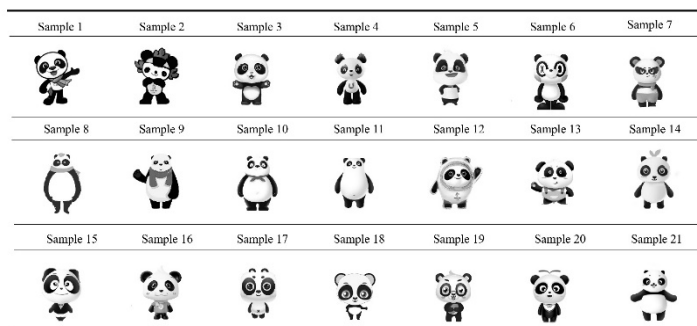

Figure 2. Visual communication system

3.2. construct perceptual semantic space

Through brainstorming and network, magazine and dictionaries, dictionaries and so on, we widely collected 40 adjectives for the study, and we kept 10 groups of them, after preliminary screening. Using the Likert scale method, we write the words of opposite meaning on the two ends of the scale, which shows 7 grades of intensity for evaluation, and the middle value is set up as 0, the left and right extreme values are respectively 3 and -3. At the same time, samples numbers will be labeled in front of the table[2]. Designers engaged in design-related industries were invited to evaluate and score the samples. The subjects expressed their feelings in a quantitative form on the attitude scale of this particular descriptive word, as shown in Table 1. The mean value of perceptual images was obtained by statistical score calculation, as shown in Table. 2.

Table 1. Perceptual vocabulary scale

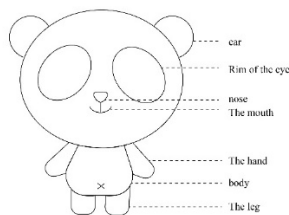| Image vocabulary	score							Image vocabulary
traditional	-3	-2	-1	0	1	2	3	modern
Personality	-3	-2	-1	0	1	2	3	common
......	-3	-2	-1	0	1	2	3	......
Affinity	-3	-2	-1	0	1	2	3	indifferent
advanced	-3	-2	-1	0	1	2	3	low-level

Figure 3. Mascot deconstruction

SPASS software was then used for principal component analysis, by entering a representative sample perceptual image average, and rectangular axis maximum variation method was performed according to the result of principal component analysis. Then we take three image factors whose values are greater than 1 , thus what participants feel about the mascot of cognition is composed of three image factors, in accordance with its attributes and meaning, images of the three factors can be classified as gender factors、style factors as well as taste

factors [1]. The positive factor load represents the positive evaluation, while the negative factor load represents the negative evaluation. After the factor analysis, the cumulative contribution value of the three factors is obtained. After the rotation matrix, the first type of factors are simple, round and advanced. The second kind of factor has the individuality, the creativity; Traditional and affinity, as shown in figure 4. Finally, the three factors advanced, creative and traditional are extracted for the later correlation analysis, and the cumulative contribution value of the three factors is obtained after factor analysis [3].

Table 2. Kansei scoring matrix score table

	personality	lovely	traditional	advanced	concise	creativity	amiable	fruity
NO1	-0.2353	0.0118	-0.1529	-0.0824	0.0235	-0.1294	-0.0471	-0.1176
NO2	-0.0706	0.1059	-0.3529	-0.0588	-0.1647	0.1647	-0.2118	0.0824
NO3	-0.3882	-0.1412	-0.2471	-0.2118	-0.1176	-0.1765	-0.1059	-0.1176
NO4	-0.2706	-0.0588	-0.3529	-0.3647	-0.2588	-0.1412	-0.1882	-0.2471
NO5	0.0471	0.0118	-0.0941	-0.3529	-0.4000	0.0471	-0.4118	-0.5176
NO6	-0.0353	-0.0235	-0.5059	-0.1529	-0.2941	0.0824	-0.1765	-0.1059
NO7	-0.2706	0.0706	-0.2824	-0.2353	-0.5412	-0.1412	-0.0353	-0.1882
NO8	-0.2353	0.0353	-0.3412	-0.6000	-0.4824	-0.1412	-0.2118	-0.1059
NO9	-0.3412	-0.3412	-0.3412	-0.3176	-0.2588	-0.1176	-0.0706	-0.1294
NO10	0.0235	-0.2118	-0.5176	-0.4588	-0.4706	-0.1294	-0.1529	-0.4471
NO11	-0.0588	0.1647	-0.2941	-0.2471	-0.3294	0.0588	-0.0824	-0.0353
NO12	-0.3412	-0.1176	-0.2941	-0.5059	-0.4588	-0.2824	-0.0353	-0.1412
NO13	-0.2000	0.0353	-0.3176	-0.2235	-0.4588	-0.2588	-0.4235	-0.2118
NO14	0.0235	-0.1176	-0.2353	-0.1882	-0.2235	-0.0824	-0.0588	-0.1412
NO15	-0.1529	-0.1647	-0.4118	-0.4118	-0.4588	-0.0706	-0.1176	-0.2588
NO16	-0.1412	0.0471	-0.4235	-0.2824	-0.3647	-0.2471	-0.2000	-0.1529
NO17	-0.3647	-0.2353	-0.2941	-0.2941	-0.3294	-0.0353	-0.2471	-0.2235
NO18	-0.2706	-0.0941	-0.2588	-0.3412	-0.5412	-0.2588	-0.2235	-0.2118
NO19	-0.4824	0.0235	-0.3059	-0.3529	-0.3529	-0.3882	-0.2824	-0.2471
NO20	-0.3294	-0.2118	-0.2706	-0.1647	-0.2706	0.0353	-0.2235	-0.0941
NO21	-0.4235	-0.1176	-0.3412	-0.3176	-0.3882	-0.1882	-0.1647	-0.0471
average	-0.2151	-0.0633	-0.3160	-0.2936	-0.3401	-0.1143	-0.1748	-0.1742

In order to make the perceptual image more representative, clustering analysis was carried out on the eight adjectives and combined it with data from factor

calculation, as shown in figure 5. The distance of each image context from its group of center is calculated by coordinates of each image, and the shortest one among

them is the representative of the group of image semantics, lastly, the next pairs of image semantics used in the next stage of experiment namely advanced, individuality, traditional was selected[4].

3.3. construct modeling semantic space

Using morphological analysis to influence people perceptual image judgment modelling factor decomposition, looking for the individual factors of the decomposed variable element, as shown in figure 4, which

will be the mascot of the shape of the deconstructed ten projects, 34 categories, including deconstruction projects form have head, mouth, eyes, nose, limbs and trunk, position can be divided into the extremities accounted for the proportion of the body, the rim of the eye of facial proportions, the transition of the neck, overall relationship has a head body scale, etc. The morphological elements of the mascot are respectively represented by a-h, and the characteristics of each morphological element are respectively represented by serial Numbers [5], as shown in table 3.
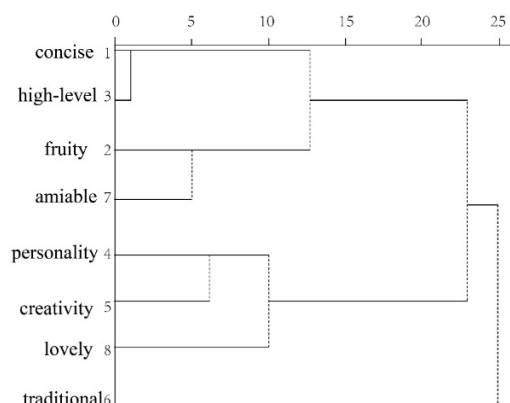
	component		
	1	2	3
concise	0.823		
fruity	0.776		
high-level	0.760		
personality		0.909	
creativity		0.782	
traditional			0.791
amiable			
lovely			-0.592

Figure 4. Component matrix after factor rotation

Figure 5. Cluster analysis tree of eight perceptual terms

Table 3. Morphological deconstruction feature table

4 Research on the relationship between image vocabulary and morphological elements

4.1. establish a correlation model between perceptual images and mascot modeling elements

According to the structural results of the constituent elements of the mascot design, and combined it with the independent variable theory of science I theory, the division results of 21 representative samples under all the modeling features can be calculated. Thus, the deconstructed modeling elements are taken as projects, the modeling design elements are taken as categories, and on the basis of re-coding the modeling elements, in order to further quantify the modeling elements of the mascot

samples, The matrix thinking can be used to quantitatively transform it into an editable data format. The specific method is: through the analysis of the characteristics of the modeling elements of the mascot, the independent variable corresponding to the characteristics of the corresponding elements is assigned to 1. Other attributes that do not match are assigned to 0 [6]. Finally, after analysis, we can only get the matrix containing "0" and "1", as shown in Table 4.

Table 4. Modeling reaction matrix

	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	e1	e2	e3	e4	f1	f2	f3	g1	g2	g3	g4	h1	h2	h3	i1	i2	i3
Picture 1	0	1	0	1	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	1
Picture 2	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0
Picture 3	0	1	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	1	0	0
Picture 4	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	3	0	0	1
Picture 5	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	1	0	0	1	0	0	1	0	0
Picture 6	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0
Picture 7	0	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0
Picture 8	0	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0
Picture 9	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0
Picture 10	0	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0
Picture 11	0	0	1	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0
Picture 12	0	1	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	1	0	1	0	0	1	0
Picture 13	1	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	1	0	0
Picture 14	0	1	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	1	0	1	0	0
Picture 15	1	0	0	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1
Picture 16	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	1	0	0	1	0	0	1
Picture 17	0	1	0	0	0	1	1	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
Picture 18	0	1	0	0	1	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1
Picture 19	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1
Picture 20	0	1	0	1	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	1	0	0	1
Picture 21	0	1	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	1

Taking the average value of perceptual semantic evaluation as dependent variable and the response value of modeling elements as independent variable, the following multivariate linear mathematical prediction model is established.

$$y = g_{a1}a_1 + g_{a2}a_2 + g_{a3}a_3 + g_{b1}b_1 + g_{b2}b_2 + g_{b3}b_3 + g_{c1}c_1 + g_{c2}c_2 + g_{c3}c_3 + g_{d1}d_1 + g_{d2}d_2 + g_{d3}d_3 + g_{e1}e_1 + g_{e2}e_2 + g_{e3}e_3 + g_{e4}e_4 + g_{f1}f_1 + g_{f2}f_2 + g_{f3}f_3 + g_{g1}g_1 + g_{g2}g_2 + g_{g3}g_3 + g_{g4}g_4 + g_{h1}h_1 + g_{h2}h_2 + g_{h3}h_3 + g_{i1}i_1 + g_{i2}i_2 + g_{i3}i_3 + m$$

y —— Average value of perceptual semantic evaluation;

g_{ij} —— Weight coefficient of each independent variable;

$a_i \sim i_i$ ——Modeling element response value;

m ——Constant term.

Through statistical software SPASS linear regression analysis, which needs the input of the dependent variable is q is obtained by a questionnaire test on average, the evaluation of the emotional vocabulary and need to participate in the linear regression analysis is mascot representative sample modelling characteristic element matrix quantitative values, thick model parameters related data, including the partial correlation coefficient, category score, multiple correlation coefficient, constant value, such as in table 5.

Table 5. Results of the semantic "individual-common" analysis

Design	category	Coefficient of partial correlation	category scores	Design	category	Coefficient of partial correlation	category scores
a	a1	0.041		f	f1	0.463	
	a2	-0.112	0.624		f2	0.244	0.479
	a3	0.197			f3	0.380	
b	b1	0.835		g	g1	-.0484	
	b2	0.547	0.236		g2	-0.345	0.036

	b_3	0.306				g_3	0.140	
c	c_1	0.406				g_4	-0.276	
	c_2	-0.173	0.118			h_1	0.217	
	c_3	0.634			h	h_2	-o.121	0.368
d	d_1	-0.255				h_3	0.112	
	d_2	-0.117	0.052			i_1	-0.003	
	d_3	0.671			g	i_2	0.521	0.481
e	e_1	0.213				i_3	0.371	
	e_2	0.503	0.108		Constant term:0.345			
	e_3	0.200			Multiple correlation coefficient:0.736			
	e_4	0.082			Coefficient of determination:0.825			

Therefore, according to the analysis results shown in Table 5, we can see that the "individual-ordinary" perceptual image is related to the modeling elements of the mascot.

The associated multivariate linear prediction model is:
$Y = 0.041a_1 - 0.112a_2 + 0.197a_3 + 0.835b_1 + 0.547b_2 + 0.306b_3 + 0.406c_1 - 0.173c_2 + 0.634c_3 - 0.255d_1 - 0.117d_2 + 0.671d_3 + 0.213e_1 + 0.503e_2 + 0.2e_3 + 0.082e_4 + 0.463f_1 + 0.244f_2 + 0.380f_3 - 0.484g_1 - 0.345g_2 + 0.14g_3 - 0.276g_4 + 0.217h_1 - 0.121h_2 + 0.112h_3 - 0.003i_1 + 0.521i_2 + 0.371i_3 + 0.345$
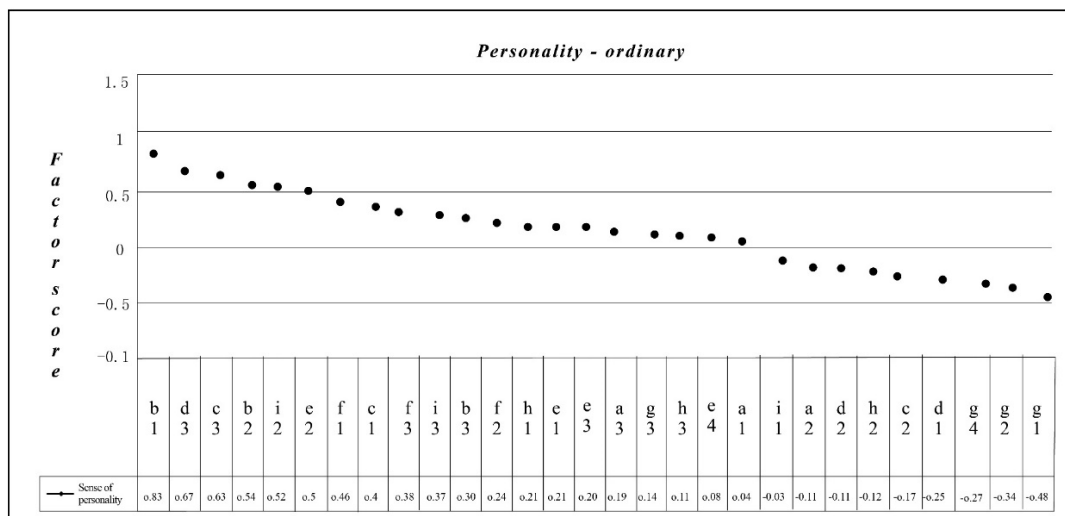
3.2 conclusion analysis

Figure 6. Score of each modeling element

Complex correlation coefficient is an index that reflects the degree of correlation between independent variables and dependent variables of a model. the larger the coefficient data is, the higher the linear correlation degree between elements and variables is. In order to verify the accuracy of the model, the square of the complex correlation coefficient is usually used to judge the determination coefficient. In a prediction equation, the closer R is to 1, the higher the accuracy of the prediction model. Generally speaking, the determination coefficient above 0.8 means that the fitting accuracy of the equation is better [7]. It can be seen from figure 6 that the R values representing the relationship between the morphological elements and perceptual images of the sample are all greater than 0.7, indicating that there is a very strong relationship between the observed value and the predicted knowledge[8]。

The magnitude of the partial correlation coefficient reflects the influence of each project on the perceptual image of the mascot. As for the perceptual image phrase "individual-ordinary" in Table 5, it is analyzed from small to large according to the partial correlation coefficient shown in the table. it is concluded that the influence degree of each item is as follows: the ratio of head to body > the transition of neck > the ratio of eye circle to face > the ratio of leg length to body > the shape of

mouth > the shape of nose > the ratio of hand length to body. By obtaining the degree of influence of the mascot element attributes on the emotional image, it can be used as a reference for the design process, that is, when the relevant emotional feelings need to be expressed, priority should be given to the influential mascot attributes.

The category score indicates the influence degree and emphasis direction of different categories on perceptual images in each project, the positive value indicates the positive meaning, and the negative value means the opposite meaning. Taking personality as an example, as shown in figure 6, we can see that the mascot modeling elements category in the case of "rounded rectangular body b_1" has the highest contribution to it, followed by "heart-shaped nose d_3"; in addition, the shape of the torso is "oval b_2", the neck transition "arc trapezoid i_2", the mouth shape is "arc e_2", "and so on also positively affect the" personality "image of the mascot. The negative part of the category shows that "nose shape" and "the proportion of hand length to body" have a high degree of influence on the "ordinary" image of the mascot, and the "common sense" is the strongest in "round triangle D_2" and "1:2g_2".

Therefore, in the design of mascots that need to reflect high-level feelings, because it is most closely related to ", the first thing that needs to be considered is that the topic is based on harmony, and it is the second item that needs to be paid attention to.

5   Conclusion

On the basis of Kansei engineering, this paper makes a quantitative study on the emotional tendency of the mascot to the audience. The semantic difference method is used to obtain the audience's perceptual image evaluation of the mascot shape, and the factor analysis is used to extract the main factors. At the same time, the morphological analysis method is used to deconstruct the basic structural attributes of the font and divide the features. The quantitative I theory establishes a mathematical model between mascot modeling features and emotional tendency, which makes it possible to predict the emotional tendency of mascot expression according to the objective factors of mascot design. Thus, to a certain extent, it can provide guidance for the design of the mascot, that is, on the basis of determining what kind of emotion the designer needs to express, the designer should follow the characteristics of the mascot structure which has obvious influence on this emotion.

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