

Perfume Bottle Shape Design based on User's Perceptual Image

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Abstract

With the development of society, packaging attributes are also developing in a more humane and emotional direction. This article takes the design of packaging container as a starting point to discuss, mainly from the consumer's sensory enjoyment, and discusses the application of sensory design in packaging design and the influence of sensory design on packaging container design. This paper uses the analytic hierarchy process to calculate the weight values of each modeling element and category and make design decisions. The design elements with different weight values are applied to the fuzzy approximation ideal solution, and then comprehensively sorted to obtain the optimal design plan. The integration of consumer's sensory enjoyment in the packaging container design can make the product more attractive and better meet the spiritual needs of consumers, which verifies the scientific nature of the design process.

Keywords

Perceptual image; Perfume bottle; Container shape; Morphological analysis method; Fuzzy approximation to ideal solution sequencing.

1. Introduction

When people receive external information, more than 80% of them come from vision. Vision is the key to attracting consumers' attention. How to successfully make a product attract consumers, arouse their interest and generate purchase desire, vision becomes the first priority. The problem [1]. This puts forward new requirements for the design of perfume bottles, which are mainly reflected in the selection and extraction of the design elements. Therefore, this article will use the analytic hierarchy process and fuzzy approximation ideal solution sorting method based on the analysis of the design samples. Modeling design decision, discussing the perfume bottle modeling design process, in order to perfect the composite image of perfume bottle modeling design, and better meet the needs of users.

2. User Perceptual Vocabulary Statistics

In the modern society of standardized and standardized mass production, people's basic material needs are gradually being met. After experiencing the basic satisfaction of material life, spiritual life has become the goal that people pursue in life. The economic form of today's society has transitioned from the era of product economy and service economy to the era of experience economy, and the function of packaging design has gradually developed in the direction of a pleasant spirit. As the most important part of packaging design-packaging container shape design, it also incorporates sensory design based on the spirit of pleasure.

This article is based on the perceptual vocabulary obtained in the paper "Study on the Perceptual Design of Perfume Bottle Shape" by Mr. Chen Yunting and Lin Yancheng, and selects three vocabularies representing consumers' perceptual image of feminine, fashionable and classical as the analytic hierarchy process. At the criterion level, it is hoped that a perfume bottle modelling scheme that represents the perceptual image of consumers will be selected.

3. Perfume Bottle Modeling Design Process

This article will use analytic hierarchy process and fuzzy approximation ideal solution sorting method to provide decision-making for agricultural robot modeling design. Analytic hierarchy process is used more in design evaluation, and it is rarely used in design decision-making. The weight analysis of the elements provides an important reference for the selection of further modeling elements.

3.1. Method Introduction

3.1.1 AHP method

AHP (Analytic Hierarchy Process) is also known as Analytic Hierarchy Process. It is a multi-objective evaluation and decision-making method proposed by American scholar Thomas Saaty, which has the advantages of classifying chaotic evaluation indicators and hierarchically. From top to bottom, an index evaluation system composed of target layer, decision-making layer and index layer is constructed. The expert evaluation method is used to judge the importance of each factor to assign the weight of the index layer, which is determined based on the influence of the index layer on the decision-making layer.

3.2. Research Process

3.2.1 Basic process

First, collect perceptual vocabulary. This article is based on the perceptual vocabulary selected by previous studies to represent consumer imagery. The selected vocabulary should represent different design styles. This article selects three perceptual vocabulary of feminine, fashionable, and classical to represent the three design styles, and provides a method for forming a database of different styles of perfume bottles in the future.

Second, to collect design samples, pay attention to the number and representativeness of sample selection.

Third, use the analytic hierarchy process to complete the design decision, that is, select perceptual vocabulary and samples. Mainly by constructing a judgment matrix to calculate the optimal modeling design goal, the weight value and ranking of each design element and category.

Fourth, use the fuzzy approximation ideal solution sorting method to evaluate the modeling innovation design plan set, and select the optimal design plan.

3.2.2 Key points of perceptual vocabulary and sample analysis

The quantitative analysis of the importance of design elements and categories is more complicated. The introduction of the analytic hierarchy process can deal with this type of multi-feature comparison and make decisions on the selection of modeling design elements and categories. According to the level structure method proposed by Saaty, the target layer is set as the "optimal modeling design plan", the criterion layer is set as the "perceptual vocabulary", and the plan layer is set as the "design sample". Then through the calculation method related to the analytic hierarchy process and the fuzzy approximation ideal solution sorting method, the weight value and sorting of the design elements and categories can be obtained for the perfume bottle design. The basic calculation process is as follows.

First, construct a judgment matrix. Before constructing the judgment matrix, for a certain target, related elements are compared in pairs. The judgment matrix scale setting is shown in Table 1. The specific value of the scale indicates the importance of the elements involved in the comparison. Construct a judgment matrix. Second, calculate the weight value and analyze the consistency of the judgment matrix. This article will use Yaahp analytic hierarchy process software to calculate.

Table 1. Relatively important scale of AHP

Relative importance	Definition of relative importance	Description
1	Equally important	Both indicators are of the same importance
3	Slightly important	From experience and judgment, a certain indicator is slightly more important
5	Quite important	From experience and judgment, a certain indicator is quite important
7	Extremely important	Actually show that a certain indicator is extremely important
9	Absolutely important	There is ample evidence that a certain indicator is absolutely important
2, 4, 6, 8	The median of adjacent measures	When a compromise is needed

3.3. Fuzzy Comprehensive Evaluation of Sample Plans

The results of modeling design decisions usually have the subjectivity of the evaluators. Therefore, in order to evaluate the objectivity of the results, it is necessary to construct an evaluation method that can handle the integration of multiple elements in the modeling design. Scholar Zade proposed the concept of fuzzy sets in the 1960s. The key is to use fuzzy mathematics to quantitatively analyze fuzzy objects. It can be seen that using this method in the evaluation of product modeling design can effectively solve the dilemma of more design elements and vague subjective judgments. The specific evaluation process is as follows.

First, select a set of elements for modeling design evaluation, and construct the level of design evaluation and corresponding standards. The evaluation level can be expressed as $V = \{V_1 + V_2 + V_3 + V_4\} = \{\text{excellent, good, qualified, Unqualified}\}$, Assign values to each level at the same time, Denoted by $H = (90, 80, 60, 50)^T$, the corresponding relationship between the evaluation grade and the score is formed.

Second, determine the weight vector of the model design criterion layer according to the weight value of the design element, which is represented by the letter w . Then establish a reasonable expert group, and the experts score the evaluation objects.

Third, add up the values of each column, and divide each element by the sum of its vertical columns; the resulting matrix is called a normalized pairwise comparison matrix (normalized pairwise comparison matrix)

Fourth, calculate the average value of each row element to get the relative importance.

$$w_i = \frac{1}{n} \sum_{j=1}^n \frac{a_{ij}}{\sum_i a_{ij}} \quad \forall i = 1, 2, \dots, n$$

4. Design Examples

According to the design process described above, three vocabularies representing consumers' perceptual images, soft, fashionable, and classical, are selected as the criterion layer in the analytic hierarchy process, and four popular perfume bottles on the market are selected as the analysis samples, as shown in the figure below:



Figure 1. Design sample

Establish the following hierarchical structure model:

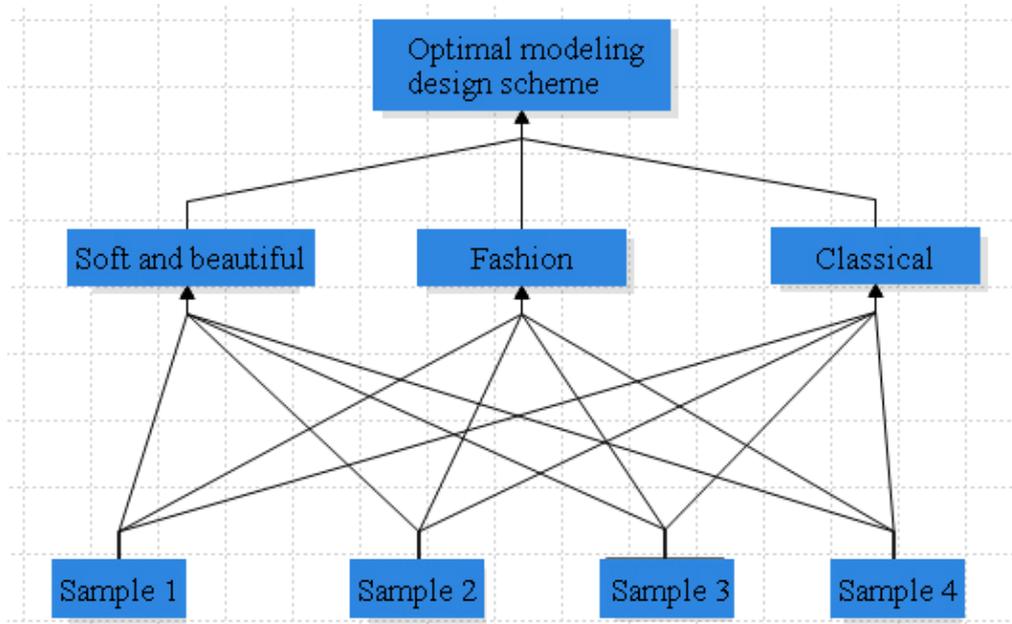


Figure 2. Hierarchical model

Five consumers (four women and one man) were interviewed. The following picture shows the experimental data of one of them:

Table 1. The criterion level is "soft"

	Sample1	Sample2	Sample3	Sample4
Sample1		1/7	1/3	1/5
Sample2			2	4
Sample3				3
Sample4				

Table 2. The standard level is "fashion"

	Sample1	Sample2	Sample3	Sample4
Sample1		3	1/4	3
Sample2			1/3	2
Sample3				6
Sample4				

Table 3. The criterion level is "classical"

	Sample1	Sample2	Sample3	Sample4
Sample1		1/8	1/4	1/3
Sample2			4	3
Sample3				2
Sample4				

The average value of the five consumer demand weights based on the analytic hierarchy process is as follows:

Table 4. Customer demand weight based on analytic hierarchy process

Customer needs	Customer demand weight
Soft sample 1 (w1)	0.25
Soft sample 2 (w2)	0.22
Soft sample 3 (w3)	0.10
Soft sample 4 (w4)	0.05
Fashion samples 1 (w5)	0.04
Fashion samples2(w6)	0.22
Fashion samples3(w7)	0.15
Fashion samples4(w8)	0.08
Classical sample1(w9)	0.10
Classical sample2(w10)	0.05
Classical sample3(w11)	0.15
Classical sample4(w12)	0.17

According to the fuzzy decision matrix of the product research and development plan, the fuzzy decision matrix is standardized with the combination formula to obtain the matrix q, and the weighted standard decision matrix V is calculated by the formula and the technical

characteristic weights output by the house of quality model in the preceding paragraph. Because the obtained matrix is too large, Not detailed here.

$$D_i^+ = \sqrt{\sum_{j=1}^n (r_{ij} - r_j^+)^2}$$

$$D_i^- = \sqrt{\sum_{j=1}^n (r_{ij} - r_j^-)^2}$$

According to the above combination formula, the distance between each sample and the ideal solution can be calculated, and the relative closeness of each sample can be calculated as SC1 = 0.683, SC2=0.661, SC3=0.572, SC4=0.568, SC5=0.364, SC6=0.547, SC7=0.447, SC8 = 0.393, SC9=0.371, SC10=0.35, SC11=0.567, SC12=0.664. The schemes are sorted according to relative closeness, and the result is:

M1>M12>M2>M3>M4>M11>M6>M7>M8>M9>M5>M10

Therefore, the best sample conforming to the "soft" perceptual image is sample one; the best sample conforming to the "fashion" perceptual image is sample two; the best sample conforming to the "classical" perceptual image is sample four.

5. Conclusion

According to the above experimental analysis, the results of consumers' posting progress on perceptual vocabulary and design samples are obtained, as shown in the following figure:

The perceptual vocabulary is "soft and beautiful", and the posting progress is sorted from left to right (the posting progress decreases from left to right).



Figure 3. "soft and beautiful" paste progress sorting

The perceptual vocabulary is "fashion", and the posting progress is sorted from left to right (the posting progress decreases from left to right).



Figure 4. "fashion" paste progress sorting

The perceptual vocabulary is "classical", and the posting progress is sorted from left to right (the posting progress decreases from left to right).



Figure 5. "classical" paste progress sorting

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