

The Affective Feelings of Timber Textures

Min-Fang Lee, Wen-Yuan Lee

Department of Industrial Design, Tatung University, Taipei, Taiwan

littlewhite225@hotmail.com, wylee@ttu.edu.tw

Abstract: The current study aims to explore the relationship between timber textures and affective feelings. Thirty participants took part in the experiment to provide their affective judgments of 14 timber textures on 13 affective scales. The results showed that three affective factors were identified. They were “comfort”, “pattern” and “attitude” factors. The timber textures used in the experiment were classified into four groups according to their affective feelings delivered. The results can be used to assist designers selecting the appropriate texture to fit their design objective.

Keywords: *Textures, Color, Design, Affective Feeling*

1. Introduction

Texture is one of the important design elements in the appearance of product. For fashion industry, texture related studies¹⁻³ are often seen. However, for industrial design, there is short of studies to discuss the affective feelings of texture appeared on products or interior design. Some texture related studies⁴⁻⁶ used various types of materials trying to find out the general phenomenon of affective feelings. But for design, selecting texture from specific material is more practical in comparison with selecting from various types of materials. How to select appropriate texture to fulfill the affective feelings is a critical issue for designers. Hence, this study used 13 affective scales to investigate the affective feelings of timber textures. The aim is to find out the relationship between timber textures and affective feelings.

2. Experimental Plan

A psychophysical experiment was carried out. Thirty participants (15 males and 15 females) took part in this experiment, each participant was asked to assess the 14 timber textures on 13 affective scales. The 14 textures were selected from the frequently used timber textures in the field of interior design, as shown in Figure 1.

During experiment, each timber texture was displayed in a 10 cm × 10 cm square shape and presented in a viewing cabinet illuminated by D65 simulator with a luminance level of around 200 cd/m². The viewing distance was about 45cm from each participant’s eyes to the texture with a 0/45 illumination/viewing geometry. In the experiment, the textures were judged using a 7-step scale in relation to the affective scales by each participant. Each participant assessed each texture on 13 affective scales, including “hard-soft”, “complex-simple”, “elegant-vulgar”, “light-heavy”, “luxury-economic”, “rough-smooth”, “active-passive”, “regular-casual”, “geometric-organic”, “expensive-cheap”, “cool-warm”, “happy-sad”, and “like- dislike”.



Figure 1: The 14 selected timber textures.

3. Participant repeatability and accuracy

In prior to analyze the obtained data, the participant repeatability and accuracy were examined by using RMS (Root Mean Square). The former one is to confirm if the participant can make consistent judgments, the latter one is to see how well the individual participant agrees with mean results. The RMS equals $\sqrt{(X_i - Y_i)^2/n}$, where X_i and Y_i are two data arrays and n is the number of data. For RMS of 0, it represents a perfect agreement between these two data arrays.

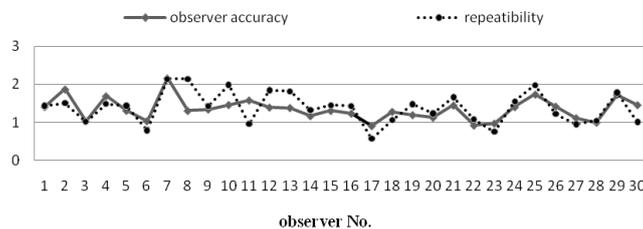


Figure 2: The participant accuracy and repeatability.

The results of repeatability and participant accuracy are illustrated in Figure 2. It can be seen that some participants' repeatability in RMS units was higher than RMS of 2.0, i.e., Participant 7, 8, 10 and 25. This reflected these participants provided inconsistent affective judgments during the experiment. Hence, Participant 7, 8, 10 and 25 were excluded from the following analysis.

The rest of 26 participants' affective judgments were averaged to represent the visual results of affective feelings for timber textures. The resulting accuracy was appeared to be lower than RMS of 2.0, indicating the 26 participants' affective judgments agree with the visual results.

4. Results

To see the relationship between 14 affective scales, the visual results were analyzed by the principle component analysis. The results showed that three affective factors were identified to describe the affective feelings of timber textures, as given in Table 1.

Table 1: The results of principle component analysis. The three factors account for 78.5% of the total variance.

Factor name	Comfort	Pattern	Attitude
% of variance	58.7%	10.7%	9.1%
Vulgar-Elegant	0.95	0.03	-0.17
Rough-Smooth	0.93	0.27	-0.13
Sad-Happy	0.91	0.36	0.03
Dislike-Like	0.87	0.07	-0.39
Light-Heavy	-0.85	-0.29	0.30
Simple-Complex	-0.83	0.14	0.52
Hard-Soft	0.81	0.53	0.04
Cool-Warm	0.61	0.59	0.09
Regular-Casual	0.09	0.93	0.18
Organic-Geometric	-0.22	-0.74	0.40
Passive-Active	0.04	0.45	0.81
Economical-Luxurious	-0.61	-0.03	0.78
Cheap-Expensive	-0.18	-0.35	0.67

The findings are described in the following. Note that the factor name could be arbitrary.

1. The first factor accounted for 58.7% of total variance. This factor was closely related to the affective scales of “vulgar-elegant”, “rough-smooth”, “sad-happy”, “dislike-like”, “hard-soft”, “light-heavy”, “simple-complex” and “cool-warm”. All these related affective scales pointed to “comfort” feeling. The “comfort” feeling can be described by “vulgar” and “elegant” on the two ends of factor, because it was the highest related scale.
2. The second factor, accounting for 10.7% of the total variance, was associated with “regular-casual” and “organic-geometric”. It is clear to correlate to texture pattern, named “pattern”. It can be described by “regular” and “casual” on the two ends of factor. .
3. The third factor, accounting for 9.1% of the total variance, consisted of “passive-active”, “economical-luxurious” and “cheap-expensive”. These three scales were related to “attitude”. This factor was described by “passive” and “active” on the two ends.

Furthermore, to understand the relationship between the affective factors and the textures, the most straightforward way is to see how these textures distribute in the affective feelings space, constructed by the three affective factors. The factor scores for each texture were used as coordinates to locate the textures in the affective space. Meanwhile the cluster analysis was carried out. The results showed that the textures can be categorized into four groups, as shown in Figure 3. The affective feelings for each group were summarized below:

1. Group 1 tended to be “regular”, “vulgar” and “active” feelings. Most textures in this group were Sandalwood.
2. Group 2 had “casual” and “active” feelings. Only one texture was in this group. This texture was

Campeachy wood, that is reddish texture.

3. The textures in Group 3 delivered the “passive”, “vulgar” and “casual” feeling. Most textures in this group were Teakwood.
4. Group 4 tended to be “elegant” feeling. The textures in this group were Doughwood and Cypress.

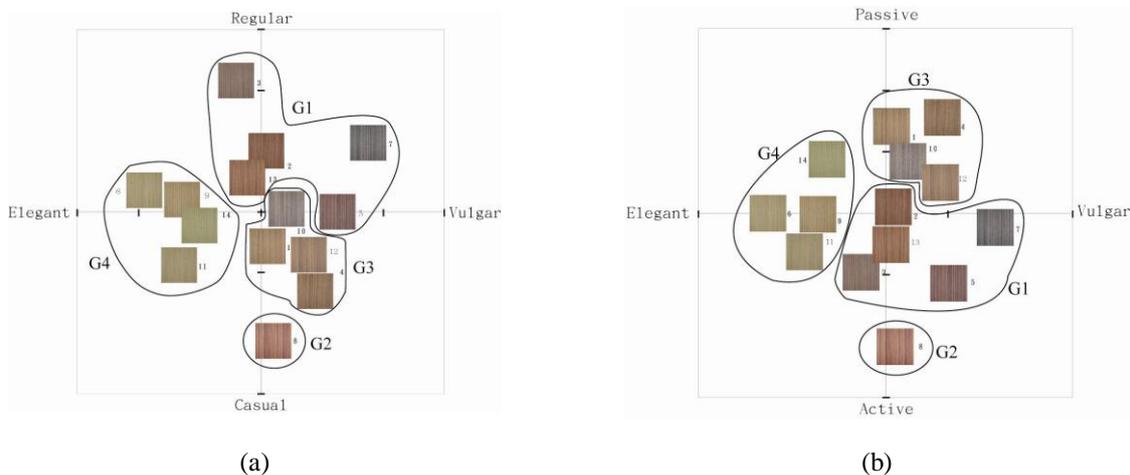


Figure 3: The three-dimensional affective space of timber texture, built by three affective factors, “pleasure”, “pattern” and “attitude”.

5. Conclusion

The current paper aims to understand the affective feelings of timber textures. Thirty participants took part in the experiment to judge 14 timber texture on 13 affective scales. The results showed that three factors were identified to describe the affective feelings of timber texture. They were “comfort”, “pattern” and “attitude” factors. It was found that the texture of Sandalwood delivered the “regular”, “vulgar” and “active” feelings. The reddish textures tended to have “casual” and “active” feelings. The Teakwood’s textures were “passive”, “vulgar” and “casual”. The texture of Doughwood and Cypress had “elegant” feeling.

Reference

1. Choo S, Kim Y. Effect of Color on Fashion Fabric Image. *Color Research and Application* 2003;28, No. 3:221-226.
2. Lee W, Sato M. Visual Perception of Texture of Textiles. *Color Research and Application* 2001;26(6):469-477.
3. Xin JH, Shen H, Lam CC. Investigation of Texture Effect on Visual Colour Difference Evaluation. *Color Research and Application* 2005;30, No.5:341-347.
4. Hollins M, Bemsmaia S, Karlof K, Young F. Individual differences in perceptual space for tactile textures: Evidence from multidimensional scaling. *Perception & Psychophysics* 2000;62:1534-1544.
5. Hollins M, Faldowski R, Rao S, Young F. Perceptual dimensions of tactile surface texture: A multidimensional scaling analysis. *Perception & Psychophysics* 1993;54:697-705.
6. Picard D, Dacremont C, Valentin D, Giboreau A. Perceptual dimensions of tactile textures. *Acta Psychologica* 2003;114:165-184.