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THE RELATIONSHIP BETWEEN EYEBROWS POSITION, SHAPE AND HUMAN MOOD

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ABSTRACT

Eyebrows with different shapes present different feelings and signal information. People have many shapes of eyebrows including long, short, curved, straight, slanting, caret-like, single and large-gap brows. Eyebrows are the most subtle body language (involuntary body language) and appear to describe people's mood and character. Eyebrows position and shape give impression and tell different information. Therefore, we investigate the relationship between eyebrows position, shape and human mood. We use the sorting method in KANSAI engineering to analyze the eyebrows. First, we defined 17 variances constituting the brows head, the brows peak and brows tail to describe all kind of eyebrow. Second, by using KJ method to classify 88 vocabularies, human moods are classified into 3 image vocabularies, "gentle", "depressed" and "resolute". Third, according to the above 3 image vocabularies and 49 eyebrows sample pictures, invited subjects are categorized into 9 groups. Finally, the numerical material will be put in SPSS to carry on the multiple regression analysis. We got the following results. The higher emergence degree (not obvious

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boundary) and the higher brows give the gentle feeling for human. The lower brows, the higher eyebrows tail, the thicker eyebrows color and the higher eyebrows peak (it is farther to eye) give the resolute feeling for human. The higher brow and the higher emergence degree will give the depressed feeling for human.

Keywords: *Eyebrows, human mood, KJ Method, Grouping Method*

1. INTRODUCTION

People are born with eyebrows which express a person's emotion. Through eyebrow and facial expression, others could sense our mood before the laugh(sound), anger (sound/movement), sorrow(tear) and happiness(movement). If we say face is a painting, then eyes are the finishing touch, and the two simple line eyebrows set off the eyes. The eyebrows have direct influence on the entire face and distinguish the virtuous and the foolish. Therefore, the eyebrow plays an important part in this virtual world. At the same time, the eyebrows are also expressing a person's moral behavior, sentimental trend and the destiny. Thin and flat eyebrows which girls very yearned for are delicate and artistic.

Feser(2007) brings up "Attractiveness of Eyebrow Position and Shape in Females Depends on the Age of the Beholder". Young subjects (below 30 years old) like the low position eyebrow except arch-type eyebrow. Old subjects (above 50 years old) have the opposite result.

Kunjur(2006) studied the eyebrow and the eyelid position about three kind of groups(Caucasian, Chinese and Indian) and quantification eyebrow and eyelid's position. They try to discover whether to have the remarkable difference in these groups.

What kind of eyebrow can give gentle, depressed and resolute feeling for human? Whether has the concrete value to explain? At the same time, we also want to understand the relationship between eyebrow and face. These are the subjects to be studied in this research.

First, we collect samples, choosing 25 male and 24 female's eyebrows from 100 pictures and use the sorting method in KANSAI engineering to define the eyebrow. Second, for discussing the relationship between eyebrow and eye, we use KJ method to classify 88 vocabularies and human moods are classified into 3 image vocabularies, "gentle", "depressed" and "resolute". Third, according to the above 3 image vocabularies and 49 eyebrows sample pictures, invited subjects are categorized into 9 groups. Finally, the numerical material put in SPSS to carry on the multiple regression analysis induces the mood vocabulary that can conform the eyebrow.

2. RESEARCH PROCEDURE AND ANALYSIS

2.1. Introduction of KJ method

KJ method was proposed by Japanese scholar Jirou Kawakita in 1964. It collected the unknown question and opinions. Using its intrinsic reciprocity makes the classification diagram. In order to reorganizes the mentality from the complex phenomenon. It was a way that can find out and solve the question.

2.2. Introduction of grouping method

Grouping method (Classification) is a supervised learning. The material category which we want to observe is assigned. Previously, we know the classified standard and the training sample respective category. According to the person's mood, the eyebrows are classified. It may discover the eyebrows type that belongs to which mood.

2.3. Introduction of multiple regression analysis

Multiple regression analysis is the simple correlation in extended application. To understand the linear relation between a group forecast variable and a sign variable. The predictive ability in each forecast variable is an important reference for researchers.

The following is the procedure and analysis in this case. As shown in Figure 1.

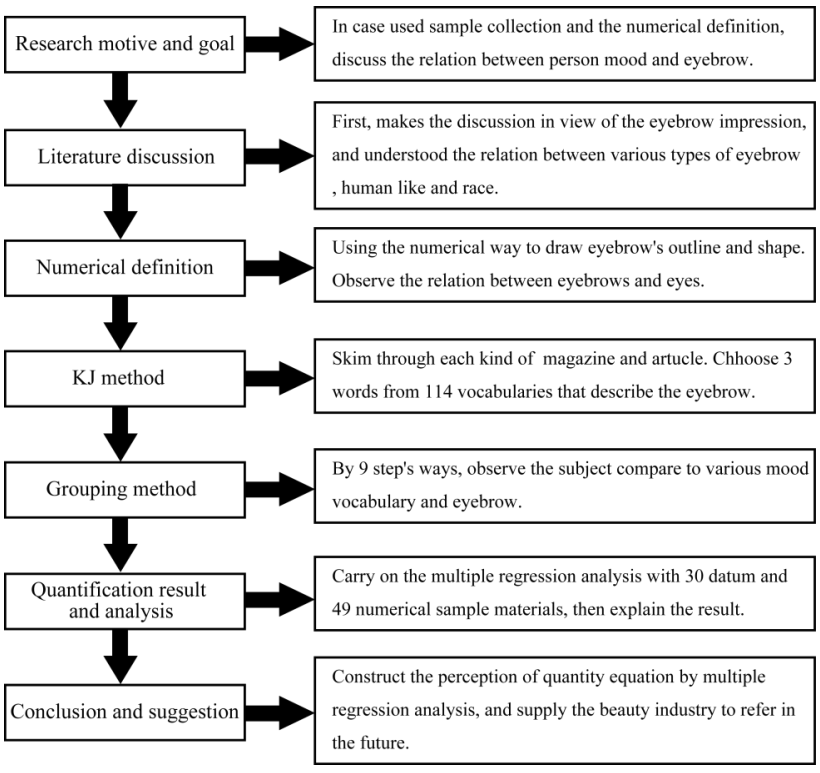

Figure 1: Research procedure and analysis.

3. EXPERIMENTAL FRAMEWORK

In this study, we use sample collection. After eliminating the picture's saturation, adjusting the same size (only retaining eye and eyebrow part), removing the slanting face, fuzzy and similar eyebrow pictures, 49 sample charts remained finally.

3.1. Numerical definition

First, we draw the eyebrow's outline and modeling, observe the eyebrow's thickness (depth and density), and try to make out the distant relation between eyebrows and eyes. In eyebrow shape description, we take two interior angles, level lines and the face center traces of line as zero points. We record the five X, Y coordinate value with high brow, low brow, high eyebrow peak, low eyebrow peak and eyebrow tail. Then we use 3D software (Rhino) to draw an arc that between two control dots which bulge the outside of eyebrow, R (radius) is + and which concave the inside of eyebrow, R (radius) is -.

In eyebrow thick description, we fill in the different gray scale color in the eyebrow contour line (80%、60%、55%) and match up the emergence effect (pixel) to process. We can look at the effect as shown in Figure 2.

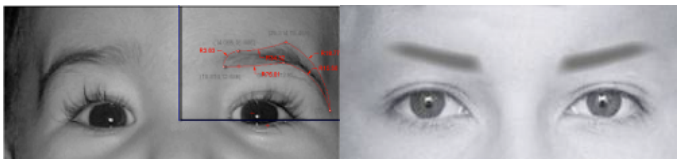

Figure 2: Numerical definition in eyebrow's outlook and thick.

We have five X, Y coordinate value with high brow, low brow, high eyebrow peak, low eyebrow peak and eyebrow tail, five arc R (radius), eyebrow thick (gray scale) degree (%) and emergence effect (pixel). Totally, there have 17 variation values. As shown in Table 1.

Table 1: The material value about sample 1~10.

Num.	X1	Y1	X2	Y2	X3	Y3	X4	Y4	X5	Y5	R12	R23	R34	R45	R51	%	pixel
1	8.34	14.25	26.25	21.82	39.00	18.35	31.17	17.20	10.07	12.65	63.73	17.66	13.56	-104.89	1.61	80	13
2	10.80	12.87	29.58	19.61	39.07	14.25	30.57	15.91	13.01	10.61	48.78	18.35	-18.96	-71.43	2.19	85	7
3	7.72	12.31	27.98	18.23	37.43	11.17	27.98	12.83	9.69	10.44	32.85	12.07	-75.70	-96.17	1.86	85	8
4	8.75	13.01	24.33	22.25	33.78	15.92	24.85	17.99	10.51	11.24	53.24	16.04	46.94	-37.53	2.55	85	7
5	9.07	13.24	28.09	18.83	39.61	13.92	29.25	15.56	10.64	10.86	57.57	20.38	-32.55	-146.02	2.38	90	11
6	9.40	15.46	26.85	17.71	35.78	12.59	26.17	14.57	8.24	10.28	41.79	10.31	-28.14	-134.64	4.26	50	6
7	7.27	14.26	28.32	20.18	36.53	12.60	26.45	15.61	9.93	11.25	55.74	9.73	-19.42	-244.99	3.21	65	13
8	9.97	12.81	27.22	19.38	38.92	11.80	27.81	16.35	11.23	9.19	48.74	19.38	-19.30	-49.94	4.07	80	6
9	5.80	9.28	24.00	16.16	37.50	12.21	26.12	11.05	9.14	6.82	52.72	31.05	24.97	-90.82	2.71	100	10
10	10.91	20.22	34.22	23.01	37.36	14.02	30.00	15.24	10.92	11.29	-69.65	-13.24	-16.29	-47.89	4.65	80	9

3.2. Vocabulary screening

Reviewing the magazines, past literature material, articles and the brainstorming between our members and we collect 114 words that can describe the eyebrows.

After replacing the vocabulary which has negative meaning and deleting the vocabulary which is controversial (some adjectives is not suitable to use in describing the eyebrow), 88 vocabularies retained finally. By the KJ method, reorganizing 88 vocabularies become the nine representative categories. As shown in Figure 3. “Gentle”, “depressed” and “resolute” is the image vocabulary in ultimate analysis.

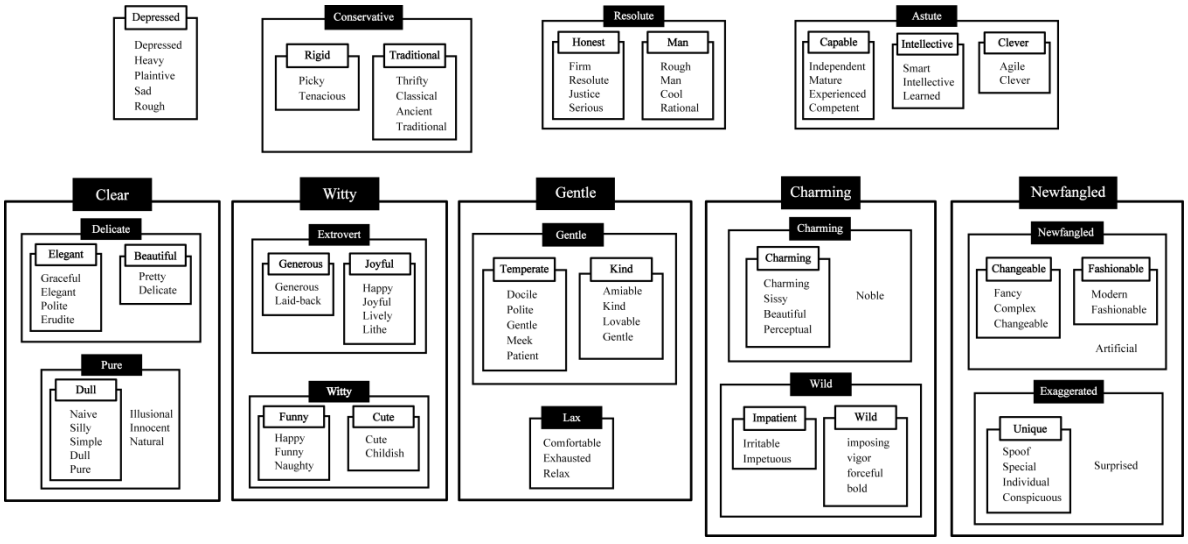

Figure 3: The representative vocabulary in KJ method.

3.3. Grouping method

After determining the adjective vocabulary that can describe the eyebrow and avoiding the different sample eyes that will influence measuring to judge the impression of eyebrow, we use an eye sample as our base map which is neutrality and has no intense image. We put the 49 eyebrows on the same eye which was draw up by the numerical definition. As shown in Figure 4.

Figure 4: The 49 sample pictures use in experiment.

We prepared 49 sample pictures and spent a week inviting 30 subjects on grouping method experiment. Considering "gentle", "depressed" and "resolute" three vocabularies, the 49 sample pictures hive off. The sample picture got 9 point if the picture conforms to the vocabulary most, in order of progressive decreasing. Each subject will carry on the grouping experiment three times and one subject spent 30~40 minutes.

3.4. Multiple regression analysis

After averaging 30 subject's score in 3 vocabularies, statistics software SPSS performs the multiple regression analysis with 49 numerical sample pictures. The model we decide to use depend on the R value and CI (collinearity)($R>0.7$, $CI<30$). If it is very difficult to determine the model, we join the variable Sig value as the reference. The result and illustration in three kinds of vocabularies are as follow.

3.4.1. Gentle, as shown in Table 2~3.

From the CI result, we decided to use model 3 and take the emergence degree, brow R, and the density as variable. The following is the final equation.

Gentle score = 9.999 + 0.303 (emergence degree) - 0.515 (brow R) - 0.079 (density)

(1) In gentle eyebrows, the brow's curve radians are more smooth and the eyebrow boundaries are not too clear.

(2) In unkind eyebrows, the Y under the brow and the gentle feeling are related, but the Y under the eyebrow peak displays the inverse correlation. The higher the brows are the less gentle human feel.

Table 2: The table about gentle eyebrow in multiple regression analysis-1.

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.988	.794		2.504	.016		
	emergence degree	.276	.073	.480	3.786	.000	1.000	1.000
2	(Constant)	3.328	.755		4.405	.000		
	emergence degree	.301	.063	.523	4.768	.000	.991	1.009
	brow R	-.424	.101	-.460	-4.191	.000	.991	1.009
3	(Constant)	9.999	1.703		5.873	.000		
	emergence degree	.303	.054	.527	5.602	.000	.991	1.009
	brow R	-.515	.089	-.559	-5.771	.000	.933	1.072
	density	-.079	.019	-.409	-4.237	.000	.941	1.063
4	(Constant)	14.813	2.533		5.848	.000		
	emergence degree	.275	.053	.478	5.222	.000	.944	1.060
	brow R	-.646	.100	-.701	-6.466	.000	.671	1.489
	density	-.092	.019	-.477	-4.986	.000	.863	1.158
	Y under peak	-.210	.085	-.268	-2.467	.017	.670	1.492
5	(Constant)	14.849	2.396		6.198	.000		
	emergence degree	.223	.054	.387	4.127	.000	.803	1.245
	brow R	-.604	.096	-.656	-6.299	.000	.651	1.535
	density	-.091	.018	-.473	-5.224	.000	.863	1.159
	Y under peak	-.330	.094	-.420	-3.523	.001	.496	2.016
	Y under brow	.189	.075	.279	2.509	.016	.573	1.745

a. Dependent Variable: Gentle

Table 3: The table about gentle eyebrow in multiple regression analysis-2.

Collinearity Diagnostics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	emergence degre	brow R	density	Y under peak	Y under brow
1	1	1.959	1.000	.02	.02				
	2	.041	6.924	.98	.98				
2	1	2.812	1.000	.01	.01	.02			
	2	.149	4.346	.04	.13	.91			
	3	.039	8.493	.95	.86	.06			
3	1	3.770	1.000	.00	.01	.01	.00		
	2	.167	4.744	.00	.04	.88	.01		
	3	.057	8.139	.02	.92	.00	.05		
	4	.006	26.168	.98	.03	.11	.95		
4	1	4.717	1.000	.00	.00	.01	.00	.00	
	2	.192	4.961	.00	.01	.57	.00	.01	
	3	.069	8.248	.00	.84	.02	.01	.04	
	4	.019	15.865	.00	.06	.04	.32	.38	
	5	.003	40.950	1.00	.10	.36	.67	.57	
5	1	5.659	1.000	.00	.00	.00	.00	.00	.00
	2	.221	5.064	.00	.00	.48	.00	.00	.02
	3	.070	9.012	.00	.73	.04	.00	.02	.00
	4	.035	12.731	.01	.00	.15	.12	.00	.50
	5	.013	20.767	.00	.16	.00	.22	.49	.47
	6	.003	45.013	.99	.10	.33	.66	.49	.01

a. Dependent Variable: Gentle

3.4.2. Resolute

From the CI result, we decide to use model 5 and take the Y on eyebrow tail, the density and the Y under brow as variable. The following is the final equation.

Resolute score = 1.327 + 0.25 (eyebrow tail Y) + 0.064 (density) - 0.429 (under brow Y)

In resolute eyebrow, the eyebrow peak is high, the brow is near the eye, and the bilateral eyebrows are more closely. From the X distance on eyebrow peak, we find that the distance from brow to eyebrow peak is long and the eyebrow tail is short. In addition, the straight eyebrow also will give the human resolute feeling.

3.4.3. Depressed

By the CI result and Sig value, we decide to use model 3 and take the Y on brow, the Y on eyebrow tail and the Y under eyebrow peak as variable. The following is the final equation.

Depressed score = 1.790 + 0.546 (brow Y) - 0.244 (under eyebrow peak Y) - 0.141 (eyebrow tail Y)

In depressed eyebrow, the biggest influence is the brow value. The more far the brow leaves the eye, the more depressed human get. When the eyebrow peak is low or the eyebrow tail is low and long, it also gives the human depressed feeling.

4. DISCUSSION AND CONCLUSION

4.1. Conclusion

In this study we use sample collection, number definition analysis and nature hiving off. We compare the eyebrows shape, thickness, position with person's impression and utilize multiple regression analysis and KJ method to obtain the following conclusion.

(1) By the numerical definition, eyebrow shape description and the X, Y coordinate axis recording, we may investigate the distance between eyebrow and eye. We can define the value clearly and adjust arc after putting R in the 3D software (radius). In eyebrow thickness description, it is very nature, due to only filling one layer in the color region (there has no question about the color sub-area boundary).

(2) We use the grouping method to be the grading standard. Because the grouping method hives off the result by nine steps, it can operate by many subjects at the same time.

(3) Finally, the stepwise regression in the multiple regression analysis displays the important degree between variation values and vocabularies. The significance is generally high in the result (this method could select the variable).

(4) Moreover, in the SPSS result, the beta value is affected by the variable. Even if the beta value is small but the variable is big, it also can't neglect. Therefore it is more accurate to make the independent variable Sig value to be the main comparison scope (<0.05).

4.2. Suggestion

In this study, due to the limitation of the research time, there has not been able to do the value definition analysis in depth. In the future, we hope carry on the depth analysis with the eyebrow, the human expression and obtain the more concrete reference and essential factor for beauty industry. There have several suggestions to be improved.

(1) Regarding the value definition, in the eyebrow arcs angle of intersection place will possibly present the sharp angle. It looks not very smooth.

(2) Filling in the color to annotate eyebrow's density is unable to describe the eyebrow when the eyebrow is uneven distribution.

(3) When we observe the sample pictures and think that thickness, emergence degree and resolute feeling are related, the result in the multiple regression analysis is unanticipated.

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